BIDDING INSTRUCTIONS
&
FORMS

Central Junior High Classroom Addition
400 N. Broadway Ave.
Moore, OK 73160

OMNI CONSTRUCTION
1909 S Eastern Ave. Moore, OK 73160

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Central Junior High Classroom Addition
400 N. Broadway Ave.
Moore, OK 73160

Division 0
Bidding Instructions
&
Forms

ARCHITECT OF RECORD:

AGP–the Abla Griffin Partnership, LLC
313 SE 5th Street Moore, OK 73160
405-735- 3477

CONSTRUCTION MANAGER:

OMNI Construction, LLC
1909 S. Eastern Ave. Moore, OK73160
405- 735-3992

DOCUMENT 100

SOLICITATION FOR BIDS

(BID NOTICE)

Sealed proposals will be received by the Board of Education, Independent School District No. I-002, Moore, Cleveland County, Oklahoma, at the Moore Public Schools Administration Service Center, 1500 SE 4th Street, Moore, Oklahoma, until 2:00 P.M., Central Standard Time, on Wednesday , the 20th day of August 2025, at which time said bids will be opened for furnishing all labor and materials for the construction of the Central Junior High Classroom Addition including the following Bid Packages:

Bid Package 1 – Demolition
Bid package 1A – Sitework
Bid Package 2 – Concrete
Bid Package 3 – Masonry
Bid Package 4 – Metal (Material Only)
Bid Package 4A Metal (Erect Only)
Bid Package 5 – Wood & Plastic
Bid Package 6 – Thermal & Moisture Protection
Bid Package 7 – Doors & Hardware
Bid Package 7A – Entrances & Storefronts
Bid Package 8 – Drywall & Ceiling System
Bid Package 9 – Specialties (Accessories)
Bid Package 10 – Flooring
Bid Package 11 – Painting
Bid Package 12 – Fire Suppression
Bid Package 13 – Mechanical
Bid Package 14 – Plumbing
Bid Package 15 – Electrical/Cabling/IT
Bid Package 16 – Utilities
Bid Package 17 – Landscaping & Irrigation
Bid Package 18 – Asphalt Paving

Bids received more than ninety-six (96) hours, excluding Saturdays, Sundays, and holidays, before the time set for opening bids, as well as bids received after the time set for opening bids, will not be considered, and will be returned unopened.
Bids will be publicly opened and read aloud at the above-mentioned office immediately following the closing time stated above.

Complete sets of General Conditions, Plans, and Specifications, and other bidding documents may be obtained through OMNI Construction, LLC, and the RPG Plan Room.

OMNI Construction
1909 S. Eastern Ave.
Moore, OK 73160
405-735-3992
www.omnioklahoma.com

RPG Plan Room
www.rpgplanroom.com

A cashier's check, a certified check, or a surety bond in the amount of five percent (5%) of the bid shall accompany the sealed proposal of each bidder if the proposal has a value greater than $50,000.00. Bid Guarantees will be returned to the unsuccessful bidders.

The Board of Education reserves the right to accept or reject any and all bids.

The period in which a contract will be executed following award to the successful bidder will not exceed thirty (30) days.

DOCUMENT 200

INSTRUCTIONS TOBIDDERS

To be considered, bids must be made in accordance with these instructions to bidders.

Section 1 Solicitation

1) Bid Submission
2) Intent
3) Work identified in the Contract Documents
4) Contract Time

Section 2 Bid Documents and Contract Documents

1) Definitions
2) Contract Documents Identification
3) Availability
4) Examination
5) Queries/Addenda
6) Product Substitution

Section 3 Site Assessment

1) Site Examination

Section 4 Qualifications

1) Evidence of Qualifications
2) Subcontractors/Suppliers/Others

Section 5 Bid Submission

1) Submission Procedure
2) Bid Ineligibility

Section 6 Bid Enclosure/Requirements

1) Security Deposit
2) Performance Assurance
3) Bid Form Requirements
4) Bid Form Signature

Section 7 Offer Acceptance/Rejection

1) Duration of Offer
2) Acceptance of Offer

Section 1-
SOLICITATION

1.1) BID SUBMISSION

A. Sealed proposals will be received by the Board of Education, Independent School District No. I-002, Moore, Cleveland County, Oklahoma, at the Moore Public Schools Administration Service Center, 1500 SE 4th Street, Moore, Oklahoma, until 2:00 P.M., Central Standard Time, on Wednesday, the 20th day of August 2025, at which time said bids will be opened for furnishing all labor and materials for the complete construction of the Central Junior High Classroom Addition project.

Bid Packages: **Bid Package 1 –** Demolition
Bid Package 1A - Sitework
Bid Package 2 – Concrete
Bid Package 3 – Masonry
Bid Package 4 – Metal (Material Only)
Bid Package 4A – Metal (Erect Only)
Bid Package 5 – Wood & Plastic
Bid Package6 – Thermal& Moisture Protection
Bid Package7 –Doors & Hardware
Bid Package 7A – Entrances & Storefronts
Bid Package 8 – Drywall & Ceiling System
Bid Package 9 – Specialties (Accessories)
Bid Package 10 – Flooring
Bid Package 11 – Painting
BidPackage12 – Fire Suppression
Bid Package 13 – Mechanical
Bid Package 14– Plumbing
Bid Package 15 – Electrical/Cabling/IT
Bid Package 16 – Utilities
Bid Package 17 – Landscaping & Irrigation
Bid Package 18 – Asphalt Paving

B. Bids received more than ninety-six (96) hours, excluding Saturdays, Sundays, and holidays, before the time set for opening bids, as well as bids received after the above time set for opening bids, will not be considered, and will be returned unopened.

C. All forms identified in Section 300 shall be properly filled out and notarized.

D. Bids will be publicly opened and read aloud at the above-mentioned office immediately following the closing time stated above.

E. Amendments to submitted Bids will be permitted when received in writing prior to bid deadline and when endorsed by the same party or parties who signed and sealed the Bid.

F. Bidders may withdraw their Bid written request at any time before bid deadline.

1.2) INTENT

A. The purpose of this bid request is to obtain an offer to perform work to complete the construction of the Central Junior High Classroom Addition, 400 N. Broadway Ave., Moore, OK, & 73160, for a Stipulated Price contract, in accordance with the Contract Documents.

B. The Owner has contracted with OMNI Construction to act as Construction Manager for the total Project. Selected parts of the work of the Project may be completed by the Construction Manager and other parts may be contracted by acceptance of public bids.

1.3) WORK IDENTIFIED IN THE CONTRACT DOCUMENTS

A. Work of this proposed Contract comprises of bid package 1 thru 18 as noted in the Bid Manual
B. The Scope of the work consists of furnishing all labor and materials for the complete construction, in accordance with the Contract Documents,
C. The Base Proposal shall include all work as described in the Drawings, Project Manual and bid day instructions and forms. Each trade shall be responsible for reviewing all sheets identified in the plan set and work that may pertain to their respected bid package.

1.4) CONTRACT TIME

A. Construction Start Date = 9/15/2025
B. Construction Completion Date = 9/15/2026

Section 2
BID DOCUMENTS AND CONTRACT DOCUMENTS

2.1) DEFINITIONS

A. Bid Documents: Project Plans, Project Manual, Bidding Instructions and Forms.
B. Bid: Executed Bid Form and required attachments submitted in accordance with these Instructions to Bidders.
C. Bid Price: Monetary lumpsum identified by the Bidder in the Bid Form.

2.2) CONTRACT DOCUMENTS IDENTIFICATION

A. The Contract Documents (Drawings and Project Manual) are identified as prepared by the Architect, AGP – the Abla Griffin Partnership, LLC, and identified in their respective Table of Contents.

2.3) AVAILABILITY

A. Refer to section 2.4 - for availability of drawings.

2.4) EXAMINATION

A. Bid Documents are on display at the offices of the following construction association plan room facilities:
   [1] OMNI Construction LLC. 1909 S. Eastern Ave. Moore, OK 73160 405-735-3992
   www.omnioklahoma.com

   [2] RPG Plan Room
   www.rpgplanroom.com

B. Upon receipt of Bid Documents verify that documents are complete. Notify the Architect or Construction Manager, OMNI Construction, LLC, should the documents be incomplete.

C. Immediately notify the Architect or Construction Manager upon finding discrepancies or omissions in the Bid Documents.

2.5) QUERIES/ADDENDA

A. Direct questions to AGP – the Abla Griffin Partnership L.L.C., 313 SE 5th Street, Moore, Oklahoma 73160, 405-735-3477 or AGP@theAGP.net. OMNI Construction, LLC, PO Box 892245 Oklahoma City, OK 73189, 405-735-3992 or omniconstructionllc@coxinet.net.

B. Verbal answers are not binding on any party.

C. Submit questions not less than 3 days before date set for receipt of Bids. Replies will be made by Addenda.

D. Addenda may be issued during the Bidding period. Addenda become part of the Contract Documents. Include resultant costs in the Bid Price.

E. List any addenda received on the Bid Form. Failure to receive any addenda shall not release the bidder from any obligations under his bid.

2.6) PRODUCT SUBSTITUTION

A. Where the Bid Documents stipulate a particular Product, substitutions will be considered by the Architect up to seven (7) days before receipt of Bids.

B. With each substitution request, provide sufficient information for architects to determine acceptability of proposed products.

C. When a request to substitute a Product is made, the architect may approve the substitution. Approved substitutions will be identified by Addenda.

D. In submission of substitutions to products specified, Bidders shall include in their Bid, any changes required in the Work to accommodate such substitutions. Later claims by the Bidder for an addition to the Contract Time or Contract Sum/Price because of changes in Work necessitated by use of substitutions shall not be considered.

Section 3
SITE ASSESSMENT

3.1) SITE EXAMINATION

A. Examine the project site before submitting a Bid.

B. Each bidder shall carefully examine the project site, compared it to the Drawings and Project Manual, including all Addenda, and satisfied themself as to the existing conditions under which their trade will be required to work, or that will affect the work under this contract.

C. No allowances will be made on behalf of the Contractor for any error or negligence in determining these existing conditions. By submission of a bid on this project, the bidders agree to accept the existing project site in its present condition.

D. All site visits shall be scheduled though the Project Manager of record, OMNI Construction, LLC 405-735-3992.

Section 4
QUALIFICATIONS

4.1) EVIDENCEOF QUALIFICATIONS

A. To demonstrate qualifications for performing the Work of this Contract, Bidders may be required to submit in writing evidence of financial position, previous experience, and current commitments. The financial statement shall reflect the true financial condition of the bidder within three months prior to the date of the bid opening. To be eligible for the Contract a bidder, must be able to show his financial ability to carry on work until such time as he receives the first payment on the Contract agreement, and to finance the work between payments until the project is complete and accepted by the Owner.

4.2) SUBCONTRACTORS/SUPPLIERS/OTHERS

A. The Owner reserves the right to reject a proposed Subcontractor for a reasonable cause.
B. Refer to OMNI Construction's Master Service Agreement when OMNIs Construction Manager.

Section 5
BID SUBMISSION

5.1) SUBMISSION PROCEDURE

A. Bidders shall be solely responsible for the delivery of their Bids in the manner and time prescribed.
B. **Submit one copy of the executed offer on the Bid Forms provided, signed, and sealed with the required security in a closed opaque envelope, clearly identified with Bidder's name, project name, Owner's name, Bid Manual 1, Bid Package Number and Description, and Bid Date on the outside of the envelope.**
C. Contents of the Proposal Packet:
   1. Complete Bid Forms(Document 300).
   2. Non-collusion Affidavit signed and notarized.
   3. Non-Kickback Affidavit signed and notarized.
   4. Affidavit of Asbestos Free Materials and Construction signed and notarized.
   5. Non-Sex Offender Affidavit signed and notarized.
   6. Business Relationship Affidavit signed and notarized.
   7. A cashier's check, a certified check, or surety bond.
D. An abstract summary of submitted Bids will be made available to all Bidders following Bid opening.

5.2) BID INELIGIBILITY

A. Bids that are unsigned, improperly signed or sealed, conditional, illegible, obscure, contain arithmetical errors, erasures, alterations, or irregularities of any kind, may be declared unacceptable at Owner's discretion.
B. Bid Forms, Appendices, and enclosures which are improperly prepared may, at the discretion of the Owner, be declared unacceptable.
C. Failure to provide security deposit, bonding or insurance requirements will be at the discretion of the Owner, invalidate the Bid.

Section 6
BID ENCLOSURES/REQUIREMENTS

6.1) SECURITY DEPOSIT

A. Bids shall be accompanied by a security deposit if the proposal has a value greater than $50,000.00 for a sum not less than five percent (5%) of the Bid Price/Sum submitted, as a guarantee that the successful bidder will properly execute a Contract and file performance assurance bonds within seven (7) days of the date of notification of award, as follows:
   1. Bid Bond or
   2. Certified or cashier's check.

B. Should the successful bidder fail to enter into a Contract Agreement or to comply with the specified requirements, the bidder's check or bond will become the property of the Owner as liquidated damages, but not as penalty.

C. Endorse the Bid Bond in the name of the Owner as obliged, signed, and sealed by the Contractor as principal and the Surety. Surety Bonds shall be issued by a surety licensed to conduct business in the State of Oklahoma and shall be accompanied by the bond agent's power-of-attorney.

D. Endorse the certified or cashier's check in the name of the Owner.

E. The security deposit will be returned after delivery to the Owner of the required Performance and Statutory Payment Bonds by the accepted Bidder.

F. The security deposit will be returned after delivery to the Owner of the required Performance and Labor and Material Payment Bond(s) by the accepted Bidder.

G. Include the cost of Bid Security in the Bid Price.

H. After a bid has been accepted, all securities will be returned to the respective Bidders and other requested enclosures.

I. If no contract is awarded, all security deposits will be returned.

6.2) PERFORMANCE ASSURANCE

A. Accepted Bidder: Provide Performance and Statutory Bonds in one hundred percent (100%) of the contract amount covering faithful performance of the contract, and payment of all obligations arising there- thereunder will be required by the Owner.

B. Provide a Defect Bond in the amount of one hundred percent (100%) of the contract amount covering defective workmanship and materials for a period of one year after the acceptance of the project.

C. Include the cost of performance assurance bonds in the Bid Price.

D. Oklahoma law allows substitution of an Irrevocable Letter of Credit is included herewith. One such letter shall be required for each of the bonds noted above.

E. The Construction Manager reserves the right to enforce or waive the surety bond requirements.

6.3) BID FORMREQUIREMENTS

A. Complete all requested information in Section 300 of the Bidding Instructions and Forms.

6.4) BID FORMSIGNATURE

A. The Bid Form shall be signed by the Bidder, as follows:
   1. Sole Proprietorship: Signature of sole proprietor in the presence of a witness who will also sign. Insert the words "Sole Proprietor" under the signature.
   2. Partnership: Signature of all partners in the presence of a witness who will also sign. Insert the word "Partner" under each signature.

3. Corporation: Signature of a duly authorized signing officer(s) in their normal signatures. Insert the officer's capacity in which the signing officer acts, under each signature. Affix the corporate seal. If the Bid is signed by officials other than the President and Secretary of the company, or the President/Secretary/Treasurer of the company, a copy of the by-law resolution of the Board of Directors authorizing them to do so, must also be submitted with the Bid Form in the Bid Envelope.
4. Joint Venture: Each party of the joint venture shall execute the Bid Form under their respective seals in a manner appropriate to such party as described above, similar to the requirements of a Partnership.

Section 7
OFFER ACCEPTANCE/REJECTION

7.1) DURATION OFOFFER

A. Bids shall remain open to acceptance and shall be irrevocable for a period of thirty (30) days after the Bid closing date.

7.2) ACCEPTANCEOF OFFER

A. The Owner reserves the right to acceptor reject any or all bids, orto accept any bid he considers advantageous and to waive formalities and irregularities.
B. The Owner reserves the right to disqualify bids, before and after opening, upon evidence of collusion with intent to defraud or other illegal practices upon the part of the bidder.
C. The contract will be awarded based on the lowest responsible bid.
D. In case of a difference in written words and figures on the Bid Form, the amount stated in written words shall govern.
E. After acceptance by the Owner, the Architect, on behalf of the Owner, will issue to the successful Bidder, a written Notice to Proceed.
F. The time Period within which a contract will be executed following award to the successful bidder will not exceed thirty (30) days.
G. In the event of a tie bid the coin toss method will be administered by the Construction Manager to determine the successful bidder.

DOCUMENT 300

BID FORMS

PROJECTNAME: Central Junior High Classroom Addition

DATE OF BID OPENING: _____

COMPANY NAME: _____
COMPANY ADDRESS: _____
CONTACT NAME: _____
TELEPHONE NUMBER: _____
FAX NUMBER: _____
EMAIL ADDRESS: _____

PACKAGENO./ DESCRIPTION	COMPLETEDESCRIPTIONAS TO SCOPE OF WORK	AMOUNT

****Any proposal containing clarifications or exclusions shall not be considered.**

Base Bid: _____(Written Words)

$_____(Numeric Form)

IT IS UNDERSTOOD THE BASE BID DOES NOT INCLUDETHE COST OF THE PERFORMANCE BOND COVERING 100% OF THE COTRACT AMOUNT. PRIOR TO AWARD, THE OWNER AND CONTRACTORRESERVE THE RIGHT TO ADD A PERFORMANCE BOND FROM THE TRADE CONTRCT AGREEMENT. PLEASE INDICATE THE FOLLOWING INFORMATION WITH REGARDS TO YOUR PERFORMANCE BOND:

PERFORMANCEBOND RATE (%):_____

COSTOFPERFORMANCE BOND ($):_____(Dollars)

Alternates:

Description of Alternate: _____

Add or Deduct: _____

**Please note that any and all items of the given package which are not specifically excluded in the bid document will be considered to be a part of the bid package.

SIGNATUREOFBIDDINGPARTY DATE

By initialing the line next to each item below you are acknowledging that you have included the following items:

_____ A cashier's check, a certified check, or a surety bond if bid is $50,000 or greater.

_____ Non-Collusion Affidavit (Signed and Notarized)

_____ Non-Kickback Affidavit (Signed and Notarized)

_____ Affidavit of Asbestos Free Materials and Construction (Signed and Notarized)

_____ Non-Sex Offender Affidavit (Signed and Notarized)

_____ Business Relations Affidavit (Signed and Notarized)

_____ Acknowledge receipt of Addenda Numbers through issued for bidding.

_____ Reviewed **ALL** plan sheets, plan notes, & project specifications.

SUBMITTED BY:

COMPANY NAME: _____

FULLPRINTED NAME: _____

SIGNATURE: _____

DATE: _____

300-1

NON-COLLUSION AFFIDAVIT

STATEOF_____)

)ss.

COUNTYOF _____)

_____, of lawful age, being first duly sworn on oath says that(s)he is the agent authorized by the bidder to submit the attached bid. Affiant further states that the bidder has not been a party to any collusion among bidders in restraint of freedom of competition by agreement to bid at a fixed price or to refrain from bidding; or with any state official or employee as to quantity, quality or price in the prospective contract, or any other terms of said prospective contract; or in any discussions between bidders and any state official concerning exchange of money or other things of value for special consideration in the letting of contract.

SIGNATURE: _____

Subscribed and sworn to me before this _____ day of _____, 20____

_____
Notary Public

My Commission Expires:

_____

300-2

NON-KICKBACK AFFIDAVIT

COMPANYNAME: _____

As required by Oklahoma State Statutes, Title 62, § 310.9, any contract for $25,000.00 or more for the purchase of materials, goods, or services, must be accompanied by the signed statement described below. Please sign this statement as indicated below and return to Moore Public Schools at the address shown below.

MOOREPUBLIC SCHOOLS
Attn: Purchasing Department
1500 S.E. 4th Street
Moore,OK 73160-8232

The undersigned (architect, contractor, supplier, or engineer), of lawful age, being first duly sworn on oath says that this contract is true and correct. Affiant further states that the (work, services, or materials) will be (completed or supplied) in accordance with the plans, specifications, orders, or requests furnished the affiant. Affiant further states that (s)he has made no payment directly or indirectly to any elected official, officer, or employee of the State of Oklahoma, any county or local subdivision of the state, of money or any other thing of value to obtain or procure the contract or purchase order.

_____
(Signature of contractor, supplier, engineer, or architect)

Subscribed and sworn to me before this _____ day of _____, 20___

_____
Notary Public

My Commission Expires: _____

300-3

NON-ASBESTOS AFFIDAVIT

STATE OF OKLAHOMA_____)

SS)

COUNTYOF _____)

_____, of lawful age, being first duly sworn, on oath says that (s)he is the agent authorized by bidder to submit the attached bid. Affiant further states that the bidder has not included as a part of the bid and will not include in the finished construction, nor will said bidder allow any subcontractor or workman to include in the finished construction, any material which contains asbestos in any form in the amount equal to or in excess of the one percent (1%) by weight or volume.

SIGNATURE: _____

Subscribed and sworn to me before this _____ day of _____, 20_____

_____

Notary Public

Mycommission Expires:

_____

3004

NON-SEX OFFENDER AFFIDAVIT

The undersigned, _____ represents that he/she is the owner or an officer of _____, who has the authority to make this declaration to Moore Public Schools, as required by Section 6-101.48 of Title 70 of the Oklahoma Statutes.
I declare that no employee on school premises during normal working hours under the authority of the above-named company or business has been convicted in the State, the United States, or another state of any se offense subject to the sex Offenders Registration Act or is subject to other states or the federal sex offender registration provisions.

I further declare that no employee working on school premises during normal working hours under the authority f the above-named company or business has been convicted of a felony offense within the past ten (10) years in this State the United States, or another state.

I further understand that Title 57, Oklahoma Statutes, Section 589 provides as follows, to wit:
It is unlawful for any person registered pursuant to the Sex Offenders Registration Act to work with or provide services to children or to work on school premises, or for any person or business who offers or provides services to children or contracts for work to be performed on school premises to knowingly and willfully allow any employee to work with children or to work on school premises who is registered pursuant to the Sex Offenders Registration Act. Upon conviction for any violation of the provisions of the subsection, the violator shall be guilty of a misdemeanor punishable by a fine not to exceed One Thousand Dollars ($1,000.00). In addition, the violator may be liable for civil damages.

Dated this_____ day of_____, 20__

Vendor / Contractor's Name and Address

_____
_____
_____

_____
Authorized Signer

Subscribed and sworn to me before this _____ day of _____, 20____

_____
Notary Public

My Commission Expires:

_____

300-5

Business Relations Affidavit

State of _____

)ss.

County of _____

_____, of lawful age, being first duly sworn on oath that (s)he is the agent authorized by the bidder to submit the attached bid. Affiant further states that the nature of any partnership, joint venture, or other business relationship presently in effect of which existed within one (1) year prior to the date of this statement which the architect, engineer, or other part of the project is as follows:

_____

_____

Affiant further states that any such business relationship presently in effect or which existed within one (1) year prior to the date of this statement between any official or director of the architectural or engineering firm or any other party to the project is as follows:

_____

_____

Affiant further states that the names of all persons who have any such business relationship and the positions they hold with their respective companies or firms are as follows:

_____

_____

(If none of the business relationships hereinabove mentioned exists, affiant should so state)

Name:_____

Title:_____

Subscribed and sworn before me this_____day of_____, 20___

_____

Notary Public

My Commission Expires:_____

300-6

DOCUMENT 400
GENERALBID PACKAGE ITEMS

Each Bid Package shall include, but is not necessarily limited to the following General Bid Package Items:

Section1-
General

A. Subcontractor acknowledges that they have performed an onsite investigation, if desired, of the site conditions and acknowledges that all activities must be performed in close coordination with other Subcontractors. The Subcontractor shall be responsible for all means and methods for performing the work according to the contract documents, site conditions, and all applicable codes.

B. The subcontractor shall comply with all provisions of the OMNI Construction contract, insurance, safety, and EEOC requirements.

C. In addition to the Conditions of Specification, drawings, submittals, and Closeout Submittals the Subcontractor shall provide the following:

- Each Submittal shall be submitted under separate coversheets indicating the specific Specification Section to which it pertains.
- The subcontractor shall submit three (3)hard copies and one (1) digital copy of each submittal.
- Subcontractor shall submit two (2) hardcopies and one (1) digital copy of Close-out Documents.

a. Subcontractor shall be responsible for timely submission of all submittals, including but not limited to: shop drawings, samples, product data sheets MSDS information, and all other submittals required by the contract documents.

b. Miscellaneous– This contract will be provided by OMNI Construction. All warranties and guarantees are to be transferred to Owner at the completion of this project.

c. Subcontractor shall sequence work as directed by OMNI without exception.

d. All correspondence for this project shall be directed to the designated Project Manager – OMNI Construction.

e. Coordination– Subcontractor shall have a designated Project Superintendent who will regularly attend construction meetings as required involving this project. The Superintendent/representative attending the meeting shall have the authority and ability to make binding commitments regarding the timing of the performance of Subcontractor's work. Subcontractor, Field Project Manager or Superintendent may not be changed without mutual agreement with OMNI Construction. Subcontractors shall attend all schedule related meetings to coordinate access to work areas with the other Subcontractors, OMNI Construction and Owner work forces that are on site.

f. The subcontractor shall engage a qualified surveyor to establish exact points to act as working points as needed. The subcontractor shall include the cost to resurvey as needed to establish final dimensions and protect and maintain working points and survey control points from disturbance caused during construction. Construction Manager will provide two (2) Benchmarks to establish the layout.

g. The subcontractor shall include all layout and field dimensions associated with this work.

h. The subcontractor shall coordinate delivery of materials. Subcontractors shall provide equipment and personnel necessary to unload, stack, and store onsite. The subcontractor shall inventory all delivered items and inspect for damage or missing items. Any damaged or missing items shall be noted on the Bill of Lading. The subcontractor shall notify suppliers and arrange for replacement items to be shipped. Subcontractor shall file all damage claims with insurance carriers. Placement of staged items shall be coordinated with OMNI Construction.

i. Subcontractor shall be responsible for any damage caused by the Subcontractor to any adjoining areas that remain.

j. Subcontractor shall pay for all repairs to other Subcontractor's work damaged by contractor's personnel, suppliers, or subcontractors during construction.

k. Subcontractor shall be responsible for daily clean-up to include but not limited to: Removal and/or proper storage of tools, equipment, and materials as required by the Construction Manager, disposal of scrap and waste material, and the sweeping of any dust and dirt generated by construction activities, including general foot traffic of the subcontractor. All debris will be removed from the working area and deposited in the dumpster or proper location by the subcontractor, as directed by the Construction Manager.

l. The subcontractor is responsible for the proper backfill and testing of work put in place by the subcontractor in accordance with specification section 02200 Earthwork.

m. Subcontractor is responsible for fire caulking and sealing of all penetrations, with an equal fire rating to that of the wall being penetrated by the subcontractor's work.

Section 2- <u>Project Schedule</u>

Project Sequence: Bidders will be required to adhere to the project schedule, which will be provided by OMNI Construction. Work will be performed as required to meet the overall completion date.

A. The Subcontractor agrees that it will provide adequate manpower to complete the Subcontractor's Work in accordance with the time established by the Schedule during regular working hours. The Schedule is based on a 40-hour work week. The Work Week is Monday – Friday, from 7:00 a.m. – 4:00 p.m. It shall be the Subcontractor's responsibility to meet the Schedule. Any cost associated with additional manpower and or overtime hours required to meet the schedule are the responsibility of the Subcontractor. In addition, the Subcontractor will be liable to the Construction Manager in connection with any overtime required to meet the schedule due to Subcontractor's inability to meet the schedule during regular hours, including but not limited to, additional supervision and a reasonable markup for overhead and profit.

B. Off hour and or Overtime may be required to complete select activities as may be directed by the Construction Manager and or Owner to meet the need of the school. These activities will be scheduled in advance.

C. It shall be the responsibility of Subcontractor to provide in writing the following information on a weekly basis, in order to update the Master Project Schedule:

- Detailed Schedule including activities, anticipate durations and man loading.
- Subcontractor daily report shall be submitted to OMNI Project Superintendent
- Planned crew size and man-hours by week.
- Actual crew size and man-hours expended by week.
- Planned units by week.
- Actual units installed by week.

D. Subcontractor shall provide an estimated man-loading curve for the duration of the project. This curve will be used as a guide for man loading throughout project. Subcontractor shall coordinate with OMNI Construction to refine the schedule for manpower loading and timely completion of the project. This responsibility will be ongoing as updates are required.

Section3- Safety

3.1 The subcontractor shall implement a safety program meeting or exceed the requirements set forth by OSHA.

3.2 High visibility clothing and proper PPE will be required100% of the time for the duration of this project.

DOCUMENT 500
BID PACKAGE 1-18

BID PACKAGE 1: DEMOLITION

Project: **Central Junior High Classroom Addition**
Location: **400 N. Broadway Ave., Moore, OK 73160**

Specification Section	Description	
Division 0	Bidding& Contract Documents	Complete
Division 1	General Requirements	Complete
Section 02910	Temporary Erosion Control	Complete
Section 024116	Demolition	Complete
Section 311000	Site Clearing	Complete

This bid package shall include all labor, materials, equipment, services, insurances, and incidentals for the DEMO/SITEWORK BID PACKAGE, including work from referenced specifications and other work normally associated with this trade.

The scope of work shall include all General Bid Package Items as listed in section 400 of Division 0 of the bid manual and shall also include, but not be limited to the following items:

1. Furnish labor, materials, and equipment necessary to complete demo/sitework.
2. Testing to be paid for by others, but to be coordinated by contractor.
3. Include all dewatering required to perform this scope of work.
4. All miscellaneous equipment and materials required for the proper completion of this scope of work.
5. The subcontractor is to ensure that all elevated work areas are made ready to protect all areas below and have OSHA approved fall protection for work to proceed.

BID PACKAGE 1A:SITEWORK

Project: **Central Junior High Classroom Addition**

Location: **400 N. Broadway Ave., Moore, OK 73160**

Specification Section	Description	
Division 0	Bidding& Contract Documents	Complete
Division 1	General Requirements	Complete
Section 02920	Landscape Grading (Finish Grade)	Complete
Section 312000	Earth Moving	Complete

This bid package shall include all labor, materials, equipment, services, insurances, and incidentals for the DEMO/SITEWORK BID PACKAGE, including work from referenced specifications and other work normally associated with this trade.

The scope of work shall include all General Bid Package Items as listed in section 400 of Division 0 of the bid manual and shall also include, but not be limited to the following items:

1. Furnish labor, materials, and equipment necessary to complete demo/sitework.
2. Testing to be paid for by others, but to be coordinated by contractor.
3. Include all dewatering required to perform this scope of work.
4. All miscellaneous equipment and materials required for the proper completion of this scope of work.
5. The subcontractor is to ensure that all elevated work areas are made ready to protect all areas below and have OSHA approved fall protection for work to proceed.
6. Provide construction entrance as set forth in specifications.

BID PACKAGE 2: CONCRETE

Project: **Central Junior High Classroom Addition**

Location: **400 N. Broadway Ave., Moore, OK 73160**

Specification Section	Description	
Division 0	Bidding& Contract Documents	Complete
Division 1	General Requirements	Complete
Section 03300	Cast-In-Place Concrete	Complete
Section 06100	Rough Carpentry	As Applicable to Concrete
Section 07200	Insulation	As Applicable to Concrete
Section 07900	Sealants	As Applicable to Concrete
Section 313116	Termite Control	As Applicable to Concrete
Section 321313	Concrete Paving Curb and Sidewalk	Except for Asphalt Paving Area
Section 321373	Concrete Paving Joint Sealants	Except for Asphalt Paving Area

This bid package shall include all labor, materials, equipment, services, insurances, and incidentals for the CONCRETEBID PACKAGE, including work from referenced specifications and other work normally associated with this trade.

The scope of work shall include all General Bid Package Items as listed in section 400 of Division 0 of the bid manual and shall also include, but not be limited to the following items:

1. Furnish and install all concrete.
2. Furnish and install all rebar, dowels, and accessories associated with concrete. Furnish and maintain all rebar caps on dowels until next trade begins tie in. **(Rebar associated with Masonry will be provided and installed in Masonry Bid package.)**
3. Furnish and install all required formwork.
4. Excavate, fill and grade subgrade as required for all concrete work.
5. Furnish all sand& gravel base required for concrete work.
6. Include all necessary layout and surveying from a provided benchmark for concrete work.
7. Include all termite treatments.
8. Testing to be paid for by others but coordinated by contractor.
9. Include all concrete related weather and temperature protection and additives.
10. Include all dewatering required to perform this scope of work.
11. Include concrete repairs including but not limited to patching, rubbing, grinding, fill, sandblast, and caulk as indicated on the drawings and specifications.

12. Furnish and install board insulation under slab and at foundation perimeter per plans and specifications.

13. All miscellaneous equipment and material required for the proper completion of this scope of work.

14. The subcontractor is to ensure that all elevated pours are made ready to protect all areas below and have OSHA approved fall protection for work to proceed.

15. Furnish and install sidewalks/paving as detailed.

16. Subcontractor is responsible for and must provide their own disposal for washout and concrete debris waste.

17. Clean your work area daily.

BID PACKAGE 3: MASONRY

Project: **Central Junior High Classroom Addition**

Location: **400 N. Broadway Ave., Moore, OK 73160**

Specification Section	Description	
Division 0	Bidding& Contract Documents	Complete
Division 1	General Requirements	Complete
Section 04810	Unit Masonry Assemblies	Complete
Section 05500	Metal Fabrications	As Applicable to Masonry

This bid package shall include all labor, materials, equipment, services, insurances, and incidentals for the MASONRY BID PACKAGE, including work from referenced specifications and other work normally associated with this trade.

The scope of work shall include all General Bid Package Items as listed in section 400 of Division 0 of the bid manual and shall also include, but not be limited to the following items:

1. Furnish and install all necessary materials to complete masonry work, inclusive of rebar related to masonry scope of work.
2. Provide all necessary equipment and materials required for completion of this scope of work.
3. Subcontractor to ensure that all elevated work areas are made ready to protect all areas below and have OSHA approved fall protection for work to proceed.
4. Install loose steel lintels over openings.
5. Subcontractor is responsible for and must provide their own disposal for masonry/brick debris waste.
6. Clean your work area daily.

BID PACKAGE 4:METALS (MATERIAL ONLY)

Project: **Central Junior High Classroom Addition**

Location: **400 N. Broadway Ave., Moore, OK73160**

Specification Section	Description	
Division 0	Bidding& Contract Documents	Complete
Division 1	General Requirements	Complete
Section 05120	Structural Steel	Material Complete
Section 05210	Steel Joists	Material Complete
Section 05310	Metal Deck	Material Complete
Section 05500	Metal Fabrications	As per plans and applicable

This bid package shall include all material, equipment, services, insurances, and incidentals for the METAL (MATERIAL ONLY) BID PACKAGE, including work from referenced specifications and other work normally associated with this trade.

The scope of work shall include all General Bid Package Items as listed in section 400 of Division 0 of the bid manual and shall also include, but not be limited to the following items:

1. Supply all structural steel framing, joist, and steel decking.
2. Supply all anchors for embedding into concrete.
3. Supply all anchors for embedding into masonry.
4. Supply all bridging and seats.
5. Supply all bearings and angles.
6. Supply all lintels.
7. Supply all internal & external handrails.
8. Supply all required fasteners to include but not limited to bolts, nuts, lag bolts, machine screws, plain washers, drilled-in expansion bolts, toggle bolts, epoxy, anchors, screens, and concrete inserts as indicated in the documents.
9. Include delivery of all material associated with this bid package. Delivery must be coordinated with the Construction Manager and steel erector.
10. Supply all seismic bracing steel.

BID PACKAGE 4A:METAL (ERECTION ONLY)

Project: **Central Junior High Classroom Addition**
Location: **400N. Broadway Ave., Moore, OK73160**

Specification Section	Description	
Division 0	Bidding& Contract Documents	Complete
Division 1	General Requirements	Complete
Section 05120	Structural Steel	as Applicable to Erection
Section 05210	Steel Joists	as Applicable to Erection
Section 05310	Metal Deck	as Applicable to Erection
Section 05500	Metal Fabrications	as Applicable to Erection

This bid package shall include all equipment, services, insurances, and incidentals for the METAL (ERECTION ONLY) BID PACKAGE, including work from referenced specifications and other work normally associated with this trade.

The scope of work shall include all General Bid Package Items as listed in section 400 of Division 0 of the bid manual and shall also include, but not be limited to the following items:

1. Supply all labor, tools, and equipment needed to erect the structural steel framing, joist, and steel decking.

2. Work with superintendent and(metal)material provider regarding the delivery of materials.

3. Clean work areas daily.

BID PACKAGE 5:WOOD & PLASTIC

Project: **Central Junior High Classroom Addition**

Location: **400N. Broadway Ave., Moore, OK73160**

Specification Section	Description	
Division 0	Bidding& Contract Documents	Complete
Division 1	General Requirements	Complete
Section06100	Rough Carpentry	As applicable to custom casework/millwork
Section 06200	Finish Carpentry	As applicable to custom casework/millwork
Section 06300	Wood Treatment	As applicable to custom casework/millwork
Section 06410	Custom Casework	As applicable to custom casework/millwork
Section 06420	Custom Laminate Casework (Contractor Option)	As applicable to custom casework/millwork

This bid package shall include all labor, materials, equipment, services, insurances, and incidentals for the WOODS & PLASTICS BID PACKAGE, including work from referenced specifications and other work normally associated with this trade.

The scope of work shall include all General Bid Package Items as listed in section 400 of Division 0 of the bid manual and shall also include, but not be limited to the following items:

1. Furnish and install all necessary materials to complete carpentry work.

2. Provide all necessary equipment and materials required for the proper completion of this scope of work.

3. Subcontractor to ensure that all elevated work areas are made ready to protect all areas below and have OSHA approved fall protection for work to proceed.

BID PACKAGE 6:THERMAL& MOISTURE PROTECTION

Project: **Central Junior High Classroom Addition**

Location: **400N. Broadway Ave., Moore, OK73160**

Specification Section	Description	
Division 0	Bidding& Contract Documents	Complete
Division 1	General Requirements	Complete
Section 07100	Waterproofing	Complete
Section 07150	Damp proofing	Complete
Section 07200	Insulation	Complete except as to concrete, roofing and interior finish
Section 07840	Firestopping	Complete
Section 07900	Sealants	Complete except for concrete

This bid package shall include all labor, materials, equipment, services, insurances, and incidentals for the THERMAL & MOISTURE PROTECTION BID PACKAGE, including work from referenced specifications and other work normally associated with this trade.

The scope of work shall include all General Bid Package Items as listed in section 400 of Division 0 of the bid manual and shall also include, but not be limited to the following items:

1. Furnish and install necessary materials to complete the waterproofing/insulation/firestopping work.
2. Provide all necessary equipment and materials required for completion of this scope of work.
3. Subcontractor to ensure that all elevated work areas are made ready to protect all areas below and have OSHA approved fall protection for work to proceed.
4. Clean your work area daily.

BID PACKAGE 7:DOORS & HARDWARE(MATERIAL ONLY)

Project: **Central Junior High Classroom Addition**

Location: **400N. Broadway Ave., Moore, OK73160**

Specification Section	Description	
Division 0	Bidding& Contract Documents	Complete
Division 1	General Requirements	Complete
Section 06100	Rough Carpentry	As applicable to this bid package
Section 06200	Finish Carpentry	As applicable to this bid package
Section 06300	Wood Treatment	As applicable to this bid package
Section 08100	Metal Doors and Frames	As applicable to this bid package
Section 08200	Wood Doors	As applicable to this bid package
Section 08310	Tornado Doors	As applicable to this bid package
Section 08700	Finish Hardware	As applicable to this bid package

This bid package shall include all labor, materials, equipment, services, insurances, and incidentals for the DOORS/HARDWARE BID PACKAGE, including work from referenced specifications and other work normally associated with this trade.

The scope of work shall include all General Bid Package Items as listed in section 400 of Division 0 of the bid manual and shall also include, but not be limited to the following items:

1. Furnish all wood and metal doors, frames and hardware per plans and specifications installation by others.

BID PACKAGE 7A:ENTRANCES & STOREFRONTS

Project: **Central Junior High Classroom Addition**

Location: **400 N. Broadway Ave., Moore, OK 73160**

Specification Section	Description	
Division 0	Bidding & Contract Documents	Complete
Division 1	General Requirements	Complete
Section08400	Entrances & Storefronts	Complete
Section08800	Glazing	Complete

This bid package shall include all labor, materials, equipment, services, insurances, and incidentals for the SPECIALTIES (ACCESSORIES) BID PACKAGE, including work from referenced specifications and other work normally associated with this trade.

The scope of work shall include all General Bid Package Items as listed in section 400 of Division 0 of the bid manual and shall also include, but not be limited to the following items:

1. Furnish all labor, materials, and hardware necessary per the plans and specifications to complete this scope of work.

BID PACKAGE 8:DRYWALL & CEILING SYSTEM

Project: **Central Junior High Classroom Addition**

Location: **400 N. Broadway Ave., Moore, OK73160**

Specification Section	Description	
Division 0	Bidding& Contract Documents	Complete
Division 1	General Requirements	Complete
Section 05400	Cold Formed Metal Framing	Complete
Section 06100	Rough Carpentry	As applicable to this bid package
Section 06200	Finish Carpentry	As applicable to this bid package
Section 06300	Wood Treatment	As applicable to this bid package
Section 07200	Insulation	As applicable to this bid package
Section 09120	Ceiling Suspension Systems	Complete
Section 09250	Gypsum Wallboard	Complete
Section 09500	Acoustic Treatment	Complete

This bid package shall include all labor, materials, equipment, services, insurances, and incidentals for the FINISHES (CEILING SYSTEM) BID PACKAGE, including work from referenced specifications and other work normally associated with this trade.

The scope of work shall include all General Bid Package Items as listed in section 400 of Division 0 of the bid manual and shall also include, but not be limited to the following items:

1. Furnish labor, materials, and equipment necessary to complete the ceiling system/finish framing/sheetrock.

2. Provide and install all wood blocking and insulation.

3. All miscellaneous equipment and material required for the proper completion of this scope of work.

4. The subcontractor is to ensure that all elevated work is made ready to protect all areas below and have OSHA approved fall protection for work to proceed.

5. Clean your work area daily.

BID PACKAGE 9:SPECIALTIES (ACCESSORIES)

Project: **Central Junior High Classroom Addition**

Location: **400 N. Broadway Ave., Moore, OK73160**

Specification Section	Description	
Division 0	Bidding& Contract Documents	Complete
Division 1	General Requirements	Complete
Section 10100	Chalkboards and Tackboards	Complete
Section 10520	Fire Protection Specialties	Complete
Section 10800	Toilet and Bath Accessories	Complete

This bid package shall include all labor, materials, equipment, services, insurances, and incidentals for the SPECIALTIES (ACCESSORIES) BID PACKAGE, including work from referenced specifications and other work normally associated with this trade.

The scope of work shall include all General Bid Package Items as listed in section 400 of Division 0 of the bid manual and shall also include, but not be limited to the following items:

1. Furnish all materials necessary for installation of accessories per the plans and specifications, installation to be provided by others.

BID PACKAGE 10: FLOORING

Project: **Central Junior High Classroom Addition**

Location: **400 N. Broadway Ave., Moore, OK 73160**

Specification Section	Description	
Division 0	Bidding & Contract Documents	Complete
Division 1	General Requirements	Complete
Section 09300	Tile	Complete
Section 09650	Resilient Tile Flooring	Complete
Section 09681	Carpet Tile	Complete

This bid package shall include all labor, materials, equipment, services, insurances, and incidentals for the FLOORING BID PACKAGE, including work from referenced specifications and other work normally associated with this trade.

The scope of work shall include all General Bid Package Items as listed in section 400 of Division 0 of the bid manual and shall also include, but not be limited to the following items:

1. Furnish labor, materials, and equipment necessary to complete flooring.
2. All miscellaneous equipment and material required for the proper completion of this scope of work.
3. Clean your work area daily.
4. Provide floor testing prior to installation and is to be performed by an independent 3rd party tester.

BID PACKAGE 11: PAINTING

Project: **Central Junior High Classroom Addition**

7Location: **400 N. Broadway Ave., Moore, OK73160**

Specification Section	Description	
Division 0	Bidding& Contract Documents	Complete
Division 1	General Requirements	Complete
Section 09900	Painting	Complete

This bid package shall include all labor, materials, equipment, services, insurances, and incidentals for the PAINTING BID PACKAGE, including work from referenced specifications and other work normally associated with this trade.

The scope of work shall include all General Bid Package Items as listed in section 400 of Division 0 of the bid manual and shall also include, but not be limited to the following items:

1. Furnish labor, materials, and equipment necessary to complete painting.
2. Provide all miscellaneous equipment and material required for the proper completion of this scope of work.
3. The subcontractor is to include taping, bedding, & texture of drywall in this scope of work.
4. The subcontractor is to ensure that all elevated work is made ready to protect all areas below and have OSHA approved fall protection for work to proceed.
5. Clean your work area daily.
6. All areas required to be tested prior to beginning the paint application.

BID PACKAGE 12:FIRE SUPRESSION

Project: **Central Junior High Classroom Addition**

Location: **400 N. Broadway Ave., Moore, OK73160**

Specification Section	Description	
Division 0	Bidding& Contract Documents	Complete
Division 1	General Requirements	Complete
Section 210100	Fire Protection Operating & Maintenance Manuals	Complete
Section 210500	Fire Protection General Provisions	Complete
Section 210510	Fire Protection Contract Quality Control	Complete
Section 210512	Fire Protection Shop Drawings, Coord Drawings & Product Data (with local municipalities of jurisdiction)	Complete
Section 211000	Fire Sprinkler Systems	Complete

This bid package shall include all labor, materials, equipment, services, insurances, and incidentals for the FIRE SUPPRESION BID PACKAGE, including work from referenced specifications and other work normally associated with this trade.

The scope of work shall include all General Bid Package Items listed in section 400 of Division 0 of the bid manual and shall also include, but not be limited to the following items:

1. Furnish all labor, materials and equipment necessary to complete this scope of work.
2. Provide all penetrations necessary, if needed to complete this scope of work.
3. The subcontractor is to ensure that all elevated work is made ready to protect all areas below and have OSHA approved fall protection for work to proceed.
4. Clean your work area daily.

BID PACKAGE 13: MECHANICAL

Project: **Central Junior High Classroom Addition**

Location: **400 N. Broadway Ave., Moore, OK 73160**

Specification Section	Description	
Division 0	Bidding & Contract Documents	Complete
Division 1	General Requirements	Complete
Section 230500	Mechanical General Provisions	Complete
Section 230512	HVAC Shop Drawings, Coordination Drawings & Product Data	Complete
Section 230513	Electrical Provisions of HVAC Work	Complete
Section 230514	HVAC Condensate Drain Piping System	Complete
Section 230593	Testing, Adjusting,& Balancing of Environmental Systems	Complete
Section 230713	External Duct Insulation	Complete
Section 230719	HVAC Piping Insulation	Complete
Section 232000	HVAC Pipe & Pipe Fittings - General	Complete
Section 232300	Refrigerant Piping and Appurtenances	Complete
Section 233113	Ductwork	Complete
Section 233416	Fans	Complete
Section 233713	Air Devices	Complete
Section 236300	Air-Cooled Condensing Units	Complete
Section 238217	Ducted Mini Splits DX Units	Complete
Section 238223	Gas Fired Furnace with DX Evaporator	Complete
Section 238239	Electric Unit Heaters	Complete

This bid package shall include all labor, materials, equipment, services, insurances, and incidentals for the MECHANICAL BID PACKAGE, including work from referenced specifications and other work normally associated with this trade.

The scope of work shall include all General Bid Package Items as listed in section 400 of Division 0 of the bid manual and shall also include, but not be limited to the following items:

1. Furnish labor, materials and equipment necessary to complete mechanical.
2. Testing to be coordinated by mechanical contractor.
3. All miscellaneous equipment and material required for the proper completion of this scope of work.
4. Coring, patching and caulking of penetrations required for this scope of work.
5. Subcontractor is to ensure that all elevated work is made ready to protect all areas below and have OSHA approved fall protection for work to proceed.
6. Clean your work area daily.
7. The contractor is to include all demo pertaining to this scope of work.

BID PACKAGE 14: PLUMBING

Project: **Central Junior High Classroom Addition**

Location: **400 N. Broadway Ave., Moore, OK 73160**

Specification Section	Description	
Division 0	Bidding & Contract Documents	Complete
Division 1	General Requirements	Complete
Section 220100	Plumbing Operating & Maintenance Manuals	Complete
Section 220500	Plumbing General Provisions	Complete
Section 220510	Plumbing Contract Quality Controls	Complete
Section 220512	Plumbing Shop Drawing, Coordination Drawings and Product Data	Complete
Section 220513	Electrical Provisions of Plumbing Work	Complete As Applicable to plumbing
Section 220515	Plumbing Earthwork	Complete
Section 220517	Plumbing Access Doors	Complete
Section 220519	Pressure & Temperature Instruments	Complete
Section 220523	Valves, Strainers& Vents	Complete
Section 220719	Plumbing Piping Insulation Plumbing	Complete
Section 220800	Plumbing Commissioning Coordination	Complete
Section 221116	Domestic Water Piping and Appurtenances	Complete
Section 221121	PEX Pipe and Fittings	Complete
Section 221123	Domestic Water Pumps	Complete
Section 221316	Soil, Waste and Sanitary Drain Piping Vent Piping and Appurtenances	Complete
Section 221413	Roof Drainage Piping and Appurtenances	Complete
Section 222000	Plumbing Pipe and Pipe Fittings – General	Complete
Section 223334	Electric Water Heater (Commercial-Non-ASME)	Complete
Section 223516	Instantaneous Gas-Fired Tankless Water Heaters	Complete
Section 224000	Plumbing Fixtures and Fixture Carriers	Complete
Section 226311	Gas Piping and Appurtenances	Complete
Section 226312	Liquefied Petroleum Gas System	Complete
Section 226313	Gas Detection System	Complete

This bid package shall include all labor, materials, equipment, services, insurances, and incidentals for the PLUMBING BID PACKAGE, including work from referenced specifications and other work normally associated with this trade.

The scope of work shall include all General Bid Package Items as listed in section 400 of Division 0 of the bid manual and shall also include, but not be limited to the follow items:

1. Provide all material, labor, and equipment required for proper installation of complete plumbing system.

2. All piping, fittings, valves, cleanouts, fixtures, and accessories as required for complete and proper installation of plumbing.

3. Any sleeves penetrations required in walls, floors, roof, etc. for this work including fire/smoke sealing inside and outside of sleeves and patching/fire caulking of the penetrations.

4. All supports, hangers and in-wall blocking required for this work.

5. All identification as called for and/or required per code.

6. Coring, patching and caulking of penetrations required for this scope of work.

7. Caulking of all fixtures.

8. Furnishing and installing all plumbing equipment.

9. Provide all necessary sleeving and or block-outs at CMU required for the proper installation of all plumbing systems included in this contract agreement. Contractor will provide adequate layout and coordination with the Masonry Contractor to ensure proper installation of the work.

10. All permits, fees and inspections as required.

11. All cutting and patching as required for the work of this proposal.

12. The subcontractor is responsible for backfilling and compaction per section00202.

13. All testing to be paid for by others and coordinated by subcontractor associated with backfilling and compaction.

14. The subcontractor is responsible for removal of excess spoils from site.

15. Subcontractor to coordinate with utilities subcontractor to tie into utilities.

16. The subcontractor shall furnish and install steel, lockable, and primed access panels in any location required to allow for proper access to the plumbing system. Access panels shall be large enough to accommodate easy access for repairs, maintenance, and inspection.

17. All penetrations through CMU walls must have block-outs. Core drilling will not be allowed.

18. Clean your work area daily.

19. The subcontractor is to connect to service hook ups.

BID PACKAGE 15: ELECTRICAL/CABLING/IT

Project: **Central Junior High Classroom Addition**

Location: **400 N. Broadway Ave., Moore, OK 73160**

Specification Section	Description	
Division 0	Bidding & Contract Documents	Complete
Division 1	General Requirements	Complete
Section 260500	Electrical General Provisions	Complete
Section 260509	Electric Utility Coordination and Service Entrance	Complete
Section 260512	Electrical Shop Drawings, Coordination Drawings and Product Data	Complete
Section 260516	Excavating, Backfilling and Compacting for Electrical	Complete
Section 260519	Conductors and Connectors – 600 Volt	Complete
Section 260526	Electrical Grounding	Complete
Section 260533	Conduit System	Complete
Section 260535	Electrical Connections for Equipment	Complete
Section 260537	Electrical Boxes and Fittings	Complete
Section 260538	Electrical Floor Boxes and Fittings	Complete
Section 260540	Electrical Gutters and Wireways	Complete
Section 260550	Firestops	Complete As Applicable to Electrical
Section 260944	Lighting Controls	Complete
Section 262416	Panelboards and Enclosures	Complete
Section 262773	Line Voltage Wiring Devices	Complete
Section 263213	Natural Gas Standby Gen Sets and Transfer Switch	Complete
Section 264300	Surge Protection Devices	Complete
Section 265113	Lighting Fixtures	Complete
Plan Sheets T000-T603	Technology	Complete

This bid package shall include all labor, material, equipment, services, insurances, and incidentals for the ELECRICAL/CABLING/IT BIDPACKAGE, including work from referenced specifications and other work normally associated with this trade.

The scope of work shall include all General Bid Package Items as listed in section 400 of Division 0 of the Bid Manual and shall also include, but not be limited to the following items:

1. Furnish and install the complete building and site electrical systems as specified.

2. Furnish, install, and coordinate all permanent fire alarm and communication systems.

3. Provide, coordinate, and maintain all temporary building/jobsite trailer and site electrical power and lighting services, including temporary construction facilities.

4. The subcontractor is responsible for coordinating all systems with the Fire Sprinkler, Mechanical, and Plumbing Contractors.
5. All associated inspections, permits, and required fees.
6. The subcontractor is responsible for all layout associated with this bid package.
7. Furnish and install all sleeves for associated electrical work.
8. The subcontractor is responsible for any and all wiring to others equipment.
9. The subcontractor is responsible for all fire-stopping where this scope of work creates penetrations.
10. Furnish and install all conduit and boxes for specification divisions 26000 through 28000.
11. Furnish and install all conduit and boxes for all mechanical controls systems.
12. Subcontractor shall furnish and install steel, lockable, and primed access panels in any location required to allow for proper access to the electrical system. Access panels shall be large enough to accommodate easy access for repairs, maintenance, and inspection.
13. Clean your work area daily.
14. The subcontractor is to include all demo pertaining to this scope of work.

BID PACKAGE 16: UTILITIES

Project: **Central Junior High Classroom Addition**
Location: **400 N. Broadway Ave., Moore, OK 73160**

Specification Section	Description	
Division 0	Bidding & Contract Documents	Complete
Division 1	General Requirements	Complete
Section 331000	Water Utilities	Complete
Section 333000	Sanitary Sewage Utilities	Complete
Section 334100	Storm Utility Drainage Piping	Complete

This bid package shall include all equipment, services, insurances, and incidentals for the METAL (ERECTION ONLY) BID PACKAGE, including work from referenced specifications and other work normally associated with this trade.

The scope of work shall include all General Bid Package Items as listed in section 400 of Division 0 of the bid manual and shall also include, but not be limited to the following items:

1. Furnish labor, material, and equipment necessary to complete this scope of work.
2. The subcontractor is to include the installation of the gas line in Civil plans
3. The subcontractor is to ensure that all elevated work is made ready to protect all areas below and have OSHA approved fall protection for work to proceed.
4. Clean work area daily.

BID PACKAGE 17:LANDSCAPE & IRRIGATION

Project: **Central Junior High Classroom Addition**
Location: **400 N. Broadway Ave.,Moore, OK73160**

Specification Section	Description	
Division 0	Bidding & Contract Documents	Complete
Division 1	General Requirements	Complete
Section02811	Underground Sprinkler System	Complete
Section02900	Trees and Turf	Complete
Section02920	Landscape Grading	As applicable to this scope of work
Section02970	Landscape Establishment	Complete
Section329200	Turf and Grasses	Complete

This bid package shall include all equipment, services, insurances, and incidentals for the METAL (ERECTION ONLY) BID PACKAGE, including work from referenced specifications and other work normally associated with this trade.

The scope of work shall include all General Bid Package Items as listed in section 400 of Division 0 of the bid manual and shall also include, but not be limited to the following items:

1 Furnish labor, material, and equipment necessary to complete this scope of work.
2 The subcontractor is to ensure that all elevated work is made ready to protect all areas below and have OSHA approved fall protection for work to proceed.
3 Clean work area daily

BID PACKAGE18:ASPHALT PAVING

Project: **Central Junior High Classroom Addition**
Location: **400 N. Broadway Ave., Moore, OK 73160**

	Description	
Division 0	Bidding & Contract Documents	Complete
Division 1	General Requirements	Complete
Section 321216	Asphalt Paving	Complete
Section 321236.13	Asphalt Seal and Fog Coat	Complete
Section 321313	Concrete Paving Curb & Sidewalk	Complete as applicable to asphalt paving area

This bid package shall include all equipment, services, insurances, and incidentals for the METAL (ERECTION ONLY) BID PACKAGE, including work from referenced specifications and other work normally associated with this trade.

The scope of work shall include all General Bid Package Items as listed in section 400 of Division 0 of the bid manual and shall also include, but not be limited to the following items:

1. Furnish labor, material, and equipment necessary to complete this scope of work.
2. The subcontractor is to ensure that all elevated work is made ready to protect all areas below and have OSHA approved fall protection for work to proceed.
3. The subcontractor is to include all concrete accessories located in paving area (curb & gutter, sidewalks, sealants, etc.)
4. Clean work area daily.

MOORE PUBLIC SCHOOLS
CENTRAL JUNIOR HIGH SCHOOL
CLASSROOM ADDITION

INDEPENDENT DISTRICT NO. 2
CLEVELAND COUNTY, MOORE, OKLAHOMA

400 NORTH BROADWAY
MOORE, OKLAHOMA 73160

PROJECT MANUAL

APRIL 2025

REVISED 6-24-25

AGP | the Abla Griffin Partnership

PROJECT MANUAL

APRIL 2025

MOORE PUBLIC SCHOOLS
CENTRAL JUNIOR HIGH SCHOOL
CLASSROOM ADDITION

INDEPENDENT DISTRICT NO. 2
CLEVELAND COUNTY, MOORE, OKLAHOMA

400 NORTH BROADWAY
MOORE, OKLAHOMA 73160

ARCHITECT:

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Dwayne McDonald Gordon
Mechanical Engineer
Salas O'Brien, LLC
OK 30822 / EXP 02.28.2026
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Engineer of Record
Division 26
Timothy Van Ostran
Electrical Engineer
Salas O'Brien, LLC
OK 32650 / EXP 03.31.2027
CA 7058 / EXP 06.30.2025

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END OF SECTION

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SPECIAL CONDITIONS

TIME FOR COMPLETION AND LIQUIDATED DAMAGES:

A. Upon execution of the contract agreement between the Owner and the Contractor, it shall become an obligation of the contractor to complete all work to be performed under this agreement for the Construction of the new Central Junior High School STEM Classroom Addition to be located at 400 North Broadway, Moore, OK - **within 365 Calendar Days.**

B. Penalty for noncompliance by the above date shall be cessation of all further periodical payments until the work is completed and can be fully used for the purpose intended.

PAYMENTS:

A. The Owner's payment schedule indicating the payment dates established by Moore Public Schools shall be provided to the contractor to establish a monthly payment schedule.

B. **Certificates of payment shall be submitted to the Architect on or before 7 days prior to Owner's cut-off date**.

C. Until the Work is 50 percent complete, the Owner will pay 95 percent of the amount due the Contractor on account of progress payments. At the time the Work is 50 percent complete, any **remaining** partial payments shall be paid at 97.5 percent of amount due. The retainage shall be retained until the project is completed.

INSURANCE AND BONDS:

A. Insurance provided shall be with a company or companies licensed to do business in the state of Oklahoma.

B. Policies shall be provided in the following types and amounts:

1. a. Workmen's Compensation-Statutory
   b. Employer's Liability-$500,000 each accident.

2. Comprehensive General Liability:
   a. Bodily Injury - $1,000,000 each occurrence.
   b. Personal Injury - $1,000,000
   c. Property Damage - $1,000,000 each occurrence

3. Automobile Liability:
   a. Bodily Injury - $500,000 each person/$1,000.000 each occurrence

b. Such Comprehensive Automobile Liability Insurance shall include all owned and non-owned hired motor vehicles.

4. Owner's Protective Liability - Same limits as above.

5. Products and Completed Operations - Same limits as above.

6. Contractual Liability - Same limits as above.

C. Furnish one copy of Certificates herein required for each copy of the Agreement; specifically set forth evidence of all coverage required by Subparagraphs 11.1 and 11.2. Furnish to the Owner copies of any endorsements that are subsequently issued amending coverage or limits.

D. T**he Contractor shall provide property insurance in the amount of the initial contract sum as well as subsequent modifications thereto for the entire Work at the site on a replacement cost basis without voluntary deductibles. This insurance coverage shall be the "all-risk" form for completed value.**

TEMPORARY SERVICES:

A. Sanitary Facilities: The Contractor shall provide and maintain necessary sanitary conveniences for the use of those employed on/or about the work. The sanitary facilities shall be properly secluded from public observation and shall be such locations as shall be approved by the Owner, and their use shall be strictly enforced.

SHOP DRAWINGS and SUBMITTALS:

A. Unless otherwise specified, the shop drawings and product data shall be submitted **electronically**. Physical samples of materials shall be submitted to the Architect as required.

B. Construction Manager is responsible for obtaining and distributing required prints of shop drawings to his subcontractors and material suppliers after as well as before final approval.

C. Shop drawings and samples shall be dated and marked to show the names of the Project, Architect, CM, originating Sub-Contractor, manufacturer or supplier, and separate detailer if pertinent.

Shop drawings shall completely identify Specifications section and locations at which materials or equipment are to be installed. Reproduction of Contract Drawings are acceptable as Shop Drawings only when specifically authorized in writing by the Architect &/or applicable Engineer/Consultant.

D. If materials or specified items other than those specified in these Contract Documents are supplied - and approved by the Architect - it shall be the Construction Manager's responsibility to provide **ALL** additional materials, accessories, substrates, utility connection, etc. for a complete and operational installation at **NO** additional cost to the Owner.

CHANGES IN THE WORK:

A. Cost shall be limited to the following: cost of materials, including sales tax and cost of delivery; cost of labor, including social security, old age and unemployment insurance, and fringe benefits under collective bargaining agreements; workmen's compensation insurance; bond premiums; and rental value of power tools and equipment. Overhead shall include the following; supervision, superintendence, wages of timekeepers, watchmen and clerks, hand tools, incidentals, general office expense, and all other expenses not included in "cost".

B. Subcontractor Change Order markups shall be limited to 10% overhead and 10% profit.

Constructor Manager markups shall be limited to 7% profit UNLESS a time extension has been approved by the Owner and the Architect allowing for an increase of G.C.s as per original base agreement times the number of approved additional days. No other markups shall be allowed.

AS BUILT DRAWINGS:

A. Provide and maintain in proper order and in good, clean condition in the field office at the project site, one complete full-size set of all working drawings. On this set of drawing prints, in red ink, neatly and accurately inscribe any and all changes in the work.

B. Upon completion of work, the Contractor shall furnish one set of "**as built**" drawings. These drawings shall be contract drawings corrected in **red ink** to show any differences between contract

drawings and actual construction. All changes made during construction shall be noted. Each drawing showing changes in dimensions, details, or containing supplemental information shall be plainly marked "**As Built**" and shall contain the signature of both the Architect and the Contractor.

CLOSEOUT SUBMITTALS:

Prepare project data in the form of an instructional manual supplied electronically on media as requested by Owner (CD or flash drive). The following information shall be included and arranged under a Table of Contents:

1. Directory listing names, addresses, and telephone numbers of the Architect/Engineer(s), General Contractor, Subcontractors, and major material/equipment suppliers.
2. Operation and Maintenance Instructions arranged by system and subdivided by specification section. For each category, identify names, addresses, and telephone numbers of Subcontractors and Suppliers. Include equipment, parts list for each, operating instructions, maintenance instructions for equipment, special finishes, etc.
3. Project documents and certificates, including shop drawings and product data, air and water balance reports, photocopies of warranties.
4. Record As-Built Drawings as described above.
5. Completed Non-Asbestos Affidavit.

DEBRIS DISPOSAL:

Waste disposal shall be the responsibility of the Contractor. The Contractor shall make arrangements with the local authorities having jurisdiction for accommodation of all waste disposal. If local facilities are not available, the contractor shall be responsible for all other arrangements for waste disposal.

SUPPLEMENTARY CONDITIONS AND SPECIAL CONDITIONS:

In the following sections where the term "General Conditions" is used, it shall include the "Supplementary Conditions" and/or "Special Conditions" bound in this project manual.

MISCELLANEOUS PROVISIONS:

A. TESTS AND INSPECTIONS

Add the following clarification: **Regardless of how it is**

described elsewhere in the drawings and specifications, the CM shall engage all testing laboratories / subcontractors as approved by the Architect; and, pay for ALL testing as required by the drawings and specifications. The CM shall pay for any additional testing due to defective work. The Owner shall pay for any additional testing requested and found to be non-defective.

B. EQUAL OPPORTUNITY

The Contractor shall maintain policies of employment as follows:

The Construction Manager and all Subcontractors shall not discriminate against any employee or applicant for employment because of race, religion, color, sex, or national origin. The Contractor shall take affirmative action to ensure that applicants are employed, and that employees are treated fairly during employment without regard to their race, religion, color, sex, or national origin. Such action shall include, but not be limited to the following: employment, upgrading, demotion, or transfer; recruitment advertising; layoff or termination; rates of pay or any other forms of compensation; and selection for training, including apprenticeship. The CM agrees to post in conspicuous places, available to employees and applicants for employment, notices setting forth the policies of non-discrimination.

C. COOPERATION WITH BUILDING OFFICIALS

Cooperate with applicable Federal, State, City or other governmental officials and inspectors at all times. If such officials or inspectors deem special inspections are necessary, provide assistance and facilities that will expedite their inspection.

Construction Manager shall be responsible for obtaining and paying for ALL building permits required for this project. This cost shall be included in the Construction Manager's General Conditions.

D. MEASUREMENTS

Before doing any work or ordering any materials, the Contractor shall verify all measurements of existing and new work and shall be responsible for their correctness.

Quantities obtained during bidding &/or construction shall

not be from the scaling of the drawings. Only dimensions obtained from dimensioned documents &/or existing on-site conditions shall be utilized for quantities determination, pricing, and ordering. Any scaling of the Construction Documents will be at the bidder’s risk and any discrepancies shall be corrected by and paid for by the bidder.

If differences are found, they shall be submitted to the Architect for consideration and verification before proceeding with the work.

E. MANUFACTURER'S SPECIFICATIONS AND INSTRUCTIONS

Install all manufactured items of materials or equipment in strict accordance with manufacturer's recommended specifications, except that the specifications herein, where more stringent, shall be complied with.

At the completion of the project and prior to final acceptance by the Owner, provide the Owner with three complete sets of operating and maintenance instructions, and demonstrate to him the procedures for proper operation and maintenance of all equipment.

F. JOB MAINTENANCE

During the course of their work, all crafts and trades shall protect all work which preceded theirs from damage, and they shall make repairs or replacements to any damage caused either directly or indirectly by them.

G. COMPLIANCE WITH STATE AND FEDERAL LAWS

Construction Manager assumes full responsibility for the payment of all contributions and payroll taxes (state and federal) as to all subcontractors and employees engaged in the performance of work pursuant hereto and further agrees to check and meet all requirements that might be specified under regulations of the administrative officials or board charged with the enforcement of any state or federal act on the subject referred. CM agrees to furnish Owner, upon request, a certificate or other evidence of compliance therewith.

H. OCCUPATIONAL SAFETY AND HEALTH ACT OF 1970 (OSHA)

The Construction Manager shall comply with the latest edition and revision of The Federal Occupational Safety and Health Act of 1970 for construction.

I. GUARANTY BONDS

1. Prior to the Owner signing the contract agreement, they will require the Construction Manager to furnish performance and payment bonds covering the faithful performance of the entire construction contract agreement. The performance bond and the payment bond shall each be made out in one hundred percent (100%) of the contract sum and shall be in a company or companies against which the Owner has no reasonable objection.

2. Bonds shall be signed by an official of the bonding company and shall be accompanied by the bonding agent's written power-of-attorney in order that one copy may be attached to each copy of the contract agreement.

3. The Construction Manager shall include in his proposal amount the total premiums for all required bonds.

4. The Contractor does hereby warrant and/or guarantee against defects in all workmanship and materials performed or furnished by him directly or by his subcontractors for a period of one (1) year from the date of completion, as evidenced by the date of the Final Certificate or final acceptance of the project. Said warranty and/or guarantee shall be in the form of a good and sufficient bond in a sum equal to one hundred percent (100%) of the contract price.

End of Special Conditions

Project Number: 05462142-2
April 22, 2020

Professional Service Industries, Inc.
11825 S. Portland Avenue
Oklahoma City, OK 73170
Phone: (405) 735-6052
Fax: (405)735-6086

Mr. Michael L. Abla, AIA
AGP – The Abla Griffin Partnership, LLC
201 North Broadway, Suite 210
Moore, OK 73160

Re: **Report of Geotechnical Engineering Services**
Proposed Moore Public Schools Pre-Planning Services
Central Junior High School - Classroom Addition
SWC NW 5th Street and N Broadway Street
Moore, Oklahoma

Dear Mr. Abla:

Thank you for choosing Professional Service Industries, Inc. (PSI), an Intertek company. The information you requested is attached.

PSI performed the geotechnical exploration that you requested on February 25, 2020. PSI transmits the geotechnical report with this letter.

We thank you for your business and we look forward to finding ways to grow our partnership, expand our services, and continue Building Better Together.

For Professional Service Industries, Inc.
CA NO. 1111 Expires 06/30/21

Yicheng Zhang, EI
Project Manager
Geotechnical Services

Adedamola I.O. Oyesanya, P.E.
Senior Geotechnical Engineer
Geotechnical Services

REGISTERED PROFESSIONAL ENGINEER
ADEDAMOLA IBIKUNLE OLUWAKEMI OYESANYA
18096
OKLAHOMA
4/22/2020

Report of Geotechnical Engineering Services

Proposed Moore Public Schools Pre-Planning Services
Central Junior High School - Classroom Addition
SWC NW 5th Street and N Broadway Street
Moore, Oklahoma

Prepared for

AGP – The Abla Griffin Partnership, LLC
201 North Broadway, Suite 210
Moore, OK 73160

Prepared by

Professional Service Industries, Inc.
11825 S. Portland Avenue
Oklahoma City, OK 73170

April 22, 2020

PSI Project 05462142-2

Yicheng Zheng, EI
Project Manager
Geotechnical Services

Adedamola I.O. Oyesanya, P.E.
Senior Geotechnical Engineer
Geotechnical Services

REGISTERED PROFESSIONAL ENGINEER
ADEDAMOLA
18096
OKLAHOMA

4/22/2020

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1 PROJECT INFORMATION

1.1 PROJECT AUTHORIZATION

Professional Service Industries, Inc. (PSI), an Intertek company, has completed a geotechnical exploration for the proposed Moore Public Schools Pre-Planning Project's Classroom Addition at the Central Junior High School in Moore, Oklahoma. PSI's services were authorized by Mr. Michael Abla, Principal, Abla Griffin Partnership, by signing PSI's proposal on February 25, 2020. This exploration was accomplished in general accordance with PSI Proposal No. P0546-303281 dated February 18, 2020.

1.2 PROJECT DESCRIPTION

Project information was provided by Mr. Clay Griffin, Principal, AGP. The proposed construction will consist of classroom additions to the east section of the existing Central Junior High in Moore, Oklahoma. The existing school building is essentially single-story. Detail information about the construction type is not available to PSI; however, PSI anticipates the construction will be typical and not unusual for the type of project and use proposed. Available information includes the following:

Loading:

- Maximum column loads on the order of 10 to 200 kips.
- Maximum wall loads on the order of 4 kips per linear feet (estimated by PSI)
- Floor slab load not exceeding 250 pounds per square feet.
-

The report is also based on the following:

Grading:

- Cut and fill on the order of 0 to 2 feet to achieve design grade.

1.3 PURPOSE AND SCOPE OF SERVICES

The purpose of this study was to explore the subsurface conditions at the site and prepare recommendations for geotechnical design considerations for the proposed building additions. PSI's scope of services included drilling a total of 3 soil test borings, laboratory testing of select soil samples, and preparation of this geotechnical report. This report briefly outlines the testing procedures, presents available project information, describes the site and subsurface conditions, and includes the approximate boring locations, boring logs, and recommendations regarding the following:

- General site development and subgrade preparation.
- Foundation types and depths, allowable bearing capacities, and estimates of potential settlement.
- Seismic site class and site coefficients according to the 2015 IBC criteria.
- Lateral soil load parameters for retaining wall design.
- Comments regarding factors that may impact construction and performance of the proposed project.

The scope of services did not include an environmental assessment for determining the presence or absence of wetlands or hazardous or toxic materials in the soil, bedrock, surface water, groundwater, or air, on or below, or

around this site. Statements in this report or on the boring logs regarding odors, colors, and unusual or suspicious items or conditions are strictly for informational purposes.

PSI did not provide any service to investigate or detect the presence of moisture, mold, or other biological contaminants in or around any structures, or any service that was designed or intended to prevent or lower the risk of the occurrence or the amplification of the same. The client should be aware that mold is ubiquitous to the environment with mold amplification occurring when building materials are impacted by moisture. Client should also be aware that site conditions are outside of PSI's control, and that mold amplification will likely occur, or continue to occur, in the presence of moisture. As such, PSI cannot and shall not be held responsible for the occurrence of, or recurrence of, mold amplification.

Laboratory consolidation testing for detailed analysis of settlement characteristics is not included in the present scope. However, consolidation settlements are not anticipated to be an issue for this project site.

2 SITE AND SUBSURFACE CONDITIONS

2.1 SITE LOCATION AND DESCRIPTION

The site for the proposed Classroom Addition is at The Central Junior High School located at the southwest corner of NW 5th Street and N Broadway Street in Moore, Oklahoma. The latitude and longitude of the proposed construction site are approximately 35.3419°N and 97.4877°W, respectively. The site is the existing Central Junior High School and is generally covered with decorative concrete paving slabs and visually appears flat. The ATV-mounted drill rig experienced no mobility difficulty in accessing the boring locations.

2.2 SUBSURFACE CONDITIONS

The site subsurface conditions were explored with 3 soil test borings. The borings were located in the field by the drilling crew with a handheld GPS device and by estimating distances from known site reference points.

The exploration was performed with an ATV mounted CME-750 drill rig equipped with an automatic hammer using a 140-pound hammer dropping 30 inches. Soil samples were routinely obtained during the drilling process. Drilling and sampling techniques were accomplished generally in accordance with ASTM procedures. The approximate location of the borings performed are presented on the boring logs.

Select soil samples were tested in the laboratory for evaluation and determination of material properties including moisture content, Atterberg limits, and fines content. Laboratory testing was accomplished generally in accordance with ASTM procedures.

The subgrade materials encountered in the borings consisted of approximately 1 to 3 feet of fill consisting of lean and fat clays with various sand contents and containing fine roots, asphalt pieces, and mixed coloration. The fill materials are underlain by fat and lean clays with various sand contents, silty clay, and silty sand to depths of approximately 11 to 15½ feet. The overburden soils are underlain by siltstone bedrock that extended to the boring depths of approximately 25 feet below the surface. Please refer to the attached boring logs for more specific information. The following table briefly summarizes the range of results from the field and laboratory testing programs:

General Range of Material Property Values						
Soil Description	Approx. Depth Range, ft.	Standard Penetration, N, blows/foot	TCP inches/100 Blows	Moisture Content, %	Percent Fines (Passing # 200 Sieve)	Liquid Limit, % Plastic Limit, % Plasticity Index
FILL	0 – 3	5 – 8	-	21 – 30	-	-
Fat CLAY (various sand contents)	1 – 7	7 – 9	-	20 – 27	86.3 – 95.0	LL=55 PL=17 – 18 PI=36 – 37
Lean CLAY (various sand contents)	5 – 11	9 – 11	-	17 – 22	89.3	LL=45 PL=16 PI=29
Silty CLAY with Sand	11 – 15½	24	-	15	-	-

General Range of Material Property Values						
Soil Description	Approx. Depth Range, ft.	Standard Penetration, N, blows/foot	TCP inches/100 Blows	Moisture Content, %	Percent Fines (Passing # 200 Sieve)	Liquid Limit, % Plastic Limit, % Plasticity Index
Silty SAND	7½ – 15½	10 – 52	-	16 – 18	-	-
Sandy SILTSTONE (Bedrock)	11 – 25	PR	1.4 – 3.6	-	-	-

PR – Practical Refusal

2.2.1 SOIL CORROSIVITY LABORATORY TESTING

PSI performed laboratory testing on a select soil sample of Boring DB-1 to assess the pH and water-soluble sulfate content. The water-soluble sulfate testing was performed in general accordance to the ODOT's OHD L-49. The pH testing was performed in general accordance to the ASTM G51. The results of the tests are summarized and provided in the table below:

Water Soluble Sulfate Test Results				
Boring	Depth (ft)	Soil pH	Sulfate Content	
			ppm (mg/kg)	Percent by Weight
B-1	3	8.4	<200	<0.02

The above subsurface description is of a generalized nature to highlight the major subsurface stratification features and material characteristics. The boring log included in the Appendix should be reviewed for specific information at the boring location. The boring log includes soil/rock descriptions, stratifications, penetration resistances, and locations of the samples. The stratifications shown on the boring log represent the conditions only at the actual boring location. Variations may occur and should be expected at other building section locations. The stratifications represent the approximate boundary between subsurface materials and the actual transition may be gradual. Water level information obtained during field operations is also shown on the boring log. The samples that were transported to the laboratory will be retained for 60 days from the date of this report and then discarded.

2.3 GROUNDWATER INFORMATION

Groundwater was observed to collect in the borings at the time of drilling, during drilling, upon completion, and after a period of delay. The depths of groundwater observation are summarized in the table below:

GROUNDWATER OBSERVATION INFORMATION			
Boring No.	During Drilling, ft	After Completion, ft	24 Hour Delayed Water Reading, ft
DB-1	8	19	4
DB-2	10	22	4½
DB-3	8	23	5

Based on the recorded groundwater information, the long-term design groundwater elevation can be taken as 4 feet below the present surface.

Groundwater can exist at varying depths during other times of the year depending upon climatic and rainfall conditions. Discontinuous zones of perched water may exist within the overburden materials and/or at the contact with bedrock.

3 EVALUATION AND RECOMMENDATIONS

3.1 GEOTECHNICAL DISCUSSION

The geotechnical related recommendations presented in this report have been developed on the basis of the subsurface conditions encountered and PSI's understanding of the proposed project. Should changes in the project criteria occur, a review must be made by PSI to determine if modifications to the recommendations will be required. The performance of the construction will be dependent upon site preparations and the shear strength of the underlying soils and bedrock.

There is a primary geotechnical related concern at this project site that should be expected to affect lightly loaded grade supported elements such as floor slab type constructions. The concern involves the shrink/swell potential of the upper soils encountered in the borings. The concern is discussed in the report subsection below.

3.1.1 SWELL POTENTIAL CLAYS

Medium high to high plasticity clay soils with high shrink/swell potential were encountered in the upper strata of the borings. These high shrink/swell potential materials are expected to exhibit significant volume changes with variations in subgrade moisture. The calculated Potential Vertical Rise (PVR) for slab-on-grade type construction at this project site is on the order of 2 to 2¾ inches for these soils, assuming that the medium high to high plasticity subgrade materials are allowed to increase in moisture content from a relatively dry condition to a relatively wet condition over a depth of approximately 8 feet. The relatively dry condition can occur with severe dry weather situations, thereby resulting in a significant degree of shrinkage and eventual potential swell in the foundation material. Differential movements are expected to be about ½ of the PVR. However, it should be noted that for extreme conditions (i.e., soils dry and shrink in one area with soils in another area being exposed to water and swelling) differential movement can be equal to or even double the PVR.

A reduction in potential vertical movement can be achieved by supporting the floor slab on a minimum of 2½ feet of properly compacted low plasticity structural fill or modified existing soils to reduce the calculated PVR to 1 inch or less. However, due to the potential for "bathtub effect" usually created by granular structural fill replacing and overlying relatively low permeability clay material in undercut areas, PSI recommends the amount of material in the structural fill passing the #200 sieve not be less than 60 percent, at least in replacing the undercut. The greater the structural fill or modified existing soil (used as structural fill) thickness beneath the slab, the less the probability of structural distress due to shrinkage and swelling of the clay soils. The structural fill should extend a minimum of 5 feet beyond the edges of the structure. The desired thickness of fill can be provided by raising the site grade with the properly compacted recommended materials or undercutting and replacing with the recommended materials. Proof-rolling and visual observation, as discussed later in this report, should be accomplished to aid in identifying soils which should be removed from the floor slab area prior to fill placement and/or floor slab construction.

3.1.1.1 LIME, CEMENT, OR FLY ASH STABILIZATION

The existing medium high to high plasticity clay subgrade soils with high shrink/swell potential clay can also be modified with hydrated lime, Portland cement, or class 'C' fly ash from a source approved by ODOT and used as structural fill. This will also reduce potential for "bathtub" effect when used as backfill in undercuts. Stabilizing the subgrade soil with an estimated 5 to 7 percent cement or lime or an estimated 12 to 14 percent fly ash, by dry weight, will reduce the potential volumetric changes due to the high shrink/swell potential soils. The actual

cement, lime, or fly ash percentage should be determined based on laboratory tests after the source of the stabilizing agent has been determined.

3.1.2 EQUIPMENT MOBILITY

Of a secondary concern is the potential for retardation of equipment mobility by the wet surficial soils. Moisture content tests of the surficial soils indicate high degree of saturation and this condition can be expected to exist once the concrete surface material is removed and the soils are exposed. The presence of wet, potential sensitive shallow soils will increase the difficulty of site grading. PSI has been involved with projects in this region where these soils can undergo a loss of stability during wetter portions of the year. PSI anticipates that the soils in their current moisture level will become easily disturbed if subjected to conventional rubber tired or narrow track-type equipment resulting in a loss of strength and characteristic "pumping". Soils that become disturbed would need to be excavated and replaced; however, this remedial excavation may expose progressively wetter soils with depth, thus compounding the condition. Thus, a normal approach to subgrade preparation may not be possible.

3.1.2.1 SOIL COMPACTION AND PROOF ROLL

Since the surficial soils at the site predominantly consist of high moisture content clay soils and medium high to high plasticity clays, it may become difficult to achieve the desired compaction of the soils due to the high current moisture contents. After stripping and undercutting activities, the surface soils may also not pass proof roll in the high moisture content state. The soils may need to be scarified and dried (in-situ or by disking) to a moisture content that will facilitate compaction in accordance with the structural fill requirements of this report. If scarifying, drying, and compacting of the soils does not stabilize the soils, removing and replacement with structural fill or treating the soil with class "C" fly ash or lime- or cement-treatment of the clay soils may need to be performed. If modification or stabilization is required, it may be performed with 5 to 7 percent hydrated lime or cement or 12 to 14 percent fly ash from source approved by ODOT. It may be necessary to perform the stabilization in test sections to determine appropriate additive and amount for effectiveness. Alternatively, the ground can be improved to provide mobility of equipment by working into the subgrade 3- to 4-inch size "shot/surge" rock in relatively thin layers at a time, until a stable work platform is attained.

3.1.3 POTENTIAL NEED FOR DEWATERING

Collected groundwater was observed in the borings at a depth as shallow as 4 feet below the drilling surface. Additionally, moisture characteristics tests of samples at shallower depths indicated relatively high degree of saturation. Hence, water may be encountered at much shallower depths at other times during excavations for foundations or underground utility installation. The contractor should be aware of this possibility and be prepared for potential dewatering during construction.

3.1.4 ADDITIONAL CONSIDERATIONS

Information about the existing building foundations is not available to PSI. For new footings in proximity of existing foundation, additional stress may and should be expected to be exerted on the subsurface material supporting the existing footings. The additional stress may result in additional settlement of the footings supporting the existing structures. Generally, the deeper the new foundation and the closer the new foundation will be to the existing foundation, the higher the potential for the additional settlements. If shallow foundation is considered and if practical for the shallow new foundation, PSI recommends as much separation as possible between the old and new foundation. Evaluation of the influence may be based on a straight-line projecting outward and downward at an

angle of 45° from the bottom of the new footing. The line not intersecting the lower existing footing and vice versa may be considered adequate and non-influential; else, additional stress analysis will be required. However, it is recommended the existing footing also be monitored during construction.

3.1.5 EXISTING FILL

With the site preparation that will be required for this project site, special treatment of the existing fill encountered in the borings to depths up to 3 feet below the surface is not anticipated.

3.2 GEOLOGIC UNIT

Division Three publication of the "Engineering Classification of Geologic Materials" manual published by ODOT indicates the project site is underlain by the Hennessey Unit (Phy).

This unit consists of red platy to blocky clay shales and mudstone. The mudstones are hard and appear blocky. The red clay shale of the Hennessey Unit is characterized by numerous bands of streaks of white or light green color ranging from a few inches to four feet in thickness. Small spheres of light green color up to 10 inches in diameter are an odd characteristic of the unit.

The total thickness of the unit varies from 400 to 600 feet.

The Hennessey Unit outcrops in a 5 to 20 miles wide north-south band across Cleveland, McClain, and Garvin Counties in Division 3.

Topographically, the unit is near level to gently rolling prairies, but most of the more level outcrops of the unit are cultivated.

3.3 SEISMIC INFORMATION

The 2015 International Building Code requires a site class for the calculation of earthquake design forces. This class is a function of soil type (i.e. depth of soil and strata types). Based on the type of materials encountered to the boring termination depths and the estimated shear strength of the soil at the boring locations, Site Class C is recommended. The IBC-2015 probabilistic ground motion values near the project site are as follows:

Seismic Design Parameters			
Period (seconds)	2% Probability of Event in 50 years (g)	Site Coefficient F_a	Site Coefficient F_v
0.2 (S_s)	0.271	1.2	N/A
1.0 (S_1)	0.079	N/A	1.7

S_{DS}: 0.217g
S_{D1}: 0.089g
PGA: 0.161g
PGA_M: 0.193g (Site modified peak ground acceleration)
Seismic Design Category (SDC): B

3.4 SITE PREPARATION

Vegetation, existing concrete, deleterious materials, and soft and loose soil in the construction area should be stripped from the site and either wasted or stockpiled for later use in non-load bearing areas such as landscaping. The depth of removal should be determined by a representative of the Geotechnical Engineer at the time of construction. Wet soils encountered should be treated as previously recommended.

After stripping and excavating to the proposed subgrade level, the construction area should be proof rolled with a tandem axle dump truck or similar rubber-tired vehicle. Soils which are observed to rut or deflect excessively (typically greater than 1 inch) under the moving load (typically 9 tons/axle) should be undercut and recompacted in place or replaced with properly compacted recommended fill. The recompacted soil or imported structural fill or engineered fill should be moisture conditioned during placement. The proof-rolling and undercutting activities should be witnessed by a representative of the Geotechnical Engineer and should be performed during a period of dry weather. The recommendations regarding wet surficial soils and previously discussed may need to be considered. Access to compaction equipment may be limited in some of the proposed construction areas due to lack of space. Other mode of compaction and site preparation, such as walk-behind portable compaction machine may be applicable.

After proof-rolling and correcting soft areas or areas exhibiting rutting or pumping, the subgrade soils should be scarified and compacted for a depth of at least 8 inches below the surface.

After subgrade preparation and testing have been completed, fill placement that will be required to establish site design grades should begin. The first layer of fill material should be placed in a relatively uniform horizontal lift and adequately keyed into the stripped and scarified subgrade soils. PSI recommends fill materials be free of organic or other deleterious material, have a maximum particle size less than 3 inches, have a liquid limit not more than 35 and plasticity index in the range of 5 to 18 and percent of fines passing the #200 sieve not less than 60 percent at least in replacing undercuts. The on-site soils generally do not appear suitable for use as structural fill without modification/stabilization as previously discussed but maybe stockpiled for later use in non-load bearing areas such as landscaping. Accurate moisture control will be required to achieve the recommended degree of compaction. Structural fill should be compacted to at least 95 percent of standard Proctor maximum dry density as determined by ASTM D698.

Fill should be placed in maximum lifts of 8 inches of loose material and should be compacted at a moisture content ranging from -2 to +3 percentage points of optimum moisture content. Stabilized materials should be placed at a minimum water content of 2 percentage points above the optimum moisture content. If water must be added, it should be uniformly applied and thoroughly mixed into the soil by disking or scarifying. Each lift of compacted engineered fill should be tested by a representative of the Geotechnical Engineer prior to placement of subsequent lifts. The edges of compacted fill should extend a minimum of 5 feet beyond the edges of the proposed structure prior to sloping on a as flat a gradient as practical. Care should be taken to apply compaction effort throughout the entire fill area.

For structural fill, PSI recommends that such fill be tested by a Geotechnical Technician and directed by a Geotechnical Engineer to monitor and document the placement of fill material. It should be noted that the Geotechnical Engineer of record can only certify the testing that is performed, and the work observed by that engineer or staff in direct report to that engineer. PSI recommends that the fill be monitored in general accordance with the following table:

Fill Placement Criteria				
Material Tested	Proctor Type	Min % Dry Density	Placement Moisture Content Range	Frequency of Testing (Based on 8-inch lifts)
Structural Fill	Standard & Modified	95%	-2 to +3%	1 per 2,500 ft^2 of fill placed
Stabilized Existing Soil			≥+2%	
Random Fill (non-load bearing)	Standard	90%	-2 to +3%	1 per 10,000 ft^2 of fill placed
Utility Trench Backfill	Standard	95%	-1 to +3%	1 per 200 cy of fill placed

A minimum of 3 field density tests per lift is recommended. If the borrow or source of fill changes, a new reference moisture/density test should be performed.

The overall performance of the construction will also depend on how well the site drains during the construction and the life of the structure. Grading of the site around the structure's pads should be accomplished to enable positive drainage away from the pads by providing an adequate gradient. The surface gradient provided will be dependent on the landscaping type and vegetation. Water infiltration and seepage into the foundation should be avoided as much as possible. If it is possible for water to collect beneath the foundation and foundation areas, it will be necessary to use interceptor drains to remove the collected water.

Excavation for utility trenches should be performed in accordance with OSHA regulations as stated in 29 CFR Part 1926. It should be noted that utility trench excavations have the potential to degrade the properties of the adjacent fill materials. Utility trench walls that are allowed to move laterally can lead to reduced bearing capacity and increased settlement of adjacent structures and structural elements.

Backfill for utility trenches is as important as the original subgrade preparation or structural fill placed to support foundations. Unless otherwise specified, the backfill for the utility trenches should be placed in 4- to 6-inch loose lifts and compacted to a minimum of 95% of the maximum dry density achieved by the standard Proctor test. The backfill soil should be moisture conditioned in the range of 1 percentage point below to 2 percentage points above the optimum moisture content value as determined by the standard Proctor test. Up to 4 inches of bedding material placed directly under the pipes or conduits placed in the utility trench can be compacted to the 90% compaction criteria with respect to standard Proctor maximum dry density. Compaction testing should be performed for every 200 cubic yards of backfill placed or for each lift within 200 linear feet of trench, whichever is less. Backfill of utility trenches should not be performed with water standing in the trench. Structural fill should be used as the trench backfill material.

3.5 SHALLOW FOUNDATION RECOMMENDATIONS

The types and depths of foundations suitable for given structure depend on several factors including the subsurface conditions, the functions of the structure, the loads they will carry, the external (lateral and uplift) forces they will resist, and the cost of the foundations. A conventional type spread footing foundation system or a monolithic slab-on-grade foundation system (reinforced or post-tensioned) may be considered for support of the building units. PSI has provided in this report section parameters that may be considered for the recommended shallow foundation systems.

A shallow foundation system may be considered for the support of the building, based on the subsurface conditions encountered by the borings. PSI has provided recommendations for both a conventional type spread footing foundation system and a monolithic slab-on-grade foundation system (reinforced or post-tensioned) for consideration and support of the proposed structure.

3.5.1 CONVENTIONAL SPREAD FOOTING RECOMMENDATIONS

The planned structure may be supported on conventional spread footing foundations. Spread footings for columns and continuous wall footings bearing on the existing soil or properly compacted structural fill or modified existing fill, as discussed, can be designed for allowable unit bearing pressures of 2,500 psf and 2,000 psf, respectively, based on dead load plus design live load. Foundation elements should bear a minimum depth of 2 feet below the final grade for frost protection. The allowable bearing capacities are based on a factor of safety of 3.

It is important that PSI observes and documents the footing excavations prior to concrete placement. Minimum dimensions of 24 inches for square footings and 18 inches for continuous wall footings should be used in design of the footings to reduce the possibility of a local bearing capacity failure.

The foundation excavations should be observed by a representative of PSI prior to steel or concrete placement to document that the foundation materials are consistent with the materials discussed in this report. Soft or loose soil zones encountered at the bottom of the footing excavations should be removed to the level of acceptable residual soils or adequately compacted structural fill as directed by the Geotechnical Engineer. The bottom of the footings should be probed to identify and locate soft areas. Cavities formed as a result of excavation of soft or loose soil zones should be backfilled with lean concrete or properly compacted structural fill.

The uplift resistance of the foundations will be limited by the weight of the foundation concrete and soil above them and the dead weight of the structure. For design purposes, the ultimate uplift resistance should be based on effective unit weights derived from presumptive total unit weights of 120 pcf and 150 pcf for soil and concrete, respectively. A factor of safety of 2 should be applied to the uplift resistance.

Footing excavations should be observed, and concrete placed as quickly as possible to avoid exposure of the footing bearing surfaces to wetting and drying. Surface run-off water should be drained away from the excavations and not be allowed to pond. If possible, the foundation concrete should be placed during the same day the excavation is made. If footing excavations are left open for more than 1 day, they should be protected to reduce evaporation or entry of moisture.

Based on the known subsurface conditions, site geology, laboratory testing, anticipated loading, and allowable bearing pressures, properly designed and constructed footings for the building supported on the properly compacted recommended materials should experience maximum total and differential settlements between adjacent columns of less than 1 inch and ¾ inch, respectively.

3.5.2 MONOLITHIC SLAB-ON-GRADE FOUNDATION RECOMMENDATIONS

As an alternative to remediation of the existing subgrade for the new construction due to the medium high to high plasticity clay and the existing undocumented fill, the use of alternative type of foundation such as a

monolithic slab type foundation may be considered. PSI has not performed a cost/benefit analysis of suitable foundation type for the project.

If additional movements can be tolerated, a steel-reinforced (conventional or post-tension reinforcing) slab on-grade foundation system (with or without waffle-type grade beam configuration) may be considered for support of the proposed structure. The slab-on-grade foundation system may be supported on the existing subgrade material, provided the associated expected movements can be tolerated, or structural fill as recommended. The thickened edge portion may also be supported on the existing soils or the structural fill.

Structural fill should consist of materials as described in the Site Preparation and Fill Materials section of this report. Proof rolling, as discussed earlier in this report, should be accomplished to identify any soft or unstable soils that should be removed from the slab area prior to fill placement and floor slab construction. Select fill required to achieve grade should extend a minimum 5 foot beyond the perimeter of the slab. Fill soil below the slab should be moisture conditioned.

Thickened edges supported on properly compacted existing soils or structural fill materials may be designed using a maximum allowable unit bearing capacity of 2,000 pounds per square foot based on dead load plus design live load considerations. The grade beams should have a minimum width of 10 inches even if actual bearing pressure is less than the design value. If frost heave is a design consideration, the perimeter grade beams should bear at least 24 inches below adjacent surface grades. If soft or very loose soils are encountered at the design bearing level, they should be undercut to stiff residual soils and the excavation backfilled with concrete or controlled low strength material (CLSM) or properly compacted fill.

Several design methods use the modulus of subgrade reaction, k, to account for soil properties in design of flat grade-supported floor slabs. Based on our laboratory test results and the slab recommendations provided in this document, k-value of 120 pounds per cubic inch (pci) may be used in the grade slab design based on values typically obtained from 1 ft x 1 ft plate load tests. However, depending on how the slab load is applied, the value will have to be geometrically modified. The value should be adjusted for larger areas using the expression/formula presented in the “Floor Slab Recommendations” section of this report.

Uniform compaction of fill materials is important to reduce total and differential settlements. If the site is prepared as recommended, and based on the anticipated loading conditions, total and differential settlements of the foundation should be about 1 inch and ½ inch, respectively, or less. To reduce moisture problems below the floor slab, a vapor retarder such as polyethylene sheeting should be provided beneath the slab. PSI recommends that a minimum four-inch-thick, free draining granular mat be placed beneath the slab. Adequate construction joints, as necessary, and reinforcement should be provided to reduce the potential for cracking of the floor slab due to differential movement. The design should take into account the added effect of trees and non-seasonal moisture sources, such as irrigation, plumbing or drainage leaks and poor surface drainage.

The foundation excavations should be observed by a representative of PSI prior to concrete placement to assess that the foundation materials are capable of supporting the design loads and are consistent with the materials discussed in this report. Soft or loose soil zones encountered at the bottom of the excavations should be removed to the level of firm soils or adequately compacted fill or stabilized soil as directed by the Geotechnical Engineer. Cavities formed as a result of excavation of soft or loose soil zones should be backfilled with lean concrete or dense graded compacted crushed stone, as determined by the Geotechnical Engineer.

Surface run-off water should be drained away from the excavations and not be allowed to pond. The structures' foundation concrete should be placed during the same day the excavation is made. If it is required that excavations be left open for more than one day, they should be protected to reduce evaporation or entry of moisture. Consideration should be given to the use of interceptor drains to collect and remove water accumulating around the perimeter and underneath the slab. The interceptor drains could be incorporated with the storm drains of other utilities located on-site.

3.6 DRILLED PIER FOUNDATION RECOMMENDATIONS

It is anticipated drilled pier foundations are also under consideration for support of the proposed classroom additions. Properly sized straight shaft cast-in-place concrete drilled piers bearing in the bedrock material below a depth of 15 feet from the existing surface can be used for the project.

The piers should be founded in the bedrock a minimum of 2 feet or one pier diameter, whichever is greater, and should be a minimum length of 10 feet or a length to diameter ratio (L/D) not less than 3, whichever is deeper, below the grade beam. The piers founded as recommended can be designed for allowable unit end-bearing capacity of 34,500 psf and allowable unit skin friction capacity of 3,400 psf, based on dead load plus design live load. The skin friction capacities are applicable to the portion of drilled shaft extended beyond the recommended minimum length into the bearing material. The allowable values are based on factors of safety of 2 and 3 for end bearing and skin friction, respectively.

The piers should be reinforced for the full depth to resist uplift forces due to the expansive clays. Reinforcement quantity should be adequate to resist tensile uplift forces generated by the clay soils equal to 800 psf over the upper 8 feet of the pier shaft. The piers should be designed after considering the dead load, the friction force in the rock, and the uplift force within the active depth.

Piers should be designed with a shaft diameter of at least 18 inches. Properly constructed piers bearing in the recommended bearing materials should experience total maximum settlement on the order of ½ inch or less.

It may be difficult for the drilling contractor to determine or identify proper recommended bearing material. Therefore, it is recommended PSI perform the pier construction observations and documentation.

The pier construction should also be observed by a representative of the Geotechnical Engineer to assess that the foundation materials have adequate strength to support the design loads and are consistent with the materials recommended in this report. Particular attention should be given to observation at locations where soil sloughing or groundwater inflow problems may occur.

Soft or loose soil zones encountered at the bearing level should be removed from the drilled shafts. If the exposed bearing material becomes significantly wet or dry, it should be removed, and the pier deepened until more uniform moisture conditions are achieved. Concrete should be placed in the piers the same day they are excavated to prevent weakening of the shaft wall and bottom.

Slurry and/or casing may be required to advance the drilled piers, especially when sloughing soil such as the underlying silty sand and/or when groundwater is encountered. Concrete placed in the piers should have a slump in the range of 5 to 7 inches. This range of slump will help to reduce the potential for formation of voids, especially as casing is extracted. The concrete mix should be designed to attain the required strength when

placed at such a slump. The drilled shafts should be filled with concrete as soon as practical to reduce the potential of groundwater related problems and weathering of the excavation wall. During simultaneous concrete placement and casing removal operations, sufficient concrete head should be maintained inside the casing to offset hydrostatic head outside the casing, and to prevent the intrusion of soil and possible groundwater into the pier concrete, if present.

3.6.1 LATERAL RESISTANCE DESIGN PARAMETERS

For drilled shafts, the soils and bedrock as well as the rigidity of the shaft will resist the lateral loads applied to the shaft. Lateral load analysis can be performed based on methods ranging from chart solutions to the 'p-y' approach utilizing computer programs such as LPILE or the public domain COM624.

The lateral design information regarding the 'p-y' data is provided in this section. The relationship between the soil resistance (p) and pile deflection (y) is commonly referred to as 'p-y'. Along the depth of the shaft, soil resistance (p) is expressed as a non-linear function of lateral shaft deflection (y). Various researchers developed 'p-y' criteria for different kinds of soils. The 'p-y' curves can be automatically generated utilizing the computer program LPILE or the public domain COM 624. The program LPILE was developed by Lymon Reese and Shin-Tower Wang, Ensoft, Inc. and based on the COM 624 developed for the FHWA by the authors and made available by the FHWA. The parameters for generation of 'p-y' criteria from LPILE as well as COM 624 are provided for the analyses of the shafts.

Parameters to Be Used in the Lateral Load Analyses

Stratum	'p-y' Criteria	**Total Unit Weight, γ (pcf)	Ø (deg.) or S_u or Q_u (psf)	***K_s or $K_{unsat.}$(pci) or $K_{c\ or}$ $K_{sat.}$ (pci) or E (psi)	***ε_{50} or K_{rm} or RQD
I*	Clay Criteria	120	S_u = 1,100	K_s = 300 or K_c = 110	ε_{50} = 0.0079
II	Sand Criteria	110	Ø = 30°	$K_{unsat.}$ = 40 or $K_{sat.}$ = 27	-
III	Rock Criteria	135	Q_u = 15,000	E = 50,000	k_{rm} = 0.0003 RQD = 50% (idealized)

Note: S_u: Undrained Shear Strength (psf); Q_u: Unconfined Compressive Strength (psf); ϕ, Angle of Internal friction; kunsat: modulus of subgrade reaction (pci) for unsaturated soil condition; ksat: modulus of subgrade reaction (pci) for saturated soil condition; k_s: modulus of subgrade reaction (pci) for static loading condition; kc: modulus of subgrade reaction (pci) for cyclic loading condition; E: Initial modulus (psi); ε_{50}: strain corresponding to one-half the principle stress. K_{rm}: a constant for overall stiffness; RQD: Rock Quality Designation.

* Neglect the top 3' of Stratum I soils for the lateral load analysis appropriately based on the location of the pile head
** For submerged portion of pier, use effective unit weight γ′
***It may be possible to default to the computer program generated values

PSI can assist in performing the lateral response analysis under a separate work proposal.

3.7 FLOOR SLAB RECOMMENDATIONS

The building's grade supported floor slab used in conjunction with the conventional spread footing or drilled pier and grade beam foundation system should be supported on a minimum 2½ feet of properly compacted structural fill or modified existing soil used as fill. When supported on a minimum 2½ feet of the recommended materials, the potential vertical rise (PVR) is expected to be 1 inch or less. Proof-rolling, as discussed earlier in this report, should be accomplished to identify soft or unsuitable soils that should be removed from the floor slab areas prior to fill placement and floor slab construction. Fill soils under the slabs should be moisture conditioned at or above the optimum moisture content throughout the construction process.

For the properly compacted structural fill and existing soil, modulus of subgrade reaction, *k,* value of 120 pounds per cubic inch (pci) may be used in the grade slab design based on a 1 ft. x 1 ft. plate load test. However, depending on how the slab load is applied, the value will have to be geometrically modified. The value should be adjusted for larger areas using the following expression for cohesive and cohesionless soils:

Modulus of Subgrade Reaction,

$k_s = \frac{k}{B}$ for cohesive soil, and

$k_s = k\left(\frac{B+1}{2B}\right)^2$ for cohesionless soil (not recommended for replacing undercut in relatively impermeable soils)

where:

k_s	=	coefficient of vertical subgrade reaction for loaded area,
k	=	coefficient of vertical subgrade reaction for 1x1 square foot area,
B	=	width of area loaded, in feet (or effective width, B', for grade beam, continuous footing, or mat/raft foundation)

PSI recommends that a minimum four-inch thick free draining granular mat be placed beneath the building floor slabs to enhance drainage. Prior to placing drainage layer, the subgrade should be graded to drain and not provide pockets to trap water. In moisture sensitive areas for equipment and flooring, vapor retarder should be installed with the grade supported slab construction according to ACI criteria. The floor slabs should have an adequate number of joints to reduce cracking resulting from differential movement and shrinkage.

3.7.1 STRUCTURAL SLAB

As an alternative to providing a minimum of 2½ feet of suitable material below grade supported floor slab, a structural slab with a minimum of 5 inches of void space along with the drilled pier and grade beam foundation system may be considered. The 5-inch void space should be provided below the slab and the grade beam elements. If a structural slab as recommended above is used, removing and replacing 2½ feet of the existing soil and/or the existing undocumented fill will not be required.

3.8 LATERAL EARTH PRESSURE RECOMMENDATIONS

It is anticipated a below grade earth retention system may be required as part of the proposed construction. To control hydrostatic loading on earth retention system, it is recommended that a perforated drainpipe be installed at

the footing level. The drainpipe should be sloped to provide positive drainage to a sump where water can be collected and removed or to a site storm sewer/drainage. The drain line should be wrapped with filter fabric to prevent intrusion of fines and backfilled with free draining granular material extending vertically above the drain line to within 1 foot of final grade. The granular section behind the earth retention system should have a minimum width of 1 foot and should be encapsulated in a suitable filter fabric to minimize intrusion of fines. The remaining portion of the excavation should be backfilled with structural fill or completed with granular material. The use of a prefabricated drainage blanket on the earth retention system may also be considered to prevent hydrostatic loading. Drainage blankets should be installed in accordance with manufacturer's recommendations.

The actual earth pressure on the walls will vary according to the type of material to be retained and backfill materials used and how the backfill is compacted. The equivalent fluid pressures (γ_{eq}) presented below, provide lateral earth pressures for design of walls using compacted granular backfill where the cut slope, if applicable, is 60° or less from the horizontal and for existing soil and structural backfill soil, and are applicable for a horizontal surface behind the earth retention system.

Lateral Soil Resistance Design Parameters								
Soil Supported	**Angle of Internal Friction, ϕ**	**Lateral Coefficient, K**			**Presumptive Total Unit Weight, pcf**	**Equivalent Fluid Unit Weights, γ_{eq}, psf/ft**		
		Active, K_a	**Passive, K_p**	**At-Rest, K_o**		**Active**	**Passive**	**At-Rest**
Granular Soil Placed	32°	0.31	3.25	0.47	115	35	374	54
In-Situ Sand Soil	28°	0.36	2.77	0.53	115	42	319	61
In-Situ Clay Soil	20°	0.49	2.04	0.66	120	59	245	79

The at-rest values should be used if walls cannot yield at top during backfilling and service conditions and passive pressure values should be used where the structure will push into the soil. The active condition is applicable where the ratio of the horizontal movement of the top of the wall to the wall height is equal to or greater than *1/240.*

If granular soil is utilized at the base of the structure, ultimate base friction coefficient of 0.53 may be considered and if granular support is not provided at the base of the structure an ultimate base adhesion value of 600 psf may be considered. Appropriate factor of safety should be applied.

Typically, only half of the passive pressure may be used to resist lateral loads due to the amount of strain required to fully mobilize the passive pressure. The above values of equivalent fluid pressure are based upon horizontal grade at the top of the wall including no surcharge loads within a distance that is twice the wall height.

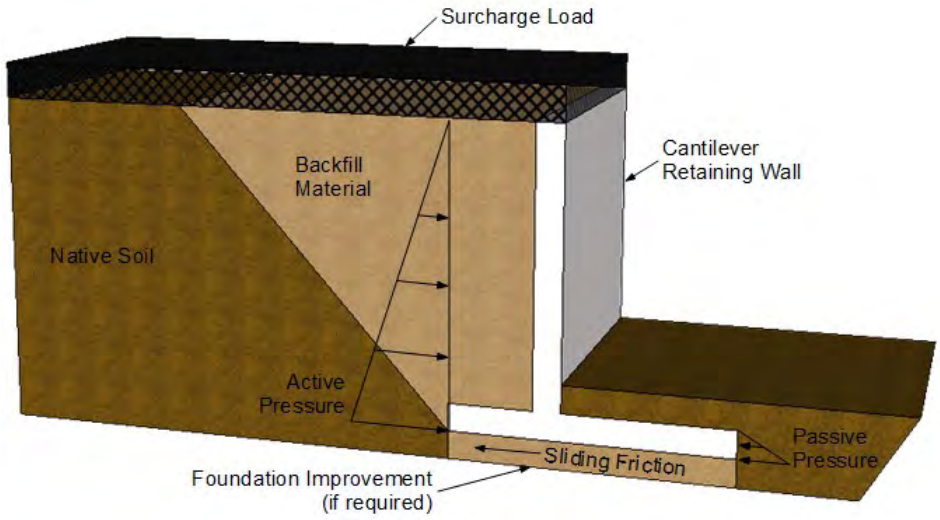
Since specific information about potential backfill material is not available for this report, PSI estimates the material may also consist of compacted clays or silts, apart from sand or structural fill assumed above, or combinations. For compacted lean clay and sandy silt, the following lateral pressure coefficient values behind the wall can be considered when applicable.

Compacted Soil Lateral Pressure Coefficients				
Soil Type	Active		At-Rest	
	K_a	γ_{eq}, psf/ft	K_o	γ_{eq}, psf/ft
Clay	0.59	74	0.74	93
Silt	0.53	66	0.69	86

γ_{eq}, - equivalent fluid pressure

When loads including traffic are present near wall, the wall should be designed to resist an additional uniform lateral load based on the active coefficient. This additional traffic load may be taken as a 2-foot surcharge load with a total unit weight of 125 pcf. Care should be exercised during the backfilling of the walls to prevent overstressing and damage to the walls. Sub-drains should be installed to avoid the buildup of hydrostatic pressure behind the retaining walls.

The following illustration provides general requirements for the design and installation of retaining walls.



3.9 CORROSIVITY OF SOIL

The concentration of water-soluble sulfates is considered to be a good indicator of the potential for chemical attack on concrete. PSI performed pH and soil water soluble sulfate content tests of a select soil sample from the project site. The results are reproduced below:

Water Soluble Sulfate Test Results				
Boring	Depth (ft)	Soil pH	Sulfate Content	
			ppm (mg/kg)	Percent by Weight
B-1	3	8.4	<200	<0.02

Based on the ACI Manual of Concrete Practice (ACI 201.2R-10) or (ACI 318/318R-33), the amount of water-soluble sulfates in soil can be used to evaluate the need for protection of concrete based on the following table:

REQUIREMENTS FOR CONCRETE EXPOSED TO SULFATE	
Water Soluble Sulfate in soil (percent by weight)	Sulfate Exposure
0.00 to 0.10	Negligible or Class 0 Exposure
0.10 to 0.20	Moderate or Class 1 Exposure
0.20 to 2.00	Severe or Class 2 Exposure
Over 2.0	Very Severe or Class 3 Exposure

Based on the test results, the water-soluble sulfates ion concentration is generally less than 200 mg/kg, and the potential for reactions within concrete exposed to sulfates is negligible or Class 0 exposure. Evaluations of soluble sulfate content contained within the selected samples indicate that Type I cement or equivalent may be utilized at this site. The actual cement type to be used should be determined by the project Structural Engineer.

The corrosion potential of the soils as regards buried conduits and metals is dependent on the acidity and/or basicity (pH value) of the soil. The results of laboratory resistivity and pH tests performed on selected soil samples obtained from drilling are indicated in the following table:

Resistivity (ohm-cm) and pH			
Boring No.	**Depth (ft)**	**pH**	**Corrosivity**
DB-1	3	8.4	Moderately Corrosive to Corrosive

Based upon the corrosivity test results, the soils can be considered moderate to corrosive to underground metallic conduits. Therefore, metal pipe may be used, but should be analyzed by the structural/corrosion engineer for protection recommendations.

However, generally for risk of corrosion, it should be noted that the building area contained 2 main mapped soil series, the Kirkland-Urban land-Pawhuska complex and Urban load soils based on the USDA/NRCS web based published information. These soils are rated as high risk of corrosion to concrete and moderate and high risk of corrosion of uncoated steel for the Kirkland-Urban land-Pawhuska complex and Urban load soils, respectively.

2 CONSTRUCTION CONSIDERATIONS

2.1 EXCAVATIONS

The following is provided in this report for the client's information. In Federal Register, Volume 54, No. 209 (October 1989), the United States Department of Labor, Occupational Safety and Health Administration (OSHA) amended its "Construction Standards for Excavations, 29 CFR, part 1926, Subpart P". It is mandated by this Federal regulation that excavations, whether they be utility trenches, basement excavations or footing excavations, be constructed in accordance with the new OSHA guidelines. It is PSI's understanding that these regulations are being strictly enforced and if not closely followed, the owner and the contractor could be liable for substantial penalties.

The contractor is solely responsible for designing and constructing stable, temporary excavations and should shore, slope, or bench the sides of the excavations as required to maintain stability of both the excavation sides and bottom. The contractor's "responsible person", as defined in 29 CFR Part 1926, should evaluate the soil exposed in the excavations as part of the contractor's safety procedures. In no case should slope height, slope inclination, or excavation depth, including utility trench excavation depth, exceed those specified in local, state, and Federal safety regulations.

PSI is providing this information solely as a service to the client. PSI does not assume responsibility for construction site safety or the contractor's compliance with local, state, and Federal safety or other regulations.

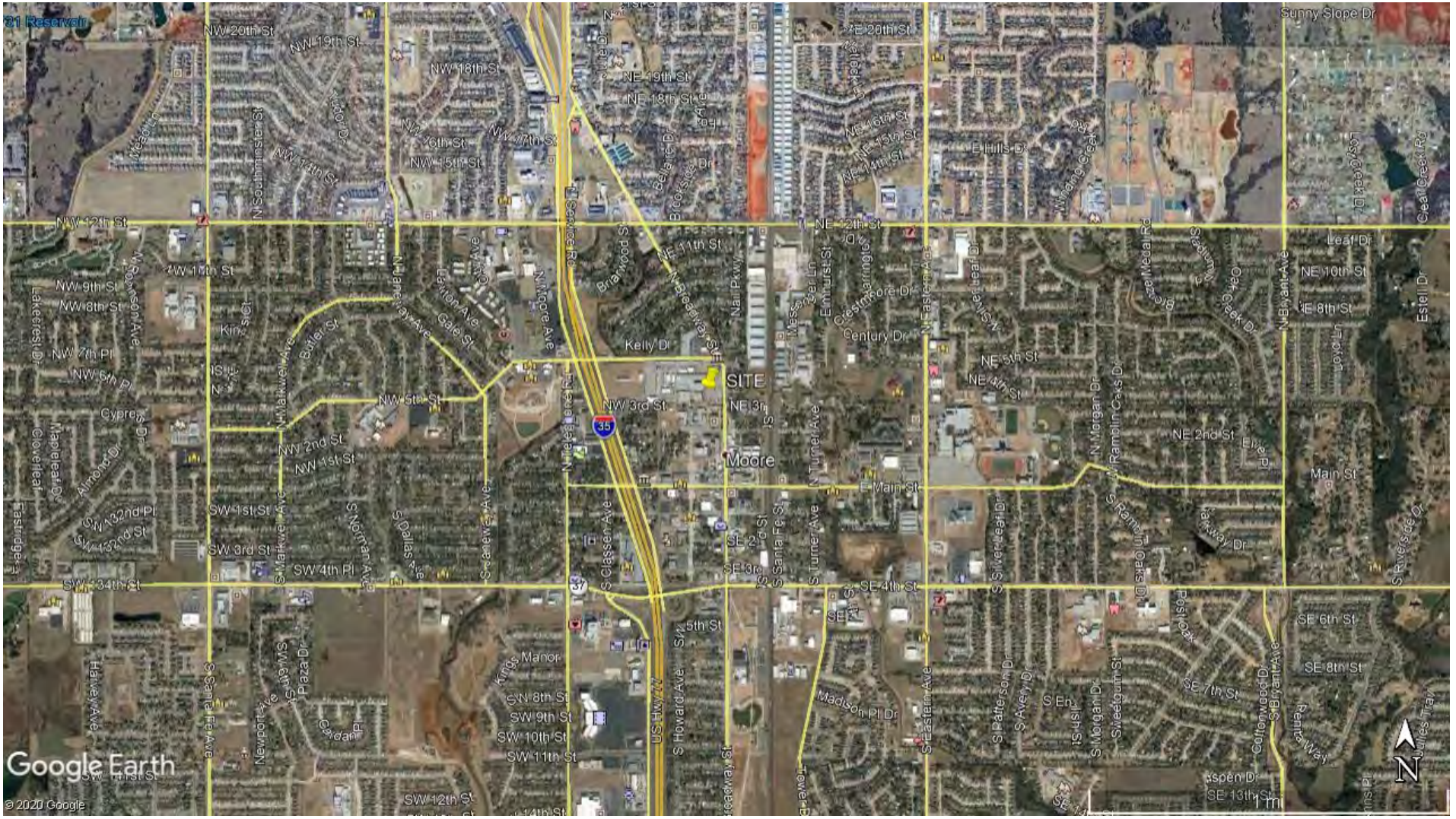
3 REPORT LIMITATIONS

The recommendations submitted are based on the available subsurface information obtained by PSI and details furnished by AGP for the proposed project. If there are revisions to the plans for this project or if deviations from the subsurface conditions noted in this report are encountered during construction, PSI should be notified immediately to determine if changes in the foundation recommendations are required. If PSI is not retained to perform these functions, PSI will not be responsible for the impact of those conditions on the project.

The Geotechnical Engineer warrants that the findings, recommendations, specifications, or professional advice contained herein have been made in accordance with generally accepted professional geotechnical engineering practices in the local area. No other warranties are implied or expressed.

After the plans and specifications are more complete, the Geotechnical Engineer should be retained and provided the opportunity to review the final design plans and specifications to check that PSI's engineering recommendations have been properly incorporated into the design documents. At this time, it may be necessary to submit supplementary recommendations. This report has been prepared for the exclusive use of AGP for the specific application to the proposed Moore Public Schools Central Junior High School Classroom Addition in Moore, Oklahoma.

FIGURES



intertek psi	*Project*	CENTRAL JUNIOR HIGH SCHOOL ADDITION—MOORE, OK	
	Drawing	SITE VICINITY	*Project No.* 05462142-2
	Drawn By	Y. Zhang	*Figure* **FIGURE 1**
	Date	April 2020	

intertek psi	*Project* CENTRAL JUNIOR HIGH SCHOOL ADDITION—MOORE, OK	
	Drawing BORING LAYOUT PLAN	*Project No.* 05462142-2
	Drawn By Y. Zhang	*Figure* **FIGURE 2**
	Date April 2020	

LIST OF APPENDICES

APPENDIX A – BORING LOGS AND PROFILES

BORING DB-1

DATE STARTED:	3/17/20	**DRILL COMPANY:**	DSO
DATE COMPLETED:	3/17/20	**DRILLER:** M. Cross	**LOGGED BY:** B. Stone
COMPLETION DEPTH	25.0 ft	**DRILL RIG:**	ATV
BENCHMARK:	N/A	**DRILLING METHOD:**	Soild Flight Auger
ELEVATION:	N/A	**SAMPLING METHOD:**	SS/TC
LATITUDE:	35.34175°	**HAMMER TYPE:**	Automatic
LONGITUDE:	-97.48774°	**EFFICIENCY**	N/A
STATION: N/A	**OFFSET:** N/A	**REVIEWED BY:**	A. Oyesanya

REMARKS:

Water

While Drilling	8	Ft.
Upon Completion	19	Ft.
Delay (24 Hrs.)	4	Ft.

BORING LOCATION:

Elevation (feet)	Depth, (feet)	Graphic Log	Sample Type	Sample No.	Recovery (inches)	MATERIAL DESCRIPTION	USCS Classification	SPT Blows per 6-inch (SS) Texas Cone (TC)	Moisture, %	STANDARD PENETRATION TEST DATA N in blows/ft ◎ × Moisture ◪ PL ✚ LL (0 25 50) STRENGTH, tsf ▲ Qu ✳ Qp (0 2.0 4.0)	Additional Remarks
	0			1		(FILL) **Fat CLAY**, medium stiff, dark brown, fine roots			27		
				2	18	...trace red inclusions and asphalt bits		2/2/3 N=5	22		
				3	18	**Fat CLAY**, stiff, light gray, brown mottling, ferrous nodules, trace gravel	CH	2/3/4 N=7	24		LL = 53 PL = 17 pH = 8.4 SO_4 = <200 mg/Kg Fines=86.3%
	5			4	18			2/3/4 N=7	26		
				5	18	**Lean CLAY**, stiff, red with gray and brown, fine roots		4/4/7 N=11	22		
	10			6	18	**Silty CLAY with Sand**, very stiff, red		7/8/16 N=24	17		
	15			7		**Sandy SILTSTONE**, hard to very hard, red, shale layers interbedded throughout		30 50 (2.50")	15		
	20			8				50 (1.25") 50 (0.75")			
	25			9		End of boring		50 (1.00") 50 (0.38")			

Professional Service Industries, Inc.
11825 S. Portland Avenue
Oklahoma City, OK 73170
Telephone: (405) 735-6052

PROJECT NO.: 05462142-2
PROJECT: Central Junior High School Addition
LOCATION: Moore, OK

The stratification lines represent approximate boundaries. The transition may be gradual.

BORING DB-2

DATE STARTED:	3/17/20	**DRILL COMPANY:**	DSO
DATE COMPLETED:	3/17/20	**DRILLER:**	M. Cross
COMPLETION DEPTH	25.0 ft	**LOGGED BY:**	B. Stone
BENCHMARK:	N/A	**DRILL RIG:**	ATV
ELEVATION:	N/A	**DRILLING METHOD:**	Soild Flight Auger
LATITUDE:	35.34211°	**SAMPLING METHOD:**	SS/TC
LONGITUDE:	-97.48745°	**HAMMER TYPE:**	Automatic
STATION:	N/A	**EFFICIENCY**	N/A
OFFSET:	N/A	**REVIEWED BY:**	A. Oyesanya

REMARKS:

Water

While Drilling	10 Ft.
Upon Completion	22 Ft.
Delay (24 Hrs.)	4.5 Ft.

BORING LOCATION:

Elevation (feet)	Depth, (feet)	Graphic Log	Sample Type	Sample No.	Recovery (inches)	MATERIAL DESCRIPTION	USCS Classification	SPT Blows per 6-inch (SS) Texas Cone (TC)	Moisture, %	STANDARD PENETRATION TEST DATA N in blows/ft ◎ × Moisture ◪ PL ✚ LL (0 25 50) STRENGTH, tsf ▲ Qu ✳ Qp (0 2.0 4.0)	Additional Remarks
	0			1		(FILL) **Sandy Lean CLAY to Fat CLAY**, stiff, dark brown to dark gray with red, fine roots			30		
				2	18			4/4/4 N=8	21		
				3	18	**Fat CLAY**, stiff, grayish-brown, ferrous nodules, fine roots, black veins		3/4/5 N=9	24		
	5			4	18	**Lean CLAY**, stiff, red with gray, trending to fat clay	CL	3/4/6 N=10	22		LL = 45 PL = 16 Fines=89.3%
				5	18	**Silty SAND**, very dense, red		8/25/27 N=52	18	>>	
	10			6	17	**Sandy SILTSTONE**, moderately hard to very hard, red, shale layers interbedded throughout		12/22 50 (5.00")	17	>>	
	15			7				50 (2.13") 50 (1.50")		>>	
	20			8				50 (1.13") 50 (1.00")		>>	
	25			9		End of boring		50 (1.25") 50 (0.38")		>>	

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PROJECT NO.: 05462142-2
PROJECT: Central Junior High School Addition
LOCATION: Moore, OK

The stratification lines represent approximate boundaries. The transition may be gradual.

BORING DB-3

DATE STARTED:	3/17/20	**DRILL COMPANY:**	DSO
DATE COMPLETED:	3/17/20	**DRILLER:** M. Cross	**LOGGED BY:** B. Stone
COMPLETION DEPTH	25.0 ft	**DRILL RIG:**	ATV
BENCHMARK:	N/A	**DRILLING METHOD:**	Soild Flight Auger
ELEVATION:	N/A	**SAMPLING METHOD:**	SS/TC
LATITUDE:	35.34251°	**HAMMER TYPE:**	Automatic
LONGITUDE:	-97.48758°	**EFFICIENCY**	N/A
STATION: N/A	**OFFSET:** N/A	**REVIEWED BY:**	A. Oyesanya

REMARKS:

Water		
	While Drilling	8 Ft.
	Upon Completion	23 Ft.
	Delay (24 Hrs.)	5 Ft.

BORING LOCATION:

Elevation (feet)	Depth, (feet)	Graphic Log	Sample Type	Sample No.	Recovery (inches)	MATERIAL DESCRIPTION	USCS Classification	SPT Blows per 6-inch (SS) Texas Cone (TC)	Moisture, %	STANDARD PENETRATION TEST DATA N in blows/ft ◎ × Moisture ◪ PL ✚ LL (0 25 50) STRENGTH, tsf ▲ Qu ✳ Qp (0 2.0 4.0)	Additional Remarks
	0			1		3" **CONCRETE**			22		
						(FILL) **Sandy Lean CLAY**, red with brown, lime like odor					
				2	18	**Fat CLAY**, stiff, grayish-brown to dark gray	CH	3/4/5 N=9	25		LL = 55 PL = 18 Fines=95.0%
				3	18	**Fat CLAY**, stiff, light gray, brown mottling, ferrous nodules, trace gravel		3/4/5 N=9	20		
	5			4	18			2/3/4 N=7	22		
						Lean CLAY with Sand, stiff, red with light gray, black veins, calcareous inclusions					
				5	18			4/4/5 N=9	19		
	10			6	18			3/4/6 N=10	20		
						Silty SAND, medium dense, red					
	15			7		**Sandy SILTSTONE**, hard, red, shale layers interbedded throughout		33 50 (3.00")	16		>>
	20			8				50 (1.25") 50 (1.00")			>>
	25			9		End of boring		50 (1.50") 50 (1.00")			>>

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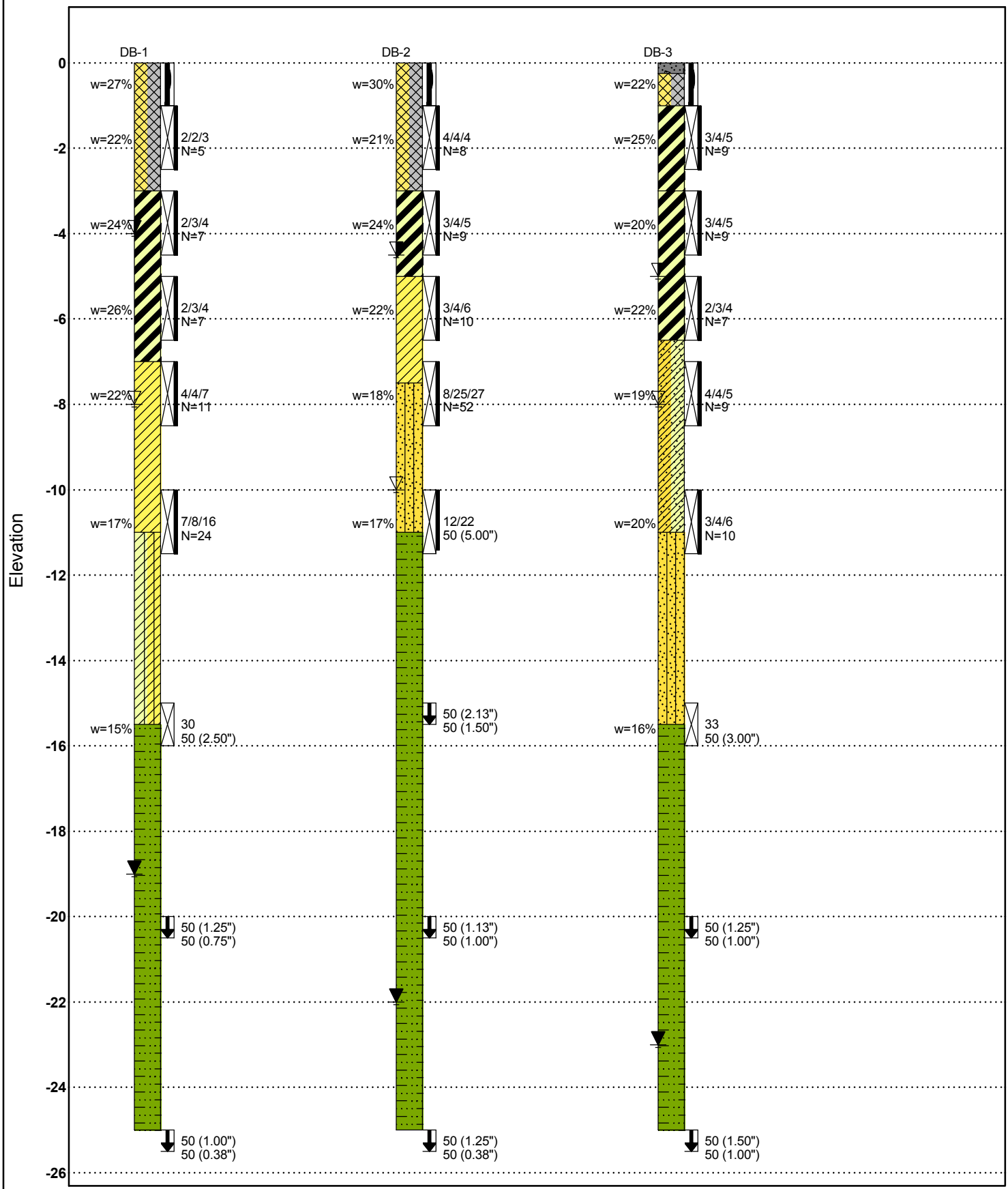
PROJECT NO.: 05462142-2
PROJECT: Central Junior High School Addition
LOCATION: Moore, OK

The stratification lines represent approximate boundaries. The transition may be gradual.

Profile



Distance Along Baseline

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Oklahoma City, OK 73170
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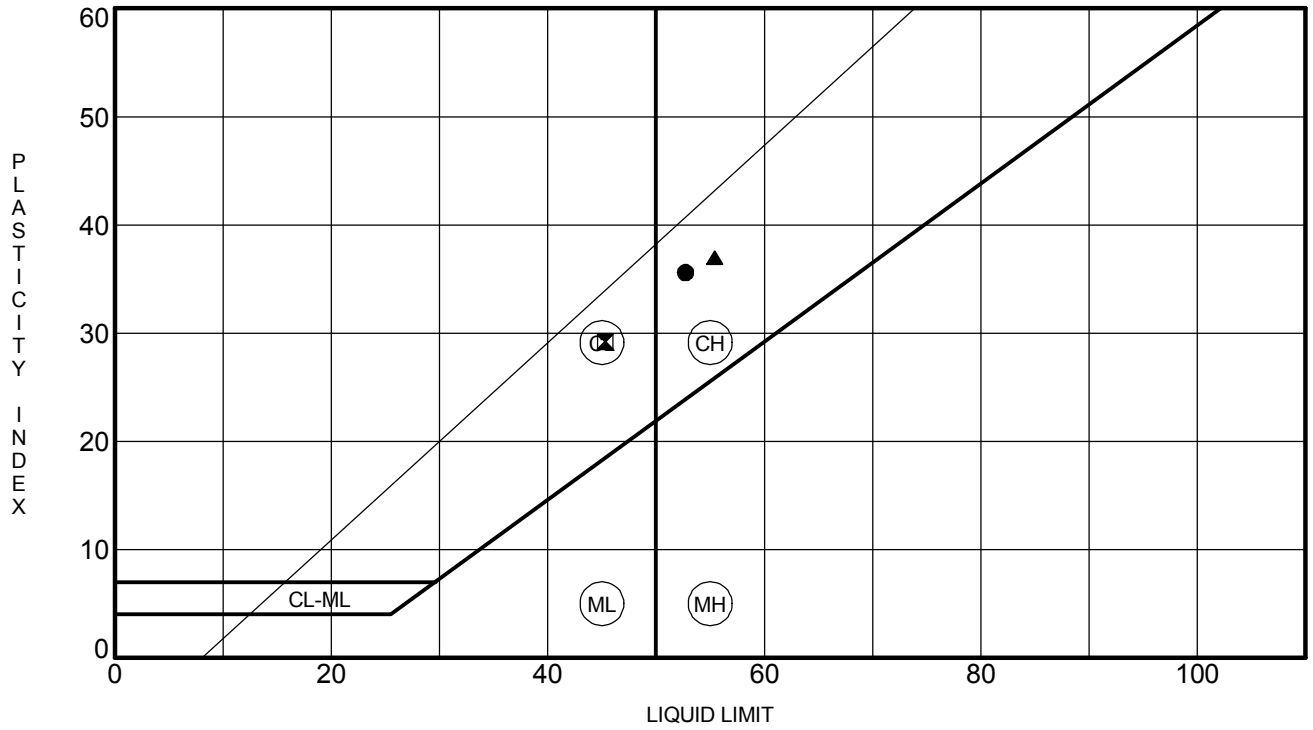
Central Junior High School Addition
PSI Project Number: 05462142-2

APPENDIX B – LABORATORY TEST REPORTS



	Boring	Depth (ft)	LL	PL	PI	Fines	Classification (*Visual)
●	**DB-1**	**3.8**	**53**	**17**	**36**	**86.3**	**Fat CLAY**
⊠	**DB-2**	**5.8**	**45**	**16**	**29**	**89.3**	**Lean CLAY**
▲	**DB-3**	**1.8**	**55**	**18**	**37**	**95.0**	**Fat CLAY**

Professional Service Industries, Inc.
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Oklahoma City, OK 73170
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Fax: (405) 735-6086

ATTERBERG LIMIT RESULTS

PSI Job No.: 05462142-2
Project: Central Junior High School Addition
Location: Moore, OK

APPENDIX C – GENERAL NOTES

GENERAL NOTES

SAMPLE IDENTIFICATION

The Unified Soil Classification System (USCS), AASHTO 1988 and ASTM designations D2487 and D-2488 are used to identify the encountered materials unless otherwise noted. Coarse-grained soils are defined as having more than 50% of their dry weight retained on a #200 sieve (0.075mm); they are described as: boulders, cobbles, gravel or sand. Fine-grained soils have less than 50% of their dry weight retained on a #200 sieve; they are defined as silts or clay depending on their Atterberg Limit attributes. Major constituents may be added as modifiers and minor constituents may be added according to the relative proportions based on grain size.

DRILLING AND SAMPLING SYMBOLS

SFA: Solid Flight Auger - typically 4" diameter flights, except where noted.
HSA: Hollow Stem Auger - typically 3¼" or 4¼ I.D. openings, except where noted.
M.R.: Mud Rotary - Uses a rotary head with Bentonite or Polymer Slurry
R.C.: Diamond Bit Core Sampler
H.A.: Hand Auger
P.A.: Power Auger - Handheld motorized auger

SS: Split-Spoon - 1 3/8" I.D., 2" O.D., except where noted.
ST: Shelby Tube - 3" O.D., except where noted.
RC: Rock Core
TC: Texas Cone
BS: Bulk Sample
PM: Pressuremeter
CPT-U: Cone Penetrometer Testing with Pore-Pressure Readings

SOIL PROPERTY SYMBOLS

N: Standard "N" penetration: Blows per foot of a 140 pound hammer falling 30 inches on a 2-inch O.D. Split-Spoon.
N_{60}: A "N" penetration value corrected to an equivalent 60% hammer energy transfer efficiency (ETR)
Q_u: Unconfined compressive strength, TSF
Q_p: Pocket penetrometer value, unconfined compressive strength, TSF
w%: Moisture/water content, %
LL: Liquid Limit, %
PL: Plastic Limit, %
PI: Plasticity Index = (LL-PL),%
DD: Dry unit weight, pcf
▼,▽,▼ Apparent groundwater level at time noted

RELATIVE DENSITY OF COARSE-GRAINED SOILS

Relative Density	N - Blows/foot
Very Loose	0 - 3
Loose	4 - 9
Medium Dense	10 - 29
Dense	30 - 49
Very Dense	50+

ANGULARITY OF COARSE-GRAINED PARTICLES

Description	Criteria
Angular:	Particles have sharp edges and relatively plane sides with unpolished surfaces
Subangular:	Particles are similar to angular description, but have rounded edges
Subrounded:	Particles have nearly plane sides, but have well-rounded corners and edges
Rounded:	Particles have smoothly curved sides and no edges

GRAIN-SIZE TERMINOLOGY

Component	Size Range
Boulders:	Over 300 mm (>12 in.)
Cobbles:	75 mm to 300 mm (3 in. to 12 in.)
Coarse-Grained Gravel:	19 mm to 75 mm (¾ in. to 3 in.)
Fine-Grained Gravel:	4.75 mm to 19 mm (No.4 to ¾ in.)
Coarse-Grained Sand:	2 mm to 4.75 mm (No.10 to No.4)
Medium-Grained Sand:	0.42 mm to 2 mm (No.40 to No.10)
Fine-Grained Sand:	0.075 mm to 0.42 mm (No. 200 to No.40)
Silt:	0.005 mm to 0.075 mm
Clay:	<0.005 mm

PARTICLE SHAPE

Description	Criteria
Flat:	Particles with width/thickness ratio > 3
Elongated:	Particles with length/width ratio > 3
Flat & Elongated:	Particles meet criteria for both flat and elongated

RELATIVE PROPORTIONS OF FINES

Descriptive Term	% Dry Weight
Trace:	< 5%
With:	5% to 12%
Modifier:	>12%

GENERAL NOTES

(Continued)

CONSISTENCY OF FINE-GRAINED SOILS

Q_U - TSF	N - Blows/foot	Consistency
0 - 0.25	0 - 1	Very Soft
0.25 - 0.50	2 - 3	Soft
0.50 - 1.00	4 - 6	Medium Stiff
1.00 - 2.00	7 - 12	Stiff
2.00 - 4.00	13 - 26	Very Stiff
4.00 +	26+	Hard

MOISTURE CONDITION DESCRIPTION

Description	Criteria
Dry:	Absence of moisture, dusty, dry to the touch
Moist:	Damp but no visible water
Wet:	Visible free water, usually soil is below water table

RELATIVE PROPORTIONS OF SAND AND GRAVEL

Descriptive Term	% Dry Weight
Trace:	< 15%
With:	15% to 30%
Modifier:	>30%

STRUCTURE DESCRIPTION

Description	Criteria
Stratified:	Alternating layers of varying material or color with layers at least ¼-inch (6 mm) thick
Laminated:	Alternating layers of varying material or color with layers less than ¼-inch (6 mm) thick
Fissured:	Breaks along definite planes of fracture with little resistance to fracturing
Slickensided:	Fracture planes appear polished or glossy, sometimes striated
Blocky:	Cohesive soil that can be broken down into small angular lumps which resist further breakdown
Lensed:	Inclusion of small pockets of different soils
Layer:	Inclusion greater than 3 inches thick (75 mm)
Seam:	Inclusion 1/8-inch to 3 inches (3 to 75 mm) thick extending through the sample
Parting:	Inclusion less than 1/8-inch (3 mm) thick

SCALE OF RELATIVE ROCK HARDNESS

Q_U - TSF	Consistency
2.5 - 10	Extremely Soft
10 - 50	Very Soft
50 - 250	Soft
250 - 525	Medium Hard
525 - 1,050	Moderately Hard
1,050 - 2,600	Hard
>2,600	Very Hard

ROCK BEDDING THICKNESSES

Description	Criteria
Very Thick Bedded	Greater than 3-foot (>1.0 m)
Thick Bedded	1-foot to 3-foot (0.3 m to 1.0 m)
Medium Bedded	4-inch to 1-foot (0.1 m to 0.3 m)
Thin Bedded	1¼-inch to 4-inch (30 mm to 100 mm)
Very Thin Bedded	½-inch to 1¼-inch (10 mm to 30 mm)
Thickly Laminated	1/8-inch to ½-inch (3 mm to 10 mm)
Thinly Laminated	1/8-inch or less "paper thin" (<3 mm)

ROCK VOIDS

Voids	Void Diameter
Pit	<6 mm (<0.25 in)
Vug	6 mm to 50 mm (0.25 in to 2 in)
Cavity	50 mm to 600 mm (2 in to 24 in)
Cave	>600 mm (>24 in)

GRAIN-SIZED TERMINOLOGY

(Typically Sedimentary Rock)

Component	Size Range
Very Coarse Grained	>4.76 mm
Coarse Grained	2.0 mm - 4.76 mm
Medium Grained	0.42 mm - 2.0 mm
Fine Grained	0.075 mm - 0.42 mm
Very Fine Grained	<0.075 mm

ROCK QUALITY DESCRIPTION

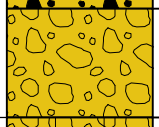
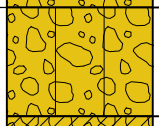
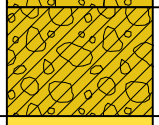
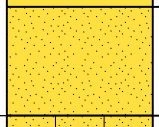
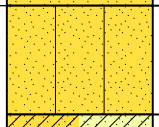
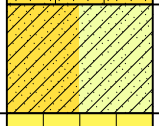
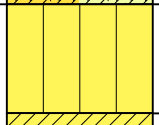
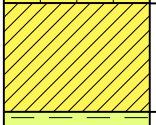
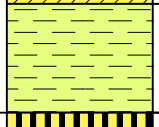
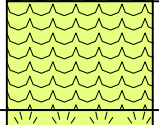
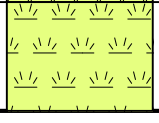
Rock Mass Description	RQD Value
Excellent	90 -100
Good	75 - 90
Fair	50 - 75
Poor	25 -50
Very Poor	Less than 25

DEGREE OF WEATHERING

Slightly Weathered:	Rock generally fresh, joints stained and discoloration extends into rock up to 25 mm (1 in), open joints may contain clay, core rings under hammer impact.
Weathered:	Rock mass is decomposed 50% or less, significant portions of the rock show discoloration and weathering effects, cores cannot be broken by hand or scraped by knife.
Highly Weathered:	Rock mass is more than 50% decomposed, complete discoloration of rock fabric, core may be extremely broken and gives clunk sound when struck by hammer, may be shaved with a knife.

SOIL CLASSIFICATION CHART

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS

MAJOR DIVISIONS			SYMBOLS GRAPH	SYMBOLS LETTER	TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	GRAVEL AND GRAVELLY SOILS MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	CLEAN GRAVELS (LITTLE OR NO FINES)		GW	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
				GP	POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
		GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)		GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES
				GC	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES
	SAND AND SANDY SOILS MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE	CLEAN SANDS (LITTLE OR NO FINES)		SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
				SP	POORLY-GRADED SANDS, GRAVELLY SAND, LITTLE OR NO FINES
		SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)		SM	SILTY SANDS, SAND - SILT MIXTURES
				SC	CLAYEY SANDS, SAND - CLAY MIXTURES
FINE GRAINED SOILS MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
				OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY
				OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS				PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

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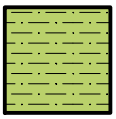
Graphic Symbols for Materials and Rock Deposits

CONCRETE
Portland Cement Concrete

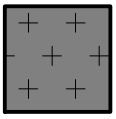
BITUMINOUS CONCRETE



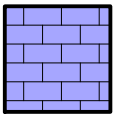
CLAYSTONE

COAL
Coal, Anthracite Coal

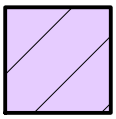
CONGLOMERATE/BRECCIA
Conglomerate, Breccia



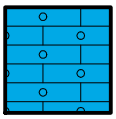
IGNEOUS ROCK
Anorthsite, Basalt, Metabasalt, Diabase (Gabbro), Gabbro, Granite/Granodionite, Homfels, Pegmatite, Rhyolite/Metarhyolite



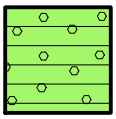
LIMESTONE
Limestone, Dolomite



METAMORPHIC ROCK
Amphibolite, Gneiss, Marble, Phyllite, Quartzite, Schist, Serpentinite, Slate

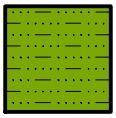


CHERT

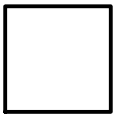


SANDSTONE
Sandstone, Orthoquarzite (Sandstone)

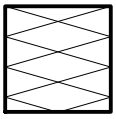
SHALE



SILTSTONE



NO RECOVERY



VOID

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DIVISION 1 - GENERAL REQUIREMENTS

SECTION 01010-SUMMARY OF THE WORK

Part 1 - General

1.01 Work Included:

A. The General Conditions, Bidding Requirements, and Division I are hereby made a part of each of the technical sections that follow, and shall be understood to apply and shall apply in full to all individuals or corporations who contract or subcontract to perform any part or all of the project work.

B. Indications on the working drawings or in any section of the specifications of an article or material, operation, or method, requires that the Contractor shall provide each item or service or quality or is subject to qualifications noted; and, the Contractor shall perform each operation prescribed according to the conditions stated providing, therefore, all necessary labor, equipment and incidentals to complete the project work.

C. The project:

1. Name: Central Junior High School STEM Addition - Moore Public Schools.
2. Location: 400 North Broadway – Moore, Oklahoma.

1.02 Summary of Work:

A. **Base Bid:** Provide and pay for all materials, labor, services, equipment, licenses, taxes, permits, and other items necessary for the complete construction of an (approximately) 22,590 s.f. new STEM classroom addition including new sidewalks, and site utilities. Contractor shall maintain all barriers, guards and other environmental items required at the site during construction.

B. Owner: Moore Public Schools

1. Owner's Representative:
   Jeff Horn, Bond Issue Consultant
   Moore Public Schools
   1500 SE 4th Street
   Moore, OK 73160
   405-735-4221

C. Design Team:

1. Architect:
   Mike Abla, Principal Architect
   AGP
   313 SE 5th Street
   Moore, OK 73160
   405-735-3477
2. Structural Engineer:
   Brandon Birch, Structural Engineer
   KFC Engineering, Inc.
   205 NW 63rd, Suite 390
   Oklahoma City, OK 73116

3. Mechanical, Electrical and Plumbing Engineers:
   Dwayne Gordon, Mechanical Engineer
   Salas O'Brien LLC
   2900 S. Telephone Rd., Suite 120
   Moore, OK 73160
   405-364-9926
4. Civil Engineer:
   Derek Harris, Engineering Intern
   Cedar Creek
   P.O. Box 14534
   Oklahoma City, OK 73113
   405-863-8984
4. Construction Manager:
   Joe Sherga, Project Manager
   Omni Construction LLC
   1909 S. Eastern Ave.
   Moore, OK 73160
   405-735-3992

1.04 Work to be Provided and Installed By Others:
Not applicable.

1.05 Use of the Site:
A. Confine operations at the site to the areas permitted under the contract. Portions of the site beyond areas on which work is indicated are not to be disturbed.
B. Keep facility free from accumulation of waste material, rubbish or construction debris.

1.06 Safety of Persons and property:
A. Contractor shall at all times protect the building from damage from rainwater.
B. Contractor shall provide barricades and clearly mark work zone areas.
C. Refer to Special Conditions "Temporary Services" for additional information.
D. During the period of construction, the OSHA Standards shall be followed as applicable by law.
E. The Contractor shall post emergency telephone numbers.

1.07 Preconstruction Conference:
A. A preconstruction meeting will be held at a time and place designated by the Architect or Owner's Representative, for the purpose of identifying responsibilities of the Owner's and the Architect's personnel and explanation of administrative procedures.
B. The Contractor shall use this meeting for the following minimum agenda:
   1. Construction Schedule/Project Phasing.
   2. Use of areas of the site.
   3. Delivery and storage.
   4. Safety.
   5. Security.
   6. Cleaning up.
   7. Subcontractor procedures relating to:
      a. Submittals.

b. Change orders.
c. Applications for payment.
d. Record documents.

C. The attendees shall include:
1. The Owner's Representatives.
2. The Architect.
3. The Contractor and its superintendent.

1.08 Project Scheduling:

A. The Contractor is responsible for the scheduling of construction and must prepare a schedule and charting system described below. This schedule is to ensure adequate planning and execution of the work by the contractor and to assist the Architect in appraising the schedule and evaluating the progress of the work.

B. The project schedule shall be presented within ten (10) days after receipt of the Notice to Proceed. Electronic copies of the schedule shall be submitted to the Architect for review and approval.

C. The schedule logic must be in the form of a "fenced" bar chart or Critical Path Method network indicating the planned start and completion dates of the activity, logical constraints between activities, and total float of each activity.

D. An updated project schedule shall be provided when requested by the Architect.

1.09 Environmental Controls:

A. Water Resources:
1. Oily substances: prevent oily or other hazardous substances from entering the ground, drainage areas, or local bodies of water.
2. Mosquito abatement: prevent ponding of stagnant water conducive to mosquito breeding habitat.

B. Land Resources:
1. Erodible soils: plan and conduct earthwork to minimize the duration of exposure of unprotected soils. Clear areas in reasonably sized increments only as needed to use the areas developed. Immediately protect side slopes and back slopes upon completion of rough grading.

C. Air resources:
1. Prevent creation of dust, air pollution, and odors.
2. Use water sprinkling, temporary enclosures, and other appropriate methods to limit dust and dirt rising and scattering in air to locate practical level.
3. Store volatile liquids, including fuels and solvents, in closed containers.
4. Properly maintain equipment to reduce gaseous pollutant emissions.

D. Comply with all applicable environmental control guidelines as required by the City of Moore.

1.10 Temporary Utilities:

A. The Contractor shall provide and pay for all temporary utilities required for the complete construction of the project including, but not limited to, electricity, lighting, heating,

cooling, ventilating, telephone, water, sanitary facilities, exterior and interior enclosures, access roads and parking areas, cleaning and waste removal, project identification and signs, etc.

1.11 Cleaning:

A. Use cleaning materials and agents recommended by manufacturer or fabricator of surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property, or that might damage finished surfaces.

B. Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit of work to condition expected from a commercial building cleaning and maintenance program. Comply with manufacturer's published instructions.

C. Complete cleaning operations prior to requesting a Final / Substantial Completion Inspection.

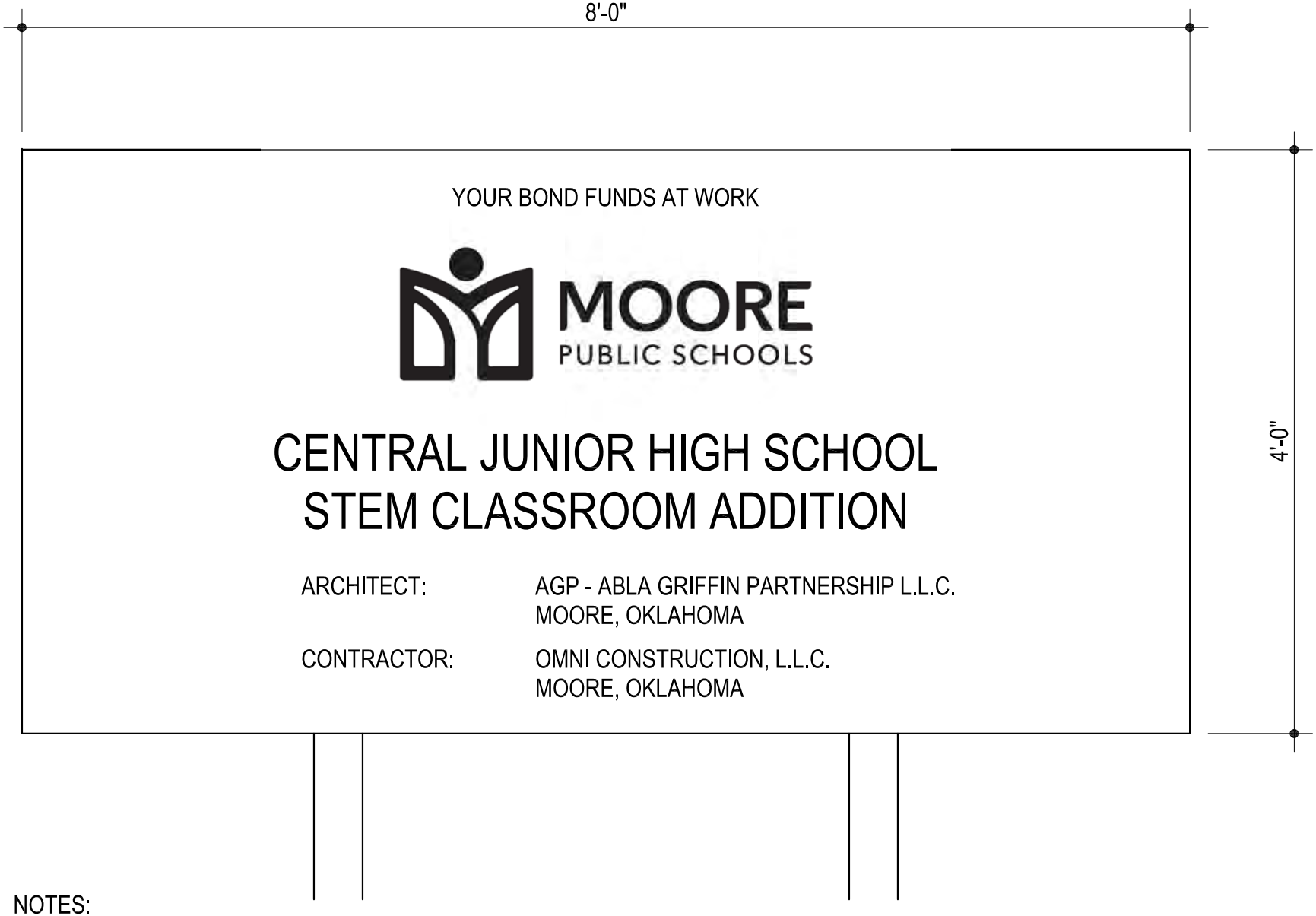
1.12 Project Sign:

A. Provide and install painted plywood project sign on wooden posts securely erected at the project site in a location approved by the Owner.

B. No other project signs or advertisement shall be allowed at the project site unless approved by the Owner.

C. Graphics and form of letter of the project sign shall be as indicated in the attached detail.

End of Section



NOTES:

1. WHITE LETTERS ON DARK BLUE BACKGROUND
2. 3/4" EXTERIOR PLYWOOD - PAINTED ALL SIDES
3. MOUNT ON 4" X 4" WOOD POST
4. CONTRACTOR TO HAVE LAYOUT APPROVED PRIOR TO INSTALLATION

DIVISION 2 - SITE WORK

SECTION 02110 - TEMPORARY CONSTRUCTION FENCING

Part 1 - General

1.01 Summary
- A. Section includes: Erection, maintenance and dismantling of temporary fencing around construction site and materials storage areas. This section does not apply where security fencing is required.
- B. Refer to Drawings for temporary fencing layout and location of gates.

1.02 Submittals
- A. Submit the following:
  1. Shop drawing indicating layout of temporary fencing, location and size of gates, existing pavement and roads, access to fire hydrants and hose connections, and other site specific conditions. Prepare drawing after site observation and verification of existing conditions.

Part 2 - Products

2.01 Temporary Chain Link fencing:
- A. Unless otherwise indicated, type of temporary chain link fencing shall be Contractor's option. Following types are acceptable:
  1. New materials or previously used salvaged chain link fencing in good condition.
  2. Posts: Galvanized steel pipe of diameter to provide rigidity. Post shall be suitable for setting in concrete footings, driving into ground, anchoring with base plates, or inserting in precast concrete blocks.
  3. Fabric: Woven galvanized steel wire mesh. Provide in continuous lengths to be wire tied to fence posts or prefabricated into modular pipe-framed fence panels.
  4. Height: Minimum Height shall be 8'-0".
- B. Gates: Provide personnel and vehicle gates of the quantity and size indicated on the Drawings or required for functional access to site.
  1. Fabricate of same material as used for fencing.
  2. Vehicle gates:
     a. Minimum width: 20 feet to allow access for emergency vehicles.
     b. Capable of manual operation by one person.

Part 3 - Execution:

3.01 Layout:
- A. Installation of temporary fencing shall not deter or hinder

access to existing and new hose connections and fire hydrants.
1. Maintain 3 feet diameter clear space around fire hydrants.
2. Where fire hydrant or hose connection is blocked by fencing, provide access gate.

B. Access: Provide gates for personnel, delivery of materials, and access by emergency vehicles.

3.02 Installation:

A. Chain link posts:
1. Space at 10'-0" maximum.
2. Drive posts, set in holes and backfill, or anchor in precast concrete blocks.
3. For soft and unstable ground conditions, cast concrete plug around post.
4. Posts over pavement: Use steel post plates or precast concrete blocks.
5. Gate posts: Use bracing or concrete footings to provide rigidity for accommodating size of gate.

B. Fabric: Securely attach to posts.

C. Gates: Install with required hardware.

D. Plastic mesh fencing: Space steel support posts to ensure mesh remains vertical and at proper height. Securely tie mesh to posts.

3.03 Maintenance and Removal:

A. Maintain fencing in good condition. If damaged, immediately repair.

B. Remove temporary fencing upon completion of Work or when no longer required for security or control. Backfill holes and compact. Holes in pavement shall be surfaced to match existing paving. Repair damage caused by installation of temporary fencing.

End of Section

DIVISION 2 – SITE WORK

SECTION 02811 - UNDERGROUND SPRINKLER SYSTEM

Part 1 - General

1.01 Work Included:

A. The General / Special Conditions and applicable sections of Division 1 shall apply to this entire section.

1.02 Summary:

This section includes the installation of an irrigation system for tree plantings and turf areas as shown on the Drawings. Components to be installed include, (but not limited to) design of the irrigation system, connection to water supply, main lines, lateral lines, trenching, backfilling, backflow device, automatic controller, bubblers, automatic drain valves, control wiring, fittings, electrical connections, zone valves, manual valves, sleeves under paving, piping, wire decoders, sensors and all necessary accessories to provide a complete operational system.

A. Contractor shall become familiar with the existing site conditions and other construction activities. Coordinate with the Owner's Representative on current construction activities, utilities, and other construction trades.

B. All planting bed areas shall be zoned independently from turf and tree zones.

1.03 Related Sections:

A. Section 02900 - Trees and Turf.

B. Section 02920 – Landscape Grading.

C. Section 02970 - Landscape Establishment

1.04 References:

A. American Society for Testing and Materials (ASTM):

1. D1785-83 - Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40 and Class 200
2. D2241-84 -Poly (Vinyl Chloride) (PVC) Plastic Pipe (SDR-PR)
3. D2287 -Nonrigid Vinyl Chloride Polymer and Copolymer Molding and Extrusion Compounds
4. D2466-78 - Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40
5. D2564-80 -Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Pipe and Fittings
6. D2855-83 -Making Solvent-Cemented Joints with Poly (Vinyl Chloride) (PVC) Pipe and Fittings
7. D3139-84 -Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals

B. National Standard Plumbing Code.

C. National Electric Code - NFPA 70.

SECTION 02811 - UNDERGROUND SPRINKLER SYSTEM

1.05 Definitions:

A. Distribution: Diameter of Coverage - diameter of the surface area receiving water (pertains to full or part circle).

B. Irrigation Heads:

1. Fill-in - heads not located on the basic symmetrical pattern and/or which may not have the same coverage as the heads in the pattern.
2. Ports - The element within the dripper line which controls the amount of water to the plant or area in the subsurface irrigation system.
3. Pop-up Rotor (if required) - water-lubricated, gear-driven head installed flush with the turf, containing a nozzle which rises four (4) inches above the turf when operating.
4. Pop-up Spray - spray head installed flush with the turf or mulch, containing a nozzle which rises four (4) inches above the turf Spray - head containing a nozzle that discharges a fine uniform water spray.
5. Strip - spray head designed for watering long, narrow strips of turf or landscaping, usually in a square or rectangular pattern.

C. Lines:

1. Header - water line leading off from a zone valve; subject to pressure only when zone is operating.
2. Lateral - water line leading off from a header to a head.
3. Main - water line under constant pressure, supplying the sprinkler zones.

D. Valves:

1. Automatic Drain - a low pressure valve used to drain main and lateral lines.
2. Manual - a valve used to activate/terminate flow to a zone.
3. Zone - a section of heads controlled by one valve.

1.06 Design Criteria:

A. General:

1. The system shall be a two wire controlled system with controller and remote controlled valves as manufactured by Hunter Industries or equal. Main line shall be drained with manual drains at all low points, while zones shall be drained automatically at all low points.

2. The irrigation system design shall specify manufacturer, types of heads, spray nozzles and bodies, and valves to be used. These items shall determine line sizes, types of heads, valve sizes, number of zones and coverage. Manufacturers may be provided as listed in these specifications with similar precipitation rates and GPMs. Changes in pipe sizing, amount of pipe, number or size of valves, number of heads, number of sleeves and other accessories shall be at no additional cost.
3. For design purposes, the following minimum water coverage shall be provided:
    1. Turf Areas - 95 percent of sodded area indicated to be sprinkled.
    2. Other planting areas - 85% percent.
4. Main line shall be manually drained, with manual valves at all low points. Lateral lines shall be automatically drained, with automatic drain valves at all low points.

B. Sleeves:
1. Required number of sleeves shall be provided as required and indicated by the Irrigation System Design. Any additional sleeves required during system installation will be provided at no additional cost to the Owner.
2. Sleeves and Boring under Sidewalks: The Contractor shall add additional sleeves as necessary to insure proper operation of the irrigation system.

C. Two Wire Irrigation System Requirements:
1. Provide Hunter ICD-100 through ICD-600 station decoders – or equal - with surge suppression and ground wire as needed to group irrigation remote control valves.
2. Locate (1) grounding rod every 500 feet along wiring/main line or as per manufacturer's recommendations. Locate ground rods a distance of 12' perpendicular to the mainline. Locate (1) grounding rod at irrigation controller. Locate grounding rods in valve boxes.
3. Provide 14 AWG/1.6 mm diameter twisted decoder wire in sheathed casing as provided by Hunter Industries. Hunter Industries wire must be used to maintain warranty provided by Hunter. Provide DBR6 or DBY6 wire fittings manufactured by 3M for connection of decoders to valve connections and

decoders to two wire system. Wire runs shall not be looped.

4. Install two wire irrigation systems as per manufacturer's recommendations to provide a complete and operational system.
5. Prior to construction of irrigation system, irrigation contractor to shall prepare shop drawings showing valve groupings and wiring path diagrams for review and approval by the Architect.

1.07 Quality Assurance:

A. Irrigation Contractor shall be a single firm with over 7-years of documented experience in all aspects of irrigation work; irrigation maintenance and capable of installing irrigation system of this scope. Wire manufacturer's representative shall provide assistance to irrigation contractor to successfully execute the proper installation of a complete and operational two wire irrigation system. System shall be installed according to the specification requirements.

B. General: Irrigation contractor shall install all elements of the irrigation system including pipe sleeving, piping, heads, valves, wiring, valve boxes, controller, sensors, decoders, and other items necessary to operate the system.

1.08 Work Coordination:

A. Scheduling and Existing Information:

1. Schedule and coordinate all related activities to ensure completion of this work in the most expeditious manner.
2. The Contractor shall assume responsibility for locating all site utilities and perform work in a manner to avoid damage. Contractor shall coordinate location of all existing utilities within the project area with "Okie" as indicated on the Drawings. Contractor is responsible for keeping the utilities clearly marked, updated and protected.
3. Coordination Drawings: the Contractor shall provide and keep up-to-date a complete set of "Record Drawings" which shall be corrected daily to indicate changes in the location of heads, controllers, backflow preventers, valves, drains, meters, points of connection, pull boxes and wire splice boxes, pipe and wire routing and other changes that may have been made from the original shop drawings.

SECTION 02811 - UNDERGROUND SPRINKLER SYSTEM

1.09 Submittals:

A. Shop Drawings: Submit complete irrigation design, indicating, mainline routing, lateral line routing, all remote control zones, a valve/zone schedule reflecting valve size and total gpm's, rotor head types (with nozzle sizes), spray head types (w/nozzle type), bubblers, gate valves, master valves, controller and backflow device locations.
   1. Provide documentation indicating certification of that piping meets tests specified herein.

B. Operations and Maintenance (O&M) Data:
   1. Operation and maintenance data shall be bound into three (3) individually bound hardback binders and properly indexed. Three (3) electronic copies saved to disk will also be provided. O&M data shall include at least the following:
      a. The index sheet shall indicate the Installer's name, address, and telephone number.
      b. Manufacturer's specifications, and description, and O&M information for all system components.
      c. Routine recommended maintenance activities of the entire system including weekly, monthly, semi-annual, seasonal and annual activities.
      d. A schedule of the measured or calculated flow rates for each zone, and a recommended controller setting and a schedule of times and duration of operation for each zone for each month or season based on a stated recommended precipitation requirement for the type of turf or plants and the geographical location of the installation.

C. Literature or Product Items include:
   1. Schedule 40 Sleeves
   2. Class 200 Laterals
   3. PVC Fittings - Schedule 40
   4. Flexible Vinyl Chloride Pipe
   5. PVC Solvent Compound
   6. Swing Joints
   7. Rotor Irrigation Heads
   8. Spray Irrigation Heads
   9. Zone Valves
   10. Gate Valves
   11. Automatic Drain Valves (Laterals)

12. Wiring
13. Wire Connectors
14. Valve Boxes
15. Identification Tape
16. Wireless Rain/Freeze Sensor
17. Wire decoders
18. 6” Pop up Bubblers for Tree Plantings
19. Tracer Wire
20. Backflow Preventer

D. Complete Record Drawings:
   1. Installed conditions.
   2. Two dimensions to each remote control valve, gate valves, etc. from two secure points.

1.10 Protection of Existing Conditions:

A. Contractor shall make every effort to protect existing items to remain.

B. Any existing structures, equipment, utilities, pavement, irrigation zones (all areas on campus), existing and proposed landscaping, etc., damaged by the Contractor during the course of the work, including any subsequent damage caused by equipment activity, leakage or settling of piping shall be restored at the Contractor's expense and to the Owner’s satisfaction.

1.11 Warranties:

A. Provide Manufacturer’s Standard Warranty each irrigation component.

B. One (1) year warranty period shall start upon final acceptance of the completed underground irrigation system.

C. Settlement – as a part of the work under this contract, if within the specified warranty period settlement occurs and adjustments to pipes, valves and sprinkler heads, planting or paving are required to meet the proper level of the permanent grade, the Contractor shall make all adjustments without additional cost to the Owner, including the complete restoration of all damaged planting, paving and other effected improvements of any kind.

Part 2 - Products

2.01 General:

A. Product Schedules: Submit a complete list of products to be incorporated in the work. List shall include catalog numbers, cuts, diagrams, and such other descriptive data as may be required by the Landscape

Architect prior to the submission of product data. Approval of products under this provision shall not be construed as authorizing any deviations from the specification unless attention has been directed in writing to the specific deviation. No consideration will be given to partial lists submitted from time to time. Approval of products will be based on manufacturer's published ratings. Products listed that are not in accordance with these specification requirements will be rejected.

B. Standard Products: Products furnished shall be standard products of manufacturers regularly engaged in the production of such products and shall be manufacturers' latest standard design that complies with the specification requirements.

C. Delivery and Storage: Products delivered to site shall be inspected for damage, unloaded, and stored with the minimum of handling. Do not store products directly on the ground. Inside of pipes and fittings shall be kept free of dirt and debris.

D. Handling: Products shall be handled in such a manner as to insure delivery to the trench in a sound undamaged condition. Pipe shall be carried to the trench, not dragged. Gasket materials and plastic materials that are not to be installed immediately shall not be stored in the direct sunlight. Valves, controller, sprinkler heads, etc., shall be removed from protective cover only upon installation.

2.02 Pipe and Fittings:

A. Pipe and fittings: Shall be PVC plastic unless otherwise specified. Pipe and fittings shall be rated for a minimum working pressure of 150 psi and a minimum hydrostatic pressure of 200 psi.

B. PVC Plastic:

1. Pipe shall conform to ASTM D1785, Schedule 40 and Class 200, Class 12454-B, PVC 1120. Fittings for use with Class 200 pipe shall conform to the requirements of ASTM D2464 or D2467. Fittings for schedule 40 pipe shall be solvent weld socket type conforming to ASTM D2466.
2. Main Lines: Schedule 40
3. Lateral Lines: Class 200
4. Sleeves Under Paving: Schedule 40
5. Flexible vinyl chloride pipe: from laterals to heads.

C. Fittings: Fittings for Solvent Welded Pipe: Provide Schedule 80 polyvinyl chloride, ASTM D2467 standard

weight, solvent weld fittings for pressured and main lines.

1. Manufacturer: SLOANE, LASCO, and SPEARS.

D. Swing Joints (for use with Quick-Couplers):

1. The full circle swing joint shall be rated at 200 psi maximum working pressure at 73_F. The swing joint shall be molded of rigid poly(vinyl) chloride (PVC), Type 1; with N.P.T. threads and pipe sockets. Each rotating joint shall be sealed with a nitrile (or equivalent material) rubber O-ring, installed pre-compressed in a sealing groove free of parting lines to prevent leakage. Modified stub threads shall have special engineered diameters and clearances to allow full-circle (360_) movement and to reduce stress concentrations and joint fracture at threaded roots.
2. Lay length shall be a minimum of 24-inches and pipe has a diameter of 1-inch.
3. Inlet configurations shall be socket and outlet configuration shall be M.I.P.T.
4. Manufacturer:
   a. LASCO

2.03 Valves:

A. Zone Valves: Valves shall be pressure regulating and sized as shown on Drawings. Valves shall be manufactured by HUNTER INDUSTRIES or approved equal.

B. Gate Valves:

1. Bronze gate valves smaller than 3 inches shall conform to MSS SP-80, Type 1, Class 150.

C. Manual Drain Valve: Valves shall be brass or bronze globe valves conforming to MSS SP-80.

D. Automatic Drain Valves:

1. Valves shall be spring-loaded, plunger type.
2. Manufacturer: KING TECHNOLOGY or approved equal.

D. Brass Hydrant:

1. Brass Hydrants shall be as shown on the Drawings and manufactured by Arrowhead or approved equal.

2.04 Control Wires:

Provide 14 AWG/1.6 mm diameter twisted decoder wire in sheathed casing as provided by Hunter Industries. Provide DBR or DBY wire fittings manufactured by 3M for connection of decoders to valve connections and decoders to two wire system. Wire runs shall not be looped.

2.05 Valve Boxes:

A. Boxes shall be high impact-strength plastic. Boxes shall have a lockable cover. Two keys shall be

furnished with each system for each type of box provided. Cover to be green in lawn areas and box enclosure to be black in color. Size boxes based on consolidation of remote control valves. Acceptable manufacturers include:

1. AMETEK
2. RAIN BIRD
3. CARSON
4. NATIONAL DIVERSIFIED SALES, INC.

B. Box Sizes:

1. Zone Valves: Standard Box with extensions as required or larger.
2. Brass Hydrant, Gate Valves, and Manual Drain Valve: 10" Round.

2.06 Identification Tape / Tracer Wire (all piping):

A. Provide underground-type plastic line markers, manufacturer's standard permanent, bright-colored continuous printed plastic tape, intended for direct burial service; not less than six (6) inches wide by four (4) mils thick. The tape shall be purple with black printing reading "CAUTION NONPOTABLE IRRIGATION WATER LINE BURIED BELOW".

B. Contractor shall provide 14 gauge Tracer insulated wire with all mainlines, running from automatic controller along the electrical lines to each valve. All splices in the tracer line will be with waterproof connectors. Contractor will have to splice into the existing tracer line at the main water line with waterproof connectors. The tracer line will follow mainlines, all main lateral lines, all two wire paths that do not run along the mainline.

C. Acceptable manufacturers include:

1. PRESCO PRODUCTS, Sherman, TX, 800.527.3295 or approved equal.

2.07 Sprinkler Heads - refer to 1.05 Definitions above:

A. Bubbler Sprinkler Heads shall be trickle type bubbler with adjustable flow and designed for permanent below ground mounting on risers in perforated, drain rock filled pipe at all tree wells, per locations on the Drawings.

B. Spray Pop-Up Heads:

1. Rotary Type Sprinkler Heads (if required): pop-up type, fully adjustable for flow and pressure, with letter or symbol designating degree of arc and arrow indicating center of spray pattern. Head with pattern to suit landscape layout.
2. Spray Pop Up Shrub Heads: 4"-12" pop-up type,

fully adjustable for flow and pressure, full, half and quarter arc as applicable. Head with pattern to suit landscape layout.

C. Acceptable manufacturers include:
   1. RAINBIRD or approved equal.

2.08 Water:
A. During construction and testing of the irrigation system, the domestic water from the Project property will be obtained from the City of Oklahoma City. The Contractor shall utilize the water in a conservative manner.

2.09 Cements, Cleaner / Primers and Joint Compounds:
A. Cement shall be #2200 series Uni-Weld or Rectorseal Cold low temperature plastic pipe cement for use on all sizes and schedules of PVC pipe and fittings. Cement shall be NSSF approved and meet ASTM D2564 requirements.
B. Cleaner / Primer shall be equal to #8700 United Elchem Hi-Tech Cleaner / Primer.
C. All threaded connections between metal to metal, PVC to metal and PCV to PVC shall be made using RectorSeal #% slow dry, soft set, thread sealing compound. Thread sealing compound shall not be used on threaded connections between sprinkler and nipple or bubbler and nipple.
D. All "O" ring gasket and pip spigot ends shall be lubricated using the lubricant recommended or supplied by the pipe manufacturer. If the pip manufacturer does not provide a lubricant for the pip, use IPS Weld-On #787 gasket lube as manufactured by Industrial Polychemical Service.

2.10 Timing Device:
A. Provide adjustable timing device, 24 hour, and 7 or 14 day clocks to operate any time of day and skip any day in a 7 or 14 day period.
B. Allow for manual or sem-automatic operation without disturbing preset automatic operation.

Part 3 - Execution

3.01 General:
A. Installers shall have a minimum of five (5) years experience locally installing commercial lawn sprinkler equipment and design of lawn sprinkler systems.
B. Installer shall be responsible for the design of entire system including layout and size of pipes,

valves, controllers, heads, etc.

3.02 Examination:

A. Examine installation areas. Report any conditions that differ from what is present in the Contract Drawings.
   1. Locate all Site Utilities: Locate all site utility systems and perform work in a manner that will also avoid damage.

B. Starting installation constitutes acceptance of conditions or satisfactory for installation of underground irrigation system by Contractor, who shall correct damage and defects or unsatisfactory work at no additional cost.

C. Coordinate with the Landscape Contractor on the location of trees and shrub beds in relationship to the location of sprinkler heads. Adjust plantings and / or sprinkler heads as necessary. Coordinate with Architect.

3.03 Installation:

A. Water Source: Connect to 4" domestic water service located at the east side of the building / classroom addition and as identified on the drawings. The location indicated is schematic. It shall be the Contractor's responsibility to field verify exact location of water service. Controller to be located as directed by Owner / Architect.
   1. Install water hammer arrester between connection to building main and circuit valves, inside building or in valve box.

B. Trenching:
   1. Sprinkler mains, laterals, and control wires shall be installed in common trenches wherever possible. Wiring shall be separated from pipe a minimum of 6-inches to avoid possibility of current leakages and short circuits. Mains shall be installed a minimum of 18-inches below finished grade. Headers and laterals shall be a minimum of 12-inches below finished grade. Soft, spongy, or otherwise unstable material that will not provide a firm foundation for the pipe shall be removed and replaced with satisfactory fill material as defined therein.
   2. Contractor to provide protective barricades and flagging along all open trenches.

C. Sleeves:
   1. Unless noted otherwise, sleeves shall be installed under all sidewalks, drives and parking

lots. Sleeves shall be Class 200 PVC pipe two (2) sizes larger than the pipe to be sleeved. Sleeves shall be 30-inches below grade. Wiring shall be placed in a separate sleeve from that of the pipe. Ends at sleeves shall be sealed following installation of piping or wiring.

D. Heads:
   1. Heads shall be of the type and make specified. Heads shall be installed with a 4" space between the edge of the head and curbs, walls, driveways, building walls, etc. heads shall be installed in the vertical position and backfilled and compacted to near original density. Contractor shall verify turf area dimension while staking head location. Heads shall be spaced to achieve uniform coverage. Provide adequate flushing of end riser assemblies.

E. Pipe Laying:
   1. Snake pipe in trench at least 1-foot per each 100-feet to allow for expansion and contraction.

F. Backfilling:
   1. After piping has been tested according to paragraph TESTING, trenches shall be cleared of trash and debris. Material for backfilling shall be satisfactory fill material as approved for use on this Project, properly moistened to obtain optimum compaction and compacted by hand or machine tampers to a density equal to the undisturbed adjacent earth or compacted fill.
   2. Install continuous line markers, located directly over buried main lines at 6-8 inches below finish grade during backfilling and topsoil operations.

G. Piping:
   1. General: Joints connecting pipe of differing materials shall be made in accordance with the manufacturer's recommendations using approved transition fittings or procedures.
   2. Flushing: When the pipelines are connected and the sprinkler risers in place, but before any heads are installed, the control valves shall be opened and the full head of water used to flush out the system.
   3. Pitch: Mains shall be pitched down not less than 1/4-inch in 10-feet in the direction of drainage valves. Laterals and headers shall be pitched toward the automatic drain valves at not less than 1/8-inch in 10-feet.

4. PVC:
   a. Pipe shall be installed in accordance with manufacturer's instructions or as hereinafter noted.
   b. Solvent cement joints shall be made in accordance with ASTM D2855 and the manufacturer's instructions.
5. Lay pipe on solid subbase, uniformly sloped without humps or depressions.
6. Wall Penetrations:
   1. Pack the opening around the pipe with non-shrink grout. At exterior face, provide backer rod and fill 3/4 deep recess with elastomeric sealant. Repair below grade waterproofing disturbed by this work and make penetration watertight.
7. Restore plant materials disturbed by this work.

H. Valves:
1. Gate valves, remote control valves, and manual drain valves shall be installed with extension valve boxes with tops set flush or not more than 1/2-inch above finished grade. Manual drain valves shall drain into sump pits made of gravel, sufficiently large in size to accommodate the volume of water released. All valves shall be installed as per Drawings and manufacturer's recommendations and with top of valve not less than 1 inch below bottom of lid valve.
2. Automatic drain valves shall be furnished at all low points on a mainline or within a zone but no closer than 12-inches from the last head. Valves shall be installed at 45 degrees below horizontal into a gravel sump or as recommended by the manufacturer. Sump shall be of sufficient size to accommodate the water released.

I. Control Wiring:
1. Wiring shall be installed a minimum of 12-inches below finished grade to the side of or below piping where possible.
2. Looped slack at valves shall be provided for electrical wiring. Wires shall be snaked in trenches with and expansion loop at 100-foot intervals.
3. Provide a two wire system to each solenoid valve from the controller.

3.04 Testing:

A. Notification: The Contractor's Quality Control

Representative will be present at all phases of testing. The Architect shall be notified a minimum of 48 hours prior to any testing.

B. Hydrostatic Testing: Water piping and valves shall be tested psi before piping is covered with earth. Test at a hydrostatic pressure of 100 pounds per square inch without pumping for a period of one hour with an allowable pressure drop of five (5). If hydrostatic pressure cannot be held for a minimum of three hours, make adjustments or replacements and repeat the tests until satisfactory results are achieved. Piping may be tested in sections to expedite work.

3.05 Operation and Maintenance:

A. Installer to provide demonstration on how to operate system. Schedule training at least 7 days prior to session.

B. Provide three (3) copies of O&M Manuals. In each copy, provide "cut sheets" of each material installed, operation manuals of controllers, and any additional materials necessary to provide an inventory of the completed installation.

C. Record Drawings and Controller Chart:

1. Maintain a complete set of irrigation Record Drawings.
2. Prepare a controller chart showing:
   a. Location of all sections, valves, lateral lines, and routes of control wires.
   b. Identify all valves as to size, station, number, and type of irrigation.
   c. Provide chart as a black-line print to show area of coverage for each station. Color copies are recommended.
   d. Locate chart inside controller door. Seal chart between two pieces of laminate.
   e. Complete chart and receive approval prior to final inspection of irrigation system.

D. Final Testing and Acceptance:

1. Final testing shall show proper operation of all components and actual measured application rates at representative and selected locations. All irrigated areas shall have 100% coverage, add extra bubblers, piping and accessories as required to achieve 100% coverage.
2. Upon final acceptance of the project, the Owner will assume responsibility for maintenance of the irrigation system.
   a. Acceptance of the underground irrigation

system is based on the Contractor furnishing a complete As-Built set of plans and an Operations and Maintenance Manual acceptable to the Architect / Owner.

E. Extra Materials:
   1. Provide the following extra components:
      a. Two (2) sprinkler heads of each type and size.
      b. Two (2) valve keys for manual valves.
      c. Two (2) valve box keys.
      d. Two (2) keys for valve markers.
   2. Two (2) wrenches for each type of head core and for removing and installing each type of head.

End of Section

DIVISION 2 - SITE WORK

SECTION 02900 - TREES and TURF

Part 1 - GENERAL

1.01 Summary:

A. This section generally describes the work, equipment, and materials required to furnish and landscape the site. The Contractor shall provide all necessary labor, equipment and materials to construct and complete site work landscaping. All work shall be completed in conformance with the recommendations of plant materials suppliers.

B. As a minimum, the Contractor must be able to provide the following materials and services:

1. Supply and grade of fill material
2. Environmentally approved control/elimination of weeds.
3. Supply and installation of trees, shrubs, and turf grass.

C. The Owner may choose to provide any of the above materials and services on or to the job site, in conjunction with Contractor supplied or performed requirements, at no liability cost to the Owner.

1.02 References:

A. Drawings and general provisions of Contract, including General and Special Conditions and Division I Specification sections, apply to Work of this Section.

B. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

1. AMERICAN ASSOCIATION OF NURSERYMEN (AAN) AAN-01 (1990) American Standard for Nursery Stock
2. COMMERCIAL ITEM DESCRIPTIONS (CID) CID A-A-1909 (Basic) Fertilizer

1.03 Submittals:

A. Architect approval is required. Submittals having an "FIO" designation are for information only. The following shall be:

1. Pesticide and Herbicide Treatment Plan, giving proposed sequence of pesticide and herbicide treatment work, before work is started. The pesticide and herbicide trade name, chemical composition, formulation, concentration, application rate of active ingredients and methods of application for all materials furnished, and the name and state license number of the state certified applicator shall be included.
2. Certificates of compliance certifying that materials meet the requirements specified, prior to the delivery of materials. Reports for the following materials shall be included:

a. Topsoil: For pH, chemical analysis, mechanical analysis and particle size.
b. Fertilizer: For chemical analysis and composition percent.
c. Plant Materials: For botanical and common name, size, quantity by species, grade, nursery grown.
d. Pesticide and Herbicide Material: For EPA registration number and registered uses.

1.04 Quality Assurance:

A. All plant materials shall be guaranteed for one (1) year and all components of the irrigation system shall be guaranteed for a period of one (1) year, following ARCHITECT/OWNER acceptance of the project.

B. The Contractor shall maintain the project by weeding, watering, and other tasks as required, through final acceptance of the project by the User. The Contractor should inspect the project on a monthly (minimum) basis to assure that User maintenance is being completed as necessary. The Contractor shall notify the ARCHITECT/OWNER in writing of any advised changes in maintenance activities. Contractor shall immediately replace any all defective components or dead or dying plant materials.

C. The ARCHITECT/OWNER representative shall inspect all planting materials upon delivery to the site and reserves the right to reject any or all materials which do not conform to the intent of this specification.

D. The source of topsoil shall be subject to inspection by the ARCHITECT/OWNER.

1.05 Delivery, Storage and Handling:

A. Pesticide and herbicide materials shall be delivered to the site in the original unopened containers bearing legible labels indicating the Environmental Protection Agency (EPA) registration numbers and the registered uses.

B. Plant material shall be inspected upon arrival at the job site by the ARCHITECT/OWNER for conformity to the paragraph Plants and any unacceptable plant material shall be removed from the job site.

C. Plants not installed on the day of arrival at the site shall be stored and protected in areas designated by the CONSTRUCTION MANAGER and approved by the ARCHITECT/OWNER. Plants shall be protected from exposure to wind and shall be shaded from the sun. Covering that will allow air to circulate and prevent internal heat from building up shall be provided. All plants shall be kept in a moist condition by watering with a fine mist spray until planted.

D. Soil amendments shall be stored in dry locations away from contaminants. Pesticide and herbicide materials shall not

be stored with other landscape materials. Storage of materials shall be in areas designated or as approved by the ARCHITECT/OWNER.

E. Care shall be taken to avoid injury to plants. Materials shall not be dropped from vehicles. Balled and burlapped plants shall be handled carefully to avoid cracking or breaking the earth ball and container-grown plants shall be handled by the container. Plants shall not be handled by the trunk or stems.

1.06 Warranty:

A. Furnished plants shall be guaranteed to be in a vigorous growing condition for a period of 12 months regardless of the contract time period. A plant shall be replaced one time under this guarantee. Transplanted existing plants require no guarantee. A written calendar time period for the guarantee of plant growth shall be furnished to the ARCHITECT/OWNER.

Part 2 - Products

2.01 Materials:

A. Plants:

1. Approved plant species in the indicated sizes, to be provided and installed by the Contractor, are shown on the bid schedule. The Contractor must be able to provide a minimum five of any specified plant in the requested, listed size within 7 calendar days of the request by the Owner.
2. Substitutions will not be permitted without written request from the Contractor for approval by the ARCHITECT/OWNER.
3. Plants shall be grown under climatic conditions similar to those in the locality of the project.
4. Well shaped, well grown, vigorous, healthy plants having healthy and well branched root systems shall be provided. Plants shall be provided free from disease, harmful insects and insect eggs, sun-scald injury, disfigurement and abrasion. Plants shall be provided that are typical of the species or variety and conforming to standards as set forth in AAN-01 and as specified herein.
5. Plants shall be furnished in sizes indicated. Plants larger in size than specified may be provided at no additional cost to the Client.
6. Container grown plants are preferred when available.

2.02 Topsoil:

A. Acceptable topsoil includes selectively excavated material

that is representative of soils in the vicinity that produces growth of crops, grass or other vegetation typical of the project area. Topsoil should be reasonably free from underlying subsoil, clay lumps, objectionable weeds, litter, brush, matted roots, toxic substances or any material that might be harmful to plant growth or be a hindrance to grading, planting, or maintenance operations. Topsoil shall not contain more than five percent by volume of stones, stumps or other objects larger than 3/4 inch in any dimension.

2.03 Fertilizer:

A. The commercial grade of fertilizer shall be suitable for the locations and season approved by the Contraction Officer. The P-N-K content shall be determined on the basis of soil conditions and the plants involved.

B. Prepackaged fertilizer delivered to the site shall be packaged in new, sealed, clean containers which bear a label fully describing the contents, the chemical analysis of each nutrient, the fertilizer grade, the net bulk, and the brand name and address of the manufacturer. Bulk fertilizer delivered to the site shall be accompanied with certification describing the contents, the chemical analysis of each nutrient, the fertilizer grade, the net bulk, and the brand name and address of the manufacturer. No fertilizer which becomes caked or otherwise damaged will be accepted.

C. Agricultural limestone shall have a minimum calcium carbonate equivalent of 90 percent and shall be ground to such a fineness that at least 90 percent will pass a 10-mesh sieve and at least 50 percent will pass a 60-mesh sieve. Coarser materials will be acceptable provided they pass the 10-mesh sieve and the specified rates of application are increased in linear proportion to the quantities passing the 60 mesh sieve where zero passage indicates doubling the application rate.

D. Other liming material shall have a minimum calcium carbonate equivalent of 80 percent and shall be crushed to such a fineness that at least 90 percent will pass an 8-mesh sieve and at least 80 percent will pass a 10-mesh sieve.

2.05 Organic Soil Amendments:

A. Peat shall be a natural product peat humus derived from a bog, swampland or marsh shall conform to ASTM D 2607.

B. Sand shall be clean and free from toxic materials and at least 95 percent by weight.

C. Decomposed wood derivatives shall be ground bark, sawdust, or other wood waste material free of stones, sticks, and

toxic substances harmful to plants and stabilized with nitrogen and having the following properties:

Particle size	Minimum percent by weight passing
No. 4 mesh screen	95
No. 8 mesh screen	80

Nitrogen Content	Minimum percent based on dry weight
Redwood sawdust	0.5
Fir sawdust	0.7
Fir and Pine Bark	1.0

2.07 Water:

A. Water shall not contain elements toxic to plant life.

2.08 Pesticide:

A. Pesticide shall be insecticide, herbicide, fungicide, nematocide, rodenticide, and miticide. Pesticide material shall be labeled for use and applied only as registered by EPA and approved herbicide, insecticide, fungicide, nematocide, rodenticide, miticide.

Part 3 - Execution

3.01 Examination:

A. The Contractor shall verify the finished grades are as indicated on drawings, and the placing of topsoil and smooth grading has been completed.

B. The location of underground utilities and facilities shall be verified. Damage to underground utilities and facilities shall be repaired at the Contractor's expense.

3.02 Site Preparation:

A. Plant material locations and bed outlines shall be staked on the project site before any excavation is made. Plant material locations may be adjusted by the ARCHITECT/OWNER to meet field conditions.

B. Where planting beds occur in existing turf areas, the turf shall be removed to a depth that will ensure the removal of the entire root system.

C. Prior to placing topsoil, the ground surface shall be cleared of all brush, snags, and rubbish.

D. Previously constructed grades shall be repaired if necessary so that areas to be topsoiled conform to the final grades upon completion of topsoil placement.

E. The topsoil shall be uniformly distributed on the designated areas and evenly spread to a minimum thickness of 6 inches. The spreading shall be performed in such a manner that planting can proceed with little additional

soil preparation or tillage. The surface resulting from topsoiling shall meet the finish surface requirements as specified. Topsoil shall not be placed when the subgrade is frozen, excessively wet, extremely dry, or in a condition otherwise detrimental to proper grading or the proposed planting.

F. All topsoiled areas covered by the project shall be uniformly smooth graded. The finished surface shall be reasonably smooth and free from irregular surface changes. The degree of finish shall be that ordinarily obtainable from either blade-grader or scraper operations. The finished surface shall be free of depressed areas where water would pond.

G. Plant pits shall be dug to produce vertical sides and flat, uncompacted bottoms. When pits are dug with an auger and the sides of the pits become glazed, the glazed surface shall be scarified. The minimum allowable dimensions of plant pits shall not be deeper than the depth of ball.

H. Add amendments to the soil removed from the hole at a rate of two parts excavated soil to one part nitrolized organic mulch. All rocks, calcite, and other foreign matter should be removed prior to mixing.

3.03 Planting Times and Conditions:

A. Deciduous and Evergreen Planting Time
Install plants from **March** through **June.**

3.04 Installation:

A. The backfill soil mixture shall be a proportioned mixture thoroughly mixed by volume of topsoil and selected soil amendments as follows:
Topsoil equal parts to mixture
Amendments 50 percent to mixture

B. Plants shall be set plumb and held in position until sufficient soil has been firmly placed around roots or ball. Plants shall be set in relation to surrounding grade so that they are even with the depth at which they were grown in the nursery, or container.

C. Materials shall be removed that are metal, plastic, nylon or treated burlap, prior to backfilling. Balled and burlapped stock shall be backfilled with backfill soil mixture to approximately half the depth of the ball and then tamped and watered. Biodegradable burlap and tying material shall be carefully opened and folded back. The backfill shall be completed, tamped and watered. A 4-inch high earth saucer shall be formed around individual plants.

D. Bare-root plants shall be installed by arranging the roots in a natural position. Damaged roots shall be removed with a clean cut. Bare-root (BR) plants shall be backfilled

with backfill soil mixture carefully worked in among the roots. The backfill and water shall be completed. A 4-inch high earth saucer shall be formed around individual plants.

3.05 Finishing:

A. Planted areas shall be uniformly edged to provide a clear-cut division line between the planted area and the adjacent turf area and to provide a shape as indicated. The entire planted area shall be raked and smoothed while maintaining the earth saucers.

B. The total amount of foliage shall be pruned by one-fourth to one-third on installed trees and shrubs to compensate for loss of roots and transplanting shock. The typical growth habit of individual plants shall be retained. Clean cuts shall be made flush with the parent trunk. Improper cuts, stubs, dead and broken branches shall be removed. "Headback" cuts at right angles to the line of growth shall not be permitted. Trees shall not be poled or the leader removed, nor shall the leader be pruned or "topped off." Cuts or wounds measuring a minimum 1/2 inch in diameter shall be painted with the specified tree wound dressing.

C. Mulch shall be spread beneath each plant in the planting basin with a minimum diameter of 3’ to a uniform thickness of 2 inches within 48 hours after planting. Mulch shall be kept out of the crowns of shrubs and off buildings, sidewalks and other facilities.

D. When required for weed control, geotextile shall be placed in accordance with the manufacturer's recommendations and/or as indicated.

3.06 Care of Existing Plant Material:

A. Existing plant material shall be maintained in a vigorous and growing condition and shall be protected from damage at all times during construction.

3.07 Application of Pesticide Material:

A. When pesticide becomes necessary to remove a disease or pest, a state-certified applicator shall apply required pesticide in accordance with State EPA label restrictions and recommendations. Hydraulic equipment shall be provided for the liquid application of pesticides with a leak-proof tank, positive agitation methods, controlled application pressure and metering gauges. A pesticide treatment plan shall be provided to the ARCHITECT/OWNER as specified in paragraph SUBMITTALS.

3.08 Restoration and Clean Up:

A. Planting areas, pavements and facilities that have been damaged from the planting operation shall be restored to original condition at the Contractor's expense.

B. Excess and waste material from the planting operation shall be removed and disposed of off the site. Adjacent paved areas shall be cleared.

End of Section

DIVISION 2 – SITE WORK

SECTION 02910 – TEMPORARY EROSION CONTROL

Part 1 – General

1.01 Work Included: The work under this section of the Specifications shall include all temporary erosion control measures including, but not necessarily limited to, rapid stabilization, rock entrance, silt fence, bale checks, bio rolls, and interim mulch as may be necessary to control soil erosion and sedimentation. The work shall include furnishing all materials, labor and equipment required for the construction and maintenance of erosion and sediment control devices as shown on the Drawings or as directed by the Architect. The work shall also include all inspections and reports as required by the storm water discharge permit for construction activities.

1.02 Reference Specifications:

A. The erosion prevention requirements of the City of Moore shall be considered as a part of this Specification.

B. All testing required by the Jurisdiction Having Authority shall be performed by the independent testing laboratory retained by the Contractor. The costs of said testing shall be borne by the Contractor.

1.03 Stormwater Pollution Prevention – General Permit: if a Permit is required by the local Jurisdiction Having Authority, it shall be obtained from said authority and all fees and/or costs shall be paid by the Contractor.

A. The Contractor will furnish a copy of the completed application package and General Permit to the Architect.

B. The back and side lot ditches shall be sodded immediately after they have been graded and top soil spread.

Part 2 – Products

2.01 Erosion Control Blankets: Erosion control blankets shall conform to applicable requirements.

2.02 Silt Fence: refer to the Drawings.

A. The geotextile fabric shall be free of flaws such as tears or other defects. Any geotextile fabric which becomes damaged shall be replaced. The geotextile fabric shall meet or exceed the following requirements:

1.	Grab Strength (ASTM D 4632)	100 lbs.
2.	Apparent Opening Size (ASTM D 4751)	20 - 70 sieve range
3.	Width	36 inches

Part 3 - Execution

3.01 General:

A. Temporary erosion control measures such as erosion control blankets, bio rolls, rock entrance, and silt fences shall be coordinated with the site work and turf establishment. No site work will be permitted until ALL necessary temporary erosion control measures are completed and in place in order to prevent excessive soil erosion and subsequent siltation from entering wetlands, streams or storm sewers. The construction of erosion control measures shall not relieve the Contractor of the responsibility for preventing or minimizing the potential for erosion or siltation. The Contractor shall be responsible for all damages and clean up and the costs therefore, resulting from erosion of the soils and any siltation which may occur, regardless of the temporary erosion control measures taken.

B. The alignment and location of erosion control measures shall be as show on the Drawings or as directed by the Architect. Minimum measures are shown on the Drawings. The Contractor shall incorporate further measures into the work as the Contractor's progress may dictate. Inspections of the temporary erosion control measures and reports thereof, shall be made by the Contractor in accordance with the storm water discharge permit for construction activities.

C. Structural practices:

1. Perimeter Ditches – Perimeter ditches will be installed to collect runoff from the disturbed area and direct runoff to the sedimentation basin.

D. Rapid stabilization shall be used in the following areas as well as the areas shown on the Plans.

1. Disturbed areas around culvert inlets and streams.
2. Ditches draining from the construction sites.
3. Disturbed slopes near storm drain inlets.

3.02 Timing of Controls/Measures: Any ditches and stabilized construction entrances shall be constructed prior to grading of any other portions of the site. Areas where construction

activity temporarily ceases for more than 21 days will be stabilized with a temporary seed and mulch within 14 days of the last disturbance. Once construction activity ceases permanently in an area, that area will be stabilized with permanent sod turf.

3.03 Removal of Temporary Erosion Control: Temporary erosion control devices shall remain in place until the permanent measures (turf establishment) have become established as determined by the Architect. All areas disturbed by the removal of temporary erosion control measures shall receive the same turf establishment as the areas adjacent thereto.

3.04 Installation Requirements:

A. Bio Rolls shall be installed as required to reduce erosion.

B. Silt Fence shall be constructed on 2 x 2 wood posts that are spaced no more than 6 feet and embedded no less than 2.0 feet. The geotextile fabric shall be secured to the upstream face of the posts. The geotextile fabric shall be embedded in an anchor trench along the upstream side of the silt fence. The anchor trench shall be 12 inches deep by 12 inches wide and shall extend the full length of the silt fence. The geotextile fabric shall line both sides and the bottom of the anchor trench. The anchor trench shall be backfilled with the excavated material, which shall be firmly compacted into place.

C. Rate of slurry application shall be variable depending on surface roughness, slope configuration and degree of undulation but it is expected that 6 M gallons per acre. This rate is equivalent to applying Type 6 Hydraulic Soil Stabilizer at 2100 pounds per acre. Amount of material applied shall be such to obtain 100% soil surface coverage. In inaccessible areas, the mix may be pumped through a hose. To obtain coverage, two (2) passes may be necessary. In inaccessible areas, the mix may be pumped through a hose.

3.05 Maintenance:

A. It shall be the Contractor's responsibility to maintain all erosion control measures and to inspect same after each rainfall event. All displaced bio rolls shall be replaced and silt fences shall be repaired where sagging or otherwise damaged. The Contractor shall review the temporary erosion control measures and make revisions as necessary in order to minimize damage due to future rainfalls. All costs of temporary erosion control shall be considered incidental and the responsibility of the Contractor.

B.The rock entrances may need occasional maintenance to prevent the tracking of mud onto paved roads. This may

require periodic top-dressing with additional rock or removal and reinstallation of the entrances. The cost of maintenance of rock entrances shall be the responsibility of the Contractor.

3.06 Waste Disposal:

A. Waste Materials: All waste materials will be disposed of as described in the "Construction Storm Water Pollution Prevention Plan".

3.07 Offset Vehicle Tracking: One (1) stabilized construction entrances shall be constructed to help reduce vehicle tracking of sediments. The paved parking lot adjacent to the site entrance shall be swept as needed to remove any excess mud, dirt or rock tracked from the site. Dump trucks hauling material from the construction site shall be covered with a tarp.

3.08 Maintenance/Inspection Procedures:

A. Erosion and Sediment Control Inspection and Maintenance Practices:

1. All control measures will be inspected at least once each week and following any storm event of 0.5 inches or greater.
2. All measures will be maintained in good working order; if a repair is necessary, it will be initiated within 24 hours of report.
3. Build up sediment will be removed from silt fence when it has reached one-third the height of the fence.
4. Silt fence will be inspected for depth of sediment, tears, to see if the fabric is securely attached to the fence posts, and to see that the fence posts are firmly in the ground.
5. Ditches will be inspected and any erosion promptly repaired.

B. Non-Storm Water Discharges: All non-storm water discharges will be directed to a location selected by the Contractor and approved by the Architect. It is expected that the following non-storm water discharges will occur from the site during the construction period:

1. Water from water line flushing.
2. Pavement wash waters (where no spills or leaks of toxic or hazardous materials have occurred).
3. Uncontaminated groundwater (from dewatering excavation).

3.09 Spill Prevention:

A. Material Management Practices.

The following good housekeeping practices shall be followed onsite during the construction project.

1. Good Housekeeping:
   The following good housekeeping practices shall be followed onsite during the construction project:
   a. An effort shall be made to store only enough product required to do the job.
   b. All materials stored onsite shall be stored in a neat, orderly manner in their appropriate containers and, if possible, under a roof or other enclosure.
   c. Products shall be kept in their original containers with the original manufacture's label.
   d. Substances shall not be mixed with one another unless recommended by the manufacturer.
   e. Whenever possible, all of a product shall be used up before disposing of the container.
   f. Manufacturers' recommendations for proper use and disposal shall be followed.
   g. The site superintendent shall inspect daily to ensure proper use and disposal of materials onsite.
2. Hazardous Products: These practices are used to reduce the risks associated with hazardous materials.
   a. Products shall be kept in original containers unless they are not re-sealable.
   b. Original labels and material safety data shall be retained; they contain important product information.
   c. If surplus product must be disposed of, manufacturer's, or Local and State recommended methods for proper disposal shall be followed.

B. Product Specific Practices: The following project specific practices shall be followed onsite:
1. Petroleum Products:
   All onsite vehicles shall be monitored for leaks and receive regular preventative maintenance to reduce the change of leakage. Petroleum products shall be stored in tightly sealed containers which are clearly labeled. Any asphalt substances used onsite shall be applied according to the manufacturer's recommendations.
2. Fertilizers:
   Fertilizers used shall be applied only in the minimum amounts recommended by the manufacturer. Once applied, fertilizer shall be worked into the soil to limit exposure to storm water. Storage shall be in

a covered shed. The contents of any partially used bags of fertilizer shall be transferred to a sealable plastic bin to avoid spills.

3. Paints:
   All containers shall be tightly sealed and stored when not required for use. Excess paint shall not be discharged to the storm sewer system but shall be properly disposed of according to manufactures' instructions or State and Local regulations.
4. Concrete Trucks:
   Concrete trucks shall not be allowed to wash out or discharge surplus concrete or drum wash water on the site.

C. Spill Control Practices:
   In addition to the good housekeeping and material management practices discussed in the previous sections of this plan, the following practices shall be followed for spill prevention and cleanup:
   1. Manufacturer's recommended methods for spill cleanup shall be clearly posted and site personnel will be made aware of the procedures and the location of the information and cleanup supplies.
   2. Materials and equipment necessary for spill cleanup shall be kept in the material storage area onsite. Equipment and materials shall include but not be limited to brooms, dust pans, mops, rags, gloves, goggles, kitty litter, sand, sawdust, and plastic and metal trash containers specifically for this purpose.
   3. All spills shall be cleaned up immediately after discovery.
   4. The spill area shall be kept well ventilated and personnel shall wear appropriate protective clothing to prevent injury from contact with a hazardous substance.
   5. Spills of toxic or hazardous material shall be reported to the appropriate State or Local government agency, regardless of the size.
   6. The spill prevention plan shall be adjusted to include measures to prevent this type of spill from reoccurring and how to clean up the spill if there is another one. A description of the spill, what caused it, and the cleanup measures shall also be included.

End of Section

DIVISION 2 - SITE WORK

SECTION 02920 - LANDSCAPE GRADING

Part 1 -General

1.01 Summary:
- A. This section describes the labor, materials and installation requirements necessary to complete the fine grading, incidental grading, and related items as indicated or specified.

1.02 Site Conditions:
- A. Protect landscaping and other features remaining as final work.
- B. Protect any existing structures, roads, sidewalks, paving and curbs, or other features pertinent to the site in this project.

Part 2 - Products NOT USED

Part 3 - Execution

3.01 Examination:
- A. The areas to be graded will be free of waste or debris developed by other trades.
- B. Contractor shall field verify all dimensions and/or layout prior to starting work.

3.02 Preparation:
- A. Prepare site by applying Round Up, or approved equal, as per label directions to weed growth on site.
  1. Scarify planting areas to a minimum depth of six (6) inches and thoroughly water to settle all soil.

3.03 Grading:
- A. Contractor shall grade all planting areas, swales or other areas as noted on drawings.
  1. Contractor shall provide incidental grading of all areas adjacent to curbs and sidewalks. Provide a finish grade one (1") inch below curbs or sidewalks.
  2. Contractor shall fine grade turf areas, eliminating rough or low areas to ensure positive drainage.
  3. Any other areas not covered specifically above shall be graded to leave a generally smooth appearance conforming to standard landscape practices defined as: The final surface shall be raked; all objectionable materials, trash, brush, weeds, and stones larger than one inch shall be removed from the site and disposed of properly off base.
  4. When sod is being installed, the appropriate sub-grade shall be graded prior to the installation of such materials. See applicable specifications, in any, for additional requirements.

End of Section

DIVISION 2 - SITE WORK

SECTION 02970 - LANDSCAPE ESTABLISHMENT

Part 1 - General

1.01 Summary:

A. Maintenance of plants shall include straightening plants, protecting plant areas from erosion, maintaining erosion control material, supplementing mulch, removing dead or broken tip growth by pruning, maintaining edging of beds, checking for girdling of plants and maintaining plant labels, watering, weeding, removing and replacing unhealthy plants. This work shall include all labor, materials, equipment, supplies, and services to sustain and maintain in healthy, attractive and safe condition all trees, shrubs and groundcovers.

B. On completion of the last day of the planting operation, the plant establishment period for maintaining installed plants in a healthy growing condition shall commence and shall be in effect for the remaining contract time period not to exceed 12 months. When the planting operation extends over more than one season or there is a variance to the planting times, plant establishment periods shall be established for the work completed, as directed. Written calendar time period shall be furnished to the ARCHITECT/OWNER for the beginning of the plant establishment period. When there is more than one plant establishment period describe the boundaries of the planted area covered for each period.

1.02 Submittlas:

A. Contractor shall supply the ARCHITECT/OWNER with a proposed scheduling of the expected day and time tasks listed below will be performed. This schedule shall be approved prior to project maintenance commencement.

B. Chemicals and methods and rates of application will be submitted to the ARCHITECT/OWNER's Representative for approval prior to use.

C. Until the end of the establishment period, the Contractor shall provide the ARCHITECT/ OWNER's Representative a monthly detailed report of all fertilizers, insecticides, fungicides, herbicides, etc., applied during the preceding month. The report shall in-include the chemical names, trade names, date and rate of application, specific areas of application and the purpose for the application.

1.03 The Contractor's Landscape Establishment Supervisor, in the performance of this contract, shall be fully qualified, professional gardener with experience in the grounds

maintenance field. This experience must have provided, as a minimum, broad knowledge of all phases of landscape pest and disease control; shrub and tree pruning; fertilization; and irrigation system operation, maintenance and repair.

Part 2 - Products **Not Used**

Part 3 - Execution

3.01 Performance:

A. All work shall be performed in a professional manner within the standards of the industry, using quality equipment, methods and materials.

3.02 Shrubs and Trees:

A. Eliminate all bracing and tree supports as rapidly as plants can become self-supporting.

B. Tree supports that must remain shall be kept in good repair and functioning at all times, and trees or shrubs fully protected. Supports or braces shall be repositioned as often as necessary to prevent damage to the tree or shrub trunk.

C. All debris resulting from care of shrubs, trees and other plant areas shall be removed from site on day work is performed and area cleaned.

D. Side shoots or branches may be "headed back" but are to be left on and encouraged on all thin or spindly tree trunks and on all trees still needing bracing or staking.

E. Sucker growth from the base of trees at soil level or below shall be removed, unless otherwise directed.

3.03 Pruning:

A. Pruning shall be provided to encourage a healthy natural growth pattern for each variety of tree or shrub.

B. All pruning shall be towards developing the natural branching structure.

1. Thinning of branch growth shall be accomplished as needed to provide for free air circulation through the remaining limbs and branches.
2. All pruning shall be accomplished in accordance with accepted practices and standards.

C. Trees and shrubs shall be kept pruned back to clear all roads, drives and walks to promote optimum efficiency and safety for all foot and vehicular traffic.

D. Pruning shall be done to keep plants clear of doorways and windows. Trees will be trimmed, pruned or topped as directed by the ARCHITECT/OWNER. Any limbs and branches touching or brushing buildings or other structures shall also be pruned back to provide clearance and free air

circulation around the plant.

3.04 Fertilizer:

A. Trees shall be fertilized using a balanced type fertilizer supplying all nutrients required of the tree.
   1. Application rate will be determined by tree type, girth, and height.
   2. Application will be at the base, on drip line.

B. The Contractor is responsible for ensuring the correct soil conditions are maintained for each tree, shrub, flower, grass or plant covered under this contract in order to promote optimum growth, environment and health for the species of plant. This may require addition of soil, soil amendments, humus, mulch, gypsum, sulfur, etc., all of which will be provided by the Contractor at no additional cost to the Government.

C. All shrubs, plants flowers, etc., not covered elsewhere in these specifications shall be fertilized once during the growing season with a balanced fertilizer which supplies all nutrients required of the type of plant.

3.05 Groundcover Maintenance:

A. Groundcovers shall be kept weed free at all times.

B. Groundcovers will be fertilized with a balanced fertilizer containing potassium, phosphorous and nitrogen.
   1. Application rate will be calculated to supply one-half pound of available nitrogen per 1,000 square feet.
   2. Immediately following fertilization, the groundcover shall be thoroughly watered in order to preclude fertilizer burn of the plants.

C. Groundcovers will be trimmed, mowed, thinned and edged.

D. Weeds, trimmings, etc., shall be removed from site on the day work is performed and the area cleaned.

3.06 Irrigation System and Watering:

A. Make adjustments and settings of automatic controllers, if any, to establish frequency and length of watering periods.

B. During the contract period, the Contractor will repair or replace any equipment damaged as a result of contract operations at the Contractor's expense.

C. The sprinkler system shall not be operated when extremely windy or freezing conditions prevail.

D. Watering cycles shall be timed to cause the least inconvenience to the building occupants and visitors. Entrances shall not be wet during the arrival and departure of occupant employees.

E. Sprinkler heads will be cleaned, adjusted, repaired, and maintained at a proper height. Missing or broken heads and risers (not the fault of the Contractor) will be furnished by the OWNER.

F. The Contractor shall make sure that sprinkler heads are adjusted to cover lawn areas and shrubs and that sprinkler heads are clean so the water comes out evenly.
   1. The Contractor is responsible for ensuring that all lawns and trees are adequately watered at all times, whether or not sprinklers are provided.
   2. During prolonged periods of drought, watering guidelines established by local water district shall apply.

3.07 Cultivation:

A. Shrub and flower beds will be cultivated to maintain a loose, friable top soil for the purposes of gas exchange, water penetration and soil aeration.

3.08 Landscape Insect, Rodent, and Disease Control:

A. The Contractor shall implement a continuous program for the control and eradication of gophers, weeds, insects, nematodes, pests, lawn, tree, and plant diseases.

B. Chemicals used, methods of application, and reporting procedures will fully comply with all Federal, State, and Local Regulations.

C. The Contractor shall furnish services necessary to exterminate rodents and insects using only those pesticides, which comply with the provisions of the Federal Insecticide, Fungicide and Rodenticide Pesticide Control Act of 1972, Public Law 92516 (86 Stat. 973), and the regulations issued thereunder. These services shall be performed by a licensed pest control contractor.

D. A thorough inspection of the premises shall be conducted to locate any infestation and intensive treatment made to eliminate any existing problems during the first month of the contract.

E. Additional inspections and treatment will be made as scheduled.

F. Appropriate protective clothing and gear consistent with the type of pesticide being used shall be provided and worn during application.

G. All containers holding pesticides shall be properly labeled with the name and strength of the chemical agent therein.

H. Pesticides, herbicides and other toxic materials will not be stored on School property.

3.09 Cleaning:

A. Any eroded areas shall be repaired by the replacement of topsoil to bring them back to original grade as required.

B. All clippings, trimmings, cuttings, trash and debris resulting from work of this contract shall be promptly removed from the site.

SECTION 02970 - LANDSCAPE ESTABLISHMENT

3.10 Demonstration:

A. Prior to the completion of the contract, or the plant establishment period, whichever occurs first, a preliminary inspection shall be held by the ARCHITECT/OWNER. Time for the inspection will be established in writing. The quantity and type of plants installed and the acceptability of the plants in accordance with the plant establishment period shall be determined.

B. A final inspection shall be held by the ARCHITECT/OWNER to determine that deficiencies noted in the preliminary inspection have been corrected. Time for the inspection shall be established in writing. Acceptance of the planting operation is subject to the guarantee of plant growth.

3.11 120-Day Landscape Establishment Schedule:

A. Landscape schedule shall be as follows:

ITEM NO.	WORK ITEM DESCRIPTION	TASK FREQUENCY	TASK TIME FRAME
1.	Prune Trees	Once	12th Month
2.	Prune Shrubs	Once	12th Month
3.	Mow & Edge Turf	Weekly	----------
4.	Fertilize Trees & Shrubs	Once	4th Month
5.	Fertilize Turf	Once	4th Month
6.	Irrigate Plants	3x Week	----------
7.	Irrigate Turf	3x Week	----------
8.	Weed All Areas	2x Month	----------
9.	Apply Pre-Emergent Herbicide	Once	4th Month
10.	Ensure Soil Conditions	Once	2nd Month
11.	Insect, Rodent & Disease Control	Monthly	----------
12.	Police Site	Weekly	----------

B. The frequencies of the tasks stated above are suggested minimums only. During extremely wet or dry periods, the Contractor must adjust schedules to ensure correct and proper conditions are maintained.

End of Section

DIVISION 3 – CONCRETE

SECTION 03300 – CAST-IN-PLACE CONCRETE

PART 1 – GENERAL

1.01 Section Includes
- A. Concrete formwork.
- B. Slabs on grade.
- C. Concrete foundation walls and retaining walls.
- D. Concrete reinforcement.
- E. Joint devices associated with concrete work.
- F. Miscellaneous concrete elements, including equipment pads and equipment pits.
- G. Concrete curing.

1.02 Related Requirements
- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Section 07 9200 - Joint Sealants: Products and installation for sealants and joint fillers for saw cut joints, construction joints and isolation joints in slabs.

1.03 Reference Standards
- A. For all reference standards listed below, comply with the version year in the governing building code adopted by the Authority Having Jurisdiction. For those reference standards that are not directly referenced by the building code, use the latest edition unless noted otherwise.
- B. ACI 117 - Specifications for Tolerances for Concrete Construction and Materials.
- C. ACI 211.1 - Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete.
- D. ACI 301 - Specifications for Structural Concrete.
- E. ACI 302.1R - Guide to Concrete Floor and Slab Construction.
- F. ACI 302.2R - Guide for Concrete Slabs that Receive Moisture-Sensitive Flooring Materials.
- G. ACI 304R - Guide for Measuring, Mixing, Transporting, and Placing Concrete.
- H. ACI 305R - Guide to Hot Weather Concreting.
- I. ACI 305.1 - Specification for Hot Weather Concreting.
- J. ACI 306R - Guide to Cold Weather Concreting.
- K. ACI 308R - Guide to External Curing of Concrete.
- L. ACI 318 - Building Code Requirements for Structural Concrete and Commentary.
- M. ACI 347R - Guide to Formwork for Concrete.
- N. ACI SP-66 - ACI Detailing Manual.
- O. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.
- P. ASTM A706/A706M - Standard Specification for Deformed and Plain Low-Alloy Steel Bars for Concrete Reinforcement.

Q. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.
R. ASTM C33/C33M - Standard Specification for Concrete Aggregates.
S. ASTM C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
T. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete.
U. ASTM C143/C143M - Standard Test Method for Slump of Hydraulic-Cement Concrete.
V. ASTM C150/C150M - Standard Specification for Portland Cement.
W. ASTM C171 - Standard Specification for Sheet Materials for Curing Concrete.
X. ASTM C173/C173M - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method.
Y. ASTM C260/C260M - Standard Specification for Air-Entraining Admixtures for Concrete.
Z. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete.
AA. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete.
AB. ASTM C1064/C1064M - Standard Test Method for Temperature of Freshly Mixed Hydraulic-Cement Concrete.
AC. ASTM C1107/C1107M - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink).
AD. ASTM C1602/C1602M - Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete.
AE. ASTM D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).
AF. ASTM D2103 - Standard Specification for Polyethylene Film and Sheeting.
AG. ASTM E1745 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs.
AH. CRSI (DA4) - Manual of Standard Practice.
AI. ICC (IBC)-2015 - International Building Code.

1.04 Definitions

A. Cold Weather: A period when for more than three successive days the average daily outdoor temperature drops below 40 F. The average daily temperature is the average of the highest and lowest temperature during the period from midnight to midnight. When temperatures above 50 F occur during more than half of any 24 hr duration, the period shall no longer be regarded as cold weather.

B. Hot Weather: Hot weather is any combination of the following conditions that tends to impair the quality of freshly mixed or hardened concrete by accelerating the rate of moisture loss and rate of cement hydration, or otherwise causing detrimental results:
   1. High ambient temperature
   2. High concrete temperature
   3. Low relative humidity
   4. Wind speed
   5. Solar radiation

1.05 Submittals

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Submit manufacturers' data on manufactured products showing compliance with specified requirements and installation instructions.

C. Mix Design: Submit proposed concrete mix design.
   1. Indicate proposed mix design complies with requirements of ACI 301, Section 4 - Concrete Mixtures.
   2. Indicate proposed mix design complies with requirements of ACI 318, Chapter 26 - Concrete Documents and Inspection.

D. Shop Drawings: Comply with requirements of ACI SP-66. Include bar schedules, shapes of bent bars, spacing of bars, and location of splices.

E. Test Reports: Submit report for each test or series of tests specified.

F. Manufacturer's Installation Instructions: For concrete accessories, indicate installation procedures and interface required with adjacent construction.

G. Formwork Design Submittal: As required by authorities having jurisdiction.

H. Project Record Documents: Accurately record actual locations of embedded utilities and components that will be concealed from view upon completion of concrete work.

I. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.06 Quality Assurance

A. Perform work of this section in accordance with ACI 301 and ACI 318.

B. Follow recommendations of ACI 305R when concreting during hot weather.

C. Follow recommendations of ACI 306R when concreting during cold weather.

D. For slabs required to include moisture vapor reducing admixture (MVRA), do not proceed with placement unless manufacturer's representative is present for placement as required by the manufacturer's warranty.

1.07 Warranty

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

C. Slabs with Moisture Vapor Reducing Admixture (MVRA): Provide warranty to cover cost of flooring failures due to moisture migration from slabs for life of the concrete.

1. Include cost of repair or removal of failed flooring, placement of topical moisture remediation system, and replacement of flooring with comparable flooring system.

2. Provide warranty by manufacturer of MVRA matching terms of flooring adhesive or primer manufacturer's material defect warranty.

PART 2 PRODUCTS

2.01 Formwork

A. Formwork Design and Construction: Comply with guidelines of ACI 347R to provide formwork that will produce concrete complying with tolerances of ACI 117.

B. Form Materials: Contractor's choice of standard products with sufficient strength to withstand hydrostatic head without distortion in excess of permitted tolerances.

1. Form Facing for Exposed Finish Concrete: Contractor's choice of materials that will provide smooth, stain-free final appearance.

2. Earth Cuts: Do not use earth cuts as forms for vertical surfaces of trenched footings unless expressly allowed in the General Notes in the structural drawings. Natural rock formations that maintain a stable vertical edge may be used as side forms for below-grade concrete.

3. Form Coating: Release agent that will not adversely affect concrete or interfere with application of coatings.

4. Form Ties: Cone snap type that will leave no metal within the clear cover zone of the concrete surface as specified in the Minimum Concrete Cover for Cast-in-Place Non-Prestressed Members table included in the General Notes of the structural drawings.

2.02 Reinforcement Materials

A. Reinforcing Steel: ASTM A615/A615M, Grade 60 (60,000 psi).
   1. Type: Deformed billet-steel bars.
   2. Finish: Unfinished, unless otherwise indicated.

B. Reinforcing Steel: ASTM A706/A706M, deformed low-alloy steel bars, weldable.
   1. Unfinished.

C. Reinforcement Accessories:
   1. Joint Dowel Bars: ASTM A615/A615M, Grade 60 (60,000 psi) plain-steel bars, cut true to length with ends square and free of burrs.
   2. Tie Wire: Annealed, minimum 16 gauge, 0.0508 inch.
   3. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for adequate support of reinforcement during concrete placement.
      a. Continuous slab bolsters shall be used to support the bottom reinforcing bars of all reinforced slabs-on-grade.
   4. Provide stainless steel, galvanized, plastic, or plastic coated steel components for placement of reinforcing steel within 1-1/2 inches of weathering surfaces and for concrete surfaces that will be exposed to view.

D. Fabrication of Reinforcing:
   1. Fabricate concrete reinforcing in accordance with CRSI (DA4) - Manual of Standard Practice.
   2. Welding of reinforcement is permitted only with the specific approval of Architect/Engineer. Perform welding in accordance with AWS D1.4/D1.4M.
   3. Locate reinforcing splices not indicated on drawings at point of minimum stress.

2.03 Concrete Materials

A. Cement: ASTM C150/C150M, Type I - Normal Portland type.
   1. Acquire cement for entire project from same source.

B. Fine and Coarse Aggregates: ASTM C33/C33M.
   1. Acquire aggregates for entire project from same source.

C. Fly Ash: ASTM C618, Class C or F.

D. Water: ASTM C1602/C1602M; clean, potable, and not detrimental to concrete.

2.04 Admixtures

A. Do not use chemicals that will result in soluble chloride ions in excess of 0.1 percent by weight of cement.

B. Air Entrainment Admixture: ASTM C260/C260M.

C. Water Reducing and Retarding Admixture: ASTM C494/C494M Type D.

D. Water Reducing Admixture: ASTM C494/C494M Type A.

E. Moisture Vapor Reducing Admixture (MVRA): Liquid, inorganic admixture free of volatile organic compounds (VOCs) and formulated to close capillary systems formed during curing to reduce moisture vapor emission and transmission with no adverse effect on concrete properties or finish flooring.
   1. Provide admixture in slabs to receive adhesively applied flooring.
   2. Manufacturers:
      a. Barrier One, Inc; Barrier One Moisture Vapor Reduction Admixture: www.barrierone.com/#sle.
      b. Substitutions: Substitutions shall comply with the use of concrete staining/dye products. See Section 01 6000 - Product Requirements.

2.05 Accessory Materials

A. Non-Shrink Cementitious Grout: Premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents.
   1. Grout: Comply with ASTM C1107/C1107M.

2.06 Bonding And Jointing Products

A. Latex Bonding Agent: Non-redispersable acrylic latex, complying with ASTM C1059/C1059M, Type II.
B. Epoxy Bonding System:
   1. Complying with ASTM C881/C881M and of Type required for specific application.
C. Waterstops: Bentonite and butyl rubber, complying with NSF 61 and NSF 372.
D. Slab Isolation Joint Filler: 1/2 inch (13 mm) thick, height equal to slab thickness.
   1. Material: ASTM D1751, cellulose fiber.

2.07 Evaporation Retarders

A. Evaporation Retarder: Liquid thin film-forming compound that reduces rapid moisture loss caused by high temperature, low humidity, and high winds; intended for application immediately after concrete placement. These products provide a protective film shield over plastic concrete, dissipate as soon as the concrete is no longer plastic, and are not curing products.
   1. Manufacturers:
      a. Euclid Chemical Company ; EUCOBAR: www.euclidchemical.com/#sle.
      b. SpecChem, LLC; SpecFilm Concentrate or SpecFilm: www.specchemllc.com/#sle.
      c. W. R. Meadows, Inc ; Evapre or Evapre-RTU: www.wrmeadows.com/#sle.
      d. Substitutions: See Section 01 6000 - Product Requirements.

2.08 Curing Materials
- A. Moisture-Retaining Sheet: ASTM C171.
  1. Polyethylene film, white opaque, minimum nominal thickness of 4 mil, 0.004 inch.
  2. White-burlap-polyethylene sheet, weighing not less than 3.8 ounces per square yard.
- B. Polyethylene Film: ASTM D2103, 4 mil, 0.004 inch thick, clear.
- C. Water: Potable, not detrimental to concrete.

2.09 Concrete Mix Design
- A. Proportioning Normal Weight Concrete: Comply with ACI 211.1 recommendations.
- B. Concrete Strength: Establish required average strength for each type of concrete on the basis of field experience or trial mixtures, as specified in ACI 301.
  1. For trial mixtures method, employ independent testing agency acceptable to Architect for preparing and reporting proposed mix designs.
- C. Admixtures: Add acceptable admixtures as recommended in ACI 211.1 and at rates recommended or required by manufacturer.
- D. Normal Weight Concrete: Refer Structural General Notes for mix requirements for various classes of concrete.

2.10 Mixing
- A. Transit Mixers: Comply with ASTM C94/C94M.
- B. Adding Water: If concrete arrives on-site with slump less than suitable for placement, do not add water that exceeds the maximum water-cement ratio or exceeds the maximum permissible slump.

PART 3 EXECUTION

3.01 Examination
- A. Verify lines, levels, and dimensions before proceeding with work of this section.

3.02 Preparation
- A. Formwork: Comply with requirements of ACI 301. Design and fabricate forms to support all applied loads until concrete is cured, and for easy removal without damage to concrete.
- B. Verify that forms are clean and free of rust before applying release agent.
- C. Coordinate placement of embedded items with erection of concrete formwork and placement of form accessories.
- D. Where new concrete is to be bonded to previously placed concrete, prepare existing surface by cleaning and applying bonding agent according to bonding agent manufacturer's instructions.

1. Use epoxy bonding system for bonding to damp surfaces, for structural load-bearing applications, and where curing under humid conditions is required.
2. Use latex bonding agent only for non-load-bearing applications.

E. Where new concrete with integral waterproofing is to be bonded to previously placed concrete, prepare surfaces to be treated in accordance with waterproofing manufacturer's instructions. Saturate cold joint surface with clean water, and remove excess water before application of coat of waterproofing admixture slurry. Apply slurry coat uniformly with semi-stiff bristle brush at rate recommended by waterproofing manufacturer.

F. In locations where new concrete is doweled to existing work, drill holes in existing concrete, clean out drilled holes, inject the adhesive indicated on drawings and/or General Notes, and insert steel dowels, all in accordance with adhesive manufacturer's installation instructions.

G. Interior Slabs on Grade: Install vapor retarder under interior slabs on grade in accordance with manufacturer's instructions, ASTM E1643, ASTM F710 and ACI 302.2R.

1. Install compactible granular fill before placing vapor retarder as indicated on drawings. Do not use sand.
2. Lap vapor retarder sheet over footings and seal to previously placed concrete foundations.
3. Lap joints minimum 6 inches (150 mm).
4. Seal joints, seams and penetrations watertight with manufacturer's recommended products and follow manufacturer's written instructions.
5. No penetration of vapor retarder is allowed except for reinforcing steel and permanent utilities.
6. Repair damaged vapor retarder before covering with other materials.
7. Vapor Retarder Over Granular Fill: Install compactible granular fill before placing vapor retarder as indicated on drawings. Do not use sand.

3.03 Installing Reinforcement And Other Embedded Items

A. Comply with requirements of ACI 301. Clean reinforcement of loose rust and mill scale, and accurately position, support, and secure in place to achieve not less than minimum concrete coverage required for protection.

B. Install welded wire reinforcement in maximum possible lengths, and offset end laps in both directions. Splice laps with tie wire.

C. Verify that anchors, seats, plates, reinforcement, waterstops and other items to be cast into concrete are

accurately placed, positioned securely, and will not interfere with concrete placement.

3.04 Placing Concrete

A. Place concrete in accordance with ACI 304R.

B. Place concrete for floor slabs in accordance with ACI 302.1R.

C. Notify Architect not less than 48 hours prior to commencement of placement operations.

D. Maintain records of concrete placement. Record date, location, quantity, air temperature, and test samples taken.

E. Ensure reinforcement, inserts, waterstops, embedded parts, and formed construction joint devices will not be disturbed during concrete placement.

F. Place concrete continuously without construction (cold) joints wherever possible; where construction joints are necessary, before next placement prepare joint surface by removing laitance and exposing the sand and sound surface mortar, by sandblasting or high-pressure water jetting.

G. Finish slab-on-grade and shored elevated floors level and flat, unless otherwise indicated, within the tolerances specified below.

3.05 Slab Jointing

A. Locate and install joints as indicated on drawings and Slab-On-Grade Schedule or as submitted by Contractor and approved by structural engineer.

B. Anchor joint fillers and devices to prevent movement during concrete placement.

C. Isolation Joints: Use preformed joint filler, total height equal to thickness of slab, set flush with top of slab.

1. Install wherever necessary to separate slab from other building members, including columns, walls, equipment foundations, footings, stairs, manholes, sumps, and drains.

D. Load Transfer Construction and Contraction Joints: Install load transfer devices as indicated; saw cut joint at surface as indicated for contraction joints.

E. Saw Cut Contraction Joints: Saw cut joints shall be installed with early-entry dry-cut saw before concrete begins to cool, within 1 to 4 hours after completing the slab finishing operations; commence in approximately 1 hours in hot weather or approximately 4 hours in cold weather. Use 3/16 inch thick blade and cut at least 1 inch deep but not less than one quarter (1/4) the depth of the slab. Refer to Slab-On-Grade Schedule in drawings for additional requirements.

3.06 Floor Flatness And Levelness Tolerances

A. An independent testing agency, as specified in Section 01 4000, will inspect finished slabs for compliance with specified tolerances.

B. Maximum Variation of Surface Flatness:

1. Exposed Concrete Floors: 1/4 inch in 10 feet.
2. Under Seamless Resilient Flooring: 1/4 inch in 10 feet.
3. Under Carpeting: 1/4 inch in 10 feet.

C. Correct the slab surface if surface variations exceed specified tolerances.

D. Correct defects by grinding or by removal and replacement of the defective work. Areas requiring corrective work will be identified. Re-measure corrected areas by the same process.

3.07 Concrete Finishing

A. Repair surface defects, including tie holes, immediately after removing formwork.

B. Unexposed Form Finish: Rub down or chip off fins or other raised areas 1/4 inch or more in height.

C. Exposed Form Finish: Rub down or chip off and smooth fins or other raised areas 1/4 inch or more in height. Provide finish as follows:

1. Smooth Rubbed Finish: Wet concrete and rub with carborundum brick or other abrasive, not more than 24 hours after form removal.

D. Concrete Slabs: Finish to requirements of ACI 302.1R, and as follows:

1. Surfaces to Receive Thick Floor Coverings: "Wood float" as described in ACI 302.1R; thick floor coverings include quarry tile, ceramic tile, and Portland cement terrazzo with full bed setting system.
2. Surfaces to Receive Thin Floor Coverings: "Steel trowel" as described in ACI 302.1R; thin floor coverings include carpeting, resilient flooring, seamless flooring, resinous matrix terrazzo, thin set quarry tile, and thin set ceramic tile.
3. Decorative Exposed Surfaces: Trowel as described in ACI 302.1R; take measures necessary to avoid black-burnish marks; decorative exposed surfaces include surfaces to be stained or dyed, pigmented concrete, surfaces to receive liquid hardeners, surfaces to receive dry-shake hardeners, surfaces to be polished, and all other exposed slab surfaces.
4. Other Surfaces to Be Left Exposed: Trowel as described in ACI 302.1R, minimizing burnish marks and other appearance defects.

E. In areas with floor drains, maintain floor elevation at walls; pitch surfaces uniformly to drains at 1:100 nominal (approximately 1/8 inch per foot).

3.08 Curing And Protection

A. Comply with requirements of ACI 308R. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.

B. Uniformly apply evaporation retarder to concrete surfaces if hot, dry, or windy conditions cause moisture loss due to evaporation approaching 0.2 lb/sq.ft./h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing. A methodology for calculating the moisture loss due to evaporation is provided in ACI 305.1.

C. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.

1. Normal concrete: Not less than seven (7) days.

D. Formed Surfaces: Cure by moist curing with forms in place for full curing period.

E. Surfaces Not in Contact with Forms:

1. Initial Curing: Start as soon as free water has disappeared and before surface is dry. Keep continuously moist for not less than seven (7) days by water ponding, water-saturated sand, water-fog spray, or saturated burlap.
   a. Ponding: Maintain 100 percent coverage of water over floor slab areas, continuously for seven (7) days.
   b. Spraying: Spray water over floor slab areas and maintain wet.
   c. Saturated Burlap: Saturate burlap-polyethylene and place burlap-side down over floor slab areas, lapping ends and sides; maintain in place.
2. Final Curing: The surface shall be protected against rapid moisture loss upon the termination of initial curing by replacing wet burlap or similar coverings with plastic sheets until the surface has dried under the sheets.
   a. Moisture-Retaining Sheet: Lap strips not less than 3 inches and seal with waterproof tape or adhesive; secure at edges.

3.09 Field Quality Control

A. An independent testing agency will perform Special Inspections and field quality control tests as required by

Chapter 17 of ICC (IBC)-2015. The testing outlined below includes some, but not all, of the testing and observations required to meet the Special Inspection provisions of the building code. Refer to the following parts of the structural drawings for additional Special Inspection requirements:

1. Statement of Special Inspection Notes
2. Table 1705.3 titled "Required Special Inspections and Tests of Concrete Construction"

B. Provide free access to concrete operations at project site and cooperate with appointed firm.

C. Submit approved mix design of each class of concrete to inspection and testing firm for review prior to commencement of concrete operations.

D. Tests of concrete and concrete materials may be performed at any time to ensure compliance with specified requirements.

E. Compressive Strength Tests: ASTM C39/C39M, for each test, mold and cure four concrete test cylinders. Obtain test samples for every 100 cubic yards or less of each class of concrete placed each day.

F. Take one additional test cylinder during cold weather concreting, cured on job site under same conditions as concrete it represents.

G. Perform one slump test for each set of test cylinders taken, following procedures of ASTM C143/C143M.

H. Air Content: ASTM C173/C173M, one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.

I. Concrete Temperature: ASTM C1064/C1064M, one test hourly when air temperature is 40 deg F and below or 80 deg F and above, and one test for each composite sample.

J. Slab Testing: Cooperate with manufacturer of specified moisture vapor reducing admixture (MVRA) to allow access for sampling and testing concrete for compliance with warranty requirements.

3.10 Defective Concrete

A. Test Results: The testing agency shall report test results in writing to Architect and Contractor within 24 hours of test.

B. Defective Concrete: Concrete not complying with required lines, details, dimensions, tolerances or specified requirements.

C. Repair or replacement of defective concrete will be determined by the Architect. The cost of additional testing shall be borne by Contractor when defective concrete is identified.

D. Do not patch, fill, touch-up, repair, or replace exposed concrete except upon express direction of Architect for each individual area.

3.11 Protection

A. Do not permit traffic over unprotected concrete floor surface until fully cured.

END OF SECTION

DIVISION 4 – MASONRY

SECTION 04810 – UNIT MASONRY ASSEMBLIES

PART 1 - GENERAL

1.01 Related Documents:
- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 Summary
- A. Section Includes:
  1. Concrete block.
  2. Clay facing brick.
  3. Mortar and grout.
  4. Reinforcement and anchorage.
  5. Lintels.
  6. Accessories.

1.03 Related Sections:
- A. Section 05500 - Metal Fabrications: Loose steel lintels and fabricated steel items.
- B. Section 07620 – Sheet Metal Flashing and Trim: Through-wall masonry flashings.
- C. Section 07900 - Joint Sealers: Backing rod and sealant at control and expansion joints.

1.04 References:
- A. ACI 530/ASCE 5/TMS 402 - Building Code Requirements for Masonry Structures; American Concrete Institute International; 2008.
- B. ACI 530.1/ASCE 6/TMS 602 - Specification For Masonry Structures; American Concrete Institute International; 2008.
- C. ASTM A 82/A 82M - Standard Specification for Steel Wire, Plain, for Concrete Reinforcement; 2005a.
- D. ASTM A 153/A 153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2005.
- E. ASTM C 129 - Standard Specification for Nonloadbearing Concrete Masonry Units; 2006.
- F. ASTM C 144 - Standard Specification for Aggregate for Masonry Mortar; 2004.
- G. ASTM C 150 - Standard Specification for Portland Cement; 2005.
- H. ASTM C 207 - Standard Specification for Hydrated Lime for Masonry Purposes; 2006.
  ASTM C 270 - Standard Specification for Mortar for Unit Masonry; 2007.
- I. ASTM C 404 - Standard Specification for Aggregates for Masonry Grout; 2006.

J. ASTM C 476 - Standard Specification for Grout for Masonry; 2002.

1.05 Submittals:

A. Product Data: Provide data for masonry units, mortar, and masonry accessories.

B. Samples: Submit 10 samples of facing brick units to illustrate color, texture, and extremes of color range.

1.06 Quality Assurance:

A. Comply with provisions of ACI 530/ASCE 5/TMS 402 and ACI 530.1/ASCE 6/TMS 602, except where exceeded by requirements of the contract documents

1.07 Pre-Installation Meeting:

A. Convene one week before starting work of this section.

1.08 Delivery, Storage, and Handling:

A. Deliver, handle, and store masonry materials by means that will prevent mechanical damage and contamination by other materials.

1.09 Project Conditions:

A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.

B. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F (4 deg C) and higher and will remain so until masonry has dried, but not less than seven days after completing cleaning.

C. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

PART 2 - PRODUCTS

2.01 Concrete Masonry Units:

A. Type: Lightweight (Standard Modular Sizes).

B. Quality: ASTM C-90, Type 1, Grade N, steam cured for a minimum of 8 hours at 350 degrees Fahrenheit under 150 psi. CMU shall be made by the Johnson CO 2 or Autoclave method. Other methods shall have approval by the Architect.

C. Face Dimension: As indicated on the drawings.
D. Thickness: As indicated on the drawings.
E. Shapes: Provide all shapes as shown on the drawings or others as required.
F. Units shall be uniform in all dimensions and texture, straight and free from cracks, spalls and other defects.

2.02 Face Brick (Veneer):
A. Type and Finish: Velour Modular Brick.
B. Quality: ASTM C-216, Type FBS.
C. Size: Nominal 4" x 2 2/3" x 8" or as directed / approved by Architect.
D. Units shall be uniform in all dimensions and texture, straight and free from cracks, spalls and other defects.
E. Color: refer to Color Schedule and confirm with Architect.

2.03 Mortar and Grout Materials:
A. Portland Cement: ASTM C 150, Type I.
1. Hydrated Lime: ASTM C 207, Type S.
2. Mortar Aggregate: ASTM C 144.
3. Grout Aggregate: ASTM C 404.
B. Water: Clean and potable.

2.04 Reinforcement and Anchorage:
A. Manufacturers of Joint Reinforcement and Anchors:
1. Dur-O-Wal: www.dur-o-wal.com.
2. Hohmann & Barnard, Inc: www.h-b.com.
3. Masonry Reinforcing Corporation of America: www.wirebond.com.
4. Substitutions: as approved by Architect / Engineer.
B. Reinforcing Steel: ASTM A 615/A 615M Grade 40 (280) deformed billet bars; galvanized.
C. Single Wythe Joint Reinforcement: Truss type; ASTM A 82/A 82M steel wire, mill galvanized to ASTM A 641/A 641M, Class 3; 0.1483 inch (3.8 mm) side rods with 0.1483 inch (3.8 mm) cross rods; width as required to provide not more than 1 inch (25 mm) and not less than 1/2 inch (13 mm) of mortar coverage on each exposure.
D. Flexible Anchors: 2-piece anchors that permit differential movement between masonry and building frame, sized to provide not more than 1 inch (25 mm) and not less than 1/2 inch (13 mm) of mortar coverage from masonry face.
E. Masonry Veneer Anchors: 2-piece anchors that permit differential movement between masonry veneer and structural backup, hot dip galvanized to ASTM A 153/A 153M, Class B.
1. Anchor plates: Not less than 0.075 inch (1.91 mm) thick, designed for fastening to structural backup

through sheathing by two fasteners; provide design with legs that penetrate sheathing and insulation to provide positive anchorage.

2. Wire ties: Triangular shape, 0.1875 inch (4.75 mm) thick.
3. Vertical adjustment: Not less than 3-1/2 inches (89 mm).

2.05 Flashings:

A. Metal Flashing Materials: Galvanized Steel / Prefinished Metal as specified in Section 07600.

2.06 Accessories:

A. Preformed Control Joints: Rubber material. Provide with corner and tee accessories, fused joints.

B. Compressible Filler: Pre-molded filler strips complying with ASTM D 1056, Grade 2A1; compressible up to 35%; formulated from neoprene, urethane or PVC.

C. Bond Breaker Strips: Asphalt-saturated, organic roofing felt complying with ASTM D 226, Type 1 (No. 15 asphalt felt).

D. Weeps: Free-draining mesh made from polyethylene strands, full height and width of head joint and depth 1/8 inch less than depth of outer wythe.

1. Manufacturers:
   a. Mortar Net USA, Ltd; Product – Mortar Net Weep Vents: www.martarnet.com
   b. Substitutions: as approved by Architect / Engineer.

Cleaning Solution: Non-acidic, not harmful to masonry work or adjacent materials.

2.07 Mortar and Grout Mixes:

A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds or other admixtures, unless otherwise indicated.

1. Do not use calcium chloride in mortar or grout.
2. Limit cementitious materials in mortar to portland cement and lime.

B. Mortar for Unit Masonry: ASTM C 270, using the Proportion Specification.

1. All masonry: Type S.
   a. Portland Cement Mixture: One part Grey Portland Cement; 1/4 to 1/2 part lime; sand, not less than 2-1/4 and not more than three times the sum of the volumes of cement and lime used, measured in

damp, loose conditions.

b. Colors at exterior face brick to be selected by Architect to match colors noted in the Color Schedule.

C. Grout for Unit Masonry: Comply with ASTM C 476.
   1. Use grout of type (fine or coarse) that will comply with Table 1.15.1 in ACI 530.1/ASCE 6/TMS 602 for dimensions of grout spaces and pour height.
   2. Provide grout with a slump of 8 to 11 inches (200 to 280 mm) as measure according to ASTM C 143/C 143M.

D. Mortar Mixing
   1. All mortars shall be machine mixed in equipment that is free of dirt, oil or grease and which is thoroughly cleaned and rinsed after each day's use. Mix no more mortar than can be used before setting takes place.
   2. Mortars shall be mixed placing all dry ingredients in the mixer first and mixing until uniform in color. Then mixed for 3 to 5 minutes with the maximum amount of water to provide workable consistency.
   3. No add-mixtures shall be used at any time in the mortar on this project, unless approved in writing by the Engineer.
   4. A waterproofing additive will be used in the mortar for brick.
   5. Construct one or two wooden boxes 12"x12"x6" deep and use them to measure the sand required in a batch. Add the cement or lime by the bag. Then add water, measuring by pail. When the desired consistency of mix is determined, mark the level of the mortar in the mixing drum. Use that as the mark for later batches when sand will be added by the shovel full. Repeat the measuring process halfway through the day or whenever the inspector requests it.
   6. Testing: General Contractor will observe a minimum of three (3) observed mixing sessions to verify that the quantities are being mixed as described in the proportions paragraph for Type "S" mortar.

PART 3 - EXECUTION

3.01 Examination:

A. Verify that field conditions are acceptable and are ready to receive masonry.

B. Verify that related items provided under other sections are

properly sized and located.

C. Verify that built-in items are in proper location, and ready for roughing into masonry work.

3.02 Erection:

A. Construction Requirements (Masonry Being Worked On)

1. Air Temperature 40 F to 32 F: Heat sand or mixing water to minimum of 70 F and maximum of 160 F.
2. Air Temperature 32 F to 25 F: Heat sand and mixing water to minimum of 70 F and maximum of 160 F.
3. Air Temperature 25 F to 20 F: Heat sand and mixing water to minimum of 70 F and maximum of 160 F. Use salamanders or other sources of heat on both sides of walls under construction. Employ windbreaks when wind is in excess of 15 mph.
4. Air Temperature 20 F and Below: Heat sand and mixing water to minimum of 70 F and maximum of 160 F. Provide enclosure and auxiliary heat to maintain air temperature above 32 F. Temperature of units when laid shall be not less than 20 F.

B. Protection Requirements (Completed Masonry or Sections Not Being Worked On)

1. Mean Daily Air Temperature 40 F to 32 F: Protect masonry from rain or snow for 24 hrs.
2. Mean Daily Air Temperature 32 F to 25 F: Completely cover masonry for 24 hrs.
3. Mean Daily Air Temperature 25 F to 20 F: Completely cover masonry with insulating blankets for 24 hrs.
4. Mean Daily Air Temperature 20 F and Below: Maintain masonry temperature above 32 F for 24 hrs. by enclosure and supplementary heat, by electric heating blankets, infrared heat lamps or other approved method.

C. No masonry shall be laid when the ambient temperature is below 40 degrees F. All masonry shall be laid plumb, true to line and level, with accurately spaced courses, with each course breaking joints with the course below, unless noted otherwise on the drawings. A story pole and template shall be used and work checked with a surveying instrument to maintain level coursing.

D. Work required to be built into masonry, including anchors, frames, bolts, sleeves, inserts, compressible fillers, expansion joints and flashing shall be built in as erection progresses. Concrete block into which anchor bolts will be installed shall be filled solid with mortar.

E. Laying Out Block Work: All concrete block work shall be laid out with uniform joints approximately 3/8" thick and shall be bonded at corners where possible and as consistent with good appearance. Where cutting is required, the cuts shall be made symmetrical above openings and as a general rule with no cuts less than 4" with power equipment designed for purpose.

F. Corners shall be made using half blocks in order to maintain head joints centered over block in adjoining courses above and below. Where intersecting masonry partitions occur, galvanized Durowall Joint Reinforcing shall be used at every 2nd course.

1. Concrete blocks shall be laid dry in a full bed of mortar and ends buttered on both edges. Care shall be used to prevent smearing mortar on exposed faces of the blocks and such accumulations that occur shall be removed immediately. The exposed face of blocks shall be wiped clean with burlap as the work proceeds. Those surfaces exposed to sight in their final position shall be further cleaned to provide for the application of finishes as required.
2. Joints in block work shall be tooled concave in such a manner as to squeeze the mortar back into the joints and to ensure complete contact is made along the edges of the units, compressing and sealing the surface of the joints.
3. Control joints shall be provided in concrete block partitions at door heads where masonry extends above the door frames, where partitions abut exterior walls and elsewhere as noted on the drawings. Joints shall be raked out 3/8" deep and caulked as specified in Division 7. Bond beams shall be installed as indicated and shall be filled with concrete and reinforced with two (2) No. 4 bars unless noted otherwise.

G. Lintels shall be provided where shown and for all openings in masonry work where other types of lintels have not been provided. Concrete block lintels shall bear not less than six inches (6") on each jamb. Lintel blocks shall be solid bottom trough block filled with concrete and reinforced as detailed on drawings.

H. Masonry Reinforcement: Joint reinforcement shall be installed in all concrete block partitions in the joints of every second block course for the full height of the wall.

I. Brick: Provide a 3/8" mortar bed with concave tooled horizontal and vertical joints. Refer to drawings for vertical coursing as related to openings and other features. Brickwork is to be brushed down daily to remove large pieces of mortar slag. At completion of brick masonry work, all exposed masonry surfaces shall be thoroughly cleaned and washed down with clean water and a stiff bristled brush or as recommended by the brick manufacturer and as approved by the Design/Builder. The brick masonry work shall be left in a state exhibiting properly and fully pointed joints and completely clean surfaces. Subcontractor shall build-in all features of brickwork as shown or indicated on the drawings including weeps, special coursing and or patterned elements.

J. The Subcontractor shall be responsible for furnishing all required labor, tools, and equipment as required to complete all areas of masonry work on the project. This shall be inclusive of all scaffolding, walk-boards and bracing as required to support the work until fully incorporated into the structure.

K. Subcontractor shall also furnish all materials save for the brick units as called out above. These materials include concrete block, mortar, reinforcing, ties and other accessories necessary for the execution of the masonry work.

3.03 Preparation:

A. Direct and coordinate placement of metal anchors supplied for installation under other sections.

B. Provide temporary bracing during installation of masonry work. Maintain in place until building structure provides permanent bracing.

3.04 Coursing:

A. Establish lines, levels, and coursing indicated. Protect from displacement.

B. Maintain masonry courses to uniform dimension. Form vertical and horizontal joints of uniform thickness.

C. Concrete Masonry Units:

1. Bond: Running.
2. Coursing: One unit and one mortar joint to equal 8 inches (200 mm).
3. Mortar Joints: Concave.

D. Brick Units:

1. Bond: Running.
2. Coursing: Three units and three mortar joints to equal

8 inches (200 mm).

3. Mortar Joints: Concave.

3.05 Placing and Bonding:

A. Lay solid masonry units in full bed of mortar, with full head joints, uniformly jointed with other work.

B. Masonry work shall be laid true to dimensions, plumb, square and in bond and properly anchored with vertical joints in line, plumb and true.

C. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures.

D. Buttering corners of joints or excessive furrowing of mortar joints is not permitted.

E. Remove excess mortar and mortar smears as work progresses.

F. Interlock intersections and external corners.

G. Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment must be made, remove mortar and replace.

H. Perform job site cutting of masonry units with proper tools to provide straight, clean, unchipped edges. Prevent broken masonry unit corners or edges.

I. Provide a 3/8" joint around hollow metal door jambs and window frames to allow for sealant and expansion.

3.06 Weeps/Cavity Vents:

Install weeps in veneer walls at 24 inches on center horizontally above through-wall flashing, above shelf angles and lintels, and at bottom of walls.

3.07 Reinforcement and Anchorage – General:

A. Fasten anchors to structural framing and embed in masonry joints as masonry is laid. Unless otherwise indicated on drawings or closer spacing is indicated under specific wall type, space anchors at maximum of 36 inches (900 mm) horizontally and 24 inches (600 mm) vertically.

B. Install additional anchors within 12 inches (305 mm) of openings and at intervals, not exceeding 36 inches (900 mm) around perimeter.

C. Locate anchor sections to allow maximum vertical differential movement of ties up and down.

3.08 Reinforcement And Anchorage - Concrete Masonry Units:

A. Unless otherwise indicated on drawings or specified under specific wall type, install horizontal joint reinforcement 8 inches (200 mm) on center.

B. Place masonry joint reinforcement in first and second horizontal joints above and below openings. Extend minimum 16 inches (400 mm) each side of opening.

C. Place continuous joint reinforcement in first and second joint below top of walls.
D. Lap joint reinforcement ends minimum 6 inches (150 mm).
E. Reinforce joint corners and intersections with strap anchors 16 inches on center.

3.09 Reinforcement And Anchorage - Masonry Veneer:

A. Stud Back-Up: Secure veneer anchors to stud framed back-up and embed into masonry veneer at maximum 16 inches on center vertically and 24 inches on center horizontally. Place additional anchors at perimeter of openings and ends of panels, so maximum spacing of anchors is 8 inches on center.

3.10 Masonry Flashings:

A. Whether or not specifically indicated, install masonry flashing to divert water to exterior at all locations where downward flow of water will be interrupted.
   1. Extend flashings full width at such interruptions and at least 4 inches into adjacent masonry or turn up at least 4 inches to form watertight pan at non-masonry construction.
   2. Remove or cover protrusions or sharp edges that could puncture flashings.
   3. Seal lapped ends and penetrations of flashing before covering with mortar.
B. Extend metal flashings through exterior face of masonry and turn down to form drip. Install joint sealer below drip edge to prevent moisture migration under flashing.
C. Lap end joints of flashings at least 4 inches and seal watertight with mastic or elastic sealant.

3.11 Lintels:

A. Install loose steel lintels over openings.

3.12 Control Joints:

A. Do not continue horizontal joint reinforcement through control joints.
B. Install preformed control joint device in continuous lengths. Seal butt and corner joints in accordance with manufacturer's instructions.
C. Size control joint in accordance with Section 07900 for sealant performance.

3.13 Built-In Work:

A. As work progresses, install built-in metal door frames and other items to be built into the work and furnished under other sections.
B. Install built-in items plumb, level, and true to line.

C. Bed anchors of metal door frames in adjacent mortar joints. Fill frame voids solid with grout.
D. Do not build into masonry construction organic materials that are subject to deterioration.

3.14 Tolerances:
A. Maximum Variation from Alignment of Columns: 1/4 inch.
B. Maximum Variation From Unit to Adjacent Unit: 1/16 inch.
C. Maximum Variation from Plane of Wall: 1/4 inch in 10 ft and 1/2 inch in 20 ft or more.
D. Maximum Variation from Plumb: 1/4 inch per story non-cumulative; 1/2 inch in two stories or more.
E. Maximum Variation from Level Coursing: 1/8 inch in 3 ft and 1/4 inch in 10 ft; 1/2 inch in 30 ft.
F. Maximum Variation of Joint Thickness: 1/8 inch in 3 ft.
G. Maximum Variation from Cross Sectional Thickness of Walls: 1/4 inch.

3.15 Cutting And Fitting:
A. Cut and fit for pipes and conduit. Coordinate with other sections of work to provide correct size, shape, and location.
B. Obtain approval prior to cutting or fitting masonry work not indicated or where appearance or strength of masonry work may be impaired.

3.16 Cleaning:
A. Remove excess mortar and mortar droppings.
B. Clean soiled surfaces with cleaning solution.

3.17 Protection Of Finished Work:
A. Without damaging completed work, provide protective boards at exposed external corners that are subject to damage by construction activities.

End of Section

DIVISION 5 – STRUCTURAL STEEL

SECTION 05120 – STRUCTURAL STEEL FRAMING

PART 1 – GENERAL

1.01 Section Includes
- A. Structural steel framing members.
- B. Base plates, shear stud connectors and anchor rods.
- C. Grouting under base plates.

1.02 Related Requirements
- A. Section 05 2100 - Steel Joist Framing.
- B. Section 05 3100 - Steel Decking: Support framing for small openings in deck.
- C. Section 05 5000 - Metal Fabrications: Steel fabrications affecting structural steel work.

1.03 Reference Standards
- A. For all reference standards listed below, comply with the version year in the governing building code adopted by the Authority Having Jurisdiction. For those reference standards that are not directly referenced by the building code, use the latest edition unless noted otherwise.
- B. AISC (MAN) - Steel Construction Manual.
- C. AISC 303 - Code of Standard Practice for Steel Buildings and Bridges.
- D. AISC 360 - Specification for Structural Steel Buildings.
- E. ASTM A6/A6M - Standard Specification for General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling.
- F. ASTM A29/A29M - Standard Specification for Steel Bars, Carbon Alloy, Hot-Wrought, General Requirements.
- G. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.
- H. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
- I. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
- J. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
- K. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength.
- L. ASTM A325 - Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.
- M. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
- N. ASTM A563 - Standard Specification for Carbon and Alloy Steel Nuts.
- O. ASTM A563M - Standard Specification for Carbon and Alloy Steel Nuts (Metric).

P. ASTM A572/A572M - Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel.
Q. ASTM A992/A992M - Standard Specification for Structural Steel Shapes.
R. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.
S. ASTM C827/C827M - Standard Test Method for Change in Height at Early Ages of Cylindrical Specimens of Cementitious Mixtures.
T. ASTM E94/E94M - Standard Guide for Radiographic Examination Using Industrial Radiographic Film.
U. ASTM E164 - Standard Practice for Contact Ultrasonic Testing of Weldments.
V. ASTM E165/E165M - Standard Test Method for Liquid Penetrant Examination for General Industry.
W. ASTM E709 - Standard Guide for Magnetic Particle Testing.
X. ASTM F436/F436M - Standard Specification for Hardened Steel Washers Inch and Metric Dimensions.
Y. ASTM F1554 - Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength.
Z. ASTM F1852 - Standard Specification for "Twist Off" Type Tension Control Structural Bolt/Nut/Washer Assemblies, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.
AA. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination.
AB. AWS D1.1/D1.1M - Structural Welding Code - Steel.
AC. ICC (IBC)-2015 - International Building Code.
AD. MPI #79 - Primer, Alkyd, Anti-Corrosive for Metal.
AE. RCSC (HSBOLT) - Specification for Structural Joints Using High-Strength Bolts; Research Council on Structural Connections.
AF. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic").
AG. SSPC-SP 3 - Power Tool Cleaning.
AH. SSPC-SP 6 - Commercial Blast Cleaning.

1.04 Submittals

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
B. Shop Drawings:
   1. Indicate profiles, sizes, spacing, locations of structural members, openings, attachments, and fasteners.
   2. Indicate cambers and loads.
   3. Indicate welded connections with AWS A2.4 welding symbols. Indicate net weld lengths.

C. Manufacturer's Mill Certificate: Certify that products meet or exceed specified requirements.
D. Product Data: For shop primers, include manufacturer's technical information including basic materials analysis and application instructions.
E. Welders Certificates: Certify welders employed on the Work, verifying AWS qualification within the previous 12 months.

1.05 Quality Assurance
A. Fabricate structural steel members in accordance with AISC (MAN) "Steel Construction Manual."
B. Fabricator Qualifications:
1. A steel fabricator specializing in performing the work of this section with minimum 10 years of experience.
C. Erector Qualifications:
1. An erector specializing in performing the work of this section with minimum 5 years of experience.

1.06 Delivery, Storage And Handling
A. Comply with the requirements of the General Conditions and of ASTM A6/A6M, including the following.
B. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect steel members and packaged materials from corrosion and deterioration.
1. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.
C. Store fasteners in a protected place in sealed containers with manufacturer's labels intact.
1. Fasteners may be repackaged provided Owner's testing and inspecting agency observes repackaging and seals containers.
2. Clean and relubricate bolts and nuts that become dry or rusty before use.
3. Comply with manufacturers' written recommendations for cleaning and lubricating ASTM F1852 fasteners and for retesting fasteners after lubrication.

PART 2 - PRODUCTS

2.01 Materials
A. Steel Angles, Plates, and Channels: ASTM A36/A36M.
B. Steel W Shapes and Tees: ASTM A992/A992M.
C. Cold-Formed Structural Tubing: ASTM A500/A500M, Grade C.
D. Pipe: ASTM A53/A53M, Grade B, Finish black.

E. Headed Stud Anchors: AWS D1.1 Type B, ASTM A29 Grades 1010 through 1020.
F. Structural Bolts and Nuts: Carbon steel, ASTM A307, Grade A and galvanized in compliance with ASTM A153/A153M, Class C.
G. High-Strength Structural Bolts, Nuts, and Washers: ASTM A325, Type 1, heavy-hex steel structural bolts; ASTM A563, Grade C heavy-hex carbon-steel nuts; and ASTM F436/F436M, Type 1, hardened carbon-steel washers; all with plain finish.
H. Tension Control Bolts: Twist-off type: ASTM F1852.
I. Unheaded Anchor Rods: ASTM F1554, Grade 55 , Supplementary Requirement S1, Weldable, plain, with matching ASTM A563 or ASTM A563M nuts and ASTM F436/F436M Type 1 washers.
J. Deformed Bar Anchors: AWS D1.1/D1.1M Type C, ASTM A1064 Grade 70.
K. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.
L. Grout: ASTM C1107/C1107M; Non-shrink; premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents.
    1. Minimum Compressive Strength at 48 Hours: 3000 pounds per square inch.
    2. Minimum Compressive Strength at 28 Days: 7,000 pounds per square inch.
    3. Height Change, Plastic State; when tested according to ASTM C827/C827M:
        a. Maximum: Plus 4 percent.
        b. Minimum: Plus 1 percent.
M. Shop and Touch-Up Primers: As required below, complying with VOC limitations of authorities having jurisdiction.
    1. Steel Exposed to Exterior Weather or an Uncontrolled Environment: Two-component, high performance, zinc-rich, aromatic urethane, compatible with topcoat and complying with SSPC-Paint 20.
    2. Interior Steel: Fabricator's standard lead- and chromate-free, non-asphaltic, rust-inhibiting primer complying with MPI #79 and compatible with topcoat.
N. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, complying with VOC limitations of authorities having jurisdiction.

2.02 Fabrication

A. Shop fabricate to greatest extent possible. Fabricate according to AISC 303 and to AISC 360.
B. Fabricate connections for bolt, nut, and washer connectors.
C. Develop required camber for members.
D. Fabricated uncambered beams with rolling camber up.

2.03 Finish

A. Prepare structural component surfaces in accordance with SSPC-SP3 for interior steel or SSPC-SP6 for all steel exposed to exterior weather or an uncontrolled environment.

B. Shop prime structural steel members:

1. Do not prime surfaces that will be galvanized, fireproofed, field welded, in contact with concrete, or [in slip surfaces of slip-critical connections].
2. All steel exposed to exterior weather or an uncontrolled environment shall be blast cleaned and primed with a submitted and approved zinc-rich primer.
3. Interior steel shall be shop primed with the fabricators standard shop primer.

C. Galvanize structural steel members to comply with ASTM A123/A123M.

2.04 Source Quality Control & Quality Assurance

A. Unless the fabricator is designated an AISC-Certified Plant, Category STD, or is accredited by the IAS Fabricator Inspection Program for Structural Steel, an independent testing agency will perform Special Inspections and field quality control and quality assurance tests in the fabricator's shop as required by Chapter 17 of ICC (IBC)-2015 and Chapter N of AISC 360. Refer to the following parts of the structural drawings for additional Special Inspection requirements.

1. Statement of Special Inspection Notes
2. Two tables titled "Required Verification and Inspection of Steel Construction"

PART 3 - EXECUTION

3.01 Examination

A. Verify that conditions are appropriate for erection of structural steel and that the work may properly proceed.

3.02 Erection

A. Erect structural steel in compliance with AISC 303.

B. Allow for erection loads and provide sufficient temporary bracing to maintain structure in safe condition, plumb, and in true alignment until completion of erection and installation of permanent bracing. Refer to the "Construction Loads and Stability" section of the General Notes in the Project Drawings for additional information and requirements.

C. Field weld components, deformed bar anchors and shear studs indicated on shop drawings.

D. Use carbon steel bolts only for temporary bracing during construction, unless otherwise specifically permitted on

drawings. Install high-strength bolts in accordance with RCSC (HSBOLT) "Specification for Structural Joints Using High-Strength Bolts".

E. Do not field cut or alter structural members without approval of Structural Engineer.

F. After erection, prime welds, abrasions, and surfaces not shop primed, except surfaces to be in contact with concrete.

G. Grout solidly between column plates and bearing surfaces, complying with manufacturer's instructions for non-shrink grout. Trowel grouted surfaces smooth, splaying neatly to 45 degrees.

3.03 Field Quality Control & Quality Assurance

A. An independent testing agency will perform Special Inspections and field quality control and quality assurance tests as required by Chapter 17 of ICC (IBC)-2015 and Chapter N of AISC 360. Refer to the following parts of the structural drawings for additional Special Inspection requirements:

1. Statement of Special Inspection Notes
2. Two tables titled "Required Verification and Inspection of Steel Construction"

END OF SECTION

DIVISION 5 – STRUCTURAL STEEL

SECTION 05210 – STEEL JOIST FRAMING

PART 1 – GENERAL

1.01 Section Includes
- A. Open web steel joists, with bridging, attached seats and anchors.
- B. Loose bearing members, such as plates or angles, and anchor bolts for site placement.
- C. Supplementary framing for floor and roof openings greater than 8 inches.

1.02 Related Requirements
- A. Section 05 1200 - Structural Steel Framing: Grouting base plates and bearing plates. Superstructure framing.
- B. Section 05 1200 - Structural Steel Framing: Superstructure framing.
- C. Section 05 3100 - Steel Decking: Bearing plates and angles.
- D. Section 05 5000 - Metal Fabrications: Non-framing steel fabrications attached to joists.

1.03 Reference Standards:
- A. For all reference standards listed below, comply with the version year in the governing building code adopted by the Authority Having Jurisdiction. For those reference standards that are not directly referenced by the building code, use the latest edition unless noted otherwise.
- B. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.
- C. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
- D. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength.
- E. ASTM A325 - Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.
- F. ASTM A436 - Standard Specification for Austenitic Gray Iron Castings.
- G. ASTM A563 - Standard Specification for Carbon and Alloy Steel Nuts.
- H. AWS B2.1/B2.1M - Specification for Welding Procedure and Performance Qualification.
- I. AWS D1.1/D1.1M - Structural Welding Code - Steel.
- J. IAS AC172 - Accreditation Criteria for Fabricator Inspection Programs for Structural Steel.
- K. ICC (IBC)-2015 - International Building Code.
- L. SJI JG-10 - Standard Specification for Joist Girders.
- M. SJI K-10 - Standard Specification for Open Web Steel Joists, K-Series.

N. SJI LH/DLH-10 - Standard Specification for Longspan Steel Joists, LH-series and Deep Longspan Steel Joists, DLH-series.
O. SJI Technical Digest No. 9 - Handling and Erection of Steel Joists and Joist Girders.
P. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer.
Q. SSPC-SP 2 - Hand Tool Cleaning.

1.04 Submittals

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
B. Shop Drawings: Indicate standard designations, joist coding, configurations, sizes, spacings, cambers, locations of joists, joist leg extensions, bridging, connections, and attachments.
C. Welders' Certificates: Submit manufacturer's certificates, certifying welders employed on the Work, verifying AWS qualification within the previous 12 months.
D. Manufacturer's Qualification Statement.
E. Comprehensive engineering analysis of all joists signed and sealed by the qualified professional engineer licensed in the state of the project responsible for its preparation.
F. Manufacturer's Certification: At completion of manufacture, the steel joist manufacturer shall submit a certificate of compliance to the owner’s authorized agent for submittal to the building official as specified in Section 1704.5 of ICC (IBC)-2015 stating that work was performed in accordance with approved construction documents and with the SJI specifications listed herein.

1.05 Quality Assurance

A. Perform Work, including that for headers and other supplementary framing, in accordance with SJI JG-10, SJI K-10, and SJI LH/DLH-10 and SJI Technical Digest No. 9.
B. Manufacturer Qualifications: Company specializing in performing the work of this section with minimum 5 years documented experience.

1.06 Delivery, Storage, And Handling

A. Transport, handle, store, and protect products to SJI requirements.

PART 2 - PRODUCTS

2.01 Materials

A. Open Web Joists: Types as indicated on drawings:
1. Minimum End Bearing on Steel Supports: Comply with referenced SJI standard.

2. Minimum End Bearing on Concrete or Masonry Supports: Comply with referenced SJI standard.
3. Finish: Shop primed.

B. Anchor Bolts, Nuts and Washers: ASTM A307, hot-dip galvanized per ASTM A153/A153M, Class C.

C. High-Strength Structural Bolts, Nuts, and Washers: ASTM A325 with matching compatible ASTM A563 nuts and ASTM A436 washers.

D. Headed Stud Anchors: [AWS D1.1 Type B, ASTM A29 Grades 1010 through 1020].

E. Structural Steel For Supplementary Framing and Joist Leg Extensions: ASTM A36/A36M.

F. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.

G. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.

2.02 Finish

A. Shop prime joists as specified.
1. Do not prime surfaces that will be fireproofed.

B. Prepare surfaces to be finished in accordance with SSPC-SP2.

2.03 Source Quality Control

A. Welded Connections: Visually inspect all shop-welded connections.

PART 3 - EXECUTION

3.01 Examination

A. Verify existing conditions prior to beginning work.

3.02 Erection

A. Erect joists in compliance with SJI Technical Digest No. 9 and all applicable provisions of OSHA safety standards.

B. Erect joists with correct bearing on supports.

C. Allow for erection loads. Provide sufficient temporary bracing to maintain framing safe, plumb, and in true alignment.

D. Coordinate the placement of anchors for securing loose bearing members furnished as part of the work of this section.

E. After joist alignment and installation of framing, field weld joist seats to steel bearing surfaces.

F. Position and field weld joist chord extensions and wall attachments as detailed.

G. Install supplementary framing for floor and roof openings greater than 8 inches.

H. Do not permit erection of decking until joists are braced, bridged, and secured or until completion of erection and installation of permanent bridging and bracing.

I. Do not field cut or alter structural members without approval of joist manufacturer.

J. After erection, prime welds, damaged shop primer, and surfaces not shop primed, except surfaces specified not to be primed.

3.03 Tolerances

A. Maximum Variation From Plumb: 1/4 inch.

B. Maximum Offset From True Alignment: 1/4 inch.

3.04 Field Quality Control

A. An independent testing agency will perform Special Inspections and field quality control as required by Chapter 17 of ICC (IBC)-2015. Refer to the following parts of the structural drawings for additional Special Inspection requirements.

1. Statement of Special Inspection Notes
2. Table 1705.2.3 titled "Required Special Inspections of Open-Web Steel Joists and Joist Girders"

END OF SECTION

DIVISION 5 – STRUCTURAL STEEL

SECTION 05310 – STEEL DECKING

PART 1 – GENERAL

1.01 Section Includes
- A. Roof deck.
- B. Supplementary framing for openings up to and including 8 inches.
- C. Bearing plates and angles.

1.02 Related Requirements
- A. Section 05 1200 - Structural Steel Framing: Support framing for openings larger than 8 inches and shear stud connectors.
- B. Section 05 2100 - Steel Joist Framing: Support framing for openings larger than 8 inches.
- C. Section 05 5000 - Metal Fabrications: Steel angle concrete stops at deck edges.

1.03 Reference Standards
- A. For all reference standards listed below, comply with the version year in the governing building code adopted by the Authority Having Jurisdiction. For those reference standards that are not directly referenced by the building code, use the latest edition unless noted otherwise.
- B. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.
- C. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
- D. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- E. AWS D1.1/D1.1M - Structural Welding Code - Steel.
- F. AWS D1.3/D1.3M - Structural Welding Code - Sheet Steel.
- G. ICC (IBC)-2015 - International Building Code.
- H. SDI (DM) - Publication No.30, Design Manual for Composite Decks, Form Decks, and Roof Decks.
- I. SDI (QA/QC) - Standard for Quality Control and Quality Assurance for Installation of Steel Deck.
- J. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic").

1.04 Submittals
- A. See Section 01 3000 - Administrative Requirements, for submittals procedures.
- B. Product Data: Provide deck profile characteristics, dimensions, structural properties, and finishes.
- C. Shop Drawings: Indicate deck plan, support locations, projections, openings, reinforcement, pertinent details, and accessories.
- D. Submit manufacturer's installation instructions.

E. Welders Certificates: Certify welders employed on the Work, verifying AWS qualification within the previous 12 months.

1.05 Quality Assurance

A. Special inspections and qualification of welding special inspectors for cold-formed steel floor and roof deck shall be in accordance with the quality assurance inspection requirements of SDI (QA/QC).

B. Installer Qualifications: Company specializing in performing the work of this Section with minimum 5 years of experience.

1.06 Delivery, Storage, And Handling

A. Cut plastic wrap to encourage ventilation.

B. Separate sheets and store deck on dry wood sleepers; slope for positive drainage.

PART 2 - PRODUCTS

2.01 Steel Deck

A. Roof Deck: Non-composite type, fluted steel sheet:

1. Galvanized Steel Sheet: ASTM A653/A653M, Structural Steel (SS) Grade 33/230, with G60/Z180 galvanized coating.

2. Structural Properties: As indicated in General Notes.

2.02 Accessory Materials

A. Bearing Plates and Angles: ASTM A36/A36M steel, galvanized per ASTM A123/A123M.

B. Welding Materials: AWS D1.1/D1.1M.

C. Mechanical Fasteners: Steel; hex washer head, self-drilling, self-tapping.

D. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, complying with VOC limitations of authorities having jurisdiction.

E. Flute Closures: Closed cell foam rubber, 1 inch thick; profiled to fit tight to the deck.

2.03 Fabricated Deck Accessories

A. Sheet Metal Deck Accessories: Metal closure strips, wet concrete stops, and cover plates, 20 gauge, 0.0359 inch thick sheet steel; of profile and size as indicated; finished same as deck.

B. Roof Sump Pans: Formed sheet steel, 14 gauge, 0.0747 inch minimum thickness, flat bottom, sloped sides, recessed 1-1/2 inches below roof deck surface, bearing flange 3 inches wide, sealed watertight.

PART 3 - EXECUTION

3.01 Examination

A. Verify existing conditions prior to beginning work.

3.02 Installation

A. Erect metal deck in accordance with SDI Design Manual and manufacturer's instructions. Align and level.

B. On concrete and masonry surfaces provide minimum 4 inch bearing.

C. On steel supports provide minimum 2 inch bearing at discontinuous ends of deck and minimum 3 inch bearing length of continuous roof deck over interior supports.

D. Fasten deck to steel support members as indicated at spacings indicated on the drawings using methods specified.

E. Drive mechanical sidelap connectors completely through adjacent lapped sheets; positively engage adjacent sheets with minimum three-thread penetration.

F. Where roof deck changes direction, install 6 inch minimum wide sheet steel cover plates, of same thickness as deck. Attach both sides of cover plate to roof deck below with the same fasteners and spacings as required for deck to supports.

G. Close openings above walls and partitions perpendicular to deck flutes with single row of foam cell closures.

H. Position roof drain pans with flange bearing on top surface of deck. Fusion weld at each deck flute.

3.03 Field Quality Control

A. An independent testing agency will perform Special Inspections and field quality control tests as required by Chapter 17 of ICC (IBC)-2015 and SDI (QA/QC). Refer to the following parts of the structural drawings for additional Special Inspection requirements:

1. Statement of Special Inspection Notes
2. Table titled "Required Inspection of Cold-Formed Steel Deck"

B. Concurrent with the submittal of special inspection reports to the Owner's Representative, the special inspector shall submit to the Owner's Representative and the Installer a list of nonconforming items.

END OF SECTION

DIVISION 5 – METALS

SECTION 05400 – COLD-FORMED METAL FRAMING

PART 1 - GENERAL

1.01 Related Documents

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 Summary

A. This Section includes the following:
   1. Exterior and interior non-load-bearing wall framing.
   2. Soffit joist framing.

B. Related Sections include the following:
   1. Division 5 Section "Metal Fabrications" for masonry shelf angles and connections.
   2. Division 9 Section "Gypsum Board Assemblies" for interior non-load-bearing, metal-stud framing and ceiling-suspension assemblies.

1.03 Performance Requirements

A. Structural Performance: Provide cold-formed metal framing capable of withstanding design loads within limits and under conditions indicated.
   1. Design Loads: Design loads shall be calculated components and cladding load per ASCE/SEI 7 edition indicated on the drawings.
   2. Deflection Limits: Design framing systems to withstand design loads without deflections greater than the following:
      a. Exterior Non-Load-Bearing Framing: Horizontal deflection of 1/600 of wall height at areas backing up brick veneer, and 1/240 of wall height at areas backing up other materials.
      b. Soffit Joist Framing: Vertical deflection of 1/240 of the span.
   3. Design framing system to maintain clearances at openings, to allow for construction tolerances, and to accommodate live load deflection of primary building structure as follows:
      a. Upward and downward movement of 1 inch.

B. Cold-Formed Steel Framing, General: Design according to AISI's "Standard for Cold-Formed Steel Framing - General Provisions."
   1. Headers: Design according to AISI's "Standard for Cold-Formed Steel Framing - Header Design."
   2. Design exterior non-load-bearing wall framing to accommodate horizontal deflection without regard for contribution of sheathing materials.

SECTION 05400 – COLD-FORMED METAL FRAMING

1.04 Submittals

A. Product Data: For each type of cold-formed metal framing product and accessory indicated.

B. Shop Drawings: Show layout, spacings, sizes, thicknesses, and types of cold-formed metal framing; fabrication; and fastening and anchorage details, including mechanical fasteners. Show reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining work.

1. For cold-formed metal framing indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

C. Welding certificates.

D. Research/Evaluation Reports: For cold-formed metal framing.

1.05 Quality Assurance

A. Engineering Responsibility: Preparation of Shop Drawings, design calculations, and other structural data by a qualified professional engineer.

B. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of cold-formed metal framing that are similar to those indicated for this Project in material, design, and extent.

C. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code--Steel," and AWS D1.3, "Structural Welding Code--Sheet Steel."

D. AISI Specifications and Standards: Comply with AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members" and its "Standard for Cold-Formed Steel Framing - General Provisions."

1. Comply with AISI's "Standard for Cold-Formed Steel Framing - Truss Design."
2. Comply with AISI's "Standard for Cold-Formed Steel Framing - Header Design."

1.06 Delivery, Storage, And Handling

A. Protect cold-formed metal framing from corrosion, deformation, and other damage during delivery, storage, and handling.

B. Store cold-formed metal framing, protect with a waterproof covering, and ventilate to avoid condensation.

SECTION 05400 – COLD-FORMED METAL FRAMING

PART 2 - PRODUCTS

2.01 Manufacturers

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering cold-formed metal framing that may be incorporated into the Work include, but are not limited to, the following:
   1. Allied Studco.
   2. AllSteel Products, Inc.
   3. California Expanded Metal Products Company.
   4. Clark Steel Framing.
   5. Consolidated Fabricators Corp.; Building Products Division.
   6. Craco Metals Manufacturing, LLC.
   7. Custom Stud, Inc.
   8. Dale/Incor.
   9. Design Shapes in Steel.
   10. Dietrich Metal Framing; a Worthington Industries Company.
   11. Formetal Co. Inc. (The).
   12. Innovative Steel Systems.
   13. MarinoWare; a division of Ware Industries.
   14. Quail Run Building Materials, Inc.
   15. SCAFCO Corporation.
   16. Southeastern Stud & Components, Inc.
   17. Steel Construction Systems.
   18. Steeler, Inc.
   19. Super Stud Building Products, Inc.
   20. United Metal Products, Inc.

2.02 Materials

A. Steel Sheet: ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of grade and coating weight as follows:
   1. Grade: ST33H (ST230H).
   2. Coating: G60 (Z180).

B. Steel Sheet for Vertical Deflection Clips: ASTM A 653/A 653M, structural steel, zinc coated, of grade and coating as follows:
   1. Grade: 50 (340), Class 1 or 2.
   2. Coating: G90 (Z275).

2.03 Exterior Non-Load-Bearing Wall Framing

A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:
   1. Minimum Base-Metal Thickness: 0.0428 inches (1.09 mm).
   2. Flange Width: 1-5/8 inches (41 mm).

B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with unstiffened flanges, and as follows:
   1. Minimum Base-Metal Thickness: 0.0538 inches (1.37 mm)
   2. Flange Width: 1-1/2 inches.

C. Vertical Deflection Clip Option: Manufacturer's standard head clips, capable of accommodating upward and downward vertical displacement of primary structure through positive mechanical attachment to stud web.
   1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
      a. Dietrich Metal Framing; a Worthington Industries Company.
      b. MarinoWare, a division of Ware Industries.
      c. SCAFCO Corporation
      d. The Steel Network, Inc.

D. Single Deflection Track Option: Manufacturer's single, deep-leg, U-shaped steel track; unpunched, with unstiffened flanges, of web depth to contain studs while allowing free vertical movement, with flanges designed to support horizontal and lateral loads and transfer them to the primary structure, and as follows:
   1. Minimum Base-Metal Thickness: 0.0538 inch (1.37 mm).
   2. Flange Width: 1 inch (25 mm) plus the design gap for 1-story structures and 1 inch (25 mm) plus twice the design gap for other applications.

E. Double Deflection Track Option: Manufacturer's double, deep-leg, U-shaped steel tracks, consisting of nested inner and outer tracks; unpunched, with unstiffened flanges.
   1. Outer Track: Of web depth to allow free vertical movement of inner track, with flanges designed to support horizontal and lateral loads and transfer them to the primary structure, and as follows:
      a. Minimum Base-Metal Thickness: 0.0538 inch (1.37 mm).
      b. Flange Width: 1 inch (25 mm) plus the design gap for 1-story structures and 1 inch (25 mm) plus twice the design gap for other applications.
   2. Inner Track: Of web depth indicated, and as follows:
      a. Minimum Base-Metal Thickness: 0.0428 inch (1.09 mm).
      b. Flange Width: Equal to sum of outer deflection track flange width plus 1 inch.

2.04 Soffit Joist Framing

A. Steel Ceiling Joists: Manufacturer's standard C-shaped steel sections, of web depth indicated, unpunched, with stiffened flanges, and as follows:
   1. Minimum Base-Metal Thickness: As indicated on drawings.
   2. Flange Width: 1-5/8 inches (41 mm) minimum.

2.05 Framing Accessories

A. Fabricate steel-framing accessories from steel sheet, ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of same grade and coating weight used for framing members.

B. Provide accessories of manufacturer's standard thickness and configuration, unless otherwise indicated, as follows:
   1. Supplementary framing.
   2. Bracing, bridging, and solid blocking.
   3. Web stiffeners.
   4. Anchor clips.
   5. End clips.
   6. Foundation clips.
   7. Gusset plates.
   8. Stud kickers, knee braces, and girts.
   9. Joist hangers and end closures.
   10. Hole reinforcing plates.
   11. Backer plates.

2.06 Anchors, Clips, And Fasteners

A. Anchor Bolts: ASTM F 1554, Grade 55, threaded carbon-steel headless bolts, with encased end threaded, and carbon-steel nuts; and flat, hardened-steel washers; zinc coated by hot-dip process according to ASTM A 153/A 153M, Class C or mechanically deposition according to ASTM B 695, Class 50.

B. Expansion Anchors: Fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 5 times design load, as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.

C. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 5 times design load, as determined by testing per ASTM E 1190 conducted by a qualified independent testing agency.

D. Mechanical Fasteners: ASTM C 1513, corrosion-resistant-coated, self-drilling, self-tapping steel drill screws.
   1. Head Type: Low-profile head beneath sheathing, manufacturer's standard elsewhere.

E. Welding Electrodes: Comply with AWS standards.

2.07 Miscellaneous Materials

A. Galvanizing Repair Paint: ASTM A 780.

B. Nonmetallic, Nonshrink Grout: Premixed, nonmetallic, noncorrosive, nonstaining grout containing selected silica sands, portland cement, shrinkage-compensating agents, and plasticizing and water-reducing agents, complying with ASTM C 1107, with fluid consistency and 30-minute working time.

C. Shims: Load bearing, high-density multimonomer plastic, nonleaching.

D. Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch (6.4 mm) thick, selected from manufacturer's standard widths to match width of bottom track or rim track members.

2.08 Fabrication

A. Fabricate cold-formed metal framing and accessories plumb, square, and true to line, and with connections securely fastened, according to referenced AISI's specifications and standards, manufacturer's written instructions, and requirements in this Section.

1. Fabricate framing assemblies using jigs or templates.
2. Cut framing members by sawing or shearing; do not torch cut.
3. Fasten cold-formed metal framing members by welding, screw fastening, clinch fastening, or riveting as standard with fabricator. Wire tying of framing members is not permitted.
    a. Comply with AWS D1.3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
    b. Locate mechanical fasteners and install according to Shop Drawings, with screw penetrating joined members by not less than three exposed screw threads.
4. Fasten other materials to cold-formed metal framing by welding, bolting, or screw fastening, according to Shop Drawings.

B. Reinforce, stiffen, and brace framing assemblies to withstand handling, delivery, and erection stresses. Lift fabricated assemblies to prevent damage or permanent distortion.

C. Fabrication Tolerances: Fabricate assemblies level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet (1:960) and as follows:

1. Spacing: Space individual framing members no more than plus or minus 1/8 inch (3 mm) from plan location. Cumulative error shall not exceed minimum fastening

requirements of sheathing or other finishing materials.

2. Squareness: Fabricate each cold-formed metal framing assembly to a maximum out-of-square tolerance of 1/8 inch (3 mm).

PART 3 - EXECUTION

3.01 Examination

A. Examine supporting substrates and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 Installation, General

A. Cold-formed metal framing may be shop or field fabricated for installation, or it may be field assembled.

B. Install cold-formed metal framing according to AISI's "Standard for Cold-Formed Steel Framing - General Provisions" and to manufacturer's written instructions unless more stringent requirements are indicated.

C. Install shop- or field-fabricated, cold-formed framing and securely anchor to supporting structure.

1. Screw, bolt, or weld wall panels at horizontal and vertical junctures to produce flush, even, true-to-line joints with maximum variation in plane and true position between fabricated panels not exceeding 1/16 inch (1.6 mm).

D. Install cold-formed metal framing and accessories plumb, square, and true to line, and with connections securely fastened.

1. Cut framing members by sawing or shearing; do not torch cut.

2. Fasten cold-formed metal framing members by welding, screw fastening, clinch fastening, or riveting. Wire tying of framing members is not permitted.

a. Comply with AWS D1.3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.

b. Locate mechanical fasteners and install according to Shop Drawings, and complying with requirements for spacing, edge distances, and screw penetration.

E. Install framing members in one-piece lengths unless splice connections are indicated for track or tension members.

F. Install temporary bracing and supports to secure framing and support loads comparable in intensity to those for

which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.

G. Do not bridge building expansion and control joints with cold-formed metal framing. Independently frame both sides of joints.

H. Install insulation, specified in Division 7 Section "Building Insulation," in built-up exterior framing members, such as headers, sills, boxed joists, and multiple studs at openings, that are inaccessible on completion of framing work.

I. Fasten hole reinforcing plate over web penetrations that exceed size of manufacturer's standard punched openings.

J. Erection Tolerances: Install cold-formed metal framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet (1:960) and as follows:

1. Space individual framing members no more than plus or minus 1/8 inch (3 mm) from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

3.03 Exterior Non-Load-Bearing Wall Installation

A. Install continuous tracks sized to match studs. Align tracks accurately and securely anchor to supporting structure as indicated.

B. Fasten both flanges of studs to bottom track, unless otherwise indicated. Fast both flanges to top track if required by deflection option selected. Space studs as follows:

1. Stud Spacing: 16 inches (406 mm).

C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar requirements.

D. Isolate non-load-bearing steel framing from building structure to prevent transfer of vertical loads while providing lateral support.

1. Single Deflection Track Option: Install single-leg deflection tracks and anchor to building structure.
2. Double Deflection Track Option: Install double deep-leg deflection tracks and anchor outer track to building structure.
3. Deflection Clip Option: Connect vertical deflection clips to infill studs and anchor to building structure.

E. Install horizontal bridging in wall studs, spaced in rows indicated on Shop Drawings but not more than 48 inches (1220 mm) apart. Fasten at each stud intersection.
   1. Top Bridging for Single Deflection Track Option: Install row of horizontal bridging within 12 inches (305 mm) of single deflection track. Install a combination of flat, taut, steel sheet straps of width and thickness indicated and stud or stud-track solid blocking of width and thickness matching studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.
      a. Install solid blocking at maximum 96-inch (2440-mm) centers and as shown on approved Shop Drawings.
   2. Bridging Options:
      a. Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs.
      b. Combination of flat, taut, steel sheet straps of width and thickness indicated and stud-track solid blocking of width and thickness to match studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.
      c. Proprietary bridging bars installed according to manufacturer's written instructions.

F. Install miscellaneous framing and connections, including stud kickers, web stiffeners, clip angles, continuous angles, anchors, fasteners, and stud girts, to provide a complete and stable wall-framing system.

3.04 Joist Installation

A. Install perimeter joist track sized to match joists. Align and securely anchor or fasten track to supporting structure at corners, ends, and spacings indicated on Shop Drawings.

B. Install joists bearing on supporting frame, level, straight, and plumb; adjust to final position, brace, and reinforce. Fasten joists to both flanges of joist track.
   1. Unless shown otherwise in drawings, install joists over supporting frame with a minimum end bearing of 1-1/2 inches (38 mm).
   2. Reinforce ends and bearing points of joists with web stiffeners, end clips, joist hangers, steel clip angles, or steel-stud sections as indicated on drawings.

C. Space joists not more than 2 inches (51 mm) from abutting walls, and as follows:
   1. Joist Spacing: As indicated.

D. Frame openings with built-up joist headers consisting of joist and joist track, nesting joists, or another combination of connected joists if indicated.
E. Install bridging at intervals indicated. Fasten bridging at each joist intersection as follows:
   1. Bridging: Joist-track solid blocking of width and thickness indicated, secured to joist webs.
F. Install miscellaneous joist framing and connections, including web stiffeners, closure pieces, clip angles, continuous angles, hold-down angles, anchors, and fasteners, to provide a complete and stable joist-framing assembly.

3.05 Field Quality Control

A. Testing: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.
B. Field and shop welds will be subject to testing and inspecting.
C. Testing agency will report test results promptly and in writing to Contractor and Architect.
D. Remove and replace work where test results indicate that it does not comply with specified requirements.
E. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.06 Repairs And Protection

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed metal framing with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.
B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and installer that ensures the cold-formed metal framing is without damage or deterioration at time of Substantial Completion.

END OF SECTION

DIVISION 5 – STRUCTURAL STEEL

SECTION 05500 – METAL FABRICATIONS

PART 1 – GENERAL

1.01 Section Includes
- A. Shop fabricated steel items.

1.02 Related Requirements
- A. Section 03 3000 - Cast-in-Place Concrete: Placement of metal fabrications in concrete.
- B. Section 04 2000 - Unit Masonry: Placement of metal fabrications in masonry.
- C. Section 05 1200 - Structural Steel Framing: Structural steel column anchor bolts.
- D. Section 05 2100 - Steel Joist Framing: Structural joist bearing plates, including anchorage.
- E. Section 05 3100 - Steel Decking: Bearing plates for metal deck bearing, including anchorage.
- F. Section 05 5100 - Metal Stairs.

1.03 Reference Standards
- A. For all reference standards listed below, comply with the version year in the governing building code adopted by the Authority Having Jurisdiction. For those reference standards that are not directly referenced by the building code, use the latest edition unless noted otherwise.
- B. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.
- C. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
- D. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
- E. ASTM A283/A283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates.
- F. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength.
- G. ASTM A501/A501M - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.
- H. ASTM F3125/F3125M - Standard Specification for High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 ksi and 150 ksi Minimum Tensile Strength, and Metric Dimensions 830 MPa and 1040 MPa Minimum Tensile Strength.
- I. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination.
- J. AWS D1.1/D1.1M - Structural Welding Code - Steel.
- K. MPI #79 - Primer, Alkyd, Anti-Corrosive for Metal.
- L. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic").

SECTION 05500 – METAL FABRICATIONS

1.04 Submittals

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable.

1. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.

2. Design data: Submit drawings and supporting calculations, signed and sealed by a qualified professional structural engineer.

a. Include the following, as applicable:

1) Design criteria.

2) Engineering analysis depicting stresses and deflections.

3) Member sizes and gauges.

4) Details of connections.

5) Support reactions.

6) Bracing requirements.

PART 2 – PRODUCTS

2.01 Materials - Steel

A. Steel Sections: ASTM A36/A36M.

B. Steel Tubing: ASTM A501/A501M hot-formed structural tubing.

C. Plates: ASTM A283/A283M.

D. Pipe: ASTM A53/A53M, Grade B Schedule 40, black finish.

E. Mechanical Fasteners: Same material as or compatible with materials being fastened; type consistent with design and specified quality level.

F. Bolts, Nuts, and Washers: ASTM A307, Grade A, plain.

G. Bolts, Nuts, and Washers: ASTM F3125/F3125M, Type 1, plain.

H. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.

I. Shop and Touch-Up Primer: As required below, complying with VOC limitations of authorities having jurisdiction.

1. Steel Exposed to Exterior Weather or an Uncontrolled Environment: Two-component, high performance, zinc-rich, aromatic urethane, compatible with topcoat and complying with SSPC-Paint 20.

2. Interior Steel: Fabricator's standard lead- and chromate-free, non-asphaltic, rust-inhibiting primer complying with MPI #79 and compatible with topcoat.

J. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, complying with VOC limitations of authorities having jurisdiction.

2.02 Fabrication

A. Fit and shop assemble items in largest practical sections, for delivery to site.

B. Fabricate items with joints tightly fitted and secured.

C. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.

D. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

2.03 Fabricated Items

A. Ledge Angles, Shelf Angles, Channels, and Plates Not Attached to Structural Framing: For support of metal decking and joists; prime paint finish.

B. Lintels: As detailed; prime paint finish.

C. Door Frames for Overhead Door Openings and Wall Openings: Channel sections; prime paint finish.

D. Elevator Hoistway Divider Beams: Beam sections; prime paint finish.

E. Toilet Partition Suspension Members: Steel channel sections; prime paint finish.

2.04 Finishes - Steel

A. Prime paint steel items.

1. Exceptions: Galvanize items to be embedded in concrete and items to be embedded in masonry.

2. Exceptions: Do not prime surfaces in direct contact with concrete, where field welding is required, and items to be covered with sprayed fireproofing.

B. Prepare surfaces to be primed in accordance with SSPC-SP3 for interior steel or SSPC-SP6 for all steel exposed to exterior weather or an uncontrolled environment.

C. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.

D. Prime Painting: One coat.

E. Galvanizing of Structural Steel Members: Galvanize after fabrication to ASTM A123/A123M requirements. Provide minimum 1.7 oz/sq ft galvanized coating.

F. Galvanizing of Non-structural Items: Galvanize after fabrication to ASTM A123/A123M requirements.

2.05 Fabrication Tolerances

A. Squareness: 1/8 inch maximum difference in diagonal measurements.

B. Maximum Offset Between Faces: 1/16 inch.

C. Maximum Misalignment of Adjacent Members: 1/16 inch.
D. Maximum Bow: 1/8 inch in 48 inches.
E. Maximum Deviation From Plane: 1/16 inch in 48 inches.

PART 3 – EXECUTION

3.01 Examination
A. Verify that field conditions are acceptable and are ready to receive work.
3.02 Preparation
A. Clean and strip primed steel items to bare metal where site welding is required.
B. Supply setting templates to the appropriate entities for steel items required to be cast into concrete or embedded in masonry.
3.03 Installation
A. Install items plumb and level, accurately fitted, free from distortion or defects.
B. Provide for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.
C. Field weld components as indicated on drawings.
D. Perform field welding in accordance with AWS D1.1/D1.1M.
E. Obtain approval prior to site cutting or making adjustments not scheduled.
F. After erection, prime welds, abrasions, and surfaces not shop primed, except surfaces to be in contact with concrete.
3.04 Tolerances
A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.
B. Maximum Offset From True Alignment: 1/4 inch.
C. Maximum Out-of-Position: 1/4 inch.

END OF SECTION

DIVISION 11 - EQUIPMENT

SECTION 05515 - ALUMINUM LADDERS

Part 1 - General

1.01 Work Included:
- A. The General Conditions and applicable sections of Division 1 shall apply to this entire section.
- B. All materials, labor, services, and incidentals necessary for the completion of this entire section of the work.

1.02 Submittals:
- A. Provide manufacturer's catalog cut and data sheets, complete parts list and installation requirements for each item specified.

1.03 Product Delivery, Storage, and Handling:
- A. Handle and store all items with care to prevent damage and injury to finish surfaces.

1.04 Related Work Specified Elsewhere:
- A. Section 06100 - Rough Carpentry.
- B. Section 07700 - Roof Accessories

Part 2 - Products

2.01 Products of the manufacturers listed below have been specified herein to simplify descriptions of design, construction, and materials only. All items have been selected for visual and performance design quality which shall serve as a basis for acceptance of equivalent products by other manufacturers.

2.01 Manufacturer:
- A. Acceptable Manufacturer: UPNOVR, Inc.; Hooksett, NH 03106.

2.02 Aluminum Vertical Access Ladders:
- A. Vertical Roof Hatch Rail Extension Ladder:
  1. Model Number: U-200.
  2. Materials: ASTM B221, Alloy 6063, Temper T-6, non-spark extruded aluminum and ASTM B209, Alloy 6063 Temper T-6 sheet aluminum.
  3. Aluminum Finish: Mill finish.
  4. Nominal Height: As indicated on the Drawings.
  5. Side Rails: 1-3/4 inches wide by 3 inch tubes with 1/8 inch wall thickness.
  6. Rungs: 1-1/4 inches wide by 1-1/4 inches tube with corrugated surfaces and capable of 1,000 pound load. Space 12 inches on center. Attach rungs in centerline of side rails by welding.
  7. Rung Length: 24 inches.
- B. Vertical Roof Access with Walk Thru Safety Handrail:
  1. Model Number: U-201.
  2. Materials: ASTM B221, Alloy 6063, Temper T-6, non-spark extruded aluminum and ASTM B209, Alloy 6063

Temper T-6 sheet aluminum.

3. Aluminum Finish: Mill finish.
4. Nominal Height: As indicated on the Drawings.
5. Side Rails: 1-3/4 inches wide by 3 inch tubes with 1/8 inch wall thickness.
6. Rungs: 1-1/4 inches wide by 1-1/4 inches tube with corrugated surfaces and capable of 1,000 pound load. Space 12 inches on center. Attach rungs in centerline of side rails by welding.

7. Rung Length: 24 inches.

C. Accessories:

1. Wall Brackets: 2 inch by 1/4 inch minimum flat bar aluminum wall brackets.
2. Safety Post Extension: Post extension for fixed ladders constructed of tubular aluminum sections with adjustable mounting brackets for attachment to top of ladder. Permanently mount operating instructions on safety post to be plainly visible to ladder users.

Part 3 Execution

3.01 Preparation:

A. Do not begin installation until substrates have been properly prepared. Notify Architect of unsatisfactory conditions before commencing work.
B. Field verify required dimensions. Coordinate with supporting construction to ensure adequate blocking and support.
C. Coordinate with requirements of roof hatch to ensure height and position of ladder is compatible with roof hatch curb and required clearances.
D. Isolate dissimilar metals to prevent electrolysis with bituminous paint or non-absorptive isolation pad to prevent contact.

3.02 Installation:

A. Install ladders and accessories in accordance with manufacturer's instructions and approved submittals.
1. Securely anchor support brackets with fasteners of type and size recommended by manufacturer.
2. Place brackets at top and bottom and at 48 inches maximum intermediate points.
3. Allow 7 inches minimum clearance from wall to center line of rungs.
4. Inspect ladder to verify proper and secure installation.
5. Hold ladder brackets a minimum of 6” above roofing

membrane.

B. If applicable, install security door assembly and adjust for smooth operation.

C. At roof hatch access ladder, install safety post extension by attaching to top 2 rungs of ladder, centered between side rails. Adjust post to extend 42 inches above top rung when roof hatch is open and post is fully extended.

3.03 Cleaning:

A. Clean ladders as recommended by manufacturer. Do not use abrasive agents, steel wool or chemicals.

End of Section

DIVISION 6 - WOOD & PLASTIC

SECTION 06100 - ROUGH CARPENTRY

Part 1 - General

1.01 Work Included:
- A. All materials, labor, services and incidentals necessary for the completion of this section of the work.

1.02 Related Work Specified Elsewhere:
- A. Wood Treatment - Section 06300

1.03 Quality Assurance:
- A. Grades specified shall conform to the most recent grading rules as established by the following bureaus and associations.
  1. PS 20 - American Softwood Lumber Standard.
  2. Western Wood Products Association
  3. Southern Pine Inspection Bureau
- B. Grade and trade mark each piece of lumber or bundle on bundled stock. Use only the recognized official marks of association under whose rules it is graded. Grade and trade marks will not be required if each shipment is accompanied by certificate of inspection issued by grading association.

1.04 Submittals:
- A. Product Data: for each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.
  1. Include data for wood preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used, net amount of preservative retained, and chemical treatment manufacturer’s written instructions for handling, storing, installing and finishing treated material.
  2. As requested by authorities having jurisdiction include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply wit requirements. Include physical properties of treated materials both before and after exposure to elevated temperatures when tested according to ASTM D5516 and ASTM D 5664.
  3. Include copies of warranties from chemical treatment manufacturers for each type of treatment.

4. Research / evaluation reports – for the following, showing compliance with building code in effect for Project:
    a. Fire-retardant treated wood.
    b. Power-driven fasteners.
    c. Power-actuated fasteners.
    d. Expansion anchors.
    e. Metal framing anchors.

1.05 Delivery, Storage and Handling:

A. Stack lumber, plywood, sheathing, and other materials: provide spacers between each bundle to provide air circulation around bundled material. Provide proper air circulation between stacks and under coverings.

Part 2 - Products

2.01 General:

A. Provide best quality of respective grades and kinds. Lumber and plywood shall be produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, “FSC Principles and Criteria for Forest Stewardship”. Factory mark each piece of lumber with grade stamp of grading agency.

B. Maximum moisture content of lumber 19%.

C. Provide dressed lumber (S4S) unless otherwise indicated.

D. Where nominal sizes are indicated, provide actual sized required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry lumber.

2.02 Grades and Applications of Lumber:

A. Framing lumber for the following shall be "Standard" grade Douglas Fir (WCLIB or WWPA).
    1. Concealed blocking/nailers, cants, grounds, and miscellaneous wood items used in conjunction with the roofing work and as indicated on the Drawings.
    2. Provide dimension lumber of grades indicated according to the American Lumber Standards Committee National Grading Rule provisions of the Grading Agency indicated.

2.03 Fire-retardant Treated Materials:

A. General – where fire-retardant treated materials are required by authorities having jurisdiction, provide materials that comply with performance requirements in AWPA C20 (lumber) and AWPA C27 (plywood). Identify fire-retardant treated wood with appropriate classification

marking of UL, U.S. Testing, Timber Products Inspection, or another testing and inspecting agency acceptable to authorities having jurisdiction.

2.04 Panel Products:

A. Miscellaneous Concealed Plywood: shear wall sheathing, span rating to suit framing in each location, and thickness indicated. Refer to Structural Drawings.

B. Telephone and Electrical Equipment Backing Panels: DOC PS 1, C-D Plugged, fire-retardant treated, in thickness indicated, or if not indicated, not less than ½ inch thick.

2.05 Fasteners:

A. All nails, spikes, bolts, connectors and other fasteners used in connections with this work shall be galvanized.

1. Nails, wire, brads and staples – FS-FF-N-105.
2. Power-driven Fasteners – CABO NER-272.
3. Wood screws – ASME B18.6.1.
4. Screws for fastening to cold formed metal framing: ASTM C954 length as recommended by screw manufacturer for material to be fastened.
5. Lag bolts – ASME B18.2.1.
6. Bolts – steel bolts complying with ASTM A 307, Grade A with ASTM C563 hex nuts and, where indicated, flat washers.
7. Expansion anchors – anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to 4 times the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing and inspecting agency.
   a. Material for interior applications: carbon steel components, zinc plated to comply with ASTM B 633, Class Fe/Zn 5.
   b. Material for exterior applications: stainless steel with bolts and nuts complying with ASTM F 593 and ASTM F 594, alloy group 1 or 2.

2.06 Metal Framing Anchors:

A. General: provide galvanized steel framing anchors of structural capacity, type, and size indicated and acceptable to authorities having jurisdiction.

B. Galvanized Steel Sheet: hot-dip, zinc-coated steel sheet complying with ASTM A 653/A 653M, G60 coating designation.

SECTION 06100 - ROUGH CARPENTRY

Part 3 - Execution

3.01 Sizes and Applications (General Framing):

A. Members shall be accurately cut and fitted, true to line and level, avoiding shims and wedges as much as possible. Discard material with defects that impair quality of carpentry and that are too small to use with minimum number of joints or optimum joint arrangement.

B. Where applicable, apply field treatment complying with AWPA M4 to cut surfaces of preservative-treated lumber and plywood.

C. At wood ground, blocking and nailer installation: install where indicated and required for attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.

D. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces, unless noted otherwise.

3.02 Rough Hardware:

A. Provide all sufficient nails, screws, etc. to insure rigidity and structural soundness. Provide hot-dipped galvanized fasteners at all weather exposed locations.

B. Spiking and nailing shall be done using largest size spikes and nails practicable and as indicated on the drawings. Securely attach carpentry according to applicable codes and recognized standards.

C. Bolt nailers and blocking to steel or concrete members with bolts of proportionate strength of members attached, length required, spaced 4'-0" o.c. maximum and 4" from each end, except as otherwise indicated. Countersink fastener heads on exposed carpentry work and fill holes with wood fiber.

D. Predrill members when necessary to avoid splitting of wood.

3.03 Panel Product Installation:

A. Wood structural panels: comply with applicable recommendations contained in APA Form No. E30K, “APA Design/Construction Guide: Residential and Commercial”, for types of structural-use panels and applications indicated. Comply with “Code Plus” provisions in above referenced guide.

End of Section

SECTION 06200 - FINISH CARPENTRY

Part 1 - General

1.01 Work Included:
- A. All materials, labor, services and incidentals necessary for the completion of this section of the work.
- B. The erection of wall and partition wood finish materials, installation of door and hardware, and shelving incidentals necessary to finish the carpentry.

1.02 Related Work Specified Elsewhere:
- A. Wood Doors - Section 08200
- B. Hardware and Specialties - Section 08700

1.03 Quality Assurance:
- A. Standards:
  1. Architectural Woodwork Institute:
     a. Architectural Woodwork Quality Standards.
  2. National Electrical Manufacturers Association:
     a. NEMA Publication LD-1.
  3. Western Wood Products Association:
     a. Standard Grading Rules for Western Lumber.
  4. American Plywood Association:

1.05 Product Delivery, Storage and Handling:
- A. All finish materials, trim, etc. shall be inspected to insure that no sub-grade, defective, or machine-marked pieces are installed.

Part 2 - Products

2.01 General:
- A. Grades specified shall conform to the most recent grading rules of the association or bureau under whose rules the lumber is produced.
- B. Quality standards specified shall conform to the latest edition of the Architectural Woodwork Institute's "Quality Standards".
- C. Lumber shall be kiln-dried to 10% to 12% moisture content which shall be maintained during the fabrication of millwork and cabinetry.

Part 3 - Execution

3.01 Miscellaneous Trim and Frames:
- A. Install all trim in longest possible lengths. Stagger joints in adjacent member. Cope at returns and miter at corners. Attach securely in place with fine finishing nails where exposed; set for filling.

B. Immediately prior to final inspection of building, the contractor shall repair or replace all millwork or cabinetry items which have been damaged in any way.

End of Section

DIVISION 6 - WOOD & PLASTIC

SECTION 06300 - WOOD TREATMENT

Part 1 - General

1.01 Work Included:
- A. All materials, labor, services and incidentals necessary for the completion of this section of the work.

1.02 Quality Assurance:
- A. Standards:
  - 1. American Wood Preservers Association:
    - a. AWPA Standard P-5 (Preservative)
    - b. AWPA Standard Commodity Standards (Treating Process).
  - 2. Federal Specifications:
    - a. TT-W-550 (Preservative).
    - b. TT-W-571 (Treating Process).
- B. All lumber and plywood receiving wood treatment shall bear the trademark of the process used.
- C. Submit certificate and guarantee of the lumber treated.

Part 2 - Products

2.01 Materials:
- A. Description: Waterborne chemical salts intended for pressure impregnation as a wood preservative. Preservatives with a petroleum vehicle are not permitted.

Part 3 - Execution

3.01 Installation:
- A. Location of treated lumber:
  - 1. All blocking, plates, nailers and curbs used in conjunction with gravel guards, roof edges and all other wood components used in the roofing project.
- B. Materials shall be pressure treated in accordance with the standards of the American Wood Preservers Institute and the chemical manufacturer's specifications.
- C. Treated material shall conform to AWPB LD-2 and treated to a maximum retention of 0.23 pound of oxide per cubic foot.
- D. Moisture content of finish products shall not exceed 19%.

End of Section

DIVISION 6 - WOOD & PLASTICS

SECTION 06410 - CUSTOM CASEWORK

Part 1 - General

1.01 Section Includes:
- A. Special fabricated cabinet units as indicated on drawings.
- B. Countertops.
- C. Hardware
- D. Preparation for site finishing.
- E. Preparation for installing utilities.
- F. Related Documents: The Contract Documents apply to the Work of this Section. Additional requirements and information necessary to complete the Work of this Section may be found in other Documents.
- **G. NOTE: FRAMELESS CABINETS / EUROPEAN CONSTRUCTION SYLE CABINETS ARE ACCEPTABLE. Provide proposed details, etc. during shop drawing submittal phase for approval by Architect.**

1.02 Related Sections:
- A. Section 06100-Rough Carpentry: Grounds and support framing.
- B. Section 06200-Finish Carpentry: Related trim not specified in this section.
- C. Section 09900- Paints and Coatings: Finishing cabinet exterior and interior where applicable.

1.03 References:
- A. ANSI/BHMA A156.9-Cabinet Hardware.
- B. AWI-Quality Standards
- C. FS L-F 508-Plastic Sheet, Laminated, Decorative and non-Decorative.
- D. FS MM-L-736-Lumber, Hardware.
- E. FS MMM-A- 130-Adhesive, Contact.
- F. NEMA LD-3-High Pressure Decorative laminates.
- G. PS 1-Construction and Industrial Plywood.
- H. PS 20-American Softwood Lumber Standard.
- I. PS 51-Hardwood and Decorative Ply.

1.04 Submittals:
- A. Shop Drawings: Indicated materials, component profiles and elevations, assembly methods, joint details, fastening methods, accessory listings, hardware location, and schedule of finishes.

1.05 Quality Assurance: Perform work in accordance with AWI Custom quality.

1.06 Qualifications: Manufacturer: Company specializing in manufacturing the products specified in this section with minimum three years of experience.

1.07 Delivery, Storage, and Handling:
- A. Protect units from moisture damage.

B. Store materials in ventilated, interior locations under constant, minimum temperatures of 60 degrees F. And maximum relative humidity of 55 percent.

1.08 Field Measurements: Verify that field measurements are as indicated on shop drawings.

1.09 Coordination: coordinate work with plumbing and electrical rough-in.

Part 2 - Products

2.01 Wood Materials:

A. Softwood Lumber:PS20; graded in accordance with AWI Custom; average moisture content of 6 percent; species and grades as follows:

Item	Species	Cut
Cabinet Frame	Douglas Fir	Economy
Internal Construction	Douglas Fir	Economy
Miscellaneous framing	Douglas Fir	Economy
Sub-Tops	Douglas Fir	Economy

B. Hardwood Lumber FS MM-L-736; graded in accordance with AWI Custom; average moisture content of 6 percent; species and grade as follows:

Item	Species	Cut
Exposed Stiles and Rails	Red Oak	Economy
Miscellaneous Trim	Red Oak	Economy

2.02 Sheet Materials:

A. Softwood Plywood: PS 1; graded in accordance with; core material of veneer or lumber, species and cut as follows:

Item	Face	Cut
Drawer Construction	Douglas Fir	Economy
Gables and Backs	Douglas Fir	Custom
Sub-tops	Douglas Fir	Economy
Non-sight exposed shelving	Douglas Fir	Custom
Miscellaneous	Douglas Fir	Custom

B. Hardwood Plywood: PS 51; AM graded in accordance with AWI; core material for veneer or lumber; type of glue recommended for application; face veneer and cuts as follows:

SECTION 06410 - CUSTOM CASEWORK

Item	Face Species	Cut
Door and Drawer Fronts	Red Oak	Economy
Drawer Construction	Red Oak	Economy
Gable and Backs	Red Oak	Economy

C. Wood Particles-PS 1;AM standard, composed of wood= chips, medium density, made with high waterproof resin binders; of grade to suit application; sanded faces, located as follows:

Item
Drawer Construction

D. Hardboard: Pressed wood fiber with resin binder, tempered grade, 1/4 inch thick, smooth one side, located as follows:

Item
Drawer Bottoms

2.03 Laminated Materials: Plastic Laminated: NEW LD-T; 00550 inch General Purpose Grade; suede surface finish, color and pattern as selected by Architect. All sight exposed surfaces (excluding countertops and backsplash) for cabinets to be laminate finished.

2.04 Accessories:

A. Adhesive: FS MMM-A-130 contact adhesive, water base type, recommended by laminate manufacturer to suit application.

B. Fasteners: Size and type to suit application.

C. Bolts, Nuts, Washers, Lags, Pins and Screws: Of size and type to suit application; galvanized finish in concealed locations and cadmium plated finish in exposed locations.

D. Concealed Joint Fasteners: Threaded steel.

E. Lumber for Shimming, Blocking, and Miscellaneous Applications: Softwood lumber of Douglas Fir species.

F. Primer. Alkyd primer sealer type.

G. Wood filler: Solvent base, tinted to match surface finish color.

H. Plastic Grommets: provide at openings in countertop as indicated on the Drawings. Color to be "black".

2.05 Architectural Cabinet Solid Surface Tops (Countertops):

A. Design Load: deflection limited to 1/360.

B. Type of Top: homogeneous solid sheets of filled plastic resin complying with the following:

1. Colors and Patterns: as selected by Architect from manufacturer's full range.
2. Special Features: eased edge treatment.
3. Accessories:

a. Adhesives: for seams and drop edges, Formica Solid Surfacing Seaming Cartridges, 9 ounce, color to blend with sheet material.

4. Fabrication: assemble work at shop and deliver to job ready for installation. Manufacture in largest practical pieces for handling and shipping without seams.
   a. Fabricate work square and to required lines.
   b. Recess and conceal fasteners connections and reinforcing.
   c. Design, construction, and installation: details to allow for expansion and contraction of materials. Properly install material with hairline joints held rigidly in place.
   d. Fabricate countertops and vanities with back splash and side splash pieces to profiles and sizes indicated.
   e. Fabricate items to profiles shown with connections and supports as indicated or as required for complete installation in accordance with manufacturer's written instruction sand approved submittals.
   f. Provide cut-outs for plumbing fixtures and trim, washroom accessories, appliances, and related items: confirm layout with manufacturer's cut-out templates before beginning work. Round corners of cut-outs and sand edges smooth.
   g. Do not exceed manufacturer's recommended unsupported overhang distances.
   h. Finish exposed surfaces smooth and polish to low sheen.
   i. Radius corners and edges.
   j. Tolerances: variations in size or openings shall not exceed +/-1/4".
5. Acceptable manufacturer: Formica Solid Surfacing as manufactured by Formica Group / Fabrications, Cincinnati, Ohio **or approved equal**.

2.06 Factory Finishing of Interior Architectural Woodwork:

A. Quality Standard: Comply with AWI Section 1500 unless otherwise indicated.

B. The finish of custom casework is included under this Section, regardless of whether factory applied or applied after installation.

C. Preparations for Finishing: Comply with referenced quality standard for sanding, filling countersunk fasteners, sealing concealed surfaces and similar preparations for finishing of

custom casework, as applicable to each unit of work.

D. Factory Finishing: The extent to which the final finish is applied to architectural woodwork a factory is Contractor's option, except factor apply at least prime/base coat to the greatest extent possible before delivery.

E. Transparent finish for Open-Grain Woods: Comply with requirements indicated below for grade Finish system, staining, effect, and sheen, with sheen measured on 60 degree gloss meter per ASTM D 523.
   1. Grade: Custom
   2. AWI Finish System No. 5: Catalyzed polyurethane.
   3. Staining: Match Architect=s sample.
   4. Effect: Closed grain (filled finish).
   5. Sheen: Medium-gross ribbed effect 35-45 deg.

F. Transparent Finish for Closed-grain Woods: Comply with requirements indicated below for grade, finish system staining, effect, and sheen.
   1. Grade: Custom
   2. AWI Finish System No. 5: Catalyzed polyurethane.
   3. Staining: Match Architect's sample.
   4. Effect: Closed grain.
   5. Sheen: Medium-gloss rubbed effect 35-45 deg.

2.07 Fabrication:

A. Shop assemble casework for delivery to site in units easily handled and to permit passage through building openings.

B. Fit shelves, doors and exposed edges with 3/8 inch matching hardwood edging. Use full length pieces only.

C. Cap exposed plastic laminate finish edges with material of same finish and pattern.

D. Door and Drawer Fronts: 3/4 inch thick; overlay style.

E. When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide trim for scribing and site cutting.

F. Apply plastic laminate finish in full uninterrupted sheets consistent with manufactured sizes. Fit corners and joints hairline; secure with concealed fasteners. Slightly bevel arises. Locate counter butt joints minimum 2 feet from sink cut-outs.

G. Mechanically fasten back splash to countertops with sleet brackets at 16 inches on center.

H. Provide cutouts for plumbing fixtures, inserts, appliances, outlet boxes; and fixtures and fitting. Verify locations of cutouts from on-site dimensions. Prime paint contact surfaces of cut edgy.

2.08 Finishing:

A. Sand work smooth and set exposed nails and screw.
B. Apply wood filler in exposed nail (and screw) indentations.
C. On items to receive transparent finishes, use wood filler which matches surrounding surfaces and of types recommended for applied finishes.
D. Seal, stain and varnish exposed to view surfaces. Brush apply only.
E. Seal and varnish internal exposed to view and semi-concealed surfaces. Brush apply only.
F. Seat internal surfaces of cabinets with one coat of shellac. Brush apply only.
G. Seal surfaces in contact with cementitious materials.

2.09 Hardware:

A. Shelf Standard and Supports: KV-256 and KV-255.
B. Drawer and Door Pulls: Chrome, U-shaped wire pulls.
C. Cabinet Locks: Keyed cylinder, two keys per lock, master keyed.
D. Catches: Magnetic, Stanley SF-45 and SP-46. Provide other types required for special conditions.
E. Drawer Slides: Knape and Vogt: KV1284 typical withKV1485 full extension ball bearing tracks.
F. Hinges: Blum Model 170-concealed hinges with 170 degree opening or Grass System 1200 (176 degree opening) self-closing with 1000-80 base plate. Two hinges per door up to 36" and 3 hinges per door up to 48" and 4 per door up to 60" high.
G. Grommets: Provide plastic grommets at all penetrations through countertop for cabling, power cords, etc. as indicated on the Drawings.

Part 3 - Execution

3.01 Examination: Verify adequacy of backing and support framing.

3.02 Installation:

A. Install woodwork to comply with AWI Section 1700 for same grade specified above for type of casework involved.
B. Set and secure casework in place; rigid, plumb, and level.
C. Use fixture attachments in concealed locations for waif mounted components.
D. Use concealed joint fasteners to align and secure adjoining cabinet units and counter tops.
E. Carefully scribe casework abutting other components, with maximum gaps of 1/32 inch. Do not use additional overlay trim for this purpose.
F. Secure cabinet and counter bases to floor using appropriate

angles and anchorages.

G. Countersink anchorage devices at exposed locations. Conceal with solid wood plugs of species to match surrounding wood; finish flush with surrounding surfaces.

H. Install without distortion so that doors and drawers fit openings properly and are accurately aligned.

I. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete the finishing work specified in this section to whatever extent not completed at shop or before installation of woodwork.

J. Complete the finishing work specified in this section to whatever extent not completed at shop or before installation of woodwork,

3.03 Adjusting:

A. Adjust moving or operating parts to function smoothly and correctly.

3.04 Cleaning:

A. Clean casework, counters, shelves, hardware, fittings and fixtures.

3.05 Schedules:

A. Furnish and install all items listed in this schedule at location indicated on the Drawings, complete as to function intended.

B. Casework indicated on the Drawings; custom grade construction.

1. Counter Tops.
2. Base Cabinets.
3. Overhead Cabinets.
4. Wall Cabinets.
5. Shelving-adjustable and fixed.
6. Other items such as shims and fillers as indicated on the Drawings or as required for a complete cabinetwork installation.

END OF SECTION

SECTION 06420 - CUSTOM LAMINATE CASEWORK (CONTRACTOR OPTION)

PART 1 – GENERAL

1.01 SECTION INCLUDES
- A. Fixed modular laminate clad casework and components.
- B. Flexible rail mounted laminate clad casework and components.
- C. Solid Surface countertops and backsplash.

1.02 RELATED SECTIONS
- A. Blocking within walls where indicated: Section 06100 Rough Carpentry.
- B. Millwork, trim, etc.: Section 06200 Finish Carpentry.
- C. Hardware: Section 06410 Custom Casework.
- D. Glass: not applicable.
- E. Base molding: Division 9.
- F. Appliances: Division 11 and drawings.
- G. Sinks and service fixtures, service waste lines, connections, and vents: Division 15.
- H. Electrical service fixtures: Division 16.

1.03 DEFINITIONS
- A. Identification of casework components and related products by surface visibility.
  1. Open Interiors: Any open storage unit without solid door or drawer fronts, units with full glass insert doors and/or acrylic doors, and units with sliding solid doors.
  2. Closed Interiors: Any closed storage unit behind solid door or drawer fronts.
  3. Exposed Ends: Any storage unit exterior side surface that is visible after installation.
  4. Other Exposed Surfaces: Faces of doors and drawers when closed, and tops of cabinets less than 72 inches above furnished floor.
  5. Semi-Exposed Surfaces: Interior surfaces which are exposed to view when doors or drawers are opened, bottoms of wall cabinets and tops of cabinets 72 inches or more above finished floor.
  6. Concealed Surfaces: Any surface not visible after installation.

1.04 QUALITY ASSURANCE
- A. Manufacturer: Minimum of 5 years experience in providing manufactured casework systems for similar types of projects, produce evidence of financial

stability (if requested), bonding capacity, and adequate facilities and personnel required to perform on this project.

B. Manufacturer: Provide products certified as meeting or exceeding ANSI-A 161.1-2000 testing standards.

C. Single Source Manufacturer: Casework, countertops and architectural millwork products must all be engineered and built by a single source manufacturer in order to ensure consistency and quality for these related products. Splitting casework, countertops and/or architectural millwork between multiple manufacturers will not be permitted.

D. Quality Standard: Unless otherwise indicated, comply with AWI's Architectural Woodwork Quality Standards for grades of interior architectural woodwork, construction, finishes and other requirements.

1.05 SUBMITTALS

A. Comply with Special Conditions, unless otherwise indicated.

B. Product Data: Manufacturer's catalog with specifications and construction details.

C. Shop Drawings: Indicate dimensions, description of materials and finishes, general construction, specific modifications, component connections, anchorage methods, hardware, and installation procedures, plus the following specific requirements.

1. Include section drawings of typical and special casework, work surfaces and accessories.
2. Indicate locations of plumbing and electrical service field connection by others.
3. Provide one set of shop drawings which includes all products within this section, engineered and built by a single source manufacturer, with seamless coordination amongst all products.

D. Casework Samples (To be available upon request):

1. Base cabinet: Cabinet conforming to specifications, with drawer and door.
2. Wall cabinet: Cabinet conforming to specifications, with door.
3. Cabinet samples shall be complete with specified hardware for doors, drawers and shelves.
4. Component samples: Two sets of samples for each of the following:

a. Decorative laminate color charts / PVC and ABS edgings.

1.06 PRODUCT HANDLING

A. Deliver completed laminate clad casework, countertops, and related products only after wet operations in building are completed, store in ventilated place, protected from the weather, with relative humidity range of 25 percent to 55 percent.

B. Protect finished surfaces from soiling and damage during handling and installation with a protective covering.

1.07 JOB CONDITIONS

A. Environmental Requirements: Do not install casework until permanent HVAC systems are operating and temperature and humidity have been stabilized for at least 1 week.

1. Manufacturer/Supplier shall advise Contractor of temperature and humidity requirements for architectural casework installation areas.
2. After installation, control temperature and humidity to maintain relative humidity between 25 percent and 55 percent.

B. Conditions: Do not install casework until interior concrete work, masonry, plastering and other wet operations are complete.

1.08 WARRANTY

A. All materials and workmanship covered by this section will carry a five (5) year warranty from date of acceptance.

PART 2 – PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS:

A. Manufacturer – Basis for Design:

1. TMI Systems Corporation.
   a. Specifications are based on manufacturer's literature from TMI SYSTEMS CORPORATION, 50 South Third Avenue West, Dickinson, North Dakota, 58601, Phone: 800-456-6716, fixed modular, flexible rail mounted, and mobile casework and accessories.

b. Other manufacturers shall comply with the minimum levels of material and detailing indicated on the drawings or as specified.

2.02 MATERIALS

A. Core Materials:
   1. Particleboard up to 7/8 inch thick: Industrial Grade average 45-pound density particleboard, ANSI A 208.1-2009, M-2 requirements.
   2. Particleboard 1 inch thick and thicker: Industrial Grade average 45-pound density particle-board, ANSI A 208.1-2009, M-2 requirements.
   3. Medium Density Fiberboard 1/4 inch thick: Minimum average density 45-50 lbs., ANSI A208.2-2009 requirements.
   4. MR Moisture Resistant Particleboard: Average 45-pound density particleboard, ANSI A208.1 1-2009, M-2 requirements.
   5. Toe Base Plywood: 3/4 inch thickness, CC/CD/CDC grades, of western softwood veneers, with NAUF exterior fully water resistant phenolic glues.

B. Decorative Laminates: GREENGUARD Indoor Air Quality Certified
   1. High-pressure decorative laminate VGS (.028), NEMA Test LD 3-2005.
   2. High-pressure decorative laminate HGS (.048), NEMA Test LD 3-2005.
   3. High-pressure decorative laminate HGP (.039), NEMA Test LD 3-2005.
   4. High-pressure cabinet liner CLS (.020), NEMA Test LD 3-2005.
   5. High-pressure backer BKH (.048), (.039), (.028), NEMA Test LD3-2005.
   6. Thermally fused melamine TFM laminate, NEMA Test LD 3-2005. (TFM allowed on casework interiors only, as specified below. Utilization of TFM on any exterior casework surfaces, including door and drawer faces and finished ends, will not be permitted.)

C. Laminate Color Selection: Maximum 1 color per unit face and 5 colors per project. (See Color Selection in section 3.05).

D. Edging Materials:
   1. 1mm PVC banding, machine applied.

2. 3mm PVC banding, machine applied and machine profiled to 1/8 inch radius.

E. Glass:
Not applicable.

2.03 SPECIALTY ITEMS

A. Support Members:
1. Countertop support brackets: Epoxy powder coated, 11 gauge steel with integral cleat mount opening and wire management opening.
2. Undercounter support frames: Epoxy powder coated.
3. Legs: Epoxy powder coated.

2.04 CABINET HARDWARE

F. Refer to Section 06410 Custom Casework for cabinet hardware.

2.05 FABRICATION:

A. Fabricate casework, countertops and related products to dimensions, profiles, and details shown.

B. All casework panel components must go through a supplemental sizing process after cutting, producing a panel precisely finished in size and square to within 0.010 inches, ensuring strict dimensional quality and structural integrity in the final fabricated product.

C. Cabinet Body Construction:
1. Tops and bottoms are glued and doweled to cabinet sides and internal cabinet components such as fixed horizontals, rails and verticals. Minimum 6 dowels each joint for 24 inch deep cabinets and a minimum of 4 dowels each joint for 12 inch deep cabinets. (Mechanical or metal hardware fasteners joining cabinet top and bottom panels to the sides will not be accepted.)
a. Tops, bottoms and sides of all cabinets are particleboard core.
2. Cabinet backs: 1/4 inch thick medium density fiberboard panel fully captured by the cabinet top, bottom and side panels. Finish to match cabinet interior. 3/4 inch x 4 inch particleboard rails will be placed behind the back panel at the top and bottom, and doweled to the sides utilizing 10mm hardwood fluted dowels. A third intermediate rail will be included on all cabinets taller than 56 inches. Utilize hot melt

glue to further secure back and increase overall strength.
   a. Exposed back on fixed or movable cabinets: 3/4 inch thick particleboard with the exterior surface finished in VGS laminate as selected.

3. Fixed base and tall units have an individual factory-applied base, constructed of 3/4 inch thick plywood. Base is 102mm (nominal 4 inch) high unless otherwise indicated on the drawings.
4. Base units, except sink base units: Full sub-top glued and doweled to cabinet sides. (Mechanical or metal hardware fasteners joining cabinet sub-top panel to the sides will not be accepted.)
   a. Sink base units are provided with open top and a stretcher at the front, attached to the sides. Back to be split removable access panel.
5. Side panels and vertical dividers shall receive adjustable shelf hardware at 32mm line boring centers. Mount door hinges, drawer slides and pull-out shelves in the line boring for consistent alignment.
6. Exposed and semi exposed edges.
   a. Edging: 1mm PVC machine applied.
7. Adjustable Shelves in Cabinets
   a. Core: Particleboard.
   b. Core Thickness: 3/4 inch up to 30 inches wide, 1 inch over 30 inches wide.
   c. Edge: 1mm PVC on Front Edge Only.
8. Interior finish, units with open Interiors:
   a. Top, bottom, back, sides, horizontal and vertical members, and adjustable shelving faces with TFM Thermally Fused Melamine laminate.
9. Interior finish, units with closed Interiors:
   a. Top, bottom, back, sides, horizontal and vertical members, and adjustable shelving faces with TFM Thermally Fused Melamine laminate.
10. Exposed ends:
   a. Faced with high-pressure decorative VGS laminate. Use of TFM on exposed ends will not be permitted.
11. Wall unit bottom:

a. Faced with thermally fused melamine laminate.

12. Balanced construction of all laminated panels is mandatory. Unfinished core stock surfaces, even on concealed surfaces (excluding edges), are not permitted.

D. Drawers:
1. Sides, back and sub front: Minimum 1/2 inch thick particleboard, laminated with TFM Thermally Fused Melamine doweled and glued into sides. Top edge banded with 1mm PVC.
2. Drawer bottom: Minimum 1/2 inch thick particleboard laminated with TFM Thermally Fused Melamine, screwed directly to the bottom edges of drawer box.
3. Paper storage drawers: Minimum 3/4 inch thick particleboard sides, back, and sub front laminated with TFM Thermally Fused Melamine. Minimum 1/2 inch thick particleboard drawer bottoms screwed directly to the bottom edges of the drawer box. Provide PVC angle retaining bar at the rear of the drawer.

E. Door/Drawer Fronts:
1. Core: 3/4 inch thick particleboard.
2. High-pressure decorative VGS laminate exterior, balanced with high-pressure cabinet liner CLS. Use of TFM on exterior or interior surfaces of door/drawer fronts will not be permitted.
3. Edges: 3mm PVC, machine applied, external edges and outside corners machine profiled to 1/8 inch radius.
4. Provide double doors in opening in excess of 24 inches wide.

F. Door Fronts with Glass Insert captured by Retainer Clips (CUSTOM GRADE):
1. Core: 3/4 inch thick particleboard.
2. High-pressure decorative VGS laminate exterior, balanced with high-pressure VGS laminate. Use of TFM on exterior or interior surfaces of door fronts will not be permitted.
3. Edges: 3mm PVC, machine applied, external edges and outside corners machine profiled to 1/8 inch radius.

4. Provide cutout in door panel resulting in 3-3/8 inch frame. Exposed cutout edge to be finished with 1mm PVC edgebanding.
5. Notch cutout 3/8 inch x 1/4 inch for glass panel to set into, mounting flush with the back side (interior side) of the door panel. Interior cutout edge to be painted a compatible color to the interior surface.
6. Glass panel to be captured and held in place utilizing glass retainer clips, screwed in place. Minimum eight clips per glass panel located in the four corners of the cutout.

G. Miscellaneous Shelving (not in Cabinets):
1. Core material: 1 inch thick particleboard.
2. High-pressure decorative VGS laminate on both faces.
3. Edges: 3mm PVC, external edges and outside corners machine profiled to 1/8 inch radius.

2.06 ARCHITECTURAL CABINET SOLID SURFACE TOPS (Countertops):

A. Design Load: deflection limited to 1/360.

B. Type of Top: homogeneous solid sheets of filled plastic resin complying with the following:

1. Colors and Patterns: as selected by Architect from manufacturer's full range.

2. Special Features: eased edge treatment.

3. Accessories:

a. Adhesives: for seams and drop edges, Formica Solid Surfacing Seaming Cartridges, 9 ounce, color to blend with sheet material.

4. Fabrication: assemble work at shop and deliver to job ready for installation. Manufacture in largest practical pieces for handling and shipping without seams.

a. Fabricate work square and to required lines.

b. Recess and conceal fasteners connections and reinforcing.

c. Design, construction, and installation: details to allow for expansion and contraction of materials. Properly install material with hairline joints held rigidly in place.

d. Fabricate countertops and vanities with back splash and side splash pieces to profiles and sizes indicated.

e. Fabricate items to profiles shown with connections and supports as indicated or as required for complete installation in accordance with manufacturer's written instruction sand approved submittals.

f. Provide cut-outs for plumbing fixtures and trim, washroom accessories, appliances, and related items: confirm layout with manufacturer's cut-out templates before beginning work. Round corners of cut-outs and sand edges smooth.

g. Do not exceed manufacturer's recommended unsupported overhang distances.

h. Finish exposed surfaces smooth and polish to low sheen.

i. Radius corners and edges.

j. Tolerances: variations in size or openings shall not exceed +/-1/4".

5. Acceptable manufacturer: Formica Solid Surfacing as manufactured by Formica Group / Fabrications, Cincinnati, Ohio **or approved equal**.

PART 3- EXECUTION

3.01 INSPECTION:

A. The casework contractor must examine the job site and the conditions under which the work under this section is to be performed and notify the building owner in writing of unsatisfactory conditions. Do not proceed with work under this Section until satisfactory conditions have been corrected in a manner acceptable to the installer.

3.02 PREPARATION:

A. Condition casework to average prevailing humidity conditions in installation areas prior to installing.

3.03 INSTALLATION:

A. Erect casework, plumb, level, true and straight with no distortions. Shim as required. Where laminate clad casework abuts other finished work, scribe and cut to accurate fit.

B. Adjust casework and hardware so that doors and drawers operate smoothly without warp or bind.

C. Repair minor damage per plastic laminate manufacturer's recommendations.

3.04 CLEANING:

A. Remove and dispose of all packing materials and related construction debris.

B. Clean cabinets inside and out. Wipe off fingerprints, pencil marks, and surface soil etc., in preparation for final cleaning by the building owner.

3.05 COLOR SELECTION:

A. Laminate Color Selection:
   1. Select from the full range of standard Wilsonart® and Formica® stock color charts.
   2. Thermally fused melamine laminate matched to White color.

B. Hardware Color Selection:
   1. Hinge: Select from your choice of epoxy powder coating stock colors matched to White, Beige, Gray, Black and Chrome.
   2. Pulls: Select from design specific finish options available in the TMI Vendor Stock Pull Program.
   3. Miscellaneous Hardware (support brackets, metal components, etc.): Select from your choice of epoxy powder coating stock colors matched to White, Beige, Gray, Black and Chrome.

C. PVC Edge Banding Color Selection:
   1. 3mm PVC: Select from the TMI Vendor Stock PVC Program, including over 200 pattern, woodgrain and solid colors matched to Wilsonart® and Formica® laminates.
   2. 1mm PVC: Select from the TMI Vendor Stock PVC Program, including over 200 pattern, woodgrain

and solid colors matched to Wilsonart® and Formica® laminates.

End of Section

DIVISION 7 -THERMAL & MOISTURE PROTECTION

SECTION 07100 - WATERPROOFING

Part 1 - General

1.01 Work Included:
- A. All materials, labor, services and incidentals necessary for the completion of this section of the work.

1.02 Quality Assurance:
- A. Standards:
  - 1. Federal Specifications:
    - a. SS-C-153B, Cement, Bituminous, Plastic.
    - b. SS-A-701B, Asphalt, Weatherproofing.
    - c. LLL-1-535A, Insulation Board, Thermal.

1.03 Submittals:
- A. Provide submittals in the form of samples, and documentation, to the Architect for review.

Part 2 - Products

2.01 Materials:
- A. Solvent Based Asphalt Water Barrier: FS-SS-A-701B.
- B. Flashing Membrane: 20 mil elastomeric modified sheet vinyl.
- C. Asphalt Plastic Cement: SS-C-153B, Type 1.
- D. Accessories: As recommended by manufacturer.
- E. Protection Board: Insulation Board, FS-LLL-1-535A, Class A.
- F. Vapor Barrier under floor slab: refer to Section 07195 - Vapor Retarder.

Part 3 - Execution

3.01 Installation - Wall Waterproofing:
- A. Location: Apply to all exterior concrete and masonry wall surfaces below grade.
- B. General:
  - 1. Repoint all holes cracks and joints and allow to dry before waterproofing.
  - 2. Do not apply until all surfaces are completely dry and clean. Apply only during favorable weather conditions.
- C. Joint Membrane:
  - 1. Location: Apply to all joints in exterior concrete walls below grade.
  - 2. Embed a strip of flashing membrane in plastic cement. Membrane shall be a minimum of 12" wide.
- D. Water Barrier:
  - 1. Hold 4" down from finish grade line so that at no time is the mastic or membrane exposed to view.
  - 2. Apply two (2) coats to form a membrane water barrier, allowing the first coat to dry before applying the second

coat. Apply in strict accordance with manufacturer's instructions. Do not apply until surfaces are completely dry.

3. Apply in a continuous unbroken film free from pin holes or other surface breaks. Take care to seal around all ties, inserts, anchor slots, conduit, pipes, electrical boxes, etc.

E. Protection:

1. Install protection board over all waterproofing prior to backfilling.
2. All back filling shall be carefully done to protect waterproofing. Repair all damaged areas.

3.02 Under Slab Vapor barrier:

A. Refer to Section 07260 – Vapor Barrier.

End of Section

DIVISION 7 - THERMAL & MOISTURE PROTECTION

SECTION 07150 - DAMPPROOFING

Part 1 - General

1.01 Work Included:
- A. All materials, labor, services and incidentals necessary for the completion of this section of the work.

1.02 Related Work Specified Elsewhere:
- A. Waterproofing - Section 07100
- B. Sealants - Section 07900

1.03 Quality Assurance
- A. Standards:
  - 1. Federal Specifications:
  - a. SS-C-153B, Cement, Bituminous, Plastic.
  - b. SS-A-701B, Asphalt, Weatherproofing.
  - 2. American Society for Testing and Materials:
    - a: ASTM D-250, Asphalt Saturated Asbestos Felts.

Part 2 - Products

2.01 Materials:
- A. Solvent Based Asphalt Water Barrier: FS-SS-A-701B
- B. Flashing Membrane: 20 mil elastomeric modified sheet vinyl.
- C. Asphalt Plastic Cement: SS-C-153B, Type 1.
- D. Asphalt Saturated Felt: ASTM D-250, Un-perforated,#15.
- E. Accessories: As recommended by manufacturer.

Part 3 - Execution

3.01 Installation - Cavity Wall Dampproofing:
- A. General - Masonry and Concrete:
  - 1. Repoint all holes, cracks and mortar joints and allow to dry before waterproofing and dampproofing.
  - 2. Sweep wall base, including concrete slab, clean of dirt and mortar droppings immediately prior to application of waterproofing and dampproofing cavity walls.
  - 3. Do not apply until all surfaces are completely dry and clean.
  - 4. Do not apply until all surfaces are completely dry and clean.
  - 5. Sight exposed mastic and membrane not allowed.
- B. Wall Base Waterproofing:
  - 1. Location: Apply at base of outer face of concrete walls and outer face of inner wythe at all exterior masonry cavity walls.
  - 2. At intersection of outer face of inner wythe with concrete slab, provide a 2" radius cove built up with asphalt plastic cement.

3. At wall base, embed a strip of plastic flashing in Plastic Cement. Lap all joints 8" minimum and seal with joint sealant. Seal completely around piping, conduit, etc. provide minimum joints using longest sheets of flashing practicable. Seal all punctures. Top edge of membrane shall be a minimum of 8" above concrete slab, worked into curve of plastic cement cover, down, and outward on concrete slab or steel shelf angle to outer wythe.

C. Cavity Wall Dampproofing:
1. Apply to outer face of inner wythe masonry cavity walls.
2. Apply two (2) coats to form a membrane water barrier, allowing the first coat to dry before applying the second coat. Apply in strict accordance with manufacturer's instructions. Do not apply until surfaces are completely dry.
3. Apply in a continuous unbroken film free from pin holes or other surface breaks. Take care to seal around all masonry ties, inserts, anchor slots, conduit, pipes, electrical boxes, etc.

End of Section

DIVISION 7 - THERMAL & MOISTURE PROTECTION

SECTION 07200 – INSULATION

Part 1 - General

1.01 Work Included:
- A. All materials, labor and services and incidentals necessary for the completion of this section of work.

1.02 Quality Assurance:
- A. Standards:
  - 1. Federal Specifications:
    - a. HH-I-524C, Type IV, Class C, Rigid Insulation.
    - b. ASTM C 665-84, Type 1, Insulation Blankets.
    - c. ASTM D1621, Compressive Strength.
    - d. ASTM E84, Flame Spread and Smoke Developed.
- B. Submittals:
  - 1. Provide submittals in the form of samples, and documentation, to the Architect for review.

1.03 Product Delivery, Storage and Handling:
- A. Rigid insulation board is combustible. During storage and insulation, observe good fire safety practice, including job site housekeeping.

1.04 **Products of certain manufacturers are specified herein to simplify descriptions of design, construction, and/or materials only. Proprietary names are not intended to imply that products of named manufacturer are required to the exclusion of equivalent products of other manufacturers.**

Part 2 - Products

2.01 Materials:
- A. Rigid Insulation: FS-HH-I-1972/1, Class 2 Rigid Insulation.
  - 1. Type: Glass fiber reinforced polyisocyanurate core with foil facing each side (glass fiber facing at roof insulation), and a compressive strength of 25 p.s.i. and a maximum water vapor transmission rate of >.03 perm-inch.
    - a. Application: 2 layers of rigid insulation. First layer shall be 2″ thick / second layer shall be 1.5″ thick for a total thickness of 3.5″ with a minimum total thermal resistance of R-20, for installation above metal roof decking and exterior wall at cavities. Refer to Drawings.
  - 2. Type: expanded polystyrene insulation.
    - a. Application: 2" thick with a thermal resistance of R-10.4, **for foundation wall perimeter below grade installation only.**
  - 3. Adhesive: as recommended by manufacturer of rigid

insulation board.

B. Fibrous Insulation: ASTM C 665-84, Type 1
   1. Type:
      a. 6" thick (approx.) mineral wool or fiberglass fire resistant insulating blanket or batt, with kraft paper facing. Thermal resistance R-19. Refer to Drawings for locations.

C. Vapor Retarder:
   1. Roof Deck Installation:
      a. Two layers of high strength kraft paper laminated with an adhesive, and reinforced at edges with fiberglass yarns.
      b. Type Example: Permstop - Owens Corning.

Part 3 - Execution

3.01 Installation - Rigid Insulation:

A. Install rigid insulation horizontally against back-up wall, or to roof deck, as shown on the Drawings.

B. **Rigid insulation and other components applied to metal decking at membrane roofing shall be fastened with approved fasteners at the rate of 1 per 2 square feet to meet FM I-90 requirements.**

C. Install 2 layers of rigid insulation to metal roof deck. Stagger joints of insulation to provide continuous insulation coverage.

D. Cut insulation by means of a saw, knife, or other sharp tool to fit around obstructions across the wall, such as vents, louvers, pipes and conduit.

E. If mastic adhesive is used to supplement holding the insulation in place, observe label directions.

End of Section

DIVISION 7 – THERMAL AND MOISTURE PROTECTION

SECTION 07260 – VAPOR BARRIER

PART 1 - GENERAL

1.01 Work Included

A. Furnish all labor, materials, services and equipment required in conjunction with or properly incidental to the installation of under-slab vapor barriers described herein and/or as shown on the drawings.

1.02 Related Work

A. Section 03300: Cast-In-Place Concrete.

1.03 Job Conditions

A. Subbase: Smooth and level, free from damaging protrusions that would puncture vapor barrier.

1.04 References

A. ASTM E 1643 - Standard Practice for Installation of Water Vapor Barriers Used in Contact with Earth or Granular Fill Under Concrete Slabs.

B. ASTM E 1745 - Standard Specification for Plastic Water Vapor Barriers Used in Contact with Soil or Granular Fill under Concrete Slabs: Exceeds Class B

C. ASTM E 96 - Standard Test Methods for Water Vapor Transmission of Materials.

D. ASTM E 154 – Standard Test Methods for Water Vapor Barriers Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover

E. ASTM D 1709 - Standard Test Methods for Impact Resistance of Plastic Film by the Free-Falling Dart Method.

F. ASTM F 1249 – Standard Test Method for Water Vapor Transmission Rate Through Plastic Film and Sheeting Using a Modulated Infrared Sensor

G. ACI 302.1R – Vapor barrier component (plastic membrane) not less than 10 inches thick.

1.05 Submittals

A. Submit in accordance with Division 1 requirements.

B. Product Data: Provide manufacturers printed product literature and description, including tests and standards that have been performed on the vapor barrier material.

C. Samples: Submit two, 8 1/2 x 11 inch in size, illustrating the vapor barrier and two (2) 8-1/2-in long sample strips of the joint tape.

D. One each of all accessories that will be used in the installation.

E. Verification by Independent testing labs indicating that materials comply with specified requirements.

F. Certificates: Certify that products of this section meet or exceed specified requirements.

G. Manufacturer's Instructions: Indicate complete installation instructions.

PART 2 - PRODUCTS

2.01 Available Products
- A. Stego Wrap 15 mil Vapor Barrier by Stego Industries, L.L.C.
- B. Perminator™ 15 mil by W.R. Meadows .
- C. Vapor Block 15 (mil) by Raven Industries, Inc.
- D. Moistop Ultra 15 (mil) by Fortifiber Building Systems Group
- E. Viper Vaporcheck II 15 mil by Insulation Solutions, Inc.

2.02 Source Quality Control And Testing
- A. Vapor barrier membrane shall have following properties:
  1. Water Vapor Barrier: Meets or exceeds Class A according to ASTM E 1745.
  2. Water Vapor Transmission Rate: 0.012 grains/ft2/hour or lower according to ASTM E 96.
  3. Water Vapor Permeance: 0.01 perms or lower according to ASTM E 154 Sec. 7 or F 1249 (max.).
  4. Tensile Strength: 45.0 lbf/in according to ASTM E 154 Sec. 9. .
  5. Puncture Resistance: 2200 g according to ASTM D 1709, Method B

2.03 Accessories
- A. Tape:
  1. High Density Polyethylene Tape with pressure sensitive adhesive. Minimum width 4".
- B. Pipe Boot:
  1. Construct pipe boots from vapor barrier material and pressure sensitive tape per manufacturer's instructions.

PART 3 - EXECUTION

3.01 Examination
- A. Verify that conditions are acceptable for the placement of the vapor barrier.

3.02 Preparation
- A. Ensure that subsoil is approved by Geotechnical Engineer.
  1. Vapor Barrier shall be installed on top of the aggregate, sand or tamped earth base or carton forms. At carton forms provide a vertical leg down to grade and adhered the vapor barrier to the grade beam at or just below the dirt line. Vapor barrier may be placed either above or beneath any carton form slip sheet.

3.03 Installation

A. Install vapor barrier per manufacturer's instructions, illustrations and ASTM E 1643 Standard Practice for Installation of Water Vapor Barriers Used in Contact with Earth or Granular Fill Under Concrete Slabs.

1. Level and tamp or roll granular base.
2. Place Vapor Barrier with the longest dimension parallel with the direction of the pour.
3. Lap Vapor Barrier over footings and seal to foundation walls. Seal all penetrations.
4. Lap joints 6 inches and seal with the recommended pressure sensitive tape.
5. Seal pipe penetrations with pipe boot made from vapor barrier and tape.
6. Protect vapor barrier from damage during installation of reinforcing steel and utilities.
7. Repair damaged areas by cutting patches of vapor barrier, overlapping damaged area 6 inches and taping all four sides with pressure sensitive tape.

3.04 Interface With Other Work

A. Coordinate work of all other trades related to the slab base and utility services.

END OF SECTION

DIVISION 7 - THERMAL & MOISTURE PROTECTION

SECTION 07415 – PREFINISHED METAL SOFFIT PANELS

Part 1 - General

1.01 Work Included:
- A. The General Conditions and applicable sections of Division 1 shall apply to this entire section.
- B. All materials, labor, services and incidentals necessary for the completion of this section of the work.

1.02 Related Work Specified Elsewhere:
- A. Metal Fabrications - Section 05500
- B. Flashing and Sheet metal - Section 07600

1.03 Quality Assurance:
- A. Qualifications of Installer: Competent and skilled sheet metal applicator familiar with this type installation with successful completion of projects of familiar scope. Applicator shall have at least two years of experience in prefinished sheet metal applications.

1.04 Shop Drawings:
- 1.1 Submit complete shop drawings on all prefinished metal applications, showing layouts of seams, joints, details, and installation methods. Show details of weatherproofing at edges, terminations and penetrations in metal work.

1.05 Applicator and Guarantee:
- C. All work shall be done by one contractor with 5 years minimum experience in this type of metal work.
- B. Provide ten (10) years guarantee written on contractor's letterhead for work of this Section.

1.06 Warranty:
- A. Provide a 20-year manufacturer's warranty covering color fade, chalk, and film integrity at no charge.

1.07 **Products of certain manufacturers are specified herein to simplify descriptions of design, construction, and/or materials only. Proprietary names are not intended to imply that products of named manufacturer are required to the exclusion of equivalent products of other manufacturers.**

Part 2 - Products

2.01 Acceptable Manufacturers:
- A. Quality of Manufacturers: The products, colors and finishes herein are of AEP-Span products to establish standards of quality and appearance. The products of other manufacturers are acceptable subject to meeting or exceeding the requirements of these specifications, and the approval of the Architect.

2.02 Materials -
- A. Prefinished Metal Soffits:
  - 1. Flush Panel, (FP 12-2) 24 gauge steel with embossed finish.

2. Color: to be selected by Architect from Manufacturer's standard colors.
3. Flashings, Closures, and Trim shall be fabricated from same material, gauge, and finish as panels.
4. Finish: Kynar 500.

Part 3 - Execution

3.01 Installation:

A. Fabricate and install prefinished metal facings in accordance with drawings and recognized sheet metal practices using conventional hand or power tools. Keep cut edges sharp, clean, properly dressed and closely aligned. Exercise care during fabrication and erection to avoid damage.

B. Structural framing members and fasteners shall be sized and located as recommended by the panel manufacturer. The applicator shall insure that the correct fastener has been chosen for size and length necessary for loading requirements. Special care shall be exercised installing fasteners so as not to overdrive or misdirect fasteners which could cause damage to panels or trim. Use colored pop rivets on trim items and where exposed fasteners are necessary. Keep exposed fasteners to very minimum.

C. Only minor scratches and abrasions will be allowed to be touched up. Any other damaged material shall be replaced.

End of Section

DIVISION 7 – THERMAL & MOISTURE PROTECTION

SECTION 07424 – COMPOSITE WALL PANELS

PART 1 General

1.1 Work Included:

A. Aluminum-faced composite panels, attachments, and sealants.

1.2 Related Sections:

A. Section 05100 – Structural Metal Framing.

B. Section 06100 – Rough Carpentry.

C. Section 07200 – Insulation

D. Section 07600 – Flashing and Sheet Metal.

E. Section 07900 – Sealants.

F. Section 09250 – Gypsum Wallboard.

1.3 References:

A. American Society for Testing and Materials (ASTM) B209 - Aluminum and Aluminum-Alloy Sheet and Plate.

B. American Society for Testing and Materials (ASTM) C481 - Laboratory Aging of Sandwich Constructions.

C. American Society for Testing and Materials (ASTM) E72 - Standard Test Methods of Conducting Strength Tests of Panels for Building Construction.

D. American Society for Testing and Materials (ASTM) E84 - Surface Burning Characteristics of Building Materials.

E. American Society for Testing and Materials (ASTM) E283 - Rate of Air Leakage through Exterior Windows, Curtain Walls, and Doors.

F. American Society for Testing and Materials (ASTM) E289 - Linear Thermal Expansion of Rigid Solids with Interferometry.

G. American Society for Testing and Materials (ASTM) E330 - Structural Performance of Exterior Windows, Curtain Walls, and Doors.

H. American Society for Testing and Materials (ASTM)

E331 - Water Penetration for Exterior Windows, Curtain Walls, and Doors.

I. American Society for Testing and Materials (ASTM) D1781 - Climbing Drum Peel for Adhesives.

J. American Society for Testing and Materials (ASTM) - Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.

K. American Architectural Manufacturers Association (AAMA) 501 – Water Penetration using Dynamic Pressure.

L. American Architectural Manufacturers Association (AAMA) 605.2 - Voluntary Specification for High Performance Organic Coatings on Architectural Extrusions and Panels.

M. American Architectural Manufacturers Association (AAMA) TIR-a11 - Maximum Allowable Deflection of Framing Systems for Building Cladding Components at Design Wind Loads.

1.4 System Description:

A. Design Requirements:
   1. Design system to accommodate movement of components without buckling, failure of joint seals, undue stress on fasteners, or other detrimental effects when subjected to temperature and humidity ranges reasonably anticipated.
   2. Design system to accommodate tolerances of structure.

B. Performance Requirements:
   1. Submit test data witnessed by an independent testing agency for the following requirements:
      a. Structural tests for wind loads by "Chamber Method" in compliance with ASTM E72.
         1) Standard test design loading: 20 psf (960 Pa) positive and negative wind load.
         2) Design panel system to withstand code imposed design loads and a deflection limit of L/180 shall apply to positive

load pressures only.

3) Design panel system to withstand code imposed design loads and a deflection limit of L/175 shall apply to positive load pressures only.

b. Air Infiltration: 0.06 cfm per square foot (32 lps per square meter) air leakage under a static pressure of 1.56 psf (7.65 kg per square meter) when tested in accordance with ASTM E283.

c. Water Penetration: No uncontrolled water penetration through the standard vertical panel and sealed joints at a static pressure of 6.24 psf (30.5 kg per square meter) when tested in accordance with ASTM E331.

1.5 Submittals:

A. Submit as directed below and as per the Special Conditions.

B. Manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation methods.

C. Shop Drawings: Submit shop drawings showing layout, flashings, drainage, ventilation, vapor barriers, vapor retarders, profiles and product components, including anchorage, accessories, finish colors, patterns, and textures.

D. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.

E. Verification Samples: For each finish product specified, two samples, minimum size 3 inches (76 mm) by 5 inches (128 mm) representing actual product, color, and patterns.

F. Quality Assurance Submittals: Submit the following:
   1. Test reports: Certified test reports showing

compliance with specified performance characteristics and physical properties.

2. Certificates: Product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria, and physical requirements.

1.6 Quality Assurance:

A. Manufacturer Qualifications: Manufacturer capable of providing field service representation during construction, approving acceptable installer and approving application method.

B. Installer Qualifications:
   1. Installer experienced in performing work of this section who has specialized in installation of work similar to that required for this project.
   2. Panel Installer shall assume responsibility for all components of the exterior panel system including, but not limited to attachment to sub-construction, panel to panel joinery, panel to dissimilar material joinery, and joint seal associated with the panel system.

C. Pre-installation Meetings: Conduct pre-installation meeting to verify project requirements, substrate conditions, manufacturer's installation instructions, and manufacturer's warranty requirements.

1.7 Delivery, Storage, and Handling:

A. Store panels horizontally, off-the-ground, in manufacturer's unopened packaging until ready for installation.

B. Examine delivered materials upon receipt to ensure that no damage has occurred during shipment. Store metal-faced composite wall panels horizontally, covered with a suitable weather tight and ventilated covering. Store metal-faced composite wall panels to ensure dryness, with a positive slope for drainage of water. Do not store metal-faced composite wall panels in contact with other materials that might cause staining, denting, or other surface damage. DO NOT allow storage space

to exceed 120 degrees F (49 degrees C).

C. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.8 Project Conditions:

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.9 Warranty:

A. Finish Warranty: Commencing on Date of Substantial Completion.
   1. Provide 20-year written warranty with PVDF/KYNAR 500 finish color coated metal finish covering color fading, chalking, and film integrity.
   2. Finish coating shall not peel, blister, chip, crack or check.
   3. Chalking, fading or erosion of finish measured by the following tests:
      a. Finish coating shall not chalk in excess of 8 numerical ratings when measured in accordance with ASTM D659.
      b. Finish coating shall not change color or fade in excess of 8 NBS units as determined by ASTM D2244.

B. Material and Installation Warranty: Commencing on Date of Substantial Completion.
   1. When installed as directed by Laminators Incorporated, panels covered by this warranty are warranted not to delaminate (separate) at any Laminators produced glue line for a period of five years.

PART 2 PRODUCTS

2.1 Manufacturers:

A. Acceptable Manufacturer: Laminators Incorporated; 3255 Penn St., Hatfield, PA 19440. ASD. Tel:

(215)723-8107. Toll Free: (877) OMEGA77. Fax: (215) 721-1239. Web: http://www.laminatorsinc.com

B. Substitutions: as approved by Architect.

C. Requests for substitutions will be considered in accordance with provisions of the Project Manual.

2.2 Omega-Lite Aluminum-Faced Composite Panels:

A. Omega-Lite Composite Panels as manufactured by Laminators Incorporated.
   1. Panel Construction: Finished aluminum sheet over a corrugated polyallomer (CPA) core with backer sheet.
   2. Panel Facing:
      a. Smooth face, minimum 0.021 inch (0.53 mm) thick, ASTM B209 aluminum sheet
   3. Panel Backing:
      a. Random painted aluminum sheet, minimum 0.013 inch (0.33 mm) thick, ASTM B209 aluminum sheet
   4. Panel Thickness: 6 mm (1/4 inch)
   5. Fire Test Performance: ASTM E84: Class A.
   6. Bond Test Performance: ASTM C481-A Cyclic Aging: Pass.
   7. Finish:
      a. PVDF/Kynar 500 – 20-year warranty paint system meeting AAMA 2605
   8. Finish Colors: Refer Room Finish Schedule included in the Drawings.

B. Aluminum Composite Panel Installation System:
   1. Installation:
      a. 1-Piece Tight-Fit Extrusion (6 mm only)
      b. Reveal "H"-Molding 4595X
      c. Provide corner, drip edge, etc. trim as required for complete and watertight installation.

2.3 Accessories:

A. Manufacturer's Sealants and Accessories: Provide manufacturer's recommended sealants and accessories for product installation.

B. Flashing: Fabricate flashing materials from 0.030 inch (0.76 mm) minimum thickness aluminum sheet

painted to match the adjacent curtain wall/panel system where exposed. Provide a 12 inch (305 mm) wide lap strap under the flashing at abutted conditions and seal lapped surfaces with a full bed of non-hardening sealant.

2.4 Fabrication:

A. Panels shall be fabricated and finished as required to provide material construction and performance as specified and as required by manufacturer to comply with warranty provisions.
   1. Tolerances: Length and Width: plus or minus 1/16 inch (1.6mm). Squareness (Diagonals): equal within 1/8 inch (3.2mm).

PART 3 EXECUTION

3.1 Examination:

A. Do not begin installation until substrates have been properly prepared.

B. Examine substrates, areas, and conditions, with substrate installer present, for compliance with requirements for structural soundness, installation tolerances, metal panel supports, and other conditions affecting performance of work.
   1. Examine primary and secondary wall framing to verify that girts, angles, channels, studs, and other structural panel support members and anchorage have been installed within alignment tolerances listed below.
      a. 1/4 inch (6 mm) in any 20 feet (6 m) length vertically or horizontally.
      b. 1/2 inch (12 mm) in any building elevation.
   2. Examine solid wall sheathing to verify that sheathing joints are supported by framing or blocking and that installation is within flatness tolerances required.
   3. For the record, prepare written report, endorsed by panel installer and substrate installer, listing remedy for conditions detrimental to performance of work.

C. Examine roughing-in for components and systems penetrating metal panels to verify actual locations of penetrations relative to seam locations of metal

panels before metal panel installation.

D. Proceed with installation only after all unsatisfactory conditions have been corrected.

E. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 Installation:

A. Comply with manufacturer's installation guides and Product Data, including product technical bulletins, product catalog installation instructions, and product carton instructions for installation type selected.

B. Work shall be done and completed in a thorough and workmanlike manner by mechanics skilled in their various trades.

C. Caulk Installation:
1. Use only approved sealants as described in Laminators Incorporated Installation Guidelines.
2. The sealant manufacturer’s instructions shall be followed in preparing and installing sealants.
3. Joints to receive sealant shall be clean, dry and free from dust, grit and contaminants.
4. The sealant shall completely fill the glazing pockets.

3.3 Field Quality Control:

A. Manufacturer's Field Services: Upon Owner's request, provide manufacturer's field service consisting of product use recommendations and periodic site visit for inspection of product installation in accordance with manufacturer's instructions.

3.4 Cleaning and Protection:

A. Protection: Protect installed product and finish surfaces from damage during construction.

B. Cleaning: Remove temporary coverings and protection of adjacent work areas. Repair or

replace damaged installed products. Clean installed products in accordance with manufacturer's instructions prior to owner's acceptance. Remove construction debris from project site and legally dispose of debris.

C. Protect installed products until completion of project.

D. Touch-up, repair or replace damaged products before Substantial Completion.

End of Section

DIVISION 7 – THERMAL AND MOISTURE PROTECTION

SECTION 07550 – MODIFIED BITUMEN MEMBRANE ROOFING SYSTEM

Part 1 - General

1.01 Section Includes:
- A. Preparation of Substrate to Receive Roofing Materials
- B. Roof Insulation Application to Prepared Substrate
- C. Roof Membrane Application
- D. Roof Flashing Application
- E. Incorporation of Sheet Metal Flashing Components and Roofing Accessories into the Roof System

1.02 Products Installed But Not Furnished Under This Section:
- A. Sheet Metal Flashing and Trim
- B. Sheet Metal Roofing Specialties

1.03 Related Sections:
- A. Roof Decks - Section 05310
- B. Rough Carpentry - Section 06100
- C. Insulation - Section 07200
- D. Flashing & Sheet Metal Section 07600

1.04 Reference Standards:

References in these specifications to standards, test methods and codes, are implied to mean the latest edition of each such standard adopted. The following is an abbreviated list of associations, institutions, and societies which may be used as references throughout these specifications.

ASTM	American Society for Testing and Materials Philadelphia, PA
FM	Factory Mutual Engineering and Research Norwood, MA
NRCA	National Roofing Contractors Association Rosemont, IL
OSHA	Occupational Safety and Health Administration Washington, DC
SMACNA	Sheet Metal and Air Conditioning Contractors National Association, Chantilly, VA
UL	Underwriters Laboratories, Northbrook, IL

1.05 Description Of Work:
- A. **Project Type:** New installation.
  Deck: Metal Slope: **3/8 inch ±** per foot.
- B. **Rigid Insulation:**
  1. Top and Bottom Layers: Polyisocyanurate, having a total thickness of **3.5"** – top layer of 1 1/2" and bottom layer of 2”. Refer to Section 07200, Insulation.
  2. Crickets: Polyisocyanurate (tapered) providing a roof slope to roof drains (refer to Drawings.)
- C. **Gypsum sheathing panel:** having a thickness of 1/2 inch, mechanically attached, as per FM I-90 requirements.
- D. **Roof System:** Modified Bitumen Base, applied in cold

adhesive; stripping and Flashing, applied in cold adhesive. Modified Bitumen Finish Ply, applied in cold adhesive.

E. **Flashing System:** SBS with continuous metal-foil surfacing, torch applied.

1.06 Submittals:

A. Submittals Prior to Contract Award:

1. Letter from the proposed primary roofing manufacturer confirming that the bidder is an acceptable Contractor authorized to install the proposed system.
2. Letter from the primary roofing manufacturer stating that the proposed application will comply with the manufacturer's requirements in order to qualify the project for the specified guarantee.

B. Submittals Prior to Project Close-out:

1. Manufacturer's printed recommendations for proper maintenance of the specified roof system including inspection frequencies, penetration addition policies, temporary repairs, and leak call procedures.

1.07 Quality Assurance:

A. Acceptable Products: Primary roofing products, including each type of sheet, all manufactured in the United States, shall be supplied by a single manufacturer which has been successfully producing the specified types of primary products for not less than 10 years. The primary roofing products shall have maintained a consistent composition for a minimum of five years.

B. Agency Approvals: The proposed roof system shall conform to the following requirements. No other testing agency approvals will be accepted.

1. Underwriters Laboratories Class A acceptance of the proposed roofing system without additional requirements for coatings.

C. Acceptable Contractor: Contractor shall have a minimum of 10 years of experience in successfully installing the same or similar roofing materials and be certified in writing by the roofing materials manufacturer to install the primary roofing products for a minimum of 5 years prior to the date of bid opening.

1. Torch Applicators: Contractor shall employ torch applicators who have successfully passed the CERTA (Certified Roofing Torch Applicator) program requirements as provided by the National Roofing Contractors Association (NRCA).
2. The Contractor shall have an office, warehouse with supplies, and permanent roofing crews within a 50 mile radius of Moore, Oklahoma. Contractor shall have had “NDL” (No Dollar Limit) approval for 5 years AT THIS

AREA OFFICE from manufacturer and shall perform a minimum of ten (10) NDL manufacturer guarantees per year.

3. **Owner's Roofing Contractor (Universal Roofing and Sheet Metal located in Moore, Oklahoma) shall be utilized on this project. The bid shall be based on the provided drawings and specifications, and agreed-to pricing.**

D. Scope of Work: The work to be performed under this specification shall include but is not limited to the following: Attend necessary job meetings and furnish competent and full-time supervision, experienced roof mechanics, all materials, tools, and equipment necessary to complete, in an acceptable manner, the roof installation in accordance with this specification. Comply with the latest written application instructions of the manufacturer of the primary roofing products. In addition, application practice shall comply with requirements and recommendations contained in the latest edition of the Handbook of Accepted Roofing Knowledge (HARK) as published by the National Roofing Contractors Association, amended to include the acceptance of a phased roof system installation.

E. Local Regulations: Conform to regulations of public agencies, including any specific requirements of the city and/or state of jurisdiction.

F. Manufacturer Requirements: Ensure that the primary roofing materials manufacturer provides direct trained company personnel to attend necessary job meetings, perform periodic inspections as necessary, and conducts a final inspection upon successful completion of the project.

G. Contractor shall have one of the following approved Contractor Certification levels prior to bid opening:

Johns Manville - Peak Advantage Contractor
Soprema – Soprema Certified Applicator
Siplast – Siplast Select Applicator
GAF - Master Select Contractor

1.08 Product Delivery Storage And Handling:

A. Delivery: Deliver materials in the manufacturer's original sealed and labeled containers and in quantities required to allow continuity of application.

B. Storage: Store materials out of direct exposure to the elements. Store roll goods on a clean, flat and dry surface. All material stored on the roof overnight shall be stored on pallets. Rolls of roofing must be stored on ends. Store materials on the roof in a manner so as to preclude overloading of deck and building structure. Store materials such as solvents, adhesives, and asphalt cutback

products away from open flames, sparks, or excessive heat. Cover all material using a breathable cover such as a canvas. Polyethylene or other non-breathable plastic coverings are not acceptable.

C. Handling: Handle all materials in such a manner as to preclude damage and contamination with moisture or foreign matter. Handle rolled goods to prevent damage to edges or ends.

D. Damaged Material: Any materials that are found to be damaged or stored in any manner other than stated above will be automatically rejected, removed, and replaced at the Contractor's expense.

1.09 Project/Site Conditions:

A. Requirements Prior to Job Start

1. Notification: Give a minimum of 5 days notice to the Owner and manufacturer prior to commencing any work and notify both parties on a daily basis of any change in work schedule.
2. Permits: Obtain all permits required by local agencies and pay all fees which may be required for the performance of the work.
3. Safety: Familiarize every member of the application crew with all fire and safety regulations recommended by OSHA, NRCA and other industry or local governmental groups.

B. Environmental Requirements:

1. Precipitation: Do not apply roofing materials during precipitation or in the event there is a probability of precipitation during application.
   Take adequate precautions to ensure that materials, applied roofing, and building interiors are protected from possible moisture damage or contamination.
2. Temperature Restrictions: At ambient temperatures between 40F and 50F, prepare / warm adhesive as directed by manufacturer.

C. Protection Requirements:

1. Membrane Protection: Provide protection against staining and mechanical damage for newly applied roofing and adjacent surfaces throughout this project.
2. Torch Safety: Designate one person on each crew to perform a daily fire watch. The designated crew member shall watch for fires or smoldering materials on all areas of roof construction. Continue the fire watch after roofing material application has been suspended for the day.
3. Limited Access: Prevent access by the public to materials, tools, and equipment during the course of

the project.

4. Debris Removal: Remove all debris daily from the project site and take to a legal dumping area authorized to receive such materials.
5. Site Condition: Complete, to the owner's satisfaction, all job site clean-up including building interior, exterior and landscaping where affected by the construction.

1.10 Guarantee/Warranty:

A. Roof Membrane Guarantee: Upon successful completion of the project, and after all post installation procedures have been completed, furnish the Owner with **the manufacturer's ten year labor and materials membrane guarantee.** The guarantee shall be a term type, without deductibles or limitations on coverage amount, and shall be issued at no additional cost to the Owner. This guarantee shall not exclude random areas of ponding from coverage.

1.11 **Products of certain manufacturers are specified herein to simplify descriptions of design, construction, and/or materials only. Only the four systems listed in 2.02 Description of Systems below will be accepted for installation on this project.**

Part 2 - Products:

2.01 Roofing System Assembly/Products:

A. Rigid Roof Insulation: Roof insulation shall be UL and FM approved. Insulation shall be approved in writing by the insulation manufacturer for intended use and for use with the specified roof assembly. Refer to Section 07200.
B. Recover Board Sheathing Panel for Roof Membrane Substrate: A panel composed of high density fiberboard, non-structural water resistant core material integrally bonded having a nominal thickness of 1/2 inch.
   1. Acceptable Manufacturer: Fiberboard Coated High Density Roof Insulation, by Huebert.
C. Gypsum Sheathing Panel for Wood/Plywood Surfaces to Receive Flashing Coverage: A panel composed of a gypsum based, non-structural water resistant core material integrally bonded with fiberglass mats on both sides having a nominal thickness of 1/2 inch. The panel surface shall be factory primed with a non-asphaltic primer.
   1. Acceptable Manufacturer: DensDeck Prime Gypsum Roof Board, by Georgia Pacific Corporation; Atlanta, GA

2.02 Description Of Systems:

A. Roofing Membrane Assembly: A roof membrane assembly consisting of two plies of a prefabricated, reinforced, homogeneous Styrene-Butadiene-Styrene (SBS) block copolymer

modified asphalt membrane, applied over a prepared substrate. Both reinforcement mats shall be impregnated/saturated and coated each side with an SBS modified bitumen blend. The roof system shall pass 500 cycles of ASTM D 5849 Resistance to Cyclic Joint Displacement (fatigue) at 14F - or show evidence of other independent testing indicating resistance fatigue, membrane cracking and delamination. Passing results shall show no signs of membrane cracking or interply delamination after 500 cycles. The roof system shall pass 200 cycles of ASTM D 5849 after heat conditioning performed in accordance with ASTM D 5147. The assembly shall possess waterproofing capability, such that a phased roof application, with only the modified bitumen base ply in place, can be achieved for prolonged periods of time without detriment to the watertight integrity of the entire roof system.

1. Acceptable Manufacturer: Johns Manville roof system:
    a. Modified Bitumen Base, Stripping, and Flashing Reinforcing Ply.
        JM DynaBase
    b. Modified Bitumen Finish Ply
        JM DynaGlas FR
    c. Stripping Ply and Flashing Reinforcing Sheet
        JM DynaPly

B. Flashing Membrane Assembly: A flashing membrane assembly consisting of a prefabricated, reinforced, Styrene-Butadiene-Styrene (SBS) block copolymer modified asphalt membrane with a continuous, channel-embossed metal-foil surfacing. The finish ply shall conform to ASTM D 6298 and the following physical and mechanical property requirements.

1. Acceptable Manufacturer: Johns Manville flashing system, aluminum finish
    a. Cant Backing Sheet for Wood/Plywood Surfaces to Receive Flashing Coverage: applicable JM product.
    b. Metal-Clad Modified Bitumen Flashing Sheet: JM DynaClad Flashing
    c. Cant Strip: JM FesCant Plus Cant Strips

C. Catalyzed Acrylic Resin Flashing System: A specialty flashing system consisting of a liquid-applied, fully reinforced, multi-component acrylic membrane installed over a prepared or primed substrate. The flashing system consists of a catalyzed acrylic resin primer, basecoat and topcoat, combined with a non-woven polyester fleece. The resin and catalyst are pre-mixed immediately prior to installation. The use of the specialty flashing system shall be specifically approved in advance by the membrane

manufacturer for each application.

1. Acceptable Manufacturer: Flashing System by Johns Manville; Denver, CO

D. Additional Roof Systems: The following additional roof systems are acceptable for use in lieu of the specified roof system.

1. GAF Materials Corp., Wayne, NJ
   Base Ply – Ruberoid Mop Smooth
   Finish Ply – Ruberoid Mop FR - cap ply Plus
   Flashing Sheet – Ruberoid Ultraclad SBS
   Stripping Ply and Flashing Reinforcing Sheet - Ruberoid Mop Smooth
2. Soprema, Inc., Wadsworth, OH
   Base Ply – Elastophene Sanded 2.2
   Finish Ply – Elastophene LS FR GR
   Flashing Sheet – Sopralast 50 TV ALU
   Stripping Ply and Flashing Reinforcing Sheet - Elastophene Sanded 2.2

2.03 Roofing Accessories:

A. Roofing Adhesives:

1. Membrane Cold Adhesive: An asphalt, solvent blend conforming to ASTM D 3019, Type III requirements.
   a. Acceptable Manufacturer: MBR Cold Application Adhesive by Johns Manville; Denver, CO

B. Bituminous Cutback Materials:

1. Primer: An asphalt, solvent blend conforming to ASTM D 41 requirements.
2. Mastics: An asphalt cutback mastic, reinforced with non-asbestos fibers, used as a base for setting metal flanges conforming to ASTM D 4586 Type II requirements.

C. Sealant: A moisture-curing, non-slump elastomeric sealant designed for roofing applications. The sealant shall be approved by the roof membrane manufacturer for use in conjunction with the roof membrane materials.

D. Ceramic Granules: No. 11 grade specification ceramic granules of color scheme matching the granule surfacing of the finish ply.

E. Metallic Powder: A finely graded metal dust as supplied or approved by the membrane manufacturer, used for covering of bitumen overruns over the foil surfaced membrane.

F. Perlite Cant Strips: A cant strip composed of expanded volcanic minerals combined with waterproofing binders. The top surface shall be pre-treated with an asphalt based coating. The face of the cant shall have a nominal 4 inch dimension.

G. Fasteners:
   1. Gypsum Sheathing Panel Fasteners for Roofing Substrates and Wood/Plywood Flashing Surfaces: Gypsum sheathing panel fasteners and plates shall be FM Approved, and/or approved by the manufacturer of the primary roofing products. The fastening pattern for each panel to be used shall be as recommended by the panel manufacturer and approved by the manufacturer of the primary roofing products. Acceptable panel fastener manufacturers for specific substrate types are listed below.
      a. Wood/Plywood Flashing Surfaces: Gypsum sheathing panel mechanical fasteners shall be factory coated for corrosion resistance. The fastener shall conform meet or exceed Factory Mutual Standard 4470 and when subjected to 30 Kesternich cycles, show less than 15% red rust. Acceptable fastener types for wood/plywood substrates are listed below.
         1) A fluorocarbon coated screw type roofing fastener having a minimum 0.220 inch thread diameter. Plates used in conjunction with the fastener shall be a metal type having a minimum 3 inch diameter, as supplied by the fastener manufacturer.
      b. Acceptable Manufacturer's:
         1) Ultrafast Fastener with UltraFast Round Metal Plates by Johns Manville; Denver, CO
         2) Dekfast #12 with Dekfast Steel Hexagonal Plates by Construction Fasteners, Inc.; Wyomissing, PA
         3) Standard Roofing Fastener by Olympic Manufacturing Group, Agawam; MA
   2. Flashing Reinforcing Sheet Fasteners: Fasteners shall be approved by the manufacturer of the primary roofing products. Acceptable fasteners for specific substrate types are listed below.
      a. Wood/Plywood Substrates
         1) A 12 gauge, spiral or annular threaded shank, zinc coated steel roofing fastener having a minimum 1 inch head.
         2) Square Cap by W.H. Maze Co.; Peru, IL
            12 Gauge Simplex Nail by the Simplex Nail and Manufacturing Co., Americus, GA
         3) Fasteners shall be applied to meet FM-I90 requirements. At crickets, if insulation thickness prohibits satisfactory application

of fasteners, use adhesive similar to Para-STIK insulation adhesive.

H. Walktread: A prefabricated, puncture resistant polyester core reinforced, polymer modified bitumen sheet material topped with a ceramic-coated granule wearing surface.
   1. Thickness: 0.25 in
   2. Width: 32 in
   3. Acceptable Manufacturer: DynaTred Roof Walkway Pads by Johns Manville; Denver, CO

I. Pipe Supports Typical:
   1. Roller System: A “roller-bearing” pipe support for roof-mounted gas pipes, RTU condensate lines, and electrical conduit up to 4" I.D. or 5"O.D. Pipes rest on a self-lubricating roller system which is made of a stainless steel or glass-filled nylon rod and a sturdy polycarbonate resin roller. Pipe support base shall be manufactured of polycarbonate resin with a roller rod of glass-filled nylon, and stainless steel metal parts.
   2. Load Weight: Maximum load weight may not exceed 125 lbs. per pipestand.
   3. Spacing: Not to exceed 10 foot centers. Do not exceed 125 lbs. load weight and adjust pipe stand in height to even load.
   4. Acceptable Manufacturer: Pillow Block Pipestand Model 4-R, Miro Industries, Inc., 1780 West 2300 South, Salt Lake City, Utah 84119.

J. Pipe Supports at Turns In Large Piping:
   1. Pipe Support Hangers: A “clevis hanger” pipe support hanger for roof mounted gas pipes at all large (over 4" I.D.) piping corners, bends, and “tees”/pipe intersections. Pipes rest on a clevis hanger with a support base of stainless steel polycarbonate. All other metal parts are hot-dip galvanized steel.
   2. Load Weight: Maximum load weight not to exceed 310 lbs. per pipestand or 155 lbs. on each base.
   3. Spacing: Locate “clevis” type pipe hangers at all corners, bends, and “tees”/pipe intersections not to exceed 10'-0" o.c. maximum. Do not exceed 310 lbs. load weight (155 lbs. on each base) and make certain each pipestand is adjusted in height to even load at all pipestands.
   4. Acceptable Manufacturer: Pillow Block Pipestand Model 6-H, Miro Industries, Inc., 1780 West 2300 South, Salt Lake City, Utah 84119.

K. Penetration Dam/Sealer Pockets shall be similar to: **ChemCurb System:** gray polyester resin exterior forms,

structural sealant and One (1) part self-leveling moisture cure pourable sealer (gray).

Part 3- Execution

3.01 Preparation:

A. General: Sweep or vacuum all surfaces, removing all loose aggregate and foreign substances prior to commencement of roofing.

3.02 Substrate Preparation - Metal Deck / Insulation:

A. Preparation of Wood/Plywood Substrates to Receive Flashing Materials: Mechanically attach the gypsum sheathing panels to all wood/plywood substrates that will be covered with the specified flashing membrane, using the specified screws/plates, at 12 inches o.c. staggered. Cut the cant backing sheet into 12 inch widths and peel the release film from the back of the sheet. Set the sheet into place extending 6 inches onto the field of the roof area and 6 inches up the gypsum sheathing panel surface utilizing minimum 3 inch side laps. Set the cant into place prior to installation of the roof membrane base ply.

B. Insulation Panel - two layers: Mechanically attach the insulation panels, using the specified fasteners, at a rate of 1 fastener for every 2.7 square feet of panel area (12 per 4' x 8' panel). Increase the fastening frequency by 50% at the perimeter of the roof area and by 75% at the corners. Meet FM I-90 requirements.

C. Gypsum Sheathing Panels: Install sheathing panels, and any tapered insulation in hot asphalt, with end joints offset; edges of the panels shall be in moderate contact without forcing applied in strict accordance with the insulation manufacturer's requirements and the following instructions.

3.04 Roof Membrane Installation:

A. Membrane Application: Apply roofing in accordance with roofing system manufacturer's instructions and the following requirements. Application of roofing membrane components shall immediately follow application of base sheet and/or insulation as a continuous operation.

B. Aesthetic Considerations: An aesthetically pleasing overall appearance of the finished roof application is a standard requirement for this project. Make necessary preparations, utilize recommended application techniques, apply the specified materials including granules and metallic powder, and exercise care in ensuring that the finished application is acceptable to the Owner.

C. Priming: Prime metal and concrete and masonry surfaces with a uniform coating of the specified primer.

D. Membrane Adhesive Application: Membrane adhesive can be applied by roller, squeegee or spray unit. Apply cold adhesive in a smooth, even, continuous layer without breaks or voids. Utilize an application rate of 2 to 2 1/2 gal/sq over irregular or porous substrates. Utilize an application rate of 1 1/2 to 2 gal/sq for interply applications. Double the adhesive application rate at the end laps of granule surfaced sheets. In the areas surrounding details that are to receive the catalyzed acrylic resin primer and flashing system, apply membrane plies in a full coating of the specified elastomeric sealant in lieu of the solvent based adhesive a minimum 8 inches from the base of the penetration or curb.

E. Bitumen Consistency: Cutting or alterations of bitumen, primer, and sealants will not be permitted.

F. Roofing Application: Apply all layers of roofing free of wrinkles, creases, or fishmouths. Exert sufficient pressure on the roll during application to ensure prevention of air pockets.

1. Apply all layers of roofing perpendicular to the slope of the deck.
2. Fully bond the base ply to the prepared substrate, utilizing minimum 3 inch side and end laps. Apply each sheet directly behind the asphalt applicator. Cut a dog ear angle at the end laps on overlapping selvage edges. Using a clean trowel, apply top pressure to top seal T-laps immediately following sheet application. Stagger end laps a minimum of 3 feet.
3. Fully bond the finish ply to the base ply, utilizing minimum 3 inch side and end laps. Apply each sheet directly behind the cold adhesive applicator. Stagger end laps of the finish ply a minimum 3 feet. Cut a dog ear angle at the end laps on overlapping selvage edges. Using a clean trowel, apply top pressure to top seal T-laps immediately following sheet application. Stagger side laps of the finish ply a minimum 12 inches from side laps in the underlying base ply. Stagger end laps of the finish ply a minimum 3 feet from end laps in the underlying base ply.
4. Maximum sheet lengths and special fastening of the specified roof membrane system may be required at various slope increments where the roof deck slope exceeds 1/2 inch per foot. The manufacturer shall provide acceptable sheet lengths and the required fastening schedule for all roofing sheet applications

to applicable roof slopes.

G. Granule Embedment: Broadcast mineral granules over all bitumen overruns on the finish ply surface, while the bitumen is still hot or the adhesive is soft, to ensure a monolithic surface color.

H. Flashing Application - masonry surfaces: Flash masonry parapet walls and curbs using the reinforcing sheet and the metal foil flashing membrane. After the base ply has been applied to the top of the cant, fully adhere the reinforcing sheet, utilizing minimum 3 inch side laps and extend a minimum of 3 inches onto the base ply surface and 3 inches up the parapet wall above the cant. After the final roofing ply has been applied to the top of the cant, prepare the surface area that is to receive flashing coverage by torch heating granular surfaces or by application of asphalt primer; allowing primer to dry thoroughly. Torch apply the metal foil-faced flashing into place using three foot widths (cut off the end of roll) always lapping the factory selvage edge. Stagger the laps of the metal foil flashing layer from lap seams in the reinforcing layer. Extend the flashing sheet a minimum of 4 inches beyond the toe of the cant onto the prepared surface of the finished roof and up the wall to the desired flashing height. Exert pressure on the flashing sheet during application to ensure complete contact with the wall/roof surfaces, preventing air pockets; this can be accomplished by using a damp sponge or shop rag. Check and seal all loose laps and edges. Nail the top edge of the flashing on 9 inch centers. (See manufacturer's schematic for visual interpretation).

I. Flashing Application – surfaces sheathed with gypsum sheathing panels: After the gypsum sheathing panel and cant backing sheet have been installed, flash parapet walls and curbs with the specified reinforcing sheet and the metal foil flashing membrane. The reinforcing sheet shall have minimum 3 inch side laps and extend a minimum of 3 inches onto the base ply surface and to the top of the parapet wall or curb. Using the specified fasteners, mechanically attach the reinforcing sheet through the field of the sheet to the vertical flashing surface on 12 inch centers from the top of the cant to the top of the wall or curb. Fully adhere the remainder of the flashing reinforcing sheet that extends over the cant and roof level. Using a Leister Hand Welding Tool, seal the laps between flashing reinforcing sheets. After the final roofing ply has been applied to the top of the cant, prepare the surface area that is to receive flashing

coverage by torch heating granular surfaces or by application of asphalt primer; allowing primer to dry thoroughly. Torch apply the metal foil-faced flashing into place using three foot widths (cut off the end of roll) always lapping the factory selvage edge. Stagger the laps of the metal foil flashing layer from lap seams in the reinforcing layer. Extend the flashing sheet a minimum of 4 inches beyond the toe of the cant onto the prepared surface of the finished roof and up the wall to the desired flashing height. Exert pressure on the flashing sheet during application to ensure complete contact with the wall/roof surfaces, preventing air pockets; this can be accomplished by using a damp sponge or shop rag. Check and seal all loose laps and edges. Nail the top edge of the flashing on 9 inch centers. (See manufacturer's schematic for visual interpretation).

J. Catalyzed Acrylic Resin Flashing System: Install the liquid-applied primer and flashing system in accordance with the membrane system manufacturer’s printed installer’s guidelines and other applicable written recommendations as provided by the manufacturer.

K. Use of Metallic Powder: Broadcast metallic powder over all bitumen overruns on the metal foil membrane surface while the bitumen is still hot to ensure a monolithic surface color.

L. Water Cut-Off: At end of day's work, or when precipitation is imminent, construct a water cut-off at all open edges. Cut-offs can be built using asphalt or plastic cement and roofing felts, constructed to withstand protracted periods of service. Cut-offs must be completely removed prior to the resumption of roofing.

3.05 Roof System Interface With Related Components:

A. Walktread: Cut the walktread into maximum 5 foot lengths and allow to relax until flat. Adhere the sheet using the specified plastic cement. Apply the specified cement in a 3/8 inch thickness to the back of the product in 5 inch by 5 inch spots in accordance with the pattern as supplied by the walktread manufacturer. Walk-in each sheet after application to ensure proper adhesion. Use a minimum spacing of 2 inches between sheets to allow for proper drainage.

B. Sealant: Apply a smooth continuous bead of the specified sealant at the exposed finish ply edge transition to metal flashings incorporated into the roof system.

3.06 Field Quality Control And Inspections:

A. Site Condition: Leave all areas around job site free of debris, roofing materials, equipment, and related items

after completion of job.

B. Notification Of Completion: Notify the manufacturer by means of manufacturer's printed Notification of Completion form of job completion in order to schedule a final inspection date.

C. Final Inspection:

1. Post-Installation Meeting: Hold a meeting at the completion of the project, attended by all parties that were present at the pre-job conference. A punch list of items required for completion shall be compiled by the Contractor and the manufacturer's representative. Complete, sign, and mail the punch list form to the manufacturer's headquarters.

D. Issuance Of The Guarantee: Complete all post installation procedures and meet the manufacturer's final endorsement for issuance of the specified guarantee.

End of Section

DIVISION 7 - THERMAL & MOISTURE PROTECTION

SECTION 07600 - FLASHING AND SHEET METAL

Part 1 - General

1.01 Work Included:
- A. All materials, labor, services and incidentals necessary for the completion of this section of the work.

1.02 Related Work Specified Elsewhere:
- A. Modified Bitumen Membrane Roofing System - Section 07550
- B. Sealants - Section 07900

1.03 Quality Assurance:
- A. Standards:
  - 1. American Society of Testing and Materials
    - a. ASTM A-526, Steel Sheet, Zinc-Coated (Galvanized), Commercial Quality.
    - b. ASTM B-32, Solder Metal
  - 2. Federal Specifications:
    - a. SS-C-153B, Cement, Bituminous, Plastics
  - 3. Sheet Metal and Air Conditioning Contractors National Association:
    - a. Architectural Sheet Metal Manual

1.04 **Products of certain manufacturers are specified herein to simplify descriptions of design, construction, and/or materials only. Proprietary names are not intended to imply that products of named manufacturer are required to the exclusion of equivalent products of other manufacturers.**

Part 2 - Products

2.01 Materials:
- A. Prefinished Sheet Metal overflow scuppers and Prefinished Metal Coping:
  - 1. Galvanized iron, prefinished one side.
  - 2. Gauge: 24 gauge, of design and width as detailed.
  - 3. Acceptable manufacturer: Color Klad - Vincent Brass and Aluminum Co.
  - 4. Finish: Kynar 500 - Refer Color Schedule
- B. Sheet Metal:
  - 1. Galvanized Sheet Steel: ASTM A-526, Commercial Quality.
  - 2. Gauge: 22 Gauge minimum or as required by Drawings or Specifications.
- C. Fasteners: Nails, screws, and other fasteners used in conjunction with this work shall be galvanized or cadmium plated.
- D. Solder: ASTM B-32, alloy grade 58, 50% tin, 50% lead.
- E. Flux: Muriatic acid with zinc.
- F. Sealants: Rubber based compound - refer to Section 07900.
- G. Bituminous Plastic Cement: FS SS-C-153B.

H. Accessories: Provide accessories as recommended by manufacturer or as indicated on Drawings.

Part 3 - Execution

3.01 Fabrication:

A. Shape and install sheet metal as indicated on Drawings. Comply with recommendations of SMACNA "Architectural Sheet Metal Manual."

B. Form exposed faces flat and free of buckles, excessive wave and tool marks. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant.

C. Hem all exposed edges.

D. Make waterproof corner joints by soldering solidly. Joints shall be full-lapped.

E. Soldering: Shall be done slowly with well heated coppers to thoroughly heat the sheet and completely sweat the solder through the full width of the seam. Ample solder shall be used and the seam shall show a least one full inch of evenly flowed solder. Soldering coppers: Shall be heavy and blunt design, properly tinned before using. Neutralize all excess flux.

F. Provide for thermal expansion of running trim, flashing and other items exposed for more than 15'-0" continuous length. Locate expansion seams at 10'-0" intervals and 2'-0" each side of corners and intersections.

G. Angle bottom edges of exposed vertical surfaces to form drips.

3.02 Installation and Application:

A. General:

1. Furnish those items to be installed by other trades to proper grade for installation.
2. Cooperate with and coordinate installation of sheet metal with roofing work as specified under Modified Bitumen Membrane Roofing System - Section 07550.
3. Install work watertight, without waves, warps, buckles, fastening stresses or distortion, allowing for expansion and contraction.
4. Embed all flashing in plastic cement. Coat dissimilar metals from contact with bituminous coating.

B. Metal Coping:

1. Material: 24 gauge, prefinished sheet metal.
2. Fabricate and install in accordance with drawings, and recognized sheet metal practices.
3. Secure coping bedded in plastic cement to blocking.
4. At joints, bed coping in plastic cement and secure on side to backing strip by soldering solid. Do not use screws

or nails in exposed face to coping.

5. Lower edge of coping to be securely hooked to hook strip. Secure to wood blocking with No. 8 x 1" galvanized sheet metal screws at 8 o.c.

End of Section

DIVISION 7 - THERMAL & MOISTURE PROTECTION

SECTION 07700 - ROOF ACCESSORIES

Part 1 General

1.01 Work Included:
- A. All materials, labor, services and incidentals necessary for the completion of this entire section of the work.

1.02 Submittals:
- A. Shop Drawings: Indicate details and dimensions of fabrication and installation including layouts and assemblies. Begin fabrication only after receiving approved shop Drawings.
- B. Manufacturer's Literature: Descriptive literature and installation instructions.

1.03 Product Delivery, Storage and Handling:
- A. Handle and store all items with care to prevent damage and injury to finish surfaces.

Part 2 - Products

2.01 Type NB Roof Hatch:
- A. Size and Construction: 2’-6” x 4’-6” (5'-1" x 3'-1" overall dimensions), single leaf type. Cover shall be 14 gauge paint bond galvanized steel with a 3" beaded flange, neatly welded. Insulation shall be glass fiber 1" in thickness, fully covered and protected by a 22 gauge paint bond steel (or 18 gauge aluminum) liner.
- B. Curb shall be 12" in height and of 14 gauge paint bond galvanized steel. It shall be formed with a 3-1/2" flange with holes provided for securing to the roof deck. Curb shall be equipped with an integral metal capflashing of the same gauge and material as the curb, full welded at the corners for weathertightness. Insulation on the exterior of the curb shall be rigid fiber board 1" in thickness.
- C. Scuttle shall be completely assembled with heavy piano hinges, compression spring operators enclosed in telescopic tubes, positive snap latch with turn handles and padlock hasps inside and outside, and thermoplastic rubber gasket. Cover shall be equipped with an automatic hold-open arm complete with vinyl grip handle to permit easy release. All hardware shall be zinc plated and chromate sealed.
- D. Provide LadderUp Safety Post – verify with Architect and Manufacturer.
- E. Manufacturer: The Bilco Company or approved equal.

Part 3 - Execution

3.01 Installation:
- A. Installation shall be in accordance with manufacturer's instructions.
- B. Coordinate installation of handrail to underside of hatch lid, to be used in conjunction with the ladder as detailed on the drawings.

C. Coordinate with installation of roofing system and related flashings.

End of Section

DIVISION 7 - THERMAL & MOISTURE PROTECTION

SECTION 07840 - FIRESTOPPING

Part 1 - General

1.01 Related Documents:

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification Section, apply to work specified in this section.

1.02 Definitions:

A. Firestopping: Material or combination of materials used to retain integrity of fire-rated construction by maintaining an effective barrier against the spread of flame, smoke, and hot gases through penetrations in, or construction joints between, fire rated wall and floor assemblies.

1.03 General Description of the Work:

A. Only tested firestop systems shall be used in specific locations as follows:

1. Penetrations for the passage of duct, cable, cable tray, conduit, piping, electrical busways and raceways through fire-rated vertical barriers (walls and partitions), horizontal barriers (floor/ceiling assemblies), and vertical service shaft walls and partitions.
2. Safing slot gaps between edge of floor slabs and curtain walls.
3. Openings between structurally separate sections of wall or floors.
4. Gaps between the top of walls and ceilings or roof assemblies.
5. Expansion joints in walls and floors.
6. Openings and penetrations in fire-rated partitions or walls containing fire doors.
7. Openings around structural members which penetrate floors or walls.

1.04 Related Work Specified Elsewhere:

A. Coordinate work of this section with work of other sections as required to properly execute the work and as necessary to maintain satisfactory progress of the work of other sections, including:

1. Section 03300 - Cast-In-Place Concrete
2. Section 04810 - Masonry
3. Section 07900 - Sealants
4. Section 09250 - Gypsum Wallboard
5. Section ***** - Fire Suppression Piping
6. Section ***** - Common Work Results for Plumbing
7. Section ***** – Common Work Results for HVAC
8. Section ***** - HVAC Insulation
9. Section ***** - Basic Electrical Materials and Methods

SECTION 07840 - FIRESTOPPING

1.05 References:

A. Test Requirements: ASTM E 814, "Standard Method of Fire Tests of Through Penetration Fire Stops".

B. Test Requirements: UL 1479, "Fire Tests of Through-Penetration Firestops".

C. Test Requirements: UL 2079, "Tests for Fire Resistance of Building Joint Systems".

D. Underwriters Laboratories (UL) of Northbrook, IL publishes tested systems in their "FIRE RESISTANCE DIRECTORY" that is updated annually.

1. UL Fire Resistance Directory:
   a. Firestop Devices (XHJI)
   b. Fire Resistance Ratings (BXRH)
   c. Through-Penetration Firestop Systems (XHEZ)
   d. Fill, Voids, or Cavity Material (XHHW)
   e. Forming Materials (XHKU)
   f. Joint Systems (XHBN)
   g. Perimeter Fire Containment Systems (XHDG)
2. Alternate Systems: "Omega Point Laboratories Directory" (updated annually).

E. Test Requirements: ASTM E 1966, "Standard Test Method for Fire Resistive Joint Systems".

F. Inspection Requirements: ASTM E 2174, "Standard Practice for On-site Inspection of Installed Fire Stops".

H. ASTM E 84, "Standard Test Method for Surface Burning Characteristics of Building Materials".

I. International Firestop Council Guidelines for Evaluating Firestop Systems Engineering Judgments.

J. All major building codes: ICBO, SBCCI, BOCA, IBC

K. NFPA 101 - Life Safety Code

L. NFPA 70 - National Electric Code

THROUGH-PENETRATION UL CLASSIFICATION SYSTEM

Fire Stopping Systems			UL Classification System	
		Construction Penetrated	Type Of Construction	System Identification
1	No Penetrating Items:	F, W, C	A, B, J, K, L	0001-0999
2	Metallic Pipes, Conduit or Tubing:	F, W, C	A, B, J, K, L	1001-1999
3	Nonmetallic Pipe, Conduit or Tubing:	F, W, C	A, B, J, K, L	2001-2999
4	Electric Cables:	F, W, C	A, B, J, K, L	3001-3999
5	Cable, Trays with Electric Cables:	F, W, C	A, B, J, K, L	4001-4999
6	Insulated Pipes:	F, W, C	A, B, J, K, L	5001-5999

7	Electrical Bussduct Penetrations:	F, W, C	A, B, J, K, L	6001-6999
8	Mechanical Ductwork Penetrations:	F, W, C	A, B, J, K, L	7001-7999
9	Multiple Penetrations Through Common Openings:	F, W, C	A, B, J, K, L	8000-8999

Construction Penetration

F	Floor penetration
W	Wall penetration
C	Either floor or wall penetration

Type of Construction

A-	Concrete floors equal to of less than 5-inches thick
B-	Concrete floors greater than 5-inches thick
J-	Concrete or masonry walls equal to or less than 8-inches thick
K-	Concrete of masonry walls greater than 8-inches thick
L-	Framed walls

JOINT UL CLASSIFICATION SYSTEM

Fire-Resistant Joint Systems		Joint System	UL Classification System Movement Capability	Joint Width
1	Floor-to-Floor	FF	D	0000-0999
2	Wall-to-Wall	WW	D	0000-0999
3	Floor-to-Wall:	FW	D	0000-0999
4	Head of Wall:	HW	D	0000-0999

Movement Capability

D-	Has movement capability

Joint Width

0000-0999 Less than or equal to 2-inches

1.06 Quality Assurance

A. Installer Responsibilities: A firm experienced installing through-penetration firestop systems similar in material, design and extent to that indicated for this Project, whose

work has resulted in construction with a record of successful performance. Qualifications include having the necessary experience, staff, and training to install manufacturer's products per specified requirements.

B. Firestop System installation must meet requirements of ASTM E 814, UL 1479 or UL 2079 tested assemblies that provide a fire rating equal to that of construction being penetrated.

C. Proposed firestop materials and methods shall conform to applicable governing codes having local jurisdiction.

D. Installation Responsibility: Assign installation of through-penetration firestop systems and fire-resistive joint systems in Project to a single qualified installer.

E. Source Limitations: Obtain through-penetration firestop systems, for each kind of penetration and construction condition indicated, through one source from a single manufacturer.

1.07 Submittals:

A. Submit Product Data: Manufacturer's specifications and technical data for each material including the composition and limitations, documentation of qualified tested firestop systems to be used and manufacturer's installation instructions.

B. Submit Manufacturer's engineering judgment identification number and drawing details when no qualified tested system is available for an application. Engineering judgment must include both project name and contractor's name who will install firestop system as described in document.

C. Submit material safety data sheets provided with product delivered to job-site.

1.08 Installer Qualifications:

A. Engage an experienced Installer who is certified, licensed, or otherwise qualified by the firestopping manufacturer as having been provided the necessary training to install manufacturer's products per specified requirements.

B. The work is to be installed by a contractor with at least one of the following qualifications:

1. FM 4991 Approved Contractor
2. UL Approved Contractor
3. Hilti Accredited Fire Stop Specialty Contractor

C. Installer shall have not less than 3 years of experience with fire stop installation.

1.09 Delivery, Storage and Handling:

A. Deliver materials undamaged in manufacturer's clearly labeled, unopened containers, identified with brand, type, and UL label where applicable.

B. Coordinate delivery of materials with scheduled installation date to allow minimum storage time at jobsite.

C. Store materials under cover and protect from weather and

damage in compliance with manufacturer's requirements, including temperature restrictions.

D. Comply with recommended procedures, precautions or remedies described in material safety data sheets as applicable.

E. Do not use damaged or expired materials.

1.10 Project Conditions:

A. Do not use materials that contain flammable solvents.

B. Schedule installation of firestopping after completion of penetrating item installation but prior to covering or concealing of openings.

C. Verify existing conditions and substrates before starting work. Correct unsatisfactory conditions before proceeding.

D. Weather conditions: Do not proceed with installation of firestop materials when temperatures exceed the manufacturer's recommended limitations for installation printed on product label and product data sheet.

E. During installation, provide masking and drop cloths to prevent firestopping materials from contaminating any adjacent surfaces.

1.11 **Products of certain manufacturers are specified herein to simplify descriptions of design, construction, and/or materials only. Proprietary names are not intended to imply that products of named manufacturer are required to the exclusion of equivalent products of other manufacturers, providing they meet or exceed that specified.**

Part 2 – Products

2.01 Firestopping, General:

A. Provide firestopping composed of components that are compatible with each other, the substrates forming openings, and the items, if any, penetrating the firestopping under conditions of service and application, as demonstrated by the firestopping manufacturer based on testing and field experience.

B. Provide components for each firestopping system that are needed to install fill material. Use only components specified by the firestopping manufacturer and approved by the qualified testing agency for the designated fire-resistance-rated systems.

C. Firestopping Materials are either "cast-in-place" (integral with concrete placement) or "post installed." Provide cast-in-place firestop devices prior to concrete placement.

2.02 Acceptable Manufacturers:

A. Subject to compliance with through penetration firestop systems (XHEZ), joint systems (XHBN), and perimeter firestop systems (XHDG) listed in Volume 2 of the UL Fire Resistance Directory; provide products of the following manufacturers

as identified below:

1. Hilti, Inc., Tulsa, Oklahoma
   800-879-8000 / www.us.hilti.com

2.03 Materials:

A. Use only firestop products that have been UL 1479, ASTM E 814 or UL 2079 tested for specific fire-rated construction conditions conforming to construction assembly type, penetrating item type, annular space requirements, and fire-rating involved for each separate instance.

B. Pre-installed firestop devices for use with noncombustible and combustible pipes (closed and open systems), conduit, and/or cable bundles penetrating concrete floors and/or gypsum walls, the following products are acceptable:
   1. Hilti CP 680-P Cast-In Place Firestop Device
      a. Add Aerator adaptor when used in conjunction with aerator ("solvent") system.
   2. Hilti CP 681 Tub Box Kit for use with tub installations.
   3. Hilti CP 680-M Cast-In Place Firestop Device for use with noncombustible penetrants.
   4. Hilti CP 653 Speed Sleeve for use with cable penetrations.

C. Sealants, caulking materials, or foams for use with non-combustible items including steel pipe, copper pipe, rigid steel conduit and electrical metallic tubing (EMT), the following products are acceptable:
   1. Hilti FS-ONE Intumescent Firestop Sealant
   2. Hilti CP 604 Self-leveling Firestop Sealant
   3. Hilti CP 620 Fire Foam
   4. Hilti CP 606 Flexible Firestop Sealant
   5. Hilti CP 601s Elastomeric Firestop Sealant

D. Sealants or caulking materials for use with sheet metal ducts, the following products are acceptable:
   1. Hilti CP 601s Elastomeric Firestop Sealant
   2. Hilti CP 606 Flexible Firestop Sealant
   3. Hilti FS-ONE Intumescent Firestop Sealant

E. Sealants, caulking or spray materials for use with fire-rated construction joints and other gaps, the following products are acceptable:
   1. Hilti CP 672 Speed Spray
   2. Hilti CP 601s Elastomeric Firestop Sealant
   3. Hilti CP 606 Flexible Firestop Sealant
   4. Hilti CP 604 Self-leveling Firestop Sealant

F. Pre-formed mineral wool designed to fit flutes of metal profile deck and gap between top of wall and metal profile deck; as a backer for spray material.
   1. Hilti CP 777 Speed Plugs
   2. Hilti CP 767 Speed Strips

G. Intumescent sealants, caulking materials for use with combustible items (penetrants consumed by high heat and flame) including insulated metal pipe, PVC jacketed, flexible cable or cable bundles and plastic pipe, the following products are acceptable:
   1. Hilti FS-ONE Intumescent Firestop Sealant

H. Foams, intumescent sealants, or caulking materials for use with flexible cable or cable bundles, the following products are acceptable:
   1. Hilti FS-ONE Intumescent Firestop Sealant
   2. Hilti CP 620 Fire Foam
   3. Hilti CP 601s Elastomeric Firestop Sealant
   4. Hilti CP 606 Flexible Firestop Sealant

I. Non-curing, re-penetrable intumescent putty or foam materials for use with flexible cable or cable bundles, the following products are acceptable:
   1. Hilti CP 618 Firestop Putty Stick
   2. Hilti CP 658T Firestop Plug

J. Wall opening protective materials for use with U.L. listed metallic and specified nonmetallic outlet boxes, the following products are acceptable:
   1. Hilti CP 617 Firestop Putty Pad
   2. Hilti Firestop Box Insert

K. Firestop collar or wrap devices attached to assembly around combustible plastic pipe (closed and open piping systems), the following products are acceptable:
   1. Hilti CP 643N Firestop Collar
   2. Hilti CP 644 Firestop Collar
   3. Hilti CP 648E/CP648S Wrap Strips

L. Materials used for large openings and complex penetrations made to accommodate cable trays and bundles, multiple steel and copper pipes, electrical busways in raceways, the following products are acceptable:
   1. Hilti CP 637 Firestop Mortar
   3. Hilti FS 657 FIRE BLOCK
   4. Hilti CP 620 Fire Foam
   5. Hilti CP 675T Firestop Board

M. Non curing, re-penetrable materials used for large size/complex penetrations made to accommodate cable trays and bundles, multiple steel and copper pipes, electrical busways in raceways, the following products are acceptable:
   1. Hilti FS 657 FIRE BLOCK
   2. Hilti CP 675T Firestop Board

N. Sealants or caulking materials used for openings between structurally separate sections of wall and floors, the following products are acceptable:
   1. Hilti CP 672 Speed Spray
   2. Hilti CP 601s Elastomeric Firestop Sealant

3. Hilti CP 606 Flexible Firestop Sealant
4. Hilti CP 604 Self-Leveling Firestop Sealant

O. For blank openings made in fire-rated wall or floor assemblies, where future penetration of pipes, conduits, or cables is expected, the following products are acceptable:
1. Hilti FS 657 FIRE BLOCK
2. Hilti CP 658T Firestop Plug

P. Provide a firestop system with a "F" Rating as determined by UL 1479 or ASTM E814 which is equal to the time rating of construction being penetrated.

Q. Provide a firestop system with an Assembly Rating as determined by UL 2079 which is equal to the time rating of construction joint assembly.

Part 3 - Execution

3.01 Preparation:

A. Verification of Conditions: Examine areas and conditions under which work is to be performed and identify conditions detrimental to proper or timely completion.
1. Verify penetrations are properly sized and in suitable condition for application of materials.
2. Surfaces to which firestop materials will be applied shall be free of dirt, grease, oil, rust, laitance, release agents, water repellents, and any other substances that may affect proper adhesion.
3. Provide masking and temporary covering to prevent soiling of adjacent surfaces by firestopping materials.
4. Comply with manufacturer's recommendations for temperature and humidity conditions before, during and after installation of firestopping.
5. Do not proceed until unsatisfactory conditions have been corrected.

3.02 Coordination:

A. Coordinate location and proper selection of cast-in-place Firestop Devices with trade responsible for the work. Ensure device is installed before placement of concrete.

B. Responsible trades to provide adequate spacing of field run pipes to allow for installation of cast-in-place firestop devices without interferences.

3.03 Installation:

A. Regulatory Requirements: Install firestop materials in accordance with UL Fire Resistance Directory or Omega Point Laboratories Directory.

B. Manufacturer's Instructions: Comply with manufacturer's instructions for installation of through-penetration and construction joint materials.
1. Seal all holes or voids made by penetrations to ensure

an air and water resistant seal.

2. Consult with mechanical engineer, project manager, and damper manufacturer prior to installation of UL firestop systems that might hamper the performance of fire dampers as it pertains to duct work.
3. Protect materials from damage on surfaces subjected to traffic.

3.04 Field Quality Control:

A. Examine sealed penetration areas to ensure proper installation before concealing or enclosing areas.
B. Keep areas of work accessible until inspection by applicable code authorities.
C. Inspection of through-penetration firestopping shall be performed in accordance with ASTM E 2174, "Standard Practice for On-Site Inspection of Installed Fire Stops" or other recognized standard.
D. Perform under this section patching and repairing of firestopping caused by cutting or penetrating of existing firestop systems already installed by other trades.

3.05 Identification:

A. Identify through-penetration firestop systems with pressure-sensitive, self-adhesive, preprinted vinyl labels. Attach labels permanently to surfaces of penetrated construction on both sides of each firestop system installation where labels will be visible to anyone seeking to remove penetrating items or firestop systems. Include the following information on labels:
   1. The words: "Warning -Through Penetration Firestop System-Do Not Disturb. Notify Building Management of Any Damage."
   2. Contractor's Name, address, and phone number.
   3. Through-Penetration firestop system designation of applicable testing and inspecting agency.
   4. Date of Installation.
   5. Through-Penetration firestop system manufacturer's name.
   6. Installer's Name.

3.06 Adjusting and Cleaning:

A. Remove equipment, materials and debris, leaving area in undamaged, clean condition.
B. Clean all surfaces adjacent to sealed holes and joints to be free of excess firestop materials and soiling as work progresses.

End of Section

DIVISION 7 - THERMAL & MOISTURE PROTECTION

SECTION 07900 - SEALANTS

Part 1 - General

1.01 Work Included:
- A. All materials, labor services, and incidentals necessary for the completion of this section of the work.

1.02 Quality Assurance:
- A. Standards:
  - 1. TT-S-00230C, Sealing Compound, One Component.
  - 2. Testing Agency Qualifications: Qualified according to ASTM C 1021 to conduct the testing indicated.

1.03 Submittals:
- A. Submit manufacturer's specifications and color chart for each type of sealant.
- B. Samples: For each kind and color of joint sealant required.
- C. Joint-Sealant Schedule: Include the following information:
  - 1. Joint-sealant application, joint location, and designation.
  - 2. Joint-sealant manufacturer and product name.
  - 3. Joint-sealant formulation.
  - 4. Joint-sealant color.
- D. Product test reports.
- E. Preconstruction compatibility and adhesion test reports.
- F. Preconstruction field-adhesion test reports.
- G. Field-adhesion test reports.

1.04 Warranty:
- A. All work done under this section of the work shall be guaranteed for a period of two years from date of final acceptance of the building. Guarantee shall include materials and workmanship required to repair any leaks or the repairs thereof.
- B. Special Warranty: Manufacturer’s standard form in which joint sealant manufacturer agrees to furnish joint sealants to repair or replace those that do not comply with performance and other requirements specified in this Section for a period of 10 years from date of final acceptance.

1.05 **Products of certain manufacturers are specified herein to simplify descriptions of design, construction, and/or materials only. Proprietary names are not intended to imply that products of named manufacturer are required to the exclusion of equivalent products of other manufacturers.**

Part 2 - Products

2.01 Materials:
- A. Building Sealant: One part high performance polyurethane waterproofing sealant, FS-TT-S-00230C.
  - 1. Acceptable Manufacturer: Sonneborn NP1 Building Sealant.
  - 2. VOC Content of Interior Sealants: Sealants and sealant primers used inside the weatherproofing system shall

comply with the following limits for VOC content when calculated according to 40 CPR 59, Subpart D (EPA Method 24):
a Architectural Sealants: 250 gIL.
b. Sealant Primers for Nonporous Substrates: 250 gIL.
c. Sealant Primers for Porous Substrates: 775 gIL.

3. Liquid-Applied Joint Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied joint sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.
   a. Suitability for Immersion in Liquids. Where sealants are indicated for Use I for joints that will be continuously immersed in liquids, provide products that have undergone testing according to ASTM C 1247. Liquid used for testing sealants is deionized water, unless otherwise indicated.
4. Stain-Test-Response Characteristics: Where sealants are specified to be nonstaining to porous substrates, provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.
5. Suitability for Contact with Food: Where sealants are indicated for joints that will come in repeated contact with food, provide products that comply with 21 CPR 177.2600.

B. Silicone Joint Sealants:
1. Mildew-Resistant Neutral-Curing Silicone Joint Sealant: ASTM C 920.
   a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
      1. BASF Building Systems.
      2. Dow Corning Corporation.
      3. GE Advanced Materials - Silicones.
      4. Pecora Corporation.
      5. Sika Corporation; Construction Products Division.
      6. Tremco Incorporated.

C. Urethane Joint Sealants: Urethane Joint Sealant: ASTM C 920.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work

include, but are not limited to, the following:
a. BASF Building Systems.
b. Bostik, Inc.
c. Lymtal, International, Inc.
d. Pecora Corporation.
e. Sika Corporation; Construction Products Division.
f. Tremco Incorporated.

D. Latex Joint Sealants: Latex Joint Sealant: Acrylic latex or siliconized acrylic latex, ASTM C 834, Type OP, GradeNF.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
a. BASF Building Systems.
b. Bostik, Inc.
c. Pecora Corporation.
d. Tremco Incorporated.

E. Preformed Joint Sealants: Preformed Foam Joint Sealant: Manufacturer's standard preformed, precompressed, open-cell foam sealant manufactured from urethane foam with minimum density of 10 lb/cu. ft. and impregnated with a nondrying, water-repellent agent. Factory produce in precompressed sizes in roll or stick form to fit joint widths indicated; coated on one side with a pressure-sensitive adhesive and covered with protective wrapping.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
a. Dayton Superior Specialty Chemicals.
b. EM SEAL Joint Systems, Ltd.
c. Sandell Manufacturing Co.
d. Schul International, Inc.
e. Willseal USA, LLC.

F. Acoustical Joint Sealants: Acoustical Joint Sealant: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
a. Pecora Corporation.
b. USG Corporation.

G. Joint Sealant Backing: cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin) Type 0 (open-cell material) or any of the preceding types, as approved in writing by joint sealant manufacturer for joint application indicated, and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.
   1. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer.

H. Miscellaneous Materials: as recommended by sealant manufacturer.
   1. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.
   2. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials.
   3. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.
   4. Joint Cleaner
   5. Joint Primer/Sealer
   6. Bond Breaker Tape
   7. Joint Backer-Rod: Closed-cell compressible rod stock, size and shape as required by application.

I. Caulking compound: Watertight, gun consistency, conforming to FS-TT-C-598, Type 1.

J. Accessories: As recommended by sealant manufacturer.

K. Color: to be selected from manufacturer’s standard colors.

Part 3 - Execution

3.01 Preparation:

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions.
   1. Remove laitance and form-release agents from concrete.
   2. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants.

B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to

areas of joint sealant bond; do not allow spillage or migration onto adjoining surfaces.

C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.02 Installation: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated. Install sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.

A. Do not leave gaps between ends of sealant backings.

B. Do not stretch, twist, puncture, or tear sealant backings.

C. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.

D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.

E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:

1. Place sealants so they directly contact and fully wet joint substrates.
2. Completely fill recesses in each joint configuration.
3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.

1. Remove excess sealant from surfaces adjacent to joints.
2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
3. Provide concave joint profile per Figure 8A in ASTM C 1193, unless otherwise indicated.

G. Acoustical Sealant Installation: Comply with ASTM C 919 and with manufacturer's written recommendations.

H. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning

materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.03 Joint Sealant Schedule:

A. Joint-Sealant Application: Exterior joints in horizontal traffic surfaces.

B. Joint-Sealant Application: Exterior joints in vertical surfaces and horizontal nontraffic surfaces.

C. Joint-Sealant Application: Interior joints in horizontal traffic surfaces.

D. Joint-Sealant Application: Interior joints in vertical surfaces and horizontal non traffic surfaces.

E. Joint-Sealant Application: Mildew-resistant interior joints in vertical surfaces and horizontal non-traffic surfaces.

F. Joint-Sealant Application: Interior acoustical joints in vertical surfaces and horizontal non traffic surfaces.

3.04 Additional Information:

A. Application: All sight exposed caulking, and all exterior applications.

B. Comply with sealant manufacturer's printed instructions.

C. Any surfaces requiring priming, shall be prepared according to manufacturer's recommendations.

D. Install sealants to depths as shown or as recommended by sealant manufacturer. Smooth uneven surfaces.

F. Do not disturb compound by touching, washing, or otherwise until it has cured tack free.

G. Excess compound shall be removed from surfaces after curing.

H. Follow manufacturer's recommendations for painting over sealant.

End of Section

DIVISION 8 - DOORS & WINDOWS

SECTION 08100 - METAL DOORS AND FRAMES

Part 1 - General

1.01 Work Included:
- A. All material labor, services and incidentals necessary for the completion of this section of the work.

1.02 Related Work Specified Elsewhere:
- A. Hardware and Specialties - Section 08700

1.03 Quality Assurance:
- A. Standards:
  1. American Society for Testing and Materials
     - a. ASTM A-366, Steel Sheets, Carbon, Cold-Rolled, Commercial Quality.
     - b. ASTM A-569, Steel, Carbon, Hot-rolled Sheet and strip, commercial quality.
  2. Underwriters' Laboratories, Inc.
  3. Steel Door Institute (SDI): Recommended specifications for Steel Doors and Frames.
- B. Installer Qualifications: An employer of workers trained and approved by manufacturer.
- C. Source Limitations: Obtain standard steel doors and frames through one source from a single manufacturer.
- D. Fire-Rated Door Frame Assemblies: Assemblies complying with IBC 2009 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire protection ratings indicated.
  1. Test Pressure: Test according to NFPA 252. After 5 minutes into the test, the neutral pressure level in furnace shall be established at 40 inches (1000 mm) or less above the sill.
  2. Temperature-Rise Rating: At exit enclosures, provide doors that have a temperature-rise rating of 450 deg F (250 deg C) maximum in 30 minutes of fire exposure.
  3. Smoke-Control Door Assemblies: Comply with NFPA 105.

1.04 Submittals:
- A. Shop Drawings: Product Data: Include construction details, material descriptions, core descriptions, label compliance, and finishes for each type of steel door and frame specified.
  1. Submit shop Drawings showing details for each frame and door type, elevations and details of construction. Provide a schedule of doors and frames referenced to detail and openings as shown on the Drawings.
     - a. Elevations of each door design.
     - b. Details of doors, including vertical and horizontal edge details.
     - c. Frame details for each frame type, including dimensioned profiles.
     - d. Details and locations of reinforcement and

preparations for hardware.
e. Details of each different wall opening condition.
f. Details of anchorages, accessories, joints, and connections.
g. Details of glazing frames and stops showing glazing.
h. Details of conduit and preparations for electrified door hardware and controls.

2. It is the manufacturer's responsibility to obtain templates of finish hardware. The shop Drawings must indicate all hardware applications to the doors and frames.
3. Begin fabrication only after receiving approved shop Drawings.
4. Qualification Data: For Installer.

1.05 Product Delivery, Storage and Handling:

A. All materials shall be protected for shipping so that they may arrive at the job site without undue damage or damage from storage at the job.
B. Deliver doors and frames palletized, wrapped, or crated to provide protection during transit and Project-site storage. Do not use non-vented plastic.
C. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.
D. Store doors and frames under cover at Project site. Place units in a vertical position with heads up, spaced by blocking, on minimum 4-inch- high wood blocking. Avoid using non-vented plastic or canvas shelters that could create a humidity chamber.
1. If wrappers on doors become wet, remove cartons immediately. Provide minimum 114-inch space between each stacked door to permit air circulation.

1.06 Project Conditions:

A. Field Measurements: Verify openings by field measurements before fabrication and indicate measurements on Shop Drawings.
1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish opening dimensions and proceed with fabricating standard steel frames without field measurements. Coordinate wall construction to ensure that actual opening dimensions correspond to established dimensions.

1.07 Coordination:

A. Coordinate installation of anchorages for standard steel frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves,

concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in masonry. Deliver such items to Project site in time for installation.

1.08 Warranty: Provide manufacturer's standard warranty.

Part 2 - Products

2.01 Acceptable Manufacturers:

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. CURRIES Company; an ASSA ABLOY Group Company.
2. Steelkraft; and Ingersoll-Rand Company.
3. Or Approved Equal.

2.02 Materials:

A. Cold-Rolled Steel Sheet: ASTM A 100S/A 100SM, Commercial Steel (CS), Type B; suitable for exposed applications.

B. Hot-Rolled Steel Sheet: ASTM A 10111A 1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.

C. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with minimum A40 zinc-iron-alloy (galvannealed) coating designation.

D. Electrolytic Zinc-Coated Steel Sheet: ASTM A 5911A 59 1M, Commercial Steel (CS), Class B coating; mill phosphatized.

E. Supports and Anchors: After fabricating, galvanize units to be built into exterior walls according to ASTM A 153/A 153M, Class B.

F. Inserts, Bolts, and Fasteners: Provide items to be built into exterior walls, hot-dip galvanized according to ASTM A 153/A 153M.

G. Mineral-Fiber Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool with 6- to 12-lb/cu. ft. density; with maximum flame-spread and smoke-developed indexes of 25 and 50 respectively; passing ASTM E 136 for combustion characteristics.

H. Glazing: Comply with requirements in Division S Section "Glazing."

I. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for I5-mil dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

J. Grout: In masonry construction use grout for masonry as specified in Division 4. In stud walls use cementitious sprayed fire-resistive material manufactured by the following:

1. Monokote Type MK-6; W.R. Grace Construction Products.
2. Cafco 300; Isolatek International Corp.

2.03 Requirements: Provide doors of design indicated, not less than thickness indicated; fabricated with smooth surfaces, without visible joints or seams on exposed faces, unless otherwise indicated. Comply with ANSI A250.8.

A. Doors – Flush Panel: (SDI Door Type III, Style 2, Seamless):
   1. Door, as indicated on the Drawings shall be constructed of 16 gauge cold-rolled, stretcher leveled sheet steel. Doors shall be insulated with foamed urethane, full length and width of doors. Construct doors with smooth, flush surfaces without visible joints or seams on exposed face or vertical edges. Doors shall be 1-3/4" thick unless noted otherwise.
   2. Close top and bottom edges with a recessed channel end closure or a flush end closure treatment.
   3. Vertical Edges for Single-Acting Doors: Square edge unless beveled edge is indicated.
      a. Beveled Edge: 1/8 inch in 2 inches.
   4. Vertical Edges for Double-Acting Doors: Round vertical edges with 2-1/8-inch radius.
   5. Tolerances: Comply with SDI 117, "Manufacturing Tolerances for Standard Steel Doors and Frames."
   6. Provide weep-hole openings in bottom of exterior doors to permit moisture to escape. Seal joints in top edges of doors against water penetration.

B. Frames:
   1. Hollow metal frames shall be of 16 gauge cold-rolled, pickled steel, except that all frames for single doors over 3'-0" wide, frames for pairs of doors over 4'-0" wide and frames for doors over 9'-0" high shall be of 14 gauge steel. Frames shall be neatly mitered and continuously welded and ground smooth for invisible joints.
   2. Furnish anchors as shown on Drawings or as recommended by manufacturer, to secure frames to adjacent construction, formed of not less than 18 gauge galvanized steel. Install anchors at a maximum of 24' centers of jamb height.
   3. Frames against masonry or concrete are to be slush filled.
   4. Knock-down frames are not permitted.
   5. Frames against masonry or concrete are to be slush filled.
   6. Jamb Anchors:
      a. Masonry Type: Adjustable strap-and-stirrup or T - shaped anchors to suit frame size, not less than 0.042 inch thick, with corrugated or perforated

straps not less than 2 inches wide by 10 inches long; or wire anchors not less than 0.177 inch thick.

b. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.042 inch thick.

c. Floor Anchors: Formed from same material as frames, not less than 0.042 inch thick, and as follows:

1. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.

2. Separate Topping Concrete Slabs: Adjustable-type anchors with extension clips, allowing not less than 2-inch height adjustment. Terminate bottom of frames at finish floor surface. Fabricate concealed stiffeners and hardware reinforcement from either cold- or hot-rolled steel sheet.

d. Ceiling Struts: Minimum 3/8-inch-thick by 2-inch-wide steel.

e. Plaster Guards: Formed from same material as frames, not less than 0.016-inch thick.

7. Sidelight Frames: Provide closed tubular members with no visible face seams or joints; fabricated from same material as door frame. Fasten members at crossings and to jambs by butt welding.

C. Hardware Reinforcement:

1. Reinforcements for locks shall be 3/16" for fronts, with 14 gauge for roses and escutcheons. Hinge reinforcements shall be at least 10 gauge x 1 2" x 9". Provide steel strike and hinge reinforcement cover for frames.

D. Jamb Anchors: Provide number and spacing of anchors as follows:

1. Masonry Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:

a. Two anchors per jamb up to 60 inches in height.

b. Three anchors per jamb from 60 to 90 inches in height.

c. Four anchors per jamb from 90 to 120 inches in height.

d. Four anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof more than 120 inches in height.

2. Stud-Wall Type: Locate anchors not more than 18 inches

from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:

a. Three anchors per jamb up to 60 inches in height.
b. Four anchors per jamb from 60 to 90 inches in height.
c. Five anchors per jamb from 90 to 96 inches in height.
d. Five anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof more than 96 inches in height.
e. Two anchors per head for frames more than 42 inches wide and mounted in metal-stud partitions.

E. Door Silencers: Except on weather-stripped doors, drill stops to receive door silencers as follows. Provide plastic plugs to keep holes clear during construction.
1. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
2. Double-Door Frames: Drill stop in head jamb to receive two door silencers.

F. Stops and Moldings:
1. Moldings for Glazed Lites in Doors: Minimum 0.032 inch thick, fabricated from same material as door face sheet in which they are installed.
2. Fixed Frame Moldings: Formed integral with standard steel frames, minimum 5/8 inch high, unless otherwise indicated.
3. Loose Stops for Glazed Lites in Frames: Minimum 0.032 inch thick, fabricated from same material as frames in which they are installed.

G. Labeled Doors and Frames:
1. Where doors and frames are called for on Drawings as labeled, their construction shall conform to all requirements and bear the appropriate U.L. label.

H. Steel Finishes
1. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
a. Finish standard steel door and frames after assembly.
2. Metallic-Coated Steel Surface Preparation: Clean surfaces with nonpetroleum solvent so surfaces are free of oil and other contaminants. After cleaning, apply a conversion coating suited to the organic coating to be applied over it. Clean welds, mechanical connections, and abraded areas, and apply galvanizing repair paint specified below to comply with ASTM A 780.

a. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in steel, complying with SSPC-Paint 20.

3. Steel Surface Preparation: Clean surfaces to comply with SSPC-SP 1, "Solvent Cleaning"; remove dirt, oil, grease, or other contaminants that could impair paint bond. Remove mill scale and rust, if present, from uncoated steel; comply with SSPC-SP 3, "Power Tool Cleaning," or SSPC-SP *6/NACE* No.3, "Commercial Blast Cleaning."

4. Factory Priming for Field-Painted Finish: Apply shop primer specified below immediately after surface preparation and pretreatment. Apply a smooth coat of even consistency to provide a uniform dry film thickness of not less than 0.7 mils.

a. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with ANSI A250.10 acceptance criteria; recommended by primer manufacturer for substrate; compatible with substrate and field-applied finish paint system indicated; and providing a sound foundation for field-applied topcoats despite prolonged exposure.

Part 3 - Execution

3.01 Fabrication:

A. All doors, and frames shall be cleaned of rust, grease and other impurities, and all welds ground and filled smooth, Metallic filler to conceal defects is not acceptable.

B. Doors and frames shall be mortised, reinforced, drilled, and tapped for all mortise hardware in accordance with Hardware schedule and templates furnished by the hardware supplier, except that drilling and tapping for surface door closers, door closer brackets, surface panic devices and/or other surface applied hardware shall be done in the field. Frames shall be accurate and done in a neat, workmanlike manner.

3.02 Installation:

A. Standard Steel Frames: Install standard steel frames for doors sidelights borrowed lights and other openings, of size and profile indicated. Comply with SDI 105.

1. Bituminous coating and grout: Any material lost, removed or damaged during transportation or installation shall be replaced.

2. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary

braces, leaving surfaces smooth and undamaged.

a. At fire-protection-rated openings, install frames according to NFP A 80.
b. Install frames with removable glazing stops located on secure side of opening.
c. Install door silencers in frames before grouting.
d. Remove temporary braces necessary for installation only after frames have been properly set and secured.
e. Check plumb, squareness, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.

3. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor and secure with post-installed expansion anchors.
   a. Floor anchors may be set with powder-actuated fasteners instead of post installed expansion anchors if so indicated and approved on Shop Drawings.
4. Metal-Stud Partitions: Solidly pack mineral-fiber insulation behind frames.
5. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with mortar as specified in Division 4 Section "Unit Masonry Assemblies."
6. Ceiling Struts: Extend struts vertically from top of frame at each jamb to supporting construction above, unless frame is anchored to masonry or to other structural support at each jamb. Bend top of struts to provide flush contact for securing to supporting construction above. Provide adjustable wedged or bolted anchorage to frame jamb members.
7. Installation Tolerances: Adjust standard steel door frames for squareness, alignment, twist, and plumb to the following tolerances:
   a. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
   b. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
   c. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
   d. Plumbness: Plus or minus 1/16 inch, measured at jambs at floor.

B. Standard Steel Doors: Fit hollow-metal doors accurately in frames, within clearances specified below. Shim as necessary.
   1. Non-Fire-Rated Standard Steel Doors:
      a. Jambs and Head: 1/8 inch plus or minus 1/16 inch.
      b. Between Edges of Pairs of Doors: 1/8 inch plus or minus 1/16 inch.
      c. Between Bottom of Door and Top of Threshold: Maximum 3/8 inch.
      d. Between Bottom of Door and Top of Finish Floor (No Threshold): Maximum ¾ inch.
   2. Fire-Rated Doors: Install doors with clearances according to NFP A 80.
   3. Smoke-Control Doors: Install doors according to NFPA 105.

C. Glazing: Comply with installation requirements in Division 8 Section "Glazing" and with standard steel door and frame manufacturer's written instructions.

3.03 Adjusting and Cleaning:

A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including standard steel doors or frames that are warped, bowed, or otherwise unacceptable.

B. Clean grout and other bonding material off standard steel doors and frames immediately after installation.

C. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying primer.

D. Galvannealed Surfaces: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions. Do not use abrasive, caustic or acid cleaning agents.

E. Protect doors and frames from damage until final acceptance by Architect. Replace/repair any damaged items as directed above.

End of Section

SECTION 08200 - WOOD DOORS

Part 1 - General

1.01 Work Included:
- A. All materials, labor, services and incidentals necessary for the completion of this section of the work.

1.02 Related Work Specified Elsewhere:
- A. Finish Hardware - Section 08700

1.03 Quality Assurance:
- A. Standards:
  1. Architectural Woodwork Institute:
     a. Architectural Woodwork Quality Standards
  2. Underwriter's Laboratories, Inc.
- B. Manufacturer Qualifications: A qualified manufacturer that is certified for chain of custody by an FSC-Accredited certification body.
- C. Source Limitations: Obtain flush wood doors from single manufacturer.
- D. Quality Standard: In addition to requirements specified, comply with AWI's "Architectural Woodwork Quality Standards Illustrated."
- E. Fire-Rated Wood Doors: Doors complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at according to NFPA 252 and UL l0B.
  1. Oversize Fire-Rated Door Assemblies: For units exceeding sizes of tested assemblies, provide certification by a qualified testing agency that doors comply with standard construction requirements for tested and labeled fire-rated door assemblies except for size.
  2. Temperature-Rise Limit: At vertical exit enclosures and exit passageways, provide doors that have a maximum transmitted temperature end point of not more than 450 deg F above ambient after 30 minutes of standard fire-test exposure.
  3. Fire-Rated Doors must be provided with fire labels.

1.04 Submittals:
- A. Shop Drawings:
  1. It is the manufacturer's responsibility to obtain templates of finish hardware. The shop Drawings must indicate all hardware applications to the doors.
  2. Begin fabrication only after receiving approved ship Drawings.
  3. Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data; location and extent of hardware blocking; and other pertinent data.
  4. Samples for Initial Selection: Color charts consisting

of actual materials in small sections.

5. Samples for Verification:
   a. Factory finishes applied to actual door face materials, approximately 8 by 10 inches, for each material and finish. For each wood species and transparent finish, provide set of three samples showing typical range of color and grain to be expected in the finished work.
6. Frames for light openings, 6 inches long, for each material, type, and finish required.

1.05 Products Delivery, Storage and Handling:

A. When doors are delivered to job site, doors shall receive first coat of finish. Store in a protected area.
B. Comply with requirements of referenced standard and manufacturer's written instructions.
C. Package doors individually in cardboard cartons and wrap bundles of doors in plastic sheeting.
D. Mark each door on bottom rail with opening number used on Shop Drawings.

1.06 Warranty:

A. General Warranty: Door manufacturer's warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.
B. Door Manufacturer's Warranty: Submit written agreement on door manufacturer's standard form signed by manufacturer, Installer, and Contractor, agreeing to repair or replace defective doors that have warped (bow, cup, or twist) more than 1/4 inch in a 42-by-84-inch section or that show telegraphing of core construction in face veneers exceeding 0.01 inch in a 3-inch span, or do not comply with tolerance limitations in referenced quality standard.
   1. Warranty shall also include installation and finishing that may be required due to repair or replacement of defective doors.
   2. Warranty shall be in effect during the following period of time after date of Final Completion.
      a. Solid Core Interior Doors: Life of installation.

Part 2 - Products

2.01 Doors (non-labeled):

A. Doors shall be 1 3/4" thick interior grade, veneered, with a particleboard core. Construction shall meet AWI 1300 PC, "Custom" standard. Doors shall have I.S. "Premium" grade

faces - Plain Sliced Red Oak. Provide hardwood top, bottom, and side edges.

2.02 Doors (labeled):

A. Doors shall be 1 3/4" thick interior grade, veneered, with a mineral core (refer to Drawings for ratings. Construction shall meet AWI 1300 FD, "Custom" standard. Doors shall have I.S. "Premium grade faces - Plain Sliced Red Oak. Provide hardwood top, bottom, and side edges.

B. Where doors are called for on drawings as labeled their construction shall conform to all U.L. requirements and bear the appropriate U.L. label.

2.03 Acceptable Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Algoma Hardwoods, Inc.
2. Ampco, Inc.
3. Buell Door Company Inc.
4. Chappell Door Co.
5. Eagle Plywood & Door Manufacturing, Inc.
6. Eggers Industries.
7. Graham; an Assa Abloy Group company.
8. Haley Brothers, Inc.
9. Ideal Architectural Doors & Plywood.
10. Ipik Door Company.
11. Lambton Doors.
12. Marlite.
13. Marshfield Door Systems, Inc.
14. Mohawk Flush Doors, Inc.; a Masonite company.
15. Oshkosh Architectural Door Company.
16. Poncraft Door Company.
17. Vancouver Door Company.
18. VT Industries Inc.

2.04 Door Construction – General:

A. Particleboard-Core Doors:

1. Particleboard: ANSI A208.1, Grade 1L-l, made with binder containing no ureaformaldehyde resin.
2. Blocking - Provide wood blocking in particleboard-core doors as follows:
   a. 5-inch top-rail blocking, in doors indicated to have closers.
   b. 5-inch bottom-rail blocking, in exterior doors and doors indicated to have kick, mop, or armor plates.
3. Provide doors with structural-composite-lumber cores instead of particleboard cores for doors indicated to receive exit devices.

B. Fire-Protection-Rated Doors: Provide core specified or

mineral core as needed to provide fire protection rating indicated.

1. Edge Construction: Provide edge construction with intumescent seals concealed by outer stile. Comply with specified requirements for exposed edges.
2. Pairs: Provide fire-retardant stiles that are listed and labeled for applications indicated without formed-steel edges and astragals. Provide stiles with concealed intumescent seals. Comply with specified requirements for exposed edges.
3. Pairs: Provide formed-steel edges and astragals with intumescent seals.

C. Factory Finishing: Comply with referenced quality standard for factory finishing. Complete fabrication, including fitting doors for openings and machining for hardware that is not surface applied, before finishing.

1. Finish faces, all four edges, edges of cutouts, and mortises. Stains and fillers may be omitted on bottom edges, edges of cutouts, and mortises.
2. Finish doors at factory.
3. Finish doors at factory that are indicated to receive transparent finish. Field finish doors indicated to receive opaque finish.
4 Transparent Finish:
    1. Grade: Premium.
    2. Finish: WDMA TR-6 catalyzed polyurethane.
    3. Staining: Water-based stain with transparent ultraviolet cured catalyzed polyurethane. Color as selected by Architect from manufacturer's full range.
    4. Effect: Open-grain finish.
    5. Sheen: Semigloss.

Part 3 - Execution

3.01 Examination:

A. Examine doors and installed door frames before hanging doors.

1. Verify that frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.
2. Reject doors with defects.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 Installation:

A. Provide clean properly sized and accurately placed mortises

and drilled holes for all mortise and surface mounted finish hardware, in accordance with Hardware Schedule and templates furnished by the hardware supplier.

B. Comply with the tolerance requirements of AWI for prefitting. Install in accordance with the requirements of the NWMA Door Guarantee.

C. Repair or replace doors damaged during installation. Repair doors which do not swing or operate properly.

D. Hardware: For installation, see Division 08 Section "Door Hardware."

E. Installation Instructions: Install doors to comply with manufacturer's written instructions and the referenced quality standard, and as indicated.
   1. Install fire-rated doors in corresponding fire-rated frames according to NFPA 80.

F. Job-Fitted Doors: Align and fit doors in frames with uniform clearances and bevels as indicated below; do not trim stiles and rails in excess of limits set by manufacturer or permitted for fire-rated doors. Machine doors for hardware. Seal edges of doors, edges of cutouts, and mortises after fitting and machining.
   1. Clearances: Provide 1/8 inch at heads, jambs, and between pairs of doors. Provide l inch from bottom of door to top of decorative floor finish or covering unless otherwise indicated. Where threshold is shown or scheduled, provide 1/4 inch from bottom of door to top of threshold unless otherwise indicated.
      a. Comply with NFP A 80 for fire-rated doors.
   2. Bevel non-fire-rated doors 1/8 inch in 2 inches at lock and hinge edges.
   3. Bevel fire-rated doors 1/8 inch in 2 inches at lock edge; trim stiles and rails only to extent permitted by labeling agency.

G. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.

H. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

3.03 Adjusting:

A. Operation: Rehang or replace doors that do not swing or operate freely.

B. Finished Doors: Replace doors that are damaged or that do not comply with requirements. Doors may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing.

End of Section

SECTION 08310 - TORNADO DOORS

Part 1 - General

1.01 Work Included:
- A. All materials, labor, services and incidentals necessary for the completion of this section of the work.

1.02 System Description:
- A. Design Requirements - Tornado Doors:
  - 1. ICC 500-2020 Tornado Doors or current required edition.

1.03 Submittals:
- A. Shop Drawings: Indicate details and dimensions of fabrications and installation, including any operators and controllers.
- B. Manufacturer’s Literature: Descriptive literature and installation instructions.

1.04 Quality Assurance:
- A. Qualifications:
  - 1. Manufacturer Qualifications: Minimum five years of experience in producing doors of the type specified.
  - 2. Installer Qualifications: Manufacturer's approval.
  - 3. Doors shall have fire resistance rating as per the drawings.

1.05 Delivery Storage and Handling:
- A. Follow manufacturer's instructions.

1.06 **Products of certain manufacturers are specified herein to simplify descriptions of design, construction, and/or materials only. Proprietary names are not intended to imply that products of named manufacturer are required to the exclusion of equivalent products of other manufacturers.**

Part 2 - Products

2.01 General:
- A. Refer to Drawings for location, size, and details.

2.02 Tornado Door:
- A. Locations: provide where indicated on the drawings (Door #9 exterior).
- B. Acceptable Manufacturer:
  - 1. Manufacturer and model number:
    - a. Steelcraft - Ingersoll Rand Security Technologies / Paladin PW-Series Flush Doors and FP14 Frame.
    - b. Republic Doors and Frames, Inc. / DE Series - FEMA 361 Flush Doors.
    - c. Provide Underwriters Laboratories, Inc. label for the fire rating classification where applicable.

C. Materials:
1. Door Construction:
a. Face Skins: 14 gage A-60 Galvannealed Steel.
b. Hinge and Rail Reinforcement: hinge edge is non-beveled and reinforced with a continuous 10 gage steel channel projection welded at 5" on center maximum.
c. Top and Bottom Channels: inverted steel channel - 14 gage at top and 16 gage at bottom, welded at 2.5" on center maximum.
d. Core: steel stiffened (both doors) with filler as required to obtain applicable strength rating at Doors #9, 14, and 28.
e. Lock Rail: beveled and reinforced with continuous 14 gage steel channel welded at 5" on center maximum.
f. Closer Reinforcement: 14 gage.
g. Stiffeners: 18 gage, 4" wide spaces at 6" on center maximum and welded at 5" on center maximum vertically.
h. Top and Bottom Channels: 14 gage inverted steel channels with additional 12 gage flush channel.
2. Provide factory applied baked-on rust inhibiting primer in accordance with ANSI A250.10-1998.
3. Refer to Section 08700 Finish Hardware for additional information concerning hardware for these doors and frames. **The hardware specified below and in Section 08700 Finish Hardware are to be supplied by the same supplier / Subcontractor.**

2.03 Hardware:

A. Provide hardware as per the following:

Hardware Group No. T1 - Door #9: Provide each PR exterior tornado door(s) with the following:

Quantity		Description	Model Number	Finish	Mfr
2	EA	CONTINUOUS HINGE	224HD HEIGHT AS REQUIRED	628	IVE
1	EA	MULLION	KR4954 HEIGHT AS REQUIRED	689	VON
2	EA	FIRE EXIT HARDWARE	WS9827/9927L 996L-R/V LENGTH AS REQUIRED	626	VON
2	EA	RIM CYLINDER	20-057 ICX	626	SCH
1	EA	MORTISE CYLINDER	20-061 ICX	626	SCH
3	EA	CLASSIC CORE	23-030	626	SCH
2	EA	SURFACE CLOSER	4041 OR P4041 MTG BRKTS,		

			SPCRS & PLATES AS REQ	689	LCN
2	EA	FLOOR STOP	WS407CCV OR FS436 AS REQ'D	628	IVE
1	SET	SEALS	5050B H & J	BLK	NGP
1	EA	DOOR SWEEP	101VA LGTH AS REQ'D.	AL	NGP
1	EA	THRESHOLD	892V LGTH AS REQ'D.	AL	NGP

SUPPLIER TO VERIFY HARDWARE SPECIFIED AND REVISE AS NECESSARY TO MEET THE REQUIREMENTS OF ICC 500-2018.

Part 3 - Execution

3.01 Installation:

A. Verify that openings are prepared with headers level, jambs plumb, floor level, without projections, etc. and are correctly dimensioned to receive doors.

B. Install in compliance with manufacturer's instruction. Hang straight, plumb and level, and adjust for smooth, quiet operation.

1. At tornado doors, comply with FEMA Regulations and follow manufacturer's instructions. **Provide complete assembly to meet FEMA 361 and other applicable codes.**

C. Supplier / Subcontractor shall supply **ALL** cores and cylinders as specified and/or required by Moore Public Schools' Hardware Department keying system. Coordinate keying of new hardware with the Owner's representative.

D. Prior to final acceptance of the project, inspect all work done under this section, and make all necessary adjustments, repairs or replacements of defective work.

End of Section

SECTION 08330 – TORNADO RESISTANT COILING DOORS

PART 1 GENERAL

1.01 GENERAL REQUIREMENTS

A. Provide all materials, labor, equipment and services necessary to furnish, deliver and install all work under this section as shown on the contract documents, specified herein, and as specified by the job conditions.

1.02 DESCRIPTION

A. Related work specified elsewhere:
   1. Metal Fabrication. Section 05500
   2. Rough Carpentry. Section 06100
   3. Painting: Section 09900
   4. Electrical: Division 26

1.03 SUBMITTALS

A. Procedures: Furnish submittals in accordance with the general requirements specified.
B. Shop Drawing: Furnish shop drawings for architect's approval. Include elevations, sections, and details indicating dimensions, materials, finishes, conditions for anchorage and support of each coiling door.
C. Listings and Certifications:
   1. Listed, labeled and certified by an IAS accredited nationally recognized testing laboratory for product compliance with FEMA 361 Safe Rooms for Tornadoes and Hurricanes.
   2. Listed, labeled and certified by an IAS accredited nationally recognized testing laboratory to ICC 500-2020 Standard for Design and Construction of Storm Shelters.
   3. Listed, labeled and certified by an IAS accredited nationally recognized testing laboratory for a wind pressure rating of 302psf (1.2 times the design wind pressure of 252psf) in accordance with ASTM E330.
   4. Listed, labeled and certified by an IAS accredited nationally recognized testing laboratory for Large Missile Impact rating in accordance with the requirements of ASTM E1886 for FEMA 361 Safe Rooms for Tornadoes and Hurricanes.
D. Product Literature: Submit manufacturer's technical literature describing the product to be used under this section.
E. Maintenance and Operating Manuals: Furnish complete manuals describing the materials, devices and procedures to be followed in operating and maintaining all tornado and hurricane resistant coiling doors under this section. Include manufacturer's

brochures and parts lists describing the actual materials used in the product.

1.04 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with applicable FEMA requirements as well as laws, codes, ordinances and regulations of federal, state and municipal authorities having jurisdiction.
B. Manufacturer Requirements: Manufacturer shall have been in the business of and have experience in manufacturing wide span opening protective door assemblies as well as providing dependable credible service for a minimum of ten (10) years.
C. Operational Cycle Life: Tornado and hurricane resistant coiling doors shall be designed and constructed for a minimum 10,000 operating cycles for the life of the door assembly. Cycles shall be verifiable by a non-resettable cycle counter located within the door’s motor operator control panel.

1.05 DELIVERY, STORAGE AND HANDLING

A. General: Deliver and store materials in manufacturer's original packaging, labeled to show name, brand and type. Store materials in a protected dry location off the ground in accordance with manufacturer's instructions.

1.06 WARRANTY

A. Tornado and Hurricane Resistant Coiling Door Warranty: Provide Two (2) Year, 10,000 Cycle Warranty signed by the manufacturer and installer agreeing to repair or replace work which has failed as a result of defects in materials or workmanship. Upon notification within the warranty period, such defects shall be repaired at no cost to the owner.

PART 2 PRODUCTS

2.01 TORNADO AND HURRICANE RESISTANT COILING DOORS

A. Manufacturer: Tornado and hurricane resistant coiling doors shall be the model SafeSpace™ SS500X-PC as manufactured by McKEON. Assembly shall be tested, listed and labeled by an IAS accredited nationally recognized testing laboratory, approved for use in FEMA 361 and ICC 500-2020 safe rooms and storm shelters.

SECTION 08330 – TORNADO RESISTANT COILING DOORS

2.02 MATERIALS

A. Curtain: Shall be assembled of light weight extruded alloy interlocking slats. Curtain shall be formed of EX slat profile sections of gauge thickness as required to sustain the minimum required design wind pressure.
   1. Slat cross section shall not be less than 3" wide by 1-1/8" deep.
B. Bottom Bar: Shall consist of a double 3" x 3" structural steel angle assembly formed to fit and engage the curtain assembly.
C. Guides: Each guide assembly shall be fabricated of structural steel support angles no greater than 4" x 4" and guide retaining angles of a minimum 6" depth to retain curtain in the guides under the design wind pressure and impact forces specified.
D. Mounting Brackets: Fabricated of hot rolled 3/16" minimum steel plates, brackets shall be provided to house ends of the counterbalance barrel assembly.
E. Hood: Shall be provided to entirely enclose coiled curtain and counterbalance barrel assembly. Hood shall be fabricated of a minimum 22 gauge G90 galvanized steel, designed and formed to match brackets. Top and bottom shall be bent and reinforced to provide for proper stiffness.
F. Counterbalance Assembly: Coiling door shall be counterbalanced by means of adjustable steel helical torsion springs attached to shaft enclosed in pipe with required mounting blocks or rings for attachment of curtain. Grease sealed bearings or self-lubricating graphite bearings shall be attached to the spring barrel which shall be fabricated of hot formed structural quality carbon steel seamless pipe.
G. Electric Motor Operator: Door shall be provided with a compact power unit designed and laboratory listed by the door manufacturer. Operator shall be equipped with an adjustable screw-type limit switch to break the circuit at termination of travel. High efficiency planetary gearing running in an oil bath, shall be furnished together with a centrifugal governor, magnetic operated brake and a fail-safe magnetic release device, completely housed to protect against damage, dust and moisture. An efficient overload protection device, which will break the power circuit and protect against damage to the motor windings shall be integral with the unit. Operator is to be housed in a NEMA type 1 enclosure.
   a. Motor: Shall be intermediate duty, thermally protected, ball bearing type with a class A or better insulation. Horsepower of motor is to be 1/2hp minimum or of manufacturer's recommended size, whichever is greater.

b. Starter: Shall be size "0" magnetic reversing starter, across the line type with mechanical and electrical interlocks, with 10 amp continuous rating and 24 volt control circuit.
c. Reducer: Planetary gear type, 80% efficiency minimum.
d. Cycle Counter: Non-resettable operational cycle counter.

H. NFS Operation: The operating system shall prevent the tornado and hurricane storm door from closing during building power interruption to the motor operator for a period of up to six hours. Once the NFS cycle lapses, the door shall self-close at a controlled governed rate of closure not greater than 6" per second.

I. Control Stations: Each tornado and hurricane storm door shall be provided with three position push button control station marked open, close and stop that is active during normal and alarm conditions. The control station shall remain operable as long as there is no main power failure to the motor operator.

J. Master Control Station: Provide a single master control station that can simultaneously activate all of the tornado and hurricane storm doors in the facility to the emergency closed or open positions. The master control station shall remain operable as long as there is no main power failure to the door's motor operators.

K. Emergency Alarm Activation: With or without main power to the motor operator, upon activation by the facility's alarm system the hurricane and tornado storm door shall immediately self-close to the fully closed position. Once the emergency alarm condition has been cleared and main power has been restored, the door shall automatically power itself back to the fully open position.

L. Emergency Manual Operation: The door assembly shall be equipped with an emergency hand chain that shall remain operable during an emergency alarm condition. The emergency hand chain shall also remain operable during main power failure lasting up to six hours, after the six hours have lapsed, the door assembly shall automatically self-close and remain in the closed position until main power has been restored to the motor operator. The hold open sequence of the emergency manual operation mode shall be programable so that during an emergency alarm condition or main power failure, not exceeding six hours, the door assembly shall remain open for a period of five to thirty minutes after the hand chain has opened the door and before the door assembly begins to automatically self-close again.

M. Obstruction Sensing Safety Edge: The obstruction sensing safety edge shall be programable to either stop or reverse upon coming in contact with an obstruction during the close cycle of the

door. The obstruction sensing safety edge shall remain active and operable as long as there is no main power failure to the motor operator. During main power failure, if the obstruction sensing safety edge comes in contact with an obstruction during the self-closing mode, the door shall stop and remain in contact with the obstruction until it is removed and the door can continue to the fully closed position.

N. True Test Panel: Tornado and hurricane storm doors shall be provided with a True Test panel. The test panel shall be designed so that it simulates an actual emergency alarm condition and activates all of the doors to self-close to the fully closed position. Once all of the doors have satisfactorily closed and the test panel has been reset, all of the doors shall automatically power themselves back to the fully open and alarm ready reset condition. Only one test panel shall be required to test all the tornado and hurricane storm doors on this project simultaneously.
O. Finish: After completion of fabrication, clean all metal surfaces to remove dirt and chemically treat to provide for powder coat adhesion. Provide powder coat finish of color as selected by architect from manufacturer's standard RAL powder coat selection chart.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine surfaces and field conditions to which this work is to be performed and notify architect if conditions of surfaces exist which are detrimental to proper installation and timely completion of work.
B. Verify all dimensions taken at job site affecting the work. Notify the architect in any instance where dimensions vary.
C. Coordinate and schedule work under this section with work of other sections so as not to delay job progress.

3.02 INSTALLATION

A. Perform installation using only factory approved and certified representatives of the coiling door manufacturer.
B. Install coiling door assemblies at locations shown in perfect alignment and elevation, plumb, level, straight and true.
C. Adjust coiling door installation to provide uniform clearances and smooth non-binding operation.
D. Install wiring in accordance with applicable local codes and the National Electrical Code Standard. Materials shall be UL listed.

3.03 PROTECTION AND CLEANING

A. Protect installed work using adequate and suitable means during and after installation until accepted by owner.
B. Remove, repair or replace materials which have been damaged in any way.
C. Clean surfaces of grime and dirt using acceptable and recommended means and methods.

End of Section

DIVISION 8 - DOORS AND WINDOWS

SECTION 08400 - ENTRANCES AND STOREFRONTS

PART 1 - General

1.01 Work Included:
- A. All materials, labor, services, and incidentals necessary for the completion of all work as shown on the Drawings and specified herein.
- B. All necessary anchors and accessories required for the complete installation of the Storefront units.
- C. Perimeter Sealant.

1.02 Related Work Specified Elsewhere:
- A. Sealants - Section 07900.
- B. Hardware and Specialties - Section 08700.
- C. Glazing - Section 08800.

1.03 Performance And Testing Requirements:
- A. Provision for Thermal Movements:
  1. Storefront framing systems shall be designed to provide for thermal movement of all component materials resulting from a cycling temperature range of 180E F. without causing buckling, stresses on glass, failure of joint seals, undue stress on structural elements, damaging loads on fasteners, reduction of performance, or other detrimental effects. Operating windows and doors shall function normally over this temperature range.
- B. Test Procedures and Performance:
  1. Air Infiltration Test, Fixed Unit:
     a. Test Fixed Unit in accordance with ASTM E 283 at static air pressure difference of 6.24 psf.
     b. Air infiltration shall not exceed .06 cfm per square foot of fixed wall area.
  2. Air Infiltration Test, Doors:
     a. Test Doors in accordance with ASTM E 283 at static air pressure difference of 1.57 psf.
     b. Air infiltration shall not exceed .10 cfm per foot of perimeter crack length for pair of doors.
  3. Water Resistance Test:
     a. Test unit in accordance with ASTM E 331.
     b. There shall be no uncontrollable water leakage at a static test pressure of 6.24 psf. (12.00 psf at doors)
  4. Uniform Load Deflection Test:
     a. Test in accordance with ASTM E 330.
     b. Design and size members to withstand dead laods and live loads caused by pressure and suction of wind as calculated in accordance with 2009 International Building Code.

c. Deflection under design load shall not exceed L/175 of the clear span.

5. Uniform Load Structural Test:
   a. Test in accordance with ASTM 330 at a pressure 1.5 times the design wind pressure in 1.03.3.b.
   b. At conclusion of the test, there shall be no glass breakage, permanent damage to fasteners, storefront parts, or any other damage which would cause the storefront to be defective.
6. Condensation Resistance Test (CRF):
   a. Test unit in accordance with ASTM 1502.7.
   b. Condensation Resistance Factor (CRF) shall be not less than 70.
7. Thermal Transmittance Test (Conductive U Value):
   a. Test in accordance with ASTM 1503.1.
   b. Conductive thermal transmittance (U Value) shall be not more than .44 BTU/HR/degree F/sf. Unless otherwise specified, units tested for condensation resistance and thermal transmittance shall be glazed with no more than two lites of clear, uncoated, annealed glass. Sealed insulating glass shall be of standard construction.

1.04 Quality Assurance:

A. Provide test reports from AAMA accredited laboratories certifying the performance as specified in 1.05.

B. Test reports shall be accompanied by the storefront manufacturer=s letter of certification stating that the tested storefront meets or exceeds the referenced criteria for the appropriate storefront type.

1.05 Submittals:

A. Contractor shall submit shop drawings to the Architect for his approval. Drawings shall show scale elevations and sections. Full size sections shall be shown only when needed for clarity. Drawings shall show construction of all parts of the work, including metal and glass thickness, methods of joining, details of all field connections and anchorage, fastening and sealing methods, metal finishes and all pertinent information. Relationship to other work should be clearly indicated. No work shall be fabricated until shop drawings for that work have been finally approved for fabrication.

1.06 Delivery, Storage And Handling:

A. Deliver, handle, store and protect system components in accordance with manufacturer's instructions.

B. After erection, the Contractor shall adequately protect all

exposed portions of the grid framing metal work from damage by grinding and polishing machines, plaster, lime, acid, cement, or other harmful compounds.

C. Immediately prior to final acceptance of building, inspect all aluminum framing for weather tightness and make all necessary repairs and adjustment.

1.07 Warranties:

A. Total Storefront System

1. The responsible contractor shall assume full responsibility and warrant for one year the satisfactory performance of the total storefront installation. This includes the framing, glass (including insulated units), glazing, anchorage and setting system, sealing, flashing, etc. as it relates to air, water and structural adequacy as called for in the specifications and approved shop drawings. A manufacturer's material warranty shall be provided for a minimum of 5 years from substantial completion.

2. Any deficiencies due to such elements not meeting the specifications shall be corrected by the responsible contractor during the warranty period.

1.08 **Products of certain manufacturers are specified herein to simplify descriptions of design, construction, and/or materials only. Proprietary names are not intended to imply that products of named manufacturer are required to the exclusion of equivalent products of other manufacturers**.

PART 2 - PRODUCTS

2.01 Entrance and Storefront System:

A. EFCO Corporation S-403 Wall Thermal Storefront System, with Series D318 DuraStyle Wide Style aluminum entrance doors.

B. Kynar 500 – color to be selected by Architect from manufacturer's standard colors / refer to Room Finish Schedule.

2.02 Material:

A. Aluminum:

1. Extruded aluminum shall be 6063-T5 or T6 alloy and temper.

B. Glass:

1. Glass for Fixed Units shall be according to Glazing Schedule.
   Glass for Entrance Doors shall be 1 inch insulated tempered glass units factory glazed.

C. Thermal Barrier:

1. The thermal barrier shall be internally connected and

locked celcon insulator clips.

D. Dissimilar Metals:
   1. All dissimilar metals must be properly insulated to prevent galvanic action.

E. Fasteners:
   1. All exposed fasteners shall be aluminum or stainless steel.

2.03 Fabrication - Fixed Units:

A. General:
   1. All aluminum frame extrusions shall have a minimum wall thickness of .180 inches.
   2. All exposed work shall be carefully matched to produce continuity of line and design with all joints. System design shall be such that raw edges will not be visible at joints.

B. Frames - for 1" glazing:
   1. Depth of frame shall not be less than 4 inches.
   2. Face dimension shall not be less than 2 inches
   3. Covers shall connect to frame back members with internally connected and locked celcon insulator clips.
   4. Frame components shall be screw spline construction.

C. Glazing
   1. All units shall be "dry" glazed with E. P. D. M. gasket on both exterior and interior.

2.04 Fabrication - Entrance Doors:

A. General:
   1. Major portions of the door sections shall have .188" wall thickness.
   2. Glazing stop sections shall have .050" wall thickness.

B. Entrance Doors:
   1. Door stiles shall be no less than 5" wide (not including glass stops).
   2. Door stiles and rails shall have hairline joints at corners. Heavy concealed reinforcement brackets shall be secured with screws and shall be deep penetration and fillet welded.
   3. All doors shall have an adjusting mechanism in the top rail to provide for minor clearance adjustments.
   4. Weather-stripping shall be wool pile and shall be installed and shall be installed in one stile of pairs of doors and in jamb stiles of center pivoted doors.
   5. Door stops shall include wool pile weather-stripping.

C. Glazing:
   1. All units shall be dry glazed with extruded pressure fitting aluminum glazing stops, and E.P.D.M. gasket.

Glazing shall be as per Glazing Schedule, Sheet A601.

D. Door Frame:
   1. Depth of frame shall not be less than 4".
   2. Face dimension shall not be less than 2".
   3. Shear block construction shall be utilized through out. System design shall be such that raw edges will not be visible at joints.

2.05 Finish:
   A. Kynar 500 – color to be selected by Architect from manufacturer's standard colors / refer to Room Finish Schedule.

PART 3 EXECUTION

3.01 Inspection:
   A. Job Conditions:
      1. All openings shall be prepared to the proper size and shall be plumb, level and in the proper location and alignment as shown on the Drawings.

3.02 Installation:
   A. Use only skilled tradesmen with work done in accordance with approved shop drawings and specifications.
   B. Storefront system shall be erected plumb and true, in proper alignment and relation to established lines and grades.
   C. Entrance doors shall be securely anchored in place to a straight, plumb and level condition, without distortion. Weather-stripping contact and hardware movement shall be checked and final adjustment made for proper operation and performance of units.
   D. Furnish and apply sealing materials to provide a weather tight installation at all joints and intersections and at opening perimeters.
   E. Sealing materials specified shall be used in strict accordance with the manufacturer>s printed instructions and shall be applied only by mechanics specially trained of experienced in their use. All surfaces must be clean and free of foreign matter before applying sealing materials. Sealing compounds shall be tooled to fill the joint and provide a smooth finished surface.

3.03 Anchorage:
   A. Adequately anchor to maintain positions permanently when subjected to normal thermal movement, specified building movement, and specified wind loads.

SECTION 08400 - ENTRANCES AND STOREFRONTS

3.04 Protection and Cleaning:

A. The general contractor shall protect the aluminum materials and finish against damage from construction activities and harmful substances. The contractor shall remove any protective coatings as directed by the Architect and shall clean the aluminum surfaces as recommended for the type of finish applied.

End of Section

SECTION 08700 - FINISH HARDWARE

Part 1 - General

1.01 Work Included:
- A. All materials, labor services and incidentals necessary for the completion of this section of the work.

1.02 Related Work Specified Elsewhere:
- A. Finish Carpentry - Section 06200
- B. Custom Casework - Section 06410
- C. Metal Doors and Frames - Section 08100
- D. Wood Doors - Section 08200
- E. Entrances and Storefronts – Section 08400

1.03 Quality Assurance:
- A. This material shall be procured from a source of supply approved by the Architect as having a member of their firm registered by the American Society of Contracting Architectural Hardware Consultants, and with a proven record of several years of satisfactory experience in contract builder's hardware, both in furnishing material and properly servicing jobs. The supplier also must be an established contract builder's hardware firm who meets all the above requirements, and who maintains and operates an office, display room and stock.

1.04 Submittals:
- A. Prepare a complete schedule including all items processed for each opening and other miscellaneous item and submit four copies to the Architect for approval within 30 days submitted within that time, the supplier shall furnish the hardware specified by catalog number.
- B. Indicate on schedule name of manufacturer after each item.
- C. Upon receiving the approved schedule, the hardware supplier shall immediately forward a copy to the metal frame suppliers, when applicable; and as soon as they receive approved shop drawings, they will immediately forward a complete set to the hardware supplier who can then check the applications and make any necessary minor revisions. If revisions are necessary, notify Architect immediately.
- D. Mark each item of hardware for opening on which it is to be used and deliver a complete schedule to the contractor when hardware is delivered.

1.05 Schedule:
- A. This specification describes the quality, character and function that is required of items of hardware; however, it is not intended to mention each particular item.
- B. It is the responsibility of the supplier to thoroughly detail the entire project to assure that the items specified will properly function in the indicated locations.
- C. Quantities shall be determined by the bidder. Part 2, following, indicates the type and function of material applicable to the typical opening. Should an unlisted opening require different type of function of hardware than that specified, for similar opening, notify the Architect, and provide hardware for unlisted openings within the bid.

SECTION 08700 - FINISH HARDWARE

Part 2 - Products

2.01 Finish Hardware:

A. Standards of Quality:

1. Codes, specifications and published recommendations, latest editions of the following are hereby made part of this section of the specifications in so far as they apply to the material or work called for.
   a. National Builders Hardware Association (NBHA)
   b. American Society for Testing Materials (ASTM)
   c. Underwriters Laboratories (UL)
   d. National Fire Protection Association (NFPA)
   e. Code of Ethics of ASAHC & NBHA
   f. Federal Emergency Management Agency (FEMA)
2. Federal Specification, (ANSI Specifications):
   a. Hinges: FF-H-116C (ANSI A156.1)
   b. Locks and Door Trim: FF-H-106A (ANSI A 156.2)
   c. Auxiliary Locks: FF-H-106A (ANSI A 156.5)
   d. Exit Devices: FF-H-106A, FF-H-111B, FF-L486 (ANSI A156.3).
   e. Door Closers: FF-H-121C (ANSI A 156.4)
   f. Shelf and Miscellaneous Hardware: FF-H-00116 (ANSI A156.6).
   g. All Door hardware: Comply with ADAAG where applicable.

B. General:

1. All hardware relating to hollow metal doors and frames shall be to standard templates of each respective hardware manufacturer for items furnished.
   a. The related suppliers such as hollow metal doors and frames and such others as may be required will furnish the hardware supplier one copy of each of their approved shop drawings for proper coordination of their work and the finish hardware.

C. Manufacturers and Requirements:

1. Hardware manufacturers and brand names are for a guide as to type and standard required and all such hardware furnished must meet these standards as far as quality, weight, finish and design.

D. Keying:

1. All locks and cylinders to be masterkeyed as directed by the Architect/Owner. Supplier / Subcontractor shall be responsible for providing ALL materials for a complete and properly functioning installation.
2. Keys: Furnish the following keys:
   a. 2 change keys each lock or cylinder
   b. 6 masterkeys
   c. all EXTERIOR locks and cylinders shall be Primus Schlage Key System and keyed to Owner's Primus Master Key system. All remaining interior locks and cylinders shall be Classic Schlage and keyed to the Owner's Primus Master Key System.

SECTION 08700 - FINISH HARDWARE

2.02 Hardware Sets:

Hardware Group No. 001: Provide each PR door(s) with the following:

Quantity		Description	Model Number	Finish	Mfr
2	EA	PIVOT SET	7215	626	IVE
2	EA	PIVOT	7215 INT	626	IVE
1	EA	MULLION	KR4954 HEIGHT AS REQUIRED	689	VON
1	EA	PANIC HARDWARE	QEL99EO LENGTH AS REQUIRED	626	VON
1	EA	PANIC HARDWARE	CD99NL-OP LENGTH AS REQUIRED	626	VON
1	EA	RIM CYLINDER	20-057 ICX	626	SCH
3	EA	MORTISE CYLINDER	20-061 ICX	626	SCH
4	EA	PRIMUS CORE ONLY	20-740	626	SCH
2	EA	OFFSET DOOR PULL	8190-0-O	630	IVE
2	EA	SURFACE CLOSER	4041 SCUSH MTG BRKTS, SPCRS & PLATES AS REQ	689	LCN
2	EA	DOOR SWEEP	C627A LENGTH AS REQUIRED	AL	NGP
1	EA	THRESHOLD	896V LENGTH AS REQUIRED	AL	NGP
1	MEETING STYLE SEAL BY DOOR MANUFACTURER				
1	PERIMETER SEAL BY DOOR MANUFACTURER				
	REFER TO ELECTRICAL FOR ACCESS, CARD READER, ETC. INFORMATION.				

Hardware Group No. 002: Provide each SGL door – 3 total in the same frame - with the following:

Quantity		Description	Model Number	Finish	Mfr
1	EA	PIVOT SET	7215	626	IVE
1	EA	PIVOT	7215 INT	626	IVE
1	EA	PANIC HARDWARE	CD99NL-OP LENGTH AS REQUIRED	626	VON
1	EA	RIM CYLINDER	20-057 ICX	626	SCH
1	EA	MORTISE CYLINDER	20-061 ICX	626	SCH
2	EA	PRIMUS CORE ONLY	20-740	626	SCH
1	EA	OFFSET DOOR PULL	8190-0-O	630	IVE
1	EA	SURFACE CLOSER	4041 SCUSH MTG BRKTS, SPCRS & PLATES AS REQ	689	LCN
1	MEETING STYLE SEAL BY DOOR MANUFACTURER				
1	PERIMETER SEAL BY DOOR MANUFACTURER				
	REFER TO ELECTRICAL FOR ACCESS, CARD READER, ETC. INFORMATION.				

Hardware Group No. 003: Provide each SGL door(s) with the following:

Quantity		Description	Model Number	Finish	Mfr
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	STOREROOM LOCK	L9080T 03N	626	SCH
1	EA	CLASSIC CORE	23-030	626	SCH
1	EA	SURFACE CLOSER	4041 OR P4041 MTG BRKTS, SPCRS & PLATES AS REQ	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	EA	STOP	WS407CCV OR FS436 AS REQUIRED	628	IVE
1	SET	SEALS	5050BR H & J (USE SILENCERS @ NON-RATED DOORS)	CLR	NGP

SECTION 08700 - FINISH HARDWARE

Hardware Group No. 004: Provide each SGL door with the following:

Quantity		Description	Model Number	Finish	Mfr
2	EA	PIVOT SET	7215	626	IVE
2	EA	PIVOT	7215 INT	626	IVE
2	EA	DUMMY TOUCH BAR	330 LENGTH AS REQ'D	630	IVE
2	EA	OFFSET DOOR PULL	8190-0-O	630	IVE
2	EA	SURFACE CLOSER	4041 SCUSH MTG BRKTS, SPCRS & PLATES AS REQ	689	LCN

Hardware Group No. 005: Provide each SGL door with the following:

Quantity		Description	Model Number	Finish	Mfr
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	STOREROOM LOCK	L9466T 03N	626	SCH
1	EA	CLASSIC CORE	23-030	626	SCH
1	EA	STOP	WS407CCV OR FS436 AS REQUIRED	628	IVE
1	SET	SEALS	5050BR H & J (USE SILENCERS @ NON-RATED DOORS)	CLR	NGP

Hardware Group No. 006: Provide each SGL door – 3 total in the same frame with the following:

Quantity		Description	Model Number	Finish	Mfr
1	EA	PIVOT SET	7215	626	IVE
1	EA	PIVOT	7215 INT	626	IVE
1	EA	DUMMY TOUCH BAR	330 LENGTH AS REQ'D	630	IVE
1	EA	OFFSET DOOR PULL	8190-0-O	630	IVE
1	EA	SURFACE CLOSER	4041 SCUSH MTG BRKTS, SPCRS & PLATES AS REQ	689	LCN

Hardware Group No. 007: Provide each PR door(s) with the following:

Quantity		Description	Model Number	Finish	Mfr
6	EA	HINGE	5BB1HW 4.5 X 4.5	652	IVE
1	SET	AUTO FLUSH BOLT	FB31P OR FB41P AS REQUIRED	630	IVE
1	EA	COORDINATOR	COR X FL X MTG BRKTS X HW PREPS X LENGTH AS REQ	628	IVE
1	SET	ASTRAGAL	9605A HEIGHT AS REQ	AL	NGP
2	EA	FIRE EXIT HARDWARE	99L-F-626-03N / 996L-BE-F-626-03N-499F LENGTH AS REQ'D	626	VON
3	EA	CLASSIC CORE	23-030	626	SCH
2	EA	SURFACE CLOSER	4041 OR P4041 MTG BRKTS, SPCRS & PLATES AS REQ	689	LCN
2	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
2	EA	STOP	WS407CCV OR FS436 AS REQ	628	IVE
1	SET	SEALS	5050B H & J	BLK	NGP
2	EA	MAGNETIC HOLD OPEN DEVICES	SEM 7800 AL x VOLTAGE & TRANSFORMER REQ'D	AL	LCN

Provide ALL connections required to the fire alarm and electrical systems necessary for a fully functioning device meeting all applicable codes.

SECTION 08700 - FINISH HARDWARE

Hardware Group No. 008: Provide each SGL door(s) with the following:

Quantity		Description	Model Number	Finish	Mfr
3	EA	HINGE	5BB1HW 4.5 X 4.5	652	IVE
1	EA	CLASSROOM LOCK	L9070T 03N	626	SCH
1	EA	CLASSIC CORE	23-030	626	SCH
1	EA	SURFACE CLOSER	4041H OR P4041H MTG BRKTS, SPCRS & PLATES AS REQ	689	LCN
1	EA	KICK PLATE	8400 10" X 1" LDW	630	IVE
1	EA	STOP	WS407CCV OR FS436 AS REQUIRED	628	IVE
1	SET	SILENCER	SR64	GRY	IVE

Hardware Group No. 009 / T2: Refer to Section 08310 Tornado Doors for information regarding this Hardware Group.

Hardware Group No. 010: Provide each SGL door(s) with the following:

Quantity		Description	Model Number	Finish	Mfr
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	OFFICE LOCK	L9050T 03N	626	SCH
1	EA	CLASSIC CORE	23-030	626	SCH
1	EA	STOP	WS407CCV OR FS436 AS REQUIRED	628	IVE
3	EA	SILENCER	SR64	GRY	IVE

Hardware Group No. 011: Provide each SGL door(s) with the following:

Quantity		Description	Model Number	Finish	Mfr
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	PRIVACY SET	L9056R 03N OS-OCC	626	SCH
1	EA	STOP	WS407CCV OR FS436 AS REQUIRED	628	IVE
3	EA	SILENCER	SR64	GRY	IVE

Hardware Group No. 012: Provide each PR door(s) with the following:

Quantity		Description	Model Number	Finish	Mfr
2	EA	CONTINUOUS HINGE	224HD HEIGHT AS REQ	628	IVE
1	EA	MULLION	KR4954 HEIGHT AS REQ	689	VON
1	EA	PANIC HARDWARE	CD99EO LENGTH AS REQUIRED	626	VON
1	EA	PANIC HARDWARE	CD99NL-OP LENGTH AS REQUIRED	626	VON
1	EA	RIM CYLINDER	20-057 ICX	626	SCH
3	EA	MORTISE CYLINDER	20-061 ICX	626	SCH
4	EA	PRIMUS CORE ONLY	20-740	626	SCH
2	EA	SURFACE CLOSER	4040XP SHCUSH MTG BKTS, SPCRS & PLATES AS REQ	689	LCN
2	EA	OFFSET DOOR PULL	8190-0-O	630	IVE
2	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	SET	SEALS	700SA H & J (INSTALL PRIOR TO OTHER HARDWARE)	AL	NGP
2	EA	DOOR SWEEP	C627A LENGTH AS REQ	AL	NGP
1	EA	OVERHEAD RAIN DRIP	16A DW + 4"	AL	NGP
1	EA	THRESHOLD	896V LENGTH AS REQ	AL	NGP

REFER TO ELECTRICAL FOR ACCESS, CARD READER, ETC. INFORMATION, ETC.

SECTION 08700 - FINISH HARDWARE

The following list of products and manufactures are acceptable for this project.

Product	Manufacture and Approved Equals
1. Hinges	A. Ives B. Hager C. Bommer
2. Continuous Hinges	A. Pemko B. Roton C. Select
3. Key System	A. **Schlage (No substitutions)**
4. Lock/Latch	A. **Schlage (No substitutions)**
5. Closers	A. **LCN (No substitutions)**
6. Exit Devices	A. **Von Duprin (No substitutions)**
7. Push/Pull/Plates	A. Ives B. Rockwood C. Trimco
8. Misc. Stop, Bolts, etc.	A. Ives B. Glynn-Johnson C. Rockwood
9. Door Seal/Thresholds	A. National Guard B. Pemko C. Reese

Each Product, by category, shall be the product of one manufacturer. Complete lockset, including keyed lock cylinder, shall be the product of one manufacturer unless noted otherwise.

Part 3 - Execution

3.01 Installation:

A. Install all finish hardware in strict accordance with the manufacturer's recommendations and printed instructions. Wherever cutting and fitting is required to install hardware onto or into surfaces which are later to be painted or finished in another way, install each item completely and then remove and store in a secure place during the finish application. After completion of the finishes, reinstall each item. Do not install surface mounted items until finishes have been completed on the substrate.

B. All hardware relating to hollow metal and aluminum doors and frames shall be to standard templates of each respective hardware manufacturer for items furnished.

C. Mounting Heights: Mount Hardware units at heights recommended by the National Builders Hardware Association, except as specifically indicated or required to comply with governing regulations, or as may be otherwise directed by the Architect.

3.02 Prior to the Final Inspection:

A. The supplier shall check all closers for proper operation after they have been installed and adjusted by the Contractor. He shall verify the keying to ensure proper location of locksets and shall assist the Contractor in correcting faulty operation of any locks.

B. Within 30 days after the acceptance of the entire project, the Contractor shall be responsible for this supplier meeting with the maintenance custodian at the job site for the purpose of instructing him thoroughly in the proper repair and adjustment of all finish hardware items, and items, and shall present to the custodian a full complement of tools to be used.

End of Section

DIVISION 8 - DOORS AND WINDOWS

SECTION 08800 - GLAZING

Part 1 - General

1.01 Work Included:
- A. The General Conditions and applicable sections of Division 1 shall apply to this entire section.
- B. All materials, labor, services and incidentals necessary for the completion of this section of the work.

1.02 Quality Assurance:
- A. Standards:
  1. Federal Specifications
     a. DD-G-451d, Glass, Plate, Sheet (for glazing and other uses).
  2. Flat Glass Jobber Association: Glazing Manual.
  3. Underwriter's Laboratories, Inc.: UL 9, UL 10B, & UL 10C.
  4. National Fire Protection Association: NFPA 80 & NFPA 257.
- B. Comply with UBC 2406, and ANSI 97.1 with testing requirements of 16 CFR 1201, Cat II.

1.03 **Products of certain manufacturers are specified herein to simplify descriptions of design, construction, and/or materials only. Proprietary names are not intended to imply that products of named manufacturer are required to the exclusion of equivalent products of other manufacturers.**

Part 2 - Products

2.01 Materials:
- A. Glass Types and Examples:
  1. 1/4" Tempered Glass:
     a. Type example: 1/4" Clear Herculite - PPG.
  2. 1" Nominal Thickness Insulating Tempered Glass - 1/4" tinted glass @ exterior side and 1/4" 100 Low E glass @ interior side of 2" air space - **both sides tempered**. Low Emissivity coating on 3rd glass surface from building exterior.
     a. Type Example: Versalux Green 2000 Insulated with Low-E, Visteon (Ford). **Note: Color will be a factor in approval.**
  3. Fire-Protection Rated Tempered Glazing Types:
     a. 20- or 90-minute fire-rated glazing, monolithic ceramic glazing.
     b. Provide safety glazing labeling.
     c. Fire-Protection-Rated Glazing, General: listed and labeled by a testing agency acceptable to authority Having Jurisdiction, for fire-protection ratings indicated, based on testing

according to NFPA 252 for door assemblies and NFPA 257 for window assemblies.

d. Fire-Protection-Rated Tempered Glass: 1/4 inch thick (verify), fire protection rated tempered, complying with testing requirements in 16 CPR 1201 for Category II materials:

e. Products: subject to compliance with requirements, available products that may be incorporated into the Work include but are not limited to, the following:

1. TPG - Technical Glass Products, FireLite Standard Grade 20 / 90.
2. InterEdge, Inc., a subsidiary of AFG Industries, Inc.; PyroEdge 20.
3. Safti First, SuperLite 20.

f. Vetrotech Saint-Gobain, SSG Pyroswiss.

B. Glazing Compounds and Preformed Glaze Sealants: Suitable type as approved for the installation, in accordance with Glazing Materials section of the FGJA Glazing Manual.

C. Glazing Accessories: Provide miscellaneous materials such as cleaners, primers, setting blocks, spacers, filler rods, beads, etc., as required for complete installation.

Part 3 - Execution

3.01 Installation:

A. Glazing-General:

1. Items to be glazed may be field-or shop-glazed, using glass of the quality and thickness specified or indicated. Preparation of surrounds and glazing, unless otherwise specified, shall be in conformance with the details and general conditions governing glazing in the FGMA Glazing Manual, beads or stops which are furnished with the items to be glazed shall be used to secure the glass in place.
2. All glass shall be set with the waves parallel to the sill. Glass that has been misordered, i.e. with the width and height dimensions not properly correlated with the Drawing process in manufacturing, resulting in pronounced waviness at right angles to the sill, will be rejected.
3. Install plastic glass edging strips where indicated. Joints shall be as tight and imperceptible as possible.

SECTION 08800 - GLAZING

B. Breakage: Replace all glass broken during or after setting. Breakage due to accident or carelessness or other will be charged to trade at fault.

C. Inspection: Prior to final acceptance of project, inspect all work done under this section and make all necessary adjustments, repairs or replacements of defective work, and clean all glass surfaces.

D. Clean-up: Remove all glass cuttings, scraps, packaging and rubbish upon completion of the work.

End of Section

DIVISION 9 - FINISHES

SECTION 09120 - CEILING SUSPENSION SYSTEMS

Part 1 - General

1.01 Work Included:
- A. All materials, labor, services and incidentals necessary for the completion of this section of the work.

1.02 Related Work Specified Elsewhere:
- A. Gypsum Wallboard - Section 09250
- B. Acoustical Treatment - Section 09500

1.03 Quality Assurance:
- A. Standards:
  1. American Society for Testing and Materials
     a. ASTM C-635, Metal Suspension Systems for Acoustical Tile and Lay-In-Panel Ceilings.
     b. ASTM C-636, Recommended Practice of Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In-Panels.
  2. All materials to comply with NFPA 101, 16-3.3.2, where applicable.
- B. Submittals:
  1. Provide submittals in the form of samples, and documentation, to the Architect for review.

1.04 **Products of certain manufacturers are specified herein to simplify descriptions of design, construction, and/or materials only. Proprietary names are not intended to imply that products of named manufacturer are required to the exclusion of equivalent products of other manufacturers.**

Part 2 - Products

2.01 Materials:
- A. Suspended Acoustical Ceiling - Exposed Grid: ASTM C-635, intermediate structural classification.
  1. Main Beams, Cross Tees and Concealed Members: .015 cold rolled zinc coated steel.
  2. Wall Angle: .020 cold rolled zinc coated steel.
  3. Special Members: Provide special shaped members as shown on the Drawings.
  4. Member Finish: Exposed surfaces shall be flat white low-gloss grid.
  5. Hanger Wire: No. 12 gauge cold drawn, annealed, galvanized.
  6. Accessories: Provide wall clips, hold-down clips (shall be removable without damage to boards; two each panels opposite sides), beam clamps leveling splines, hanger clips, splice plates), (keep to a minimum), for a complete installation.

7. Acceptable Manufacturer: 200 Snap-Grid System, Chicago Metallic Corporation

B. Suspended Gypsum Board Ceilings:
   1. Structural Channels: Cold-rolled, 16 gauge, galvanized steel.
   2. Furring Channels: Roll-formed, hat sections, 20 gauge.

Part 3 - Execution

3.01 General:
   A. Coordinate with electrical and mechanical contractors in placement of light fixtures, grilles, etc. to conform with ceiling pattern.
   B. Construct necessary scaffolding, adequate and safe, in accordance with applicable laws and ordinances. Maintain during this work and remove after completion.
   C. Provide thorough and competent foreman and skilled mechanics.

3.02 Installation:
   A. Suspended Acoustical Ceiling:
      1. Deflection of any component shall not exceed 1/360 of the span.
      2. Main tees shall be suspended on 48" centers by 12 gauge wire spaced not more than 48" o.c. along main tee.
      3. Cross tees shall be placed at 24" o.c. or as required by the Drawings.
      4. Install wall angles at intersection of suspended ceiling and all vertical surfaces. Miter corners where wall molding intersects.
      5. Install grid system and ceiling panels with faces in a plane.
      6. Provide intersection clips at intersection of all tees.
      7. Provide additional hangar wire at four corners of light fixtures.
      8. Provide additional hangar wires to insure proper placement and alignment of grid system.
      9. Prior to the final acceptance of the building, examine and adjust water level to be certain that all planes and lines are plumb, square and smooth. Replace all marked, marred or otherwise damaged materials.
   B. Suspended Gypsum Board Ceilings:
      1. Coordinate location of hangars with other work.
      2. Install ceiling framing independent of walls, columns and above ceiling work.
      3. Install ceiling framing system in accordance with manufacturer's recommendations.
      4. Reinforce openings in ceilings in accordance with

manufacturer's recommendations.

5. Laterally brace entire suspension system where required.

3.03 Clean-Up:

A. Completely remove from the job site, at the completion of the work, all cartons, packaging, etc., and all other scraps and waste caused by this trade.

End of Section

DIVISION 9 - FINISHES

SECTION 09250 - GYPSUM WALLBOARD

Part 1 - General

1.01 Work Included:
A. All materials, labor, services and incidentals necessary for the completion of this section of the work.

1.02 Quality Assurance:
A. Standards:
1. American Society for Testing and Materials:
a. ASTM C-36, Gypsum Wallboard
b. ASTM C-475, Joint Treatment for Gypsum Wallboard Construction.
B. Federal Specifications:
1. FS-SS-L-30D, Type III, Grade X, Class 1, Gypsum Wallboard.

1.03 Submittals:
A. Provide submittals in the form of samples, and documentation, to the Architect for review.

1.04 Product Delivery, Storage and Handling:
A. All materials shall be delivered to the job site with manufacturer's labels intact and stored in an enclosed shelter providing protection from damage and exposure to the elements.

Part 2 - Products

2.01 Gypsum Wallboard:
A. Type: Fire-rated, ASTM C-36.
B. Size: 5/8" thick x 48" wide x 96" or as required.
C. Edges: Tapered.
D. Location: All gypsum board.

2.02 Fasteners:
A. Screws: Self-drilling, self-tapping, bugle head, Type S.
B. Nails: Annular ring: GWB-54.

2.03 Joint Treatment Materials:
A. Joint Tape: Perforated Tape, ASTM C-475.
B. Joint Compound: ASTM C-475.

2.04 Accessories:
A. Metal Edge: Similar to United States Gypsum Trim No. 402.

Part 3 - Execution

3.01 Installation:
A. Apply gypsum board to horizontal surfaces first, then to vertical.
B. Install gypsum board parallel to studs at vertical surfaces.
C. To minimize joints, use panels of maximum practical lengths.
D. Position all ends and edges of gypsum board over nailing or fastening members. Fit ends and edges closely; do not force

together. Stagger end joints.

E. Cut ends, edges, scribe or make cutouts within field of panel in a workmanlike manner.

F. Install trim at all intersections of gypsum board and other surfaces. Provide corner bead at all vertical or horizontal corners.

G. Fasteners:

1. Drive fasteners in field of panel first, work toward ends and edges.
2. Perimeter fasteners shall be a least 3/8" from ends and edges.
3. Attach panels to wood framing members with specified nails spaced out 8" for ceiling, and 8" o.c. at ends and 12" o.c. at each support.
4. Drive nail head slightly below surface of panel in a uniform dimple without breaking face paper.
5. Screw fasteners shall be spaced 12" o.c. at each support in the field of the board and 8" o.c. at all edges and ends.
6. Screws shall be power-driven with an electric screwdriver and screw heads shall provide a slight depression below surface of panel without breaking face paper.

3.02 Joint Treatment:

A. Treat all exposed joints and trim with a three-coat approved system applied in strict accordance with manufacturer's recommendations.

3.03 Clean-Up:

A. Use all necessary care during execution of the Work of this Section to prevent undue scattering of drywall scraps and dust and to prevent tracking of joint and finishing compounds onto floor surfaces. On completion of each installation segment in a room or space, promptly pick up and remove from the working area all scraps, debris and surplus material.

End of Section

DIVISION 9 - FINISHES

SECTION 09300 - TILE

Part 1 - General

1.01 Work Included:
- A. All materials, labor services and incidentals necessary for the completion of this section of the work.

1.02 Quality Assurance:
- A. Standards:
  1. Tile Council of America:
     a. Handbook for Ceramic Tile Installation.
  2. American National Standards Institute:
     a. ANSI A108.6, Ceramic Tile installed with Epoxy Mortar.
     b. ANSI A108.4, Ceramic Tile installed water-resistant organic adhesive.
     c. ANSI A108.5, Ceramic Tile installed with latex Portland Cement.
     d. ANSI A118.4, Latex Portland Cement Mortar.
     e. ANSI A118.3, Epoxy Mortar and Grout.
     f. ANSI A136.1, Type 1 Organic Adhesive.
     g. ANSI A137.1, Ceramic Tile.
     h. ANSI A137.3, Porcelain Tiles and Porcelain Tile Panels/Slabs
  3. American Society for Testing and Materials:
     a. ASTM C-144, Aggregate.
     b. ASTM C-150, Portland Cement, Type 1.
     c. ASTM C-206, Special Finish Hydrated Lime.
- B. All materials shall meet IBC 2009, where applicable.
- C. Floor surfaces and elevation changes shall comply with ADAABAAG 302 and 303.
- D. Static Coefficient of Friction: For tile installed on walkway surfaces, provide products with the following values as determined by testing identical products per ASTM C 1028:
  1. Level Surfaces: Minimum.
  2. Step Treads: Minimum.
  3. Ramp Surfaces: Minimum.
- E. Source Limitations for Tile: Obtain tile of each type and color or finish from one source or producer.
  1. Obtain tile of each type and color or finish from same production run and of consistent quality in appearance and physical properties for each contiguous area.
- F. Source Limitations for Setting and Grouting Materials: Obtain ingredients of a uniform quality for each mortar, adhesive, and grout component from one manufacturer and each aggregate from one source or producer.
- G. Source Limitations for Other Products: Obtain each of the

following products specified in this Section from a single manufacturer for each product:
1. Stone thresholds.
2. Joint sealants.
3. Cementitious backer units.
4. Metal edge strips.

1.03 Submittals:

A. Submit samples of all tile and grout specified under this section for approval and color selection prior to installation.

B. Submit a "Master Grade Certificate" bearing signatures of both manufacturer and contractor.

C. Submit tile manufacturer's maintenance guides for owner's use in maintaining all tile work specified in this section.

D. Shop Drawings: Show locations of each type of tile and tile pattern. Show widths, details, and locations of expansion, contraction, control, and isolation joints in tile substrates and finished tile surfaces.

F. Samples for Initial Selection: For each type of tile and grout indicated. Include Samples of accessories involving color selection.

G. Samples for Verification:
1. Full-size units of each type and composition of tile and for each color and finish required.
2. Assembled samples mounted on a rigid panel, with grouted joints, for each type and composition of tile and for each color and finish required. Make samples at least 24 inches square, but not fewer than 4 tiles. Use grout of type and in color or colors approved for completed Work.
3. Full-size units of each type of trim and accessory for each color and finish required.
4. Stone thresholds in 6-inch lengths.
5. Metal edge strips in 6-inch lengths.

H. Qualification Data: For qualified Installer.

I. Master Grade Certificates: For each shipment, type, and composition of tile, signed by tile manufacturer and Installer.

J. Product Certificates: For each type of product, signed by product manufacturer.
1. Material Test Reports: For each tile-setting and -grouting product and special purpose tile.

1.04 Product Delivery, Storage and Handling:

A. Deliver all materials to job site in manufacturer's unopened containers with grade seal unbroken and labels intact. Keep containers dry. Comply with requirements in

ANSI A137.1 for labeling tile packages.

B. Store tile and cementitious materials on elevated platforms, under cover, and in a dry location.

C. Store aggregates where grading and other required characteristics can be maintained and contamination can be avoided.

D. Store liquid materials in unopened containers and protected from freezing.

E. Handle tile that has temporary protective coating on exposed surfaces to prevent coated surfaces from contacting backs or edges of other units. If coating does contact bonding surfaces of tile, remove coating from bonding surfaces before setting tile.

1.05 Project Conditions:

A. Environmental Limitations: Do not install tile until construction in spaces is complete and ambient temperature and humidity conditions are maintained at the levels indicated in referenced standards and manufacturer's written instructions.

1.05 **Products of certain manufacturers are specified herein to simplify descriptions of design, construction, and/or materials only. Proprietary names are not intended to imply that products of named manufacturer are required to the exclusion of equivalent products of other manufacturers.**

Part 2 - Products

2.01 General:

A. All tile shall be standard grades conforming to ANSI 137.1 unless noted otherwise.

B. Both glazed and unglazed ceramic tile shall be manufactured by the same manufacturer.

C. Refer to Color Schedule for tile color. Colors will a determining factor in tile approval.

D. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI AlOS.02, ANSI standards referenced in other Part 2 articles, ANSI standards referenced by TCA installation methods specified in tile installation schedules, and other requirements specified.

E. Mounting: For factory-mounted tile, provide back- or edge-mounted tile assemblies as standard with manufacturer unless otherwise indicated.

F. Factory-Applied Temporary Protective Coating: Where indicated under tile type, protect exposed surfaces of tile against adherence of mortar and grout by precoating with continuous film of petroleum paraffin wax, applied hot. Do

not coat unexposed tile surfaces.

G. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. American Olean; Division of Dal-Tile International Inc.
   2. Crossville, Inc.
   3. Daltile; Division of Dal-Tile International Inc.

2.02 Ceramic Tile:

A. Wall Tile and Floor Tile:
   1. Type: Glazed porcelain.
   2. Nominal Face Size: 12″ x 24″ – orient as per Drawings.
   3. Edge: All-purpose cushion.
   4. Acceptable Manufacturer: Daltile – Synchronic.

B. Trim Shapes and Bases:
   1. Type: Same as floor tile.
   2. Includes bases, caps, stops, returns, trimmers and other shapes to finish installation.
      a. Base for Thin-Set Mortar Installations: Straight, module size 6 by 12 inches.
      b. External Corners for Portland Cement Mortar Installations: provide metal corner trim as manufactured by Schluter Systems LP unless otherwise indicated.
      c. External Corners for Thin-Set Mortar Installations: same as above.
      d. Internal Corners: Field-butted square corners. For base and cap use angle pieces designed to fit with stretcher shapes.

C. Setting Materials:
   1. Epoxy Mortar: ANSI A118.3
   2. Organic Adhesive: ANSI A136.1
   3. Latex Portland Cement Mortar: ANSI A118.4
   4. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
      a. Boiardi Products; a QEP company.
      b. Bonsai American; an Oldcastle company.
      c. Bostik, Inc.
      d. C-Cure.
      e. Custom Building Products.
      f. Jamo Inc.
      g. Laticrete International, Inc.
      h. MAPEl Corporation.
      i. Southern Grouts & Mortars, Inc.

j. Summitville Tiles, Inc.
k. TEC; a subsidiary of H. B. Fuller Company.

D. Grouting Materials:
1. Floor Tile: Epoxy Grout.
2. Wall Tile: Portland Cement Type.
3. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
a. Boiardi Products; a QEP company.
b. BonsaI American; an Oldcastle company.
c. Bostik, Inc.
d. C-Cure.
e. Custom Building Products.
f. Jamo Inc.
g. Laticrete International, Inc.
h. MAPEl Corporation.
i. Southern Grouts & Mortars, Inc.
j. Summitville Tiles, Inc.
k. TEC; a subsidiary of H. B. Fuller Company.

E. Granite Thresholds:
1. Type: Polished granite.
2. Size: 1 1/4" wide x 1/2" high, double-beveled.
3. Location: Provide marble threshold at centerline of doors at transition between ceramic tile flooring and exposed concrete.

F. Accessories: Provide vitreous china accessories of type and size indicated, suitable for installing by same method as adjoining wall tile.
1. Color and Finish: Match adjoining glazed wall tile.

G. Elastomeric Sealants:
1. General: Provide sealants, primers, backer rods, and other sealant accessories that comply with the following requirements and with the applicable requirements in Division 07 Section "Joint Sealants."
a. Use sealants that have a VOC content of 250 gIL or less when calculated according to 40 CPR 59, Subpart D (EPA Method 24).
b. Use primers, backer rods, and sealant accessories recommended by sealant manufacturer.
2. Colors: Provide colors of exposed sealants to match colors of grout in tile adjoining sealed joints unless otherwise indicated.
3. One-Part, Mildew-Resistant Silicone Sealant: ASTM C 920; Type S; Grade NS; Class 25;
Uses NT, G, A, and, as applicable to nonporous joint

substrates indicated, 0; formulated with fungicide, intended for sealing interior ceramic tile joints and other nonporous substrates that are subject to in-service exposures of high humidity and extreme temperatures.

a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
   1. DAP Inc.; 100 percent Silicone Kitchen and Bath Sealant.
   2. Dow Corning Corporation; Dow Corning 786.
   3. GE Silicones; a division of GE Specialty Materials; Sanitary 1700.
   4. Laticrete International, Inc.; Latasil Tile & Stone Sealant.
   5. Pecora Corporation; Pecora 898 Sanitary Silicone Sealant.
   6. Tremco Incorporated; Tremsil 600 White.

H. Miscellaneous Materials:
   1. Trowelable Underlayments and Patching Compounds: Latex-modified, portland cement-based formulation provided or approved by manufacturer of tile-setting materials for installations indicated.
   2. Metal Edge Strips: Angle or L-shape, height to match tile and setting-bed thickness, metallic base, designed specifically for required applications; stainless-steel, ASTM A 666, 300 Series exposed-edge material.
      a. Equal to products manufactured by Schluter Systems LP.
      b. Provide in minimum lengths of 10’ where possible and practical.
      c. Provide at ALL exposed edges of ceramic wall tile – i.e. top, exterior corners, expansion joints, etc.
   3. Temporary Protective Coating: Either product indicated below that is formulated to protect exposed surfaces of tile against adherence of mortar and grout; compatible with tile, mortar, and grout products; and easily removable after grouting is completed without damaging grout or tile.
      a. Petroleum paraffin wax, fully refined and odorless, containing at least 0.5 percent oil with a melting point of 120 to 140 deg F per ASTM D 87.

b. Grout release in form of manufacturer's standard proprietary liquid coating that is specially formulated and recommended for use as temporary protective coating for tile.

4. Tile Cleaner: A neutral cleaner capable of removing soil and residue without harming tile and grout surfaces, specifically approved for materials and installations indicated by tile and grout manufacturers.

5. Grout Sealer: Manufacturer's standard silicone product for sealing grout joints and that does not change color or appearance of grout.

a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

1. BonsaI American; an Oldcastle company; Grout Sealer.
2. Bostik, Inc.; CeramaSeal Grout & Tile Sealer.
3. C-Cure; Penetrating Sealer 978.
4. Custom Building Products; Grout Sealer.
5. Jamo Inc.; Penetrating Sealer.
6. MAPEl Corporation; KER 003, Silicone Spray Sealer for Cementitious Tile Grout and 004, Keraseal Penetrating Sealer for Unglazed Grout and Tile.
7. Southern Grouts & Mortars, Inc.; Silicone Grout Sealer.
8. Summitville Tiles, Inc.; SL-15, Invisible Seal Penetrating Grout and Tile Sealer.
9. TEC; a subsidiary of H. B. Fuller Company; TA-256 Penetrating Silicone Grout Sealer.

2.03 Porcelain Tile Panels:

A. Wall Tile Panels:

1. Type: Porcelain Tile Panel – Fokos 3+mm.
2. Nominal Face Size: 1000x3000mm – orient as per Drawings. **Where practical - all tile panels shall be factory cut prior to delivery to project site.**
3. Acceptable Manufacturer: Crossville, Inc.

B. Trim Shapes:

1. Includes shapes to finish installation.

a. Internal Corners: Field-butted square corners. For coved base and cap use angle pieces designed to fit with stretcher shapes.

C. Setting Materials:
   1. As required by wall panel manufacturer.
   2. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
      a. Bostik, Inc.
      b. Custom Building Products.
      c. Laticrete International, Inc.
      d. MAPEl Corporation.
      e. TEC; a subsidiary of H. B. Fuller Company.

D. Grouting Materials:
   1. As required by wall panel manufacturer.
   2. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
      a. Bostik, Inc.
      b. Custom Building Products.
      c. Laticrete International, Inc.
      d. MAPEl Corporation.
      e. TEC; a subsidiary of H. B. Fuller Company.

E. Miscellaneous Materials:
   1. Metal Edge Strips: Angle or L-shape, height to match tile and setting-bed thickness, metallic base, designed specifically for required applications; stainless-steel, ASTM A 666, 300 Series exposed-edge material.
      a. Equal to products manufactured by Schluter Systems LP.
      b. Provide in minimum lengths of 10’ where possible and practical.
      c. Provide at ALL exposed edges of ceramic wall tile – i.e. top, exterior corners, expansion joints, etc.

Part 3 - Execution

3.01 Examination:

A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of installed tile.
   1. Verify that substrates for setting tile are firm, dry, clean, and free of coatings that are incompatible with tile-setting materials including curing compounds and

other substances that contain soap, wax, oil, or silicone; and comply with flatness tolerances required by ANSI Al08.0 for installations indicated.

2. Verify that concrete substrates for tile floors installed with adhesives or thin-set mortar comply with surface finish requirements in ANSI A108.01 for installations indicated.
   a. Verify that surfaces that received a steel trowel finish have been mechanically scarified.
   b. Verify that protrusions, bumps, and ridges have been removed by sanding or grinding.
3. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed.
4. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust joint locations in consultation with Architect.
5. At Porcelain Wall Tile Panels: verify wall substrate has a maximum allowable variation of 1/8″ in 10′ from required plane with no more than 1/16″ variation in 24′. +

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 Preparation:

A. Fill cracks, holes, and depressions in concrete substrates for tile floors installed with thin-set mortar with trowelable leveling and patching compound specifically recommended by tilesetting material manufacturer.

B. Where indicated, prepare substrates to receive waterproofing by applying a reinforced mortar bed that complies with ANSI AlOS.IA and is sloped 1/4 inch per foot toward drains.

C. Blending: For tile exhibiting color variations, verify that tile has been factory blended and packaged so tile units taken from one package show same range of colors as those taken from other packages and match approved Samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.

D. Field-Applied Temporary Protective Coating: If indicated under tile type or needed to prevent grout from staining or adhering to exposed tile surfaces, precoat them with continuous film of temporary protective coating, taking care not to coat unexposed tile surfaces.

3.02 Installation:

A. All workmanship and materials shall conform in all respects to specifications and requirements and in accordance with the standard practice of the Tile Council of America.

B. All ceramic floor tile shall be installed using the following Tile Council of America specifications.
   1. Floor Tile, TCA F131-2K (Concrete).

C. Provide all required trim shapes required to module with field tile, unless otherwise noted on Drawings. All exterior corners shall have metal corner trim as manufactured by Schluter Systems LP.

D. Layout all tile work as to minimize cuts less than one-half tile in size. Align all joints to give straight uniform grout lines, plumb and level or parallel with walls. Strike all joints with a rounded, non-staining tool.
   1. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.
   2. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.
   3. Jointing Pattern: Lay tile in grid pattern unless otherwise indicated. Layout tile work and center tile fields in both directions in each space or on each wall area. Layout tile work to minimize the use of pieces that are less than half of a tile. Provide uniform joint widths unless otherwise indicated.
      a. Where adjoining tiles on floor, base, walls, or trim are specified or indicated to be same size, align joints.
      b. Where tiles are specified or indicated to be whole integer multiples of adjoining tiles on floor, base, walls, or trim, align joints unless otherwise indicated.
   4. Joint Widths: Unless otherwise indicated, install tile with the following joint widths:
      a. Wall Tile: 1/16 inch.
      b. Porcelain Wall Tile Panels: 1/16 inch.
   5. Layout tile wainscots to dimensions indicated or to

next full tile beyond dimensions indicated.

6. Expansion Joints: Provide expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated or required by tile manufacturer. Form joints during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles.
   a. Where joints occur in substrates, locate joints in tile surfaces directly above them.
   b. Prepare joints and apply sealants to comply with requirements in Division 07 Section "Joint Sealants."
   c. At Porcelain Wall Tile Panels: provide movement joint every 20’ to allow for needed movement of tile layer.
7. Stone Thresholds: Install stone thresholds in same type of setting bed as adjacent floor unless otherwise indicated.
   a. At locations where mortar bed (thickset) would otherwise be exposed above adjacent floor finishes, set thresholds in latex-portland cement mortar (thin set).
   b. Do not extend cleavage membrane waterproofing or crack isolation membrane under thresholds set in dry-set portland cement mortar. Fill joints between such thresholds and adjoining tile set on crack isolation membrane with elastomeric sealant.
      1. Metal Edge Strips: Install where exposed edge of tile flooring meets carpet, wood, or other flooring that finishes flush with or below top of tile and no threshold is indicated.
8. Grout Sealer: Apply grout sealer to cementitious grout joints in tile floors according to grout sealer manufacturer's written instructions. As soon as grout sealer has penetrated grout joints, remove excess sealer and sealer from tile faces by wiping with soft cloth.

E. Slope entire room or area to floor drains.

3.03 Tile Backing Panel Installation:

A. Install cementitious backer units and treat joints according to ANSI AlOS.11 and manufacturer's written instructions for type of application indicated. Use latex-portland cement mortar for bonding material unless otherwise directed in manufacturer's written instructions.

3.04 Waterproofing Installation:

A. Install waterproofing to comply with ANSI A108.13 and manufacturer's written instructions to produce waterproof membrane of uniform thickness and bonded securely to substrate.

B. Do not install tile or setting materials over waterproofing until waterproofing has cured and been tested to determine that it is watertight.

3.05 Cleaning and Protecting:

A. Cleaning: On completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.

1. Remove epoxy and latex-portland cement grout residue from tile as soon as possible.
2. Clean grout smears and haze from tile according to tile and grout manufacturer's written instructions but no sooner than 10 days after installation. Use only cleaners recommended by tile and grout manufacturers and only after determining that cleaners are safe to use by testing on samples of tile and other surfaces to be cleaned. Protect metal surfaces and plumbing fixtures from effects of cleaning. Flush surfaces with clean water before and after cleaning.
3. Remove temporary protective coating by method recommended by coating manufacturer and that is acceptable to tile and grout manufacturer. Trap and remove coating to prevent drain clogging.

B. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear. If recommended by tile manufacturer, apply coat of neutral protective cleaner to completed tile walls and floors.

C. Prohibit foot and wheel traffic from tiled floors for at least seven days after grouting is completed.

D. Before final inspection, remove protective coverings and rinse neutral protective cleaner from tile surfaces.

E. Immediately prior to final inspection, replace all damaged tile.

F. Contractor will supply 2% of the total quantity of each tile used. Contractor will supply 3% of the total quantity of each grout used. Place materials in clean marked containers for future use at building.

End of Section

DIVISION 9 - FINISHES

SECTION 09500 - ACOUSTICAL TREATMENT

Part 1 - General

1.01 Work Included:
- A. All materials, labor, services and incidentals necessary for the completion of this section of the work.

1.02 Related Work Specified Elsewhere:
- A. Ceiling Suspension Systems - Section 09120

1.03 Quality Assurance:
- A. Standards:
  - 1. American Society for Testing and Materials:
    - a. ASTM C-636 Recommended Practice of Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels.
    - b. ASTM E-84 Surface Burning Characteristics of Building Materials.
  - 2. Federal Specifications:
    - a. SS-S-118B, Sound Controlling Blocks and Boards. Underwriter's Laboratories, Inc.
- B. Submittals:
  - 1. Provide submittals in the form of samples, and documentation, to the Architect for review.

1.04 **Products of certain manufacturers are specified herein to simplify descriptions of design, construction, and/or materials only. Proprietary names are not intended to imply that products of named manufacturer are required to the exclusion of equivalent products of other manufacturers**

Part 2 - Products

2.01 Acoustical Ceiling Panels:
- A. 2x2 Tile - Square Edge:
  - 1. Type: FS-SS-S-118B, Class 25
  - 2. Size: 24" x 24" x 5/8". Provide special sizes as indicated on Drawings or as required by others.
  - 3. Finish: Board finish shall be a factory-applied white latex paint, medium textured non-direction fissured surface with a minimum light reflection of 80%.
  - 4. Noncombustibility: Board shall meet class 25-Federal Specification SS-S-118B, ASTM E-84; and, classified by Underwriter's Laboratories for Flame Spread Index 0-25.
  - 5. Type Example and Manufacturer:
    - a. Armstrong Fine Fissured No. 1728, square (2x2)
- B. 2x2 Tile - Tegular Edge:
  - 1. Type: FS-SS-S-118B, Class 25
  - 2. Size: 24" x 24" x 5/8". Provide special sizes as indicated on Drawings or as required by others.

3. Finish: Board finish shall be a factory-applied white latex paint, medium textured non-direction fissured surface with a minimum light reflection of 80%.
4. Noncombustibility: Board shall meet class 25-Federal Specification SS-S-118B, ASTM E-84; and, classified by Underwriter's Laboratories for Flame Spread Index 0-25.
5. Type Example and Manufacturer:
   a. Armstrong Fine Fissured No. 1732, beveled tegular 2x2).

Part 3 - Execution

3.01 Installation:

A. Install in specified grid system per ASTM C-636 and manufacturer's recommendations, as shown on the Drawings.

B. Provide ten (10) pieces of ceiling panels in cartons for future use. Panels shall be in perfect condition.

End of Section

DIVISION 9 - FINISHES

SECTION 09650 – RESILIENT FLOORING

Part 1 - General

1.01 Work Included:
- A. All materials, labor, services, and incidentals necessary for the completion of this section of the work.

1.02 Quality Assurance:
- A. Installation Qualification: contractors for floor covering installation shall be experienced in managing commercial flooring projects and provide professional installers, qualified to install the various flooring materials specified with a minimum of three years of documented experience. Installer shall be trained by flooring manufacturer and – if applicable – certified to install the specified flooring by the manufacturer.
- B. Manufacturer Qualifications: company specializing in manufacturing the specified flooring with minimum three years documented experience.

1.03 Submittals:
- A. Submit product data for each type of product indicated.
- B. Submit samples for color selection / verification.
- C. Maintenance Data and Instructions Furnish manufacturer's recommended maintenance methods and procedures.

1.04 Delivery, Storage, and Handling:
- A. Store resilient products and installation materials in dry spaces protected from the weather, at temperatures required by the product manufacturer. Store tiles on flat surfaces.

Part 2 - Products

2.01 General:
- A. Refer to color schedule – available tile colors WILL be a factor in product acceptance.

2.02 Materials:
- A. Resilient Floor Tile:
  1. Type Example: Luxury Vinyl Composition Tile (LVT-1, LVT-2, and LVT-3) as manufactured by Interface LVT.
  2. Size: 25cm x 1m.
  3. Thickness: 4.5mm.
  4. Pattern: Studio Set.
  5. Location: as shown on the Drawings.
  6. Colors: refer to Drawings.
- B. Rubber Cove Base: ASTM F 1861, Type TP-Rubber as manufactured by Armstrong Cork Company or approved equal.
  1. Size: 4" high x .018 gauge.
  2. Provide preformed inside and outside corners.
- C. Edging Strips and Tile Reducers: size and length as

required.

D. Primer and Adhesive: As recommended by manufacturer of resilient floor tile for this particular project. All wall base and reducer strips shall be applied with epoxy adhesive.

E. Cleaner or other finishing material: As recommended by flooring manufacturer for the particular type of floor material.

Part 3 - Execution

3.01 Installation:

A. Comply with manufacturer's written instructions for installing specified tile flooring.

B. The Contractor shall be responsible for the manufacturer's representative making mat moisture and PH tests and reporting condition of concrete slab to the Architect in writing prior to placing floor materials.

C. Carefully examine the surfaces on which the above materials are to be applied, report to Architect in writing any unsatisfactory surface and do not begin work until all defective surfaces have been corrected. Otherwise, the Contractor shall assume responsibility for all failures and defects resulting from such defective surfaces.

D. Installation shall not begin until the work of all other trades, including painting, has been completed. The Contractor shall maintain all rooms and sub-floors at a minimum of 70 degrees F. for several days before and after application of tile.

E. The floor shall be thoroughly cleaned and any pockets or cracks shall be filled in accordance with manufacturer's instructions flush with floor surface.

F. The material shall be applied in a first class, workmanlike manner by skilled mechanics experienced in this type of work.

G. Primer and adhesive shall be as recommended by the manufacturer of the flooring for this particular project. The adhesive for applying all materials shall be waterproof and shall be furnished and guaranteed by the flooring manufacturer.

H. Lay tile from center of room or space, working toward perimeter, so that tile at opposite edges of room are of equal width. Adjust as necessary to avoid cut widths of less than 3 inches at room perimeter. Lay tile square to room axis.

I. Fit floor material neatly and tightly into breaks and

recesses, against bases, around pipes and penetrations, under saddles or thresholds, and around permanent cabinets and equipment.

J. Install reducer at each transition from tile to concrete floor.

K. After the flooring has been installed and before the waterproof adhesive has thoroughly set, the surface shall be rolled both ways with rollers made for this purpose, and all excess adhesive on the surface or in the joints shall be removed and the entire surface shall be left perfectly clean.

3.02 Cleaning and Waxing:

A. When, in the opinion of the Contractor, the flooring has sufficiently sealed itself to permit cleaning, the floors shall be thoroughly cleaned with a neutral cleaner as recommended by the manufacturer of the flooring used. After the floors have been cleaned, the Contractor shall protect the floors either with building paper or by keeping traffic off the floors until the building is ready for occupancy.

3.03 Replacement Tile and Base:

A. Provide enough spare floor tile, of each major color, in cartons to cover 50 square feet for future use. Provide 20 linear feet of spare rubber wall base. Resilient floor tile and wall base shall be in perfect condition.

End of Section

SECTION 09681 – CARPET TILE

Part 1 - General

1.01 Work Included:

A. Work includes but is not limited to providing carpet tile and installation.

1.02 Quality Assurance:

A. Standards:

1. The carpet manufacturer shall have no less than fifteen years of production experience with modular carpet similar to type specified. Published product literature of carpet manufacturer must clearly indicate compliance of products with requirements of this section.

B. Installer Qualifications:

1. The installation provider must be directly responsible for the quality of the completed floor covering installation, including both the quality of the materials and labor used in the installation. The installation provider must directly warrant to owner that all products, materials and services related to the floor covering installation (including any floor covering(s),adhesive(s) and/or other products or materials used in the installation) will meet specifications set forth herein. The product warranty required herein must be provided directly by the carpet manufacturer.
2. The installation provider must have successful carpet installation experience similar to the work of this Section and be recommended, trained, and approved by the carpet manufacturer.

1.03 Submittals:

A. Manufacturer's Data - copies, as required, of carpet manufacturer's specifications and installation instructions for carpet and related items specified.

B. Fiber Verification – Certification from the fiber producer verifying use of the premium branded, Post-Consumer Content Type 6 fiber in the submitted carpet product.

C. All applicable product warranties provided by manufacturer.

1.04 Delivery and Storage:

A. Deliver all materials to the installation site in the manufacturer's original packaging. Packaging to contain manufacturers name, identification number and related information.

SECTION 09681 – CARPET TILE

B. Product to be delivered as required by manufacturer. Store in pallet form as supplied by manufacturer. Do not stack pallets.

C. Store materials in area of installation for a minimum period of 48 hours prior to installation.

1.05 Installation Quality Assurance:

A. Flooring contractor to be specialty contractor normally engaged in this type of work and shall have three (3) years minimum documented experience in the installation of these materials.

B. Flooring contractor and sub-contractors must be approved by the architect and/or the carpet manufacturer.

C. Flooring contractor will be responsible for the proper product installation, including floor preparation in all the areas indicated in the drawings to receive carpet. The carpet installation standard will be as listed in The Carpet and Rug Institute's **Standard for Installation of Commercial Carpet CRI-104.**

D. Flooring contractor to provide owner a written warranty that guarantees the completed installation to be free from defects in materials and workmanship for a period of no less than one (1) year after job completion.

F. Qualifications of Installers: All work shall be done by installation firms specializing in commercial carpet installation. It is required, that the firm shall be a member of the Floor Covering Installation Contractors Association (FCICA) and/or certified by the Floor Covering Installation Board (FCIB).

G. Floor temperatures must be a minimum of 65^0 for 24 hours prior to installation. Floor temperature can usually vary 5-10^0 lower than room temperature. Modules must be conditioned to room temperature for 24 hours prior to installation. Relative humidity must be between 10%-65% maximum for 24 hours prior to installation. These conditions must also be maintained for 48 hours after completion of installation.

H. All carpet modules must be installed in the order they were manufactured. Select pallets in sequential order and follow the numbers located on each carton of tiles. Typically, an installation will begin with the lowest carton numbers and progress through the highest numbers until project is complete.

I. Full Spread Adhesive System: Requires a full spread adhesive system for the most trouble-free installation. Fully spread adhesive using a 1/32 x 1/16 x 1/16 "U" or "V" notch trowel. Allow to completely dry so adhesive does not transfer when touched. The proper amount of adhesive is mandatory to prevent the modules from shifting or moving.

1.06 Job Conditions:

A. Sub-floor preparation is to include all required work to prepare the existing floor for installation of the product as specified in this document.

B. Carpet installation shall not commence until painting and finishing work is complete and ceiling and overhead work is tested, approved, and completed.

C. Site conditions shall include those specified in the carpet manufacturer's installation manual and shall also include sufficient heat, light, and power required for effective and efficient working conditions.

1.07 Extra Materials:

A. Provide five percent (5%) extra material for shelf stock of carpet for each color and type specified.

1.08 Warranty - Carpet:

A. Warranties must be the standard, printed warranties on the carpet manufacturer's letterhead. All warranty items to be full term, not pro-rated for the indicated period. All warranties must be issued by the manufacturer as standard published warranties on all types of carpet within this document. If the product fails to perform as warranted when properly installed and maintained according to procedures, the affected area will be repaired or replaced at the expense of the manufacturer. The carpet manufacturer, will provide standard published written performance warranties for the following:

1. **Lifetime against excessive surface wear**. Excessive wear means no more than 10% loss of pile fiber weight measured before and after use as tested under ASTM D-3936.
2. **Lifetime static protection**, meaning built-in protection below 3.0 kv as tested under AATCC-134.

B. Carpet manufacturer shall warrant carpet manufactured with secondary backing for the useful life of the original
installation against product failure from:

1. Tuft Bind (edge ravel, yarn pulls, zippering)
2. Delamination
3. Moisture Penetration
4. Dimensional Stability

C. All warranties to be sole source responsibility of the carpet manufacturer. Second source warranties that involve parties other than the carpet manufacturer are unacceptable.

D. Warranties shall not be written only for this purchase or purchaser. All warranties shall be standard issue nationally of official documents.

1.09 Performance Insurance General:

A. Flammability Requirements:
1. Pill Test / DOC-FF-1-70 (ASTM D-2589)
Requirement: Pass
2. Flooring Radiant Panel / ASTM E-648
Requirement: Class 1 (Above .45 w/cm)
3. Optical Smoke Density Test / NFPA-258 NBS Smoke Chamber (ASTM E-662)
Requirement: Less than 450, Flaming Mode
4. Comply with the Carpet and Rug Institute (CRI) VOC Chamber Test/Indoor Air Quality test (CRI-IAQ) Green Label Test

B. Face Fiber Characteristics for **all** Carpets
1. Bulked Continuous Filament (BCF),
2. Acceptable Fiber Systems: as manufactured by Aquafil.

C. Sustainable Carpet Assessment Standard:
1. NSF - 140 Gold.
2. Carpet manufacturer and/or fiber producer must be a signatory of the National Carpet Recycling Agreement memorandum of understanding.

1.10 Products of certain manufacturers are specified herein to simplify descriptions of design, construction, and/or materials only. Proprietary names are not intended to imply that products of named manufacturer are required to the exclusion of equivalent products of other manufacturers.

Part 2 - Products

2.01 General:

A. Certified test reports shall be submitted by the carpet manufacturer, for all performance assurance specifications listed below.

B. Requirements listed below must be met by all products being submitted for approval.

C. All submitted test numbers should represent average for standard production goods.

2.02 Product Specification - Modular carpet tile shall meet the following specifications:

A. Style: InterfaceFLOR
   1) Color "A" – Field: Open Air Neutrals 410 Colorline.
   2) Color "B" – Accent: Aerial Flying Colors AE317.

B. Yarn: 100% Nylon (with minimum 4% post-consumer content and +/- 60% total recycled content)

C. Dye Method: 100% Solution / Yarn Dyed

D. Pile Thickness: 0.093 inch

E. Density: 6,968

F. Backing System: CQuest GB

G. Color: refer to Room Finish Schedule.

H. Special Treatments: ProTekt

2.03 Minimum Construction Standards:

A. Nylon Specification - All nylon fiber shall be branded (premium) type 6 nylon from Aquafil with performance certification from the fiber manufacturer.

B. Antimicrobial, registered by the EPA for use in carpeting with broad spectrum efficacy against the growth of bacteria and fungi for a minimum of 15 years, assuming proper maintenance. The antimicrobial ingredient shall meet standards set by the U.S. General Services Administration (GSA) for Antimicrobial Carpet as supported by independent lab testing less than six months old.
   1. Intersept (AATCC 138 Washed).
   2. The preservative should be incorporated into the primary latex coating of the product during the manufacturing process, not topically applied to the carpet fibers.
   3. The antimicrobial treated carpet when new must pass GSA parameters for treated carpets via AATCC method 174 parts II and III. Initial performance must be 90% reduction of the microorganisms (Staphylococcus aureus 6538 and Klebsiella pneumoniae 4352) and no fungal growth on either the primary backing or fibers both on washed (AATCC method 174) and non-washed samples.
   4. The antimicrobial treated carpet must maintain, for the warranted life of the carpet, a minimum of 90% reduction of the microorganisms (Staphylococcus aureus 6538 and Klebsiella pneumoniae 4352) listed in AATCC

method 171 part II, provided the carpet is maintained as specified. Additionally, the antimicrobial treated carpet must maintain a "no macroscopic growth" rating against Aspergillus niger 6275 at the primary backing in accordance with AATCC 171 part III.

5. The preservative must be environmentally responsible i.e. (biodegradable and not toxic to non-target species).
6. Efficacy of the preservative should be documented in professional peer reviewed scientific publications.

2.04 Related Carpet Materials:

A. Leveling compound - Latex type as recommended by carpet manufacturer. Must be compatible with carpet adhesive and curing/sealing compound on concrete.

B. Releasable pressure sensitive type adhesive – Adhesive must be water-based and allow for removal of carpet tile at any time without damage to carpet or substrate. Adhesive must contain antimicrobial preservative and have “zero” calculated VOC’s.

C. Carpet edge guard, non-metallic - Extruded or molded heavy duty vinyl or rubber carpet edge guard of size and profile indicated, and with minimum two inch wide anchorage flange; colors selected by architect/designer from among standard colors available within the industry.

D. Miscellaneous materials - As recommended by manufacturer of carpet. Other carpeting products to be selected by installation provider to meet project requirements.

E. Electrostatic (Dissipation low-generation):
   1. < 3.0 KV (AATCC 16-E).

F. Lightfastness:
   1. $\geq$ 4.0 @ 60 AFU’s.

Part 3 - Execution

3.01 Installation:

A. General
   1. Comply with manufacturer’s instructions and recommendations for uniformity of direction.
   2. Install carpet under open-bottom obstructions and under removable flanges and furnishings, and into alcoves and closets of each space.
   3. Provide cut outs where required. Conceal cut edges with protective edge guards or overlapping flanges.
   4. Run carpet under open bottom items such as heating convectors and install tight against walls, columns

and cabinets so that the entire floor area is covered with carpet. Cover over all floor type door closures.

5. Install edging guard at all openings and doors wherever carpet terminates, unless indicated otherwise.
6. Cutting shall be done in accordance with the manufacturer's recommendation, using the tools designed for the carpet being installed.
7. Use leveling compound where necessary. Any floor filling or leveling shall have a minimum of 4'0" of feather.
8. Expansion joints - Do not bridge building expansion joints with continuous carpeting.

B. Installation

1. Install carpet according to carpet manufacturer's printed instructions and in accordance with the Carpet and Rug Institute's Installation Standard.

3.03 Cleaning and Protection:

A. On completion of the installation in each area, all dirt, carpet scraps, etc. must be removed from the surface of the carpet.
B. Remove debris, and sort pieces to be saved from scraps to be redirected and recycled.
C. Construction manager shall protect carpeting against damage during construction.

3.04 Inspection:

A. Upon completion of the installation, verify that work is complete, properly installed and acceptable.

End of Section

DIVISION 9 - FINISHES

SECTION 09900 - PAINTING

Part 1 - General

1.01 Work Included:
- A. All materials, labor, services and incidentals necessary for the completion of this entire section of the work.
- B. Consult Drawings, finish schedules, details and specification section.

1.02 Quality Assurance:
- A. All painted surfaces shall be uniform in color, texture and finish to the satisfaction of the Architect.

1.03 Submittals:
- A. Submit manufacturer's specifications, including paint label analysis and application instructions for each material specified.
- B. Submit color samples for review of color and texture.
- C. Provide samples of all natural and stained wood finishes.
- D. Final samples: Prepare samples of finishes on the job to the satisfaction of the Architect. If required, a 4' x 8' portion of wall surface finished as final sample.

1.04 Product Deliver, Storage and Handling:
- A. Materials shall be delivered to the project site in strong, undamaged, waterproof containers with manufacturer's label intact. Materials in previously opened or unsealed containers, are not acceptable.
- B. Include on label of container: Manufacturer's name, type of paint, number and application instructions.
- C. Immediately upon delivery to the project site, all painter materials shall be stored and locked in a watertight shed with floor well off the ground. The shed shall remain locked at all times except for adding or removing materials.
- D. No materials of any manufacturer will be allowed on the project site any time during construction except those of the manufacturers specified or approved by the Architect.

1.05 Job Conditions:
- A. Comply with manufacturer's recommendations as to environmental conditions under which coating and coating systems can be applied.
- B. Do not apply finishes in areas where dust is being generated or where work in progress may affect finish quality.
- C. Protect finished work of other trades, and all surfaces not being painted concurrently, or not to be painted.

Part 2 - Products

2.01 General:
- A. The following specifications for Finishes is not intended to mention every particular item which will receive painter finish, but is intended to establish type and quality of finish which shall be required on various materials.
- B. **Products of Sherwin-Williams are specified herein to simplify descriptions of types and qualities of finishes required only.**

SECTION 09900 - PAINTING

Proprietary names are not intended to imply that products of named manufacturer are required to the exclusion of equivalent products of other manufacturers.

C. Wherever the abbreviation "SW" appears in the following detailed specification, it shall be understood to mean Sherwin-Williams.

D. Primers shall be as specified by manufacturers of finish paint used and as approved by the Architect.

2.02 Acceptable Manufacturers:

A. Sherwin-Williams.

B. PPG Industries.

C. Cook Paint and Varnish Co.

D. Pratt and Lambert.

E Kelly-Moore.

2.02 Exterior Finishes:

A. Enamel on Ferrous Metals:
   1. One coat SW Kem Kromik Primer, (Alkyd primer).
   2. Two coats SW Industrial Enamel, (Alkyd gloss enamel).

B. Enamel on Exterior Door Frames and Doors:
   1. Shop coat by others-touch up as required.
   2. Two coats SW Industrial Enamel, (Alkyd gloss enamel).

C. Enamel on Galvanized Metal:
   1. One Coat SW Galvite primer.
   2. 2 Coats SW Industrial Enamel, (Alkyd gloss enamel).

D. Enamel on Exterior Concrete Block:
   1. One coat SW Promar Latex Block Filler B25W25.
   2. Two coats SW A-100 Semi-Gloss Latex Enamel.

2.03 Interior Finishes:

A. Enamel on Metal: All miscellaneous and ornamental metal items which are left exposed, hollow metal doors and frames.
   1. Shop coat by others - touch up as required.
   2. Two coats SW Promar 200 Semi-Gloss. Enamel, (Alkyd semi-gloss enamel).

B. Enamel on Concrete Block:
   1. One coat SW Promar 200 Block Filler (vinyl acrylic latex).
   2. Two coats SW Promar 200 Semi-Gloss Enamel.

C. Enamel on Gypsum Board Ceilings/Facias/Walls
   1. One coat SW Promar 200 Wall Primer with Medium Texture. (Vinyl Acrylic Latex Wall Primer.)
   2. Two coats SW Promar 200 Semi-Gloss Latex Enamel.

D. Tape and Float: Joints on Gypsum Board.
   1. As per manufacturer's instructions.
   2. All joints shall be sanded ready for primer's finish.

E. Interior Millwork and Cabinetry:
   1. One coat SW Promar 200 Alkyd Enamel Primer/Undercoat.
   2. Two coats SW Promar 200 Semi-Gloss Latex Enamel.

F. Enamel on Wood Trim:
   1. One coat SW Promar 200 Alkyd Enamel Primer/Undercoat.
   2. Two coats SW Promar 200 Semi-Gloss Latex Enamel.

G. Back-Painting, Interior Work:
   1. Two coats SW Promar 200 Alkyd Enamel Primer/Undercoat.

H. Enamel on Exposed Metal Piping:
   1. One coat SW Galvite primer.
   2. Two coats SW Promar 200 Semi-Gloss Latex Enamel.

Part 3 - Execution

3.01 Inspection:
   A. Notify Contractor of any surface not in proper condition to be finished before proceeding with the work. Starting work will constitute the painter's acceptance of preceding work, and conditions under which finish will be applied and his assumption of responsibility for results to be obtained.

3.02 Preparation of Surfaces:
   A. Wood:
      1. Sand to a smooth even surface, then dust off.
      2. Touch-up knots, resinous spots, etc., on all surfaces with shellac 18 hours before applying prime coat.
      3. Fill nail holes, cracks and blemishes flush after priming coat has dried.
   B. Concrete Block and Concrete:
      1. Repair cracks and irregularities to provide uniform surface texture.
   C. Ferrous Metal Surfaces:
      1. Remove rust and scale, clean grease or oil surfaces with turpentine or benzine before painting.

3.03 Application:
   A. Number of coats and quality of finish shall be in accordance with these specifications, which requires the use of material which will product first quality finish if properly applied.
   B. Apply coats of material in strict accordance with manufacturer's currently published specifications, except where requirements of these specifications are in excess or manufacturer's requirements.
   C. Except as otherwise approved by the Architect, the first two coats of painter's finish shall be applied by roller or brush application. Finish coats may be applied by spray application.
   D. Comply with recommendation of product manufacturer for drying time between succeeding coats allow additional as required until finish is dry.
   E. All work where a coat of material has been applied must be inspected and approved before application of succeeding coat, otherwise, no credit for the coat well be given. Notify Architect when a particular coat has been completed for inspection and approval.
   F. Shellacs, oils, turpentine, etc., shall be of the highest quality and subject to approval of Architect. Materials shall be mixed in and applied directly from containers which they are purchased except when use of other containers is approved.
   G. First Coat of all finishes, except of varnish and stains, shall be white.
   H. Sand lightly between coats where shellac, varnish or enamel

is used.

I. Remove all hardware, accessories, machined surfaces, and similar items in place and not to be finish-painted, or provide surface-applied protection prior to surface preparation and painting operations.

3.04 Clean-up:

A. Clean and paint spots from work and touch-up or otherwise repair any defective or damaged work.

B. Remove all surplus materials and equipment after work is completed.

C. Leave entire job clean and acceptable to the Architect.

End of Section

DIVISION 10 - SPECIALTIES

SECTION 10100 - CHALKBOARDS AND TACKBOARDS

Part 1 - General

1.01 Work Included:
- A. All materials, labor, services and incidentals necessary for the completion of this section of the work.

1.02 Quality Assurance:
- A. Standards:
  - 1. American Society for Testing and Materials:
    - a. ASTM A-424, Steel Sheets for Porcelain Enameling.
  - 2. Federal Specifications:
    - a. LL-B-810B, Hardboard.
  - 3. Military Specifications:
    - a. MIL-C-15116C, Cork Sheet.

1.03 Submittals:
- A. Shop Drawings: Submit dimensioned ship Drawings indicating location, type, size, arrangement, adhesive, backing, anchor or mounting details, trim, and accessories.
- B. Submit samples showing the full range of colors available for each unit.

Part 2 - Products

2.01 Materials:
- A. Porcelain Enamel Steel Markerboards:
  - 1. Type: Factory-built aluminum framed unit.
  - 2. Construction: Factory LCS face on 24 gauge steel laminated to 3/8" hardboard with .015 aluminum back-up.
  - 3. Color: LCS faces shall be white.
  - 4. Trim: Provide "H" bar joint cover at adjacent panels, color to match narrow leg showing, map rail with cork inserts and chalk trough.
  - 5. Accessories: Provide two map hooks with paper clips at each chalkboard unit.
  - 6. Mounting System: Concealed metal spline system. **At exterior walls provide "stand-off" mounting brackets to prevent condensation behind boards.**
- B. Tackboard:
  - 1. Type: Factory-built aluminum framed unit.
  - 2. Construction: Vinyl covered surface bonded to a 2" thick insulation board core, with a 7/8" x 5/8" aluminum frame. Refer to Color Schedule.
  - 3. Mount System: Manufacturer's standard.
  - 4. Acceptable manufacturer: Best-Rite Vin-Tak tackboards.

SECTION 10100 - CHALKBOARDS AND TACKBOARDS

Part 3 - Execution

3.01 Installation:

A. Install units straight, plumb, and level with metal splice system. Refer to Drawings.

End of Section

DIVISION 10 - SPECIALTIES

SECTION 10400 - INTERIOR SIGNAGE

Part 1 - General

1.01 Work Included:
- A. All materials, labor, services and incidentals necessary for the completion of this entire section of the work.

1.02 Quality Assurance:
- A. Standards:
  1. UFAS Fed. Std. 795-Requirements for the physically handicapped.
  2. MIL Spec. L-P-387a, type NDP, rated self-extinguishing, for sign materials.

1.03 Submittals:
- A. Provide manufacturer's catalog cut and data sheets, complete parts list and installation requirements for each item specified.
- B. Schedules: Indicate location and placement for all graphic items.

1.04 Product Delivery, Storage and Handling:
- A. Handle and store all items with care to prevent damage and injury to finish surfaces.

Part 2 - Products

2.01 Products of the manufacturers listed below have been specified herein to simplify descriptions of design, construction, and materials only. All items have been selected for visual and performance design quality which shall serve as a basis for acceptance of equivalent products by other manufacturers.

2.02 Signage System:
- A. Material: 1/8 inch thick, type ES melamine plastic.
- B. Size: 8" x 8" x 1/8", with 1/2" radius corners. Custom design - refer to 2.04 for text and symbols.
- C. Mounting: All graphics shall be permanently mounted to wall or door surface with tamper resistant screws except where mounting to glazing is required. Provide adhesive for mounting and provide blank plates at opposite side of glass. Coordinate with Architect.
- D. Color: refer to Color Schedule, submit color samples with submittals, prior to approval. **Colors will be a factor in product acceptance.**
- E. Letter Style: Helvetica Medium.
- F. Standard Grade 2 braille shall be below all copy, all signs.
- G. All graphic material shall meet the requirements of UFAS Fed. Std. 795, and MIL spec L-P-387a.
- H. Acceptable Manufacturer: Series 200A, Type D format, Mohawk Sign systems.

2.03 Plaque Groupings Required (letter designation refers to 2.04):

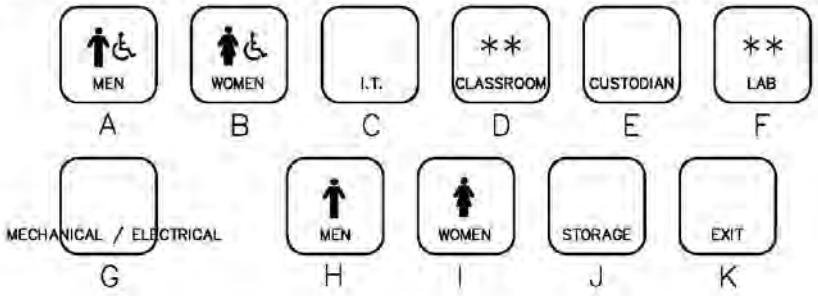
Quantity	Plaque	Mounting Location

**Coordinate location with Architect

Plaque	**Quantity**	**Location**
A	1	@ room no. 14d
B	1	@ room no. 14e
C	1	@ door no. 26
D	4	@ doors no. 44, 45, 46, & 47
E	1	@ door no. 27
F	6	@ doors no. 17, 18, 21, 22, 31, & 34
G	2	@ door no. 25 & 48
H	3	@ rooms no. 14a, 14b, & 14c
I	3	@ rooms no. 14f, 14g, & 14h
J	1	@ door no. 35
K	10	@ doors no. 2, 5, 8, 10, 11, 12, 13, 14, 16, & 28

SECTION 10400 - INTERIOR SIGNAGE

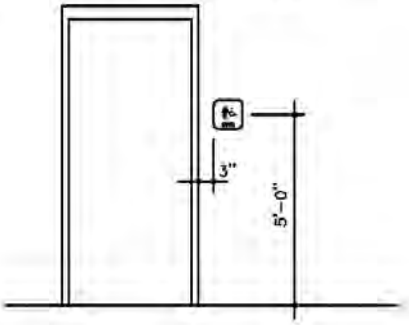
2.04 Signage Plaques Required:



** INDICATES ROOM NUMBER TO BE COORDINATED WITH ARCHITECT AND OWNER

Note: all signage plaques shall have grade 2 braille translations under text.

2.05 Typical Mounting:



Mounting Height

Typical Wall Location

Verify location with architect.

SECTION 10400 - INTERIOR SIGNAGE

Part 3 - Execution

3.01 Installation:

A. Comply with manufacturer's installation instructions and details on the Drawings. Set all units plumb and level in location indicated on the Drawings or as directed.

B. Provide all necessary accessories: Items to support or attach Identifying Devices to result in a complete installation.

C. Protect all signage plaques to prevent damage after installation.

End of Section

DIVISION 10 - SPECIALTIES

SECTION 10420 - LETTERS AND PLAQUES

Part 1 General

1.01 Work Included:
- A. All materials, labor, services, and incidentals necessary for the completion of this entire section of the work.

1.02 Submittals:
- A. Shop Drawings: Indicate details and dimensions of fabrication and installation including layouts and assemblies. Begin fabrication only after receiving approved shop Drawings.
- B. Manufacturer's Literature: Descriptive literature and installation instructions.

1.03 Product Delivery, Storage, and Handling:
- A. Handle and store all items with care to prevent damage and injury to finish surfaces.

Part 2 - Products

2.01 Cast Letters at exterior locations:
- A. Finish / Color: **CLEAR ANODIZED ALUMINUM**.
- B. Letter Style: **OPTIMA FONT**.
- C. Size: height – see below.
- D. Mounting: coordinate with Architect.
- E. Quantity: Sufficient letters to spell out the following (quantities in parentheses):

    1. **CENTRAL JUNIOR HIGH** (X 1 / 30″ TALL / WALL MOUNTED)
    2. **AUDITORIUM** (X 1 / 18″ TALL / MOUNT TO TOP OF STEEL TUBE AS PER DRAWINGS)

- F. Verify exact spelling/punctuation with Architect.
- G. Location: refer to the Drawings.
- H. Acceptable Manufacturer: A.R.K. Ramos, Oklahoma City.

2.02 Cast Metal Plaque at interior location:

- A. Castings shall be free from pits, scale, sand holes, or other defects. Comply with requirements specified for metal, border style, background texture, and finish, and with requirements shown for thickness, size, shape, and copy. Hand-tool and buff borders and raised copy to produce the manufacturer's standard satin polished finish. Coordinate final design with Architect.
    1. Metal: aluminum.
    2. Border Style: Type 504.
    3. Background Texture: manufacturer's standard No. 2 black pebble texture.

SECTION 10420 - LETTERS AND PLAQUES

4. Letter Style: Helvetica upper case – raised satin aluminum finish.
5. Mounting Method: No. 4 concealed fasteners.
6. Finish: manufacturer's satin aluminum finish.
7. Size: 20 inches x 24 inches.
8. Content:

CENTRAL JUNIOR HIGH
STEM CLASSROOM ADDITION
MOORE PUBLIC SCHOOLS

SUPERINTENDENT OF SCHOOLS:
DR. ROBERT ROMINES

BOARD OF EDUCATION:

MANDY KINCANNON	PRESIDENT
ERIN MORRISON	VICE PRESIDENT
MATT PURSER	MEMBER
STACI PRUETT	MEMBER
JENNY NGUYEN-STATLER	MEMBER

ASSISTANT SUPERINTENDENT – OPERATIONS:
JEFF HORN

ARCHITECT:
AGP – THE ABLA GRIFFIN PARTNERSHIP LLC
MOORE, OKLAHOMA

CONTRACTOR:
OMNI CONSTRUCTION LLC
MOORE, OKLAHOMA

9. Type Example: ARK-Ramos Manufacturing Company, Inc.

Part 3 - Execution

3.01 Installation:

A. Install units plumb and level in locations indicated on the Drawings, following manufacturer's recommendations.
B. Provide all necessary accessories: Items to support or attach metal letters to result in a complete installation.

C. Protect all finishes to prevent damage before, during and after installation.

End of Section

DIVISION 10 - SPECIALTIES

SECTION 10520 - FIRE PROTECTION SPECIALTIES

Part 1 General

1.01 Work Included:
- A. All materials, labor, services and incidentals necessary for the completion of this entire section of the work.

1.02 Submittals:
- A. Submit Manufacturer's Literature: Descriptive literature, product data and installation instructions.

1.03 Product Delivery, Storage and Handling:
- A. Handle and store all items with care to prevent damage to equipment. Damaged equipment shall be rejected.

1.04 Quality Assurance:
- A. Standards:
  1. Conform to NFPA 10 requirements for portable fire extinguishers.
- B. Provide fire extinguishers, cabinets and accessories by a single manufacturer.

1.05 **Products of certain manufacturers are specified herein to simplify descriptions of design, construction, and/or materials only. Proprietary names are not intended to imply that products of named manufacturer are required to the exclusion of equivalent products of other manufacturers.**

Part 2 - Products

2.01 Materials:
- A. Fire Extinguishers:
  1. Model No. 10E - Cosmic multi-purpose dry chemical fire extinguisher. UL, 4A-60-BC.
- B. Fire Extinguisher Cabinets:
  1. Model No.: Academy 1026V10 with return trim as required with rolled edge.
  2. Door Style: Contemporary V, with flat trim.
  3. Glazing: 1/4" clear acrylic.
  4. Finish: Aluminum, mill finish, clear anodized.
  5. Fire Rated Enclosure: provide fire stopping material to protect integrity of fire rated partition as required by applicable codes and standards.

Part 3 - Execution

3.01 Installation:
- A. Install equipment as located on the Drawings and comply with manufacturer's written instructions for equipment provided.
- B. Prepare recesses in walls for fire extinguisher cabinets as required for type and size of cabinet and style of trim, and

to comply with manufacturer's instructions.

C. Securely fasten mounting brackets and fire extinguisher cabinets to the structure, square and plumb, to comply with manufacturer's instructions.

D. Check extinguishers for proper charge operation.

E. Remove and replace damaged, defective or under charged units.

End of Section

DIVISION 10 – SPECIALTIES

SECTION 10750 - FLAGPOLES

Part 1 - General

1.01 Description:

A. The General / Special Conditions and applicable sections of Division 1 shall apply to this entire section.

B. Furnish all labor and materials necessary for the completion of work in this section as shown on the contract drawings and specified herein.

C. Provide each flagpole as a complete unit produced by a single manufacturer, including fittings, accessories, bases and anchorage devices.

D. Construct pole and ship to site in one piece, if possible. If more than one piece is necessary, provide snug fitting, precision joints with self-aligning, internal splicing sleeve arrangement for weather-tight, hairline field joints.

E. Related work specified elsewhere shall include accessories, anchorage/blocking and concrete for installation of flagpoles.

1.02 Related Work Specified Elsewhere

A. Section 03300 – Cast-In-Place Concrete.

B. Section 07900 - Sealants.

1.03 Quality Assurance:

A. American Architectural Manufacturers Association (AAMA)611 - Voluntary Specification for Anodized Architectural Aluminum.

B. ASTM International (ASTM):

1. A312 – Standard Specification for Seamless and Austenitic Stainless Steel Pipe.
2. B241 – Standard Specification for Aluminum-Alloy Seamless Pipe and Seamless Extruded Tube.
3. C94 – Standard Specifications for Ready-Mix Concrete.
4. E527 – Standard Practice for Numbering Metals and Alloys.

C. National Association of Architectural Metal Manufacturers (NAAMM) 503 - Finishes for Stainless Steel.

D. American National Standards Institute/National Association of Architectural Metal Manufacturers (ANSI/NAAMM) - Guide Specifications for Design of Metal Flagpoles Manual.

E. Product Delivery: Wrap poles in heavy paper to prevent damage during shipping and handling.

1.04 Submittals:

A. Shop Drawings: provide product data Including pole and base dimensions, materials, finishes, and accessories.

B. Sustainable Design Submittals:

1. Regional materials.

SECTION 10750 - FLAGPOLES

1.05 Warranty:
A. Provide manufacturer's standard warranty.

1.06 Project Conditions:
A. Field Measurements: Verify actual locations of flagpoles and concrete footings by field measurements before fabrication and indicate measurements on Shop Drawings.

1.07 **Products of certain manufacturers are specified herein to simplify descriptions of design, construction, and/or materials only. Proprietary names are not intended to imply that products of named manufacturer are required to the exclusion of equivalent products of other manufacturers.**

Part 2 – Products

2.01 Design Requirements:
A. Design flagpole and anchorage devices in accordance with ANSI/NAAMM FP 100197.
B. Fabricate from seamless extruded tubing, having a minimum wall thickness of 0.188", tensile strength not less than 30,000 psi and a yield point of 25,000 psi. Heat-treat and age-harden flagpoles after fabrication.
C. Description:
1. Tapered pole - stainless steel, ASTM A312.
2. Exposed Height: 45 feet.
3. Overall Height: 48 feet.
4. Butt Diameter: 6 inches.
5. Top Diameter: 3.5 inches.

2.02 Mounting:
A. Embedded:
1. Foundation Tube: fabricate from 16 gauge, galvanized steel, with a steel base plate whose square dimension is at least the inside dimension of the sleeve plus 4". A setting plate 6" square shall be securely welded to the ground spike, at least 6" below the base plate. The ground spike shall be ¾" diameter, not less than 18" long.
2. Provide a spun aluminum collar, Type FC-11, finish to match flagpole shaft. Diameter shall be at least 1" greater than diameter of the sleeve.
3. Apply bituminous coating to that part of flagpole to be set in base, inside and out.

2.03 Finish:
A. Aluminum: Deep Luster Finish (NAAMM-32).

2.04 Fittings:
A. Finial: 14 gauge spun aluminum ball, finish to match pole with flush seam, sized to match butt diameter of shaft.
B. Truck: cast aluminum revolving, non-fouling, complete with

stainless steel ball bearings, and two 2-3/8" diameter cast nylon sheaves.

C. Halyards: two (2) sets of #10 (5/16") white waterproof polypropylene, each equipped with two (2) chrome swivel snaps to secure the flag. Provide cover.

D. Cleats: tow (2) 9" cast aluminum cleats, with stainless steel socket-head bolts included. Finish to match shaft. Provide locking cover.

2.05 Acceptable Manufacturers:

A. American Flagpole, Inc.

B. Baartol Co., Inc.

C. Concord Industries, Inc.

Part 3 - Execution

3.01 Preparation:

A. Examine areas to receive flagpoles for correct elevation, subgrade preparation, etc. and report any discrepancies to the architect.

B. Take complete and accurate measurements for location of flagpoles prior to starting work.

C. Start installation only after all deficiencies are resolved to the approval of the Architect.

3.02 Installation:

A. Excavation: excavate for foundation concrete to neat clean lines in undisturbed soil. Provide forms where required at unstable soil conditions. Remove loose soil and other foreign matter from excavation and moisten earth before placing concrete.

B. Concrete: provide concrete as indicated in Section 03300 – Cast-in-Place Concrete.

C. Install foundation sleeve in concrete footing. Center pole in sleeve using steel wedges and fill sleeve with clean, dry sand and top off with grout.

D. Flagpole Installation: Install flagpoles as indicated and in compliance with approved shop drawings and manufacturer's instructions. Install flagpoles in a rigid, straight, plumb and level manner. Provide positive lightning ground for each flagpole installation. Paint portions of ground-set flagpole below grade with a heavy coat of bituminous paint.

E. Apply joint sealer around pole at top of grout and collar.

End of Section

DIVISION 10 - SPECIALTIES

SECTION 10800 - TOILET AND BATH ACCESSORIES

Part 1 - General

1.01 Work Included:
- A. All materials, labor, services, and incidentals necessary for the completion of this section of the work.

1.02 Submittals:
- A. Provide manufacturer's catalog cut and data sheets, complete parts list and installation requirements for each accessory item specified.
- B. Where applicable, submit maintenance data, operating instructions and keys required for each type of equipment and lock.

1.03 **Products of certain manufacturers are specified herein to simplify descriptions of design, construction, and/or materials only. Proprietary names are not intended to imply that products of named manufacturer are required to the exclusion of equivalent products of other manufacturers.**

Part 2 - Products

2.01 The following model numbers refer to products of Bradley Corporation (except where noted otherwise).

2.02 Accessories:
- A. Grab Bars:
  1. Model No. 8120-001360-36".
  2. Quantity: 1 each @ rooms 14d and 14e
- B. Grab Bars:
  1. Model No. 8120-001420-42".
  2. Quantity: 1 each @ rooms 14d and 14e
- C. Grab Bars:
  1. Model No. 8120-001180-18".
  2. Quantity: 1 each @ rooms 14d and 14e
- D. Tilted Stainless Steel Mirror (Frame and Surface):
  1. Model No. 740-1830.
  2. Quantity: 2 total with 1 each side of room 14 (above washfountains)
- E. Stainless Steel Mirror (Frame and Surface):
  1. Model No. 781-1830
  2. Quantity: 2 total with 1 each side room 14 (above washfountains)
- F. Custodian's Utility Shelf/With Mop & Broom Holder:
  1. Model No. 9984, 36" long.
  2. Quantity: 1 @ room 16
- G. Toilet Paper Dispensers to be provided by Owner and installed by Contractor.
- H. Paper Towel Dispenser to be provided by Owner and installed by Contractor.

SECTION 10800 - TOILET AND BATH ACCESSORIES

I. Soap Dispenser to be provided by Owner and installed by Contractor.

Part 3 - Execution

3.01 General:

A. Install where noted on the Drawings and mount as indicated or per manufacturer's recommendations.

B. Use concealed or tamper-proof fasteners of same material and finish as unit. Provide anchors, bolts, and other mounting devices and attach units securely.

End of Section

SECTION 21 01 00

FIRE PROTECTION OPERATING AND MAINTENANCE MANUALS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Compilation product data and related information appropriate for Owner's operation and maintenance of products furnished under Contract. Prepare operating and maintenance data as specified.

B. Instruct Owner's personnel in operation and maintenance of equipment and systems.

C. Submit three copies of complete manual in final form.

1.2 SUBMITTALS

A. Thirty (30) days after the Contractor has received the final scheduled identified submittals bearing the Architect / Engineer's stamp of acceptance (including resubmittals), submit for review one copy of the first draft of the Operating and Maintenance Manual. This copy shall contain as a minimum:
   1. Table of Contents for each element.
   2. Contractor information.
   3. All submittals, coordination drawings and product data, reviewed by the Architect / Engineer; bearing the Architect / Engineer's stamp of acceptance. (When submittals are returned from Engineer "Correct as Noted", corrected inserts shall be included.)
   4. All parts and maintenance manuals for items of equipment.
   5. Warranties (without starting dates).
   6. Certifications that have been completed. Submit forms and outlines of certifications that have not been completed.
   7. Operating and maintenance procedures.
   8. Form of Owner's Training Program Syllabus (including times and dates).
   9. Control operations/equipment wiring diagrams.
   10. Other required operating and maintenance information that are complete.

B. Copy will be returned to the Contractor within 15 days with comments for corrections.

C. Submit completed manuals in final electronic form to the Architect / Engineer one day after substantial completion, and prior to Owner's instructions. Include all specified data, test and balance reports, drawings, dated warranties, certificates, reports, along with other materials and information.

D. The Architect / Engineer will review the manuals for completeness within fifteen (15) days.

E. The Contractor shall be notified of any missing or omitted materials. The Manuals shall be reworked by the Contractor, as required, in the office of the Architect / Engineer. The manuals will not be retransmitted.

F. Complete electronic manuals will be delivered to the Owner.

PART 2 - PRODUCTS

2.1 BINDERS

A. Commercial quality black three-ring binders with clear overlay plastic covers.

B. Minimum ring size: 1"; Maximum ring size: 3".

C. When multiple binders are used, correlate the data into related groupings.

D. Label contents on spine and face of binder with full size insert. Label under plastic cover.

PART 3 - EXECUTION

3.1 OPERATION AND MAINTENANCE MANUAL

A. Form for Manuals:
   1. Prepare data in form of an instructional manual for use by Owner's personnel.
   2. Format:
      a. Size: 8-1/2" x 11".
      b. Text: Manufacturer's printed data or neatly typewritten.
   3. Drawings:
      a. Provide reinforced punched binder tab and bind in text.
      b. Fold larger drawings to size of text pages.
   4. Provide flyleaf indexed tabs for each separate product or each piece of operating equipment.
   5. Cover: Identify each volume with typed or printed title "Operating and Maintenance Instructions". List:
      a. Title of Project.
      b. Identity of separate structures as applicable.
      c. Identity of general subject matter covered in the manual.
   6. Binder as specified.

B. Content of Manual:
   1. Neatly typewritten Table of Contents for each volume arranged in systematic order as outlined in the specifications.
      a. Contractor, name of responsible principal, address and telephone number.
      b. A list of each product required to be included, indexed to content of the volume.
      c. List with each product, name, address and telephone number of:
         1) Subcontractor or installer.
         2) Maintenance contractor as appropriate.
         3) Identify area of responsibility of each.
         4) Local source of supply for parts and replacement.
      d. Identify each product by product name and other identifying symbols as set forth in Contract Documents.
   2. Product Data:
      a. Include those sheets pertinent to the specific product
      b. Annotate each sheet to:
         1) Identify specific product or part installed.
         2) Identify data applicable to installation.
         3) Delete references to inapplicable information. (All options not supplied with equipment shall be marked out indicated in some manner.
   3. Drawings:

a. Supplement product data with drawings as necessary to illustrate:
   1) Relations of component parts of equipment and systems.
   2) Control and flow diagrams.
b. Coordinate drawings with information in Project Record Documents to assure correct illustration of completed installation.
c. Do not use Project Record Documents as maintenance drawings.

4. Written text, as required to supplement product data for the particular installation:
   a. Organize in consistent format under separate headings for different procedures.
   b. Provide logical sequence of instructions for each procedure.
5. Copy of each warranty, bond and service contract issued.
   a. Provide information sheet for Owner's personnel, giving:
      1) Proper procedures in event of failure
      2) Instances that might affect validity of warranties or bonds
6. Shop drawings, coordination drawings and product data as specified.

C. Sections for Equipment and Systems.
1. Content for each unit of equipment and system as appropriate:
   a. Description of unit and component parts
      1) Function, normal operating characteristics, and limiting conditions
      2) Performance curves, engineering data and tests
      3) Complete nomenclature and commercial number of replaceable parts.
   b. Operating procedures:
      1) Start up, break-in, routine and normal operating instructions.
      2) Regulation, control, stopping, shut down and emergency instructions.
      3) Summer and winter operating instructions.
      4) Special operating instructions.
   c. Maintenance procedures:
      1) Routine operations
      2) Guide to trouble-shooting.
      3) Disassembly, repair and reassembly.
      4) Alignment, adjusting and checking.
      5) Routine service based on operating hours.
   d. Servicing and lubrication schedule. List of lubricants required.
   e. Manufacturer's printed operating and maintenance instructions.
   f. Description of sequence of operation by control manufacturer.
   g. Original manufacturer's parts list, illustrations, assembly drawings and diagrams required for maintenance.
      1) Predicted life of part subject to wear.
      2) Items recommended to be stocked as spare parts.
   h. As installed control diagrams by controls manufacturer.
   i. Complete equipment internal wiring diagrams.
   j. Each Contractor's coordination drawings.
   k. As installed color coded piping diagrams.
   l. Charts of valve tag number, with location and function of each valve.
   m. List of original manufacturer's spare parts and recommended quantities to be maintained in storage.
   n. Other data as required under pertinent sections of the specifications.
2. Prepare and include additional data when the need for such data becomes apparent during instruction of Owner's personnel.
3. Additional requirements for operating and maintenance data as outlined in respective sections of specifications.
4. Provide complete information for products specified in Division 21.

5. Provide certificates of compliance as specified in each related section.
6. Provide start up reports as specified in each related section.
7. Provide signed receipts for spare parts and material.
8. Provide training report and certificates.
9. Provide backflow preventer certified test reports.

END OF SECTION

SECTION 21 05 00

FIRE PROTECTION GENERAL PROVISIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Except as modified in this Section, General Conditions and Supplementary Conditions, applicable provisions of the General Requirements, and other provisions and requirements of the contract documents apply to work of Division 21 Fire Sprinkler Systems.

B. Applicable provisions of this section apply to all sections of Division 22, Plumbing.

1.2 CODE REQUIREMENTS AND FEES

A. Perform work in accordance with applicable statutes, ordinances, codes and regulations of governmental authorities having jurisdiction.

B. Plumbing work shall comply with applicable inspection services:
1. Underwriters Laboratories.
2. National Fire Protection Association.
3. State Health Department.
4. Local Municipal Building Inspection Department.

C. Resolve any code violations discovered in contract documents with the Engineer prior to award of the contract. After Contract award, any correction or additions necessary for compliance with applicable codes shall be made at no additional cost to the Owner.

D. This Contractor shall be responsible for being aware of and complying with asbestos NESHAP regulations, as well as all other applicable codes, laws and regulations.

E. Obtain all permits required.

1.3 CONTRACTOR'S QUALIFICATIONS

A. An approved contractor for the work under this division shall be:
1. A licensed specialist in this field and have the personnel, experience, training, skill, and organization to provide a practical working system
2. Able to furnish evidence of having contracted for and installed not less than 3 systems of comparable size and type that has served their Owners satisfactorily for not less than 3 years.

1.4 REFERENCE SPECIFICATIONS AND STANDARDS

A. Materials which are specified by reference to Federal Specifications; ASTM, ASME, ANSI, or AWWA Specifications; Federal Standards; or other standard specifications must comply with latest editions, revisions, amendments or supplements in effect on date bids are received. Requirements in reference specifications and standards are minimum for all equipment, material, and work. In instances where specified capacities, size, or other features of equipment, devices, or materials exceed these minimums, meet specified capacities.

1.5 CONTRACT DRAWINGS

A. Contract drawings are diagrammatic only and do not give fully dimensioned locations of various elements of work. Determine exact locations from field measurements.

1.6 PROJECT RECORD DOCUMENTS

A. Maintain at the job site a separate set of white prints (blue line or black line) of the contract drawings for the sole purpose of recording the "as-built" changes and diagrams of those portions of work in which actual construction is at variance with the contract drawings. Mark the drawings with a colored pencil. Prepare, as the work progresses and upon completion of work, reproducible drawings clearly indicating locations of various lines, valves, ductwork, traps, equipment, and other pertinent items, as installed. Include flow-line elevation of sewer lines. Record existing and new underground and under slab piping with dimensioned locations and elevations of such piping.

B. At the conclusion of project, obtain without cost to the Owner, original drawings and transfer as-built changes to these. Prior to transmittal of corrected drawings, obtain 3 sets of prints of each drawing, regardless of whether corrections were necessary and include in the transmittal (2 sets are for the Owner's use and one set is for the Architect/Engineer's records). Delivery of these as-built prints and reproducible is a condition of final acceptance. Provide record drawings on one set each and AutoCad 2012 / Revit CAD files.

C. As-Built drawings should indicate the following information as a minimum:
1. Indicate all addendum changes to documents.
2. Remove Engineer’s seal, name, address and logo from drawings.
3. Mark documents RECORD DRAWINGS.
4. Clearly indicate: DOCUMENT PRODUCED BY.
5. Indicate all changes to construction during construction. Indicate actual routing of all piping, etc. that were deviated from construction drawings.
6. Correct schedules to reflect (actual) equipment furnished and manufacturer.
7. During the execution of work, maintain a complete set of drawings and specifications upon which all locations of equipment, ductwork, piping, devices, and all deviations and changes from the construction documents in the work shall be recorded.
8. Location and size of all ductwork and mechanical piping above ceiling including exact location of isolation of domestic and plumbing valves.
9. Exact location of all electrical equipment in and outside of the building.
10. Fire Protection System documents revised to indicate exact location of all sprinkler heads and zone valves.
11. Exact location of all roof mounted equipment, wall, roof and floor penetrations.
12. Cloud all changes.

1.7 SPACE REQUIREMENTS

A. Consider space limitations imposed by contiguous work in selection and location of equipment and material. Do not provide equipment or material that is not suitable in this respect.

1.8 RELATION WITH OTHER TRADES

A. Carefully study all matters and conditions concerning the project. Submit notification of conflict in ample time to prevent unwarranted changes in any work. Review other Divisions of these specifications to determine their requirements.

B. Because of the complicated relationship of this work to the total project, conscientiously study the relation and cooperate as necessary to accomplish the full intent of the documents.

C. Provide sleeves and inserts in forms as required for the work. Stub up and protect open ends of pipe before any concrete is placed. Furnish sizes of required equipment pads. Furnish and locate bolts and fittings required to be cast in them.

D. Locate and size openings required for installation of work specified in this Division in sufficient time to prevent delay in the work.

E. Refer to other Divisions of the specifications for the scope of required connections to equipment furnished under that Division. Determine from the Contractor for the various trades, the Owner, and by direction from the Architect/Engineer, the exact location of all items.

1.9 CONCEALED AND EXPOSED WORK

A. When the word "concealed" is used in connection with insulating, painting, piping, ducts and the like, the work is understood to mean hidden from sight as in chases, furred spaces or above ceilings. "Exposed" is understood to mean open to view.

1.10 GUARANTEE

A. Guarantee work for 1 year from the date of substantial completion of the project. During that period make good any faults or imperfections that may arise due to defects or omissions in material, equipment or workmanship. At the Owner's option, replacement of failed parts or equipment shall be provided.

1.11 MATERIAL AND EQUIPMENT

A. Furnish new and unused materials and equipment meeting the requirements of the paragraph specifying acceptable manufacturers. Where two or more units of the same type or class of equipment are required, provide units of a single manufacturer.

1.12 NOISE AND VIBRATION

A. Select equipment to operate with minimum noise and vibration. If objectionable noise or vibration is produced or transmitted to or through the building structure by equipment, piping, ducts or other parts of work, rectify such conditions at no additional cost. If the item of equipment is judged to produce objectionable noise or vibration, demonstrate at no additional cost that equipment performs within designated limits on a vibration chart.

1.13 ACCEPTABLE MANUFACTURERS

A. Manufacturers names and catalog number specified under sections of Division 21 are used to establish standards of design, performance, quality and serviceability and not to limit competition. Equipment of similar design, equal to that specified, manufactured by a named manufacturer will be acceptable on approval. A request for prior approval of equipment not listed must be submitted ten (10) days before bid due date. Submit complete design and performance data to the Engineer.

1.14 OPERATING TESTS

A. After all plumbing systems have been completed and put into operation, subject each system to an operating test under design conditions to ensure proper sequencing and

operation throughout the range of operation. Tests shall be made in the presence of the Architect/Engineer. Make adjustments as required to ensure proper functioning of all systems. Special tests on individual systems are specified under individual sections. Submit 3 copies of all certifications and test reports adequately in advance of completion of the work to allow for remedial action as required to correct deficiencies discovered in equipment and systems.

1.15 WARRANTIES

A. Submit 3 copies of all warranties and guarantees for systems, equipment, devices and materials. These shall be included in the Operating and Maintenance Manuals.

1.16 BUILDING CONSTRUCTION

A. It shall be the responsibility of each sub-contractor to consult the Architectural and Engineering drawings, details, and specifications and thoroughly familiarize himself with the project and all job related requirements. Each sub-contractor shall cooperate with the General Contractor to verify that all piping and other items are placed in the walls, furred spaces, chases, etc., so there will be no delays in the job.

PART 2 - PRODUCTS – NOT USED

PART 3 - EXECUTION

3.1 OPENINGS

A. Framed, cast or masonry openings for ductwork, equipment or piping are specified under other divisions. Drawings and layout work for exact size and location of all openings are included under this division.

3.2 HOUSEKEEPING PADS

A. Provide equipment housekeeping pads under all floor mounted and ground mounted plumbing equipment, and as shown on the drawings.

B. Concrete work as specified in Division 3.

C. Concrete pads:
1. 4" high, rounded edges, minimum 2500 psi unless otherwise indicated on the drawings
2. Chamfer strips at edges and corner of forms.
3. Smooth steel trowel finish.
4. Doweled to existing slab

D. Install concrete curbs around multiple pipe penetrations.

3.3 VANDAL RESISTANT DEVICES

A. Where vandal resistant screws or bolts are employed on the project, deliver to the Owner 2 suitable tools for use with each type of fastener used.

B. Proof of delivery of these items to the Owner shall be included in the Operating and Maintenance Manuals.

3.4 INSTRUCTION OF OWNER'S PERSONNEL

A. Prior to final inspection, conduct an on-site training program to instruct the Owner's operating personnel in the operation and maintenance of the fire protection systems.
   1. Provide the training during the Owner's regular working day.
   2. The instructors shall each be experienced in their phase of operation and maintenance of building plumbing systems and with the project.

B. Time to be allocated for instructions.
   1. Minimum of 4 hours dedicated instructor time.
   2. 2 hours on each of 2 days.

C. Before proceeding with the on-site training program, submit the program syllabus; proposed time and dates; and other pertinent information for review and approval.
   1. One copy to the Owner.
   2. One copy to the Architect/Engineer.

D. The Owner will provide a list of personnel to receive instructions, and will coordinate their attendance at the agreed upon times.

E. Use the operation and maintenance manuals as the basis of instruction. Review contents of manual with personnel in detail to explain all aspects of operation and maintenance.

F. Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, maintenance, and shut down of each item of equipment.

G. Demonstrate equipment functions (both individually and as part of the total integrated system).

H. Prepare and insert additional data in the operating and maintenance manuals when the need for additional data becomes apparent during instructions.

I. Submit a report within one week after completion of the training program that instructions have been satisfactorily completed. Give time and date of each demonstration and hours devoted to the demonstration, with a list of people present.

J. At the conclusion of the on-site training program, have the person designated by the Owner sign a certificate to certify that he/she has a proper understanding of the system, that the demonstrations and instructions have been satisfactorily completed, and the scope and content of the operating and maintenance manuals used for the training program are satisfactory.

K. Provide a copy of the report and the certificate in an appropriately tabbed section of each Operating and Maintenance Manual.

3.5 EQUIPMENT IDENTIFICATION

A. Provide a laminated engraved plastic nameplate on each piece of equipment and starter.
   1. Designation approved by Architect/Engineer.
   2. Equipment includes, but is not limited to, pumps, and utility controllers.
   3. Submit schedule of equipment to be included and designations.

B. Provide nameplates with 1/2" high letters and fastened with epoxy or screws.

3.6 OBSTRUCTIONS

A. The drawings indicate certain information pertaining to surface and subsurface obstructions which has been taken from available drawings. Such information is not guaranteed, however, as to accuracy of location or complete information.
   1. Before any cutting or trenching operations are begun, verify with Owner's representative, utility companies, municipalities, and other interested parties that all available information has been provided.
   2. Should obstruction be encountered, whether shown or not, alter routing of new work, reroute existing lines, remove obstruction where permitted, or otherwise perform whatever work is necessary to satisfy the purpose of the new work and leave existing services and structures in a satisfactory and serviceable condition.

B. Assume total responsibility for and repair any damage to existing utilities or construction, whether or not such existing facilities are shown.

3.7 PROTECTION

A. Protect work, equipment, fixtures, and materials. At work completion, work must be clean and in original manufacturer's condition.

END OF SECTION

SECTION 21 05 10

FIRE PROTECTION CONTRACT QUALITY CONTROL

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Contract quality control including workmanship, manufacturer's instructions and demonstrations.

1.2 QUALITY CONTROL PROGRAM

A. Maintain quality control over supervision, subcontractors, suppliers, manufacturers, products, services, site conditions and workmanship to produce work in accordance with contract documents.

1.3 WORKMANSHIP

A. Comply with industry standards except when more restrictive tolerances or specified requirements indicate more rigid standards or more precise workmanship.

B. Perform work by persons qualified to produce workmanship of specified quality.

C. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, and racking. Under no conditions shall material or equipment be suspended from structural bridging.

D. Provide finishes to match approved samples. All exposed finishes shall be approved by the Architect. Submit color samples as required.

1.4 MANUFACTURER'S INSTRUCTIONS

A. Comply with instructions in full detail, including each step in sequence.

B. Should instruction conflict with Contract Documents, request clarification from Architect / Engineer before proceeding.

1.5 MANUFACTURER'S CERTIFICATES

A. When required in individual Specification Sections, submit manufacturer's certificate in duplicate, certifying that products meet or exceed specified requirements.

1.6 MANUFACTURER'S FIELD SERVICES

A. When required in individual Specification Sections, manufacturer shall provide qualified personnel to observe:
   1. Field conditions.
   2. Condition of installation.
   3. Quality of workmanship.
   4. Start-up of equipment.
   5. Testing, adjusting, and balancing of equipment.

B. Representative shall make written report of observations and recommendations to Architect / Engineer.

PART 2 - PRODUCTS

2.1 REFERENCE APPLICABLE SPECIFICATION SECTIONS.

PART 3 - EXECUTION

3.1 PROTECTION OF EQUIPMENT

A. Do not deliver equipment to the project site until progress of construction has reached the stage where equipment is actually needed or until building is closed in enough to protect the equipment from weather. Equipment allowed to stand in the weather will be rejected, and the Contractor is obligated to furnish new equipment of a like kind at no additional cost to the Owner.

B. Adequately protect equipment from damage after delivery to the project. Cover with heavy tarpaulins, drop cloths or other protective coverings as required to protect from plaster, paint, mortar and/or dirt. Do not cover with plastic materials and trap condensate and cause corrosion.

END OF SECTION

SECTION 21 05 12

FIRE PROTECTION SHOP DRAWINGS, COORDINATION DRAWINGS & PRODUCT DATA

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Prepare submittals as required by Division 1.

B. The term submittal, as used herein, refers to all:
1. Shop Drawings.
2. Coordination Drawings.
3. Product data.

C. Submittals shall be prepared and produced for:
1. Distribution as specified.
2. Inclusion in the Operating and Maintenance Manual, as specified, in the related section.

1.2 SHOP DRAWINGS

A. Present drawings in a clear and thorough manner. Identify details by reference to sheet and detail, schedule, or room numbers shown on Contract Drawings.

B. Show all dimensions of each item of equipment on a single composite Shop Drawing. Do not submit a series of drawings of components.

C. Identify field dimensions; show relationship to adjacent features, critical features, work, or products.

D. Submit shop drawings in plan, elevation and sections, showing equipment in mechanical equipment areas.

1.3 COORDINATION DRAWINGS

A. Present in a clear and thorough manner. Title each drawing with project name. Identify each element of drawings by reference to sheet number and detail, or room number of contract documents. Minimum drawing scale: 1/8” = 1’-0”.

B. Prepare coordination drawings to coordinate installations for efficient use of available space, for proper sequence of installation, and to resolve conflicts. Coordinate with work specified in other sections and other divisions of the specifications.

C. For each mechanical room and for each outside equipment pad where equipment is located, submit plan and elevation drawings. Show:
1. Actual mechanical equipment and components to be furnished.
2. Service clearance.
3. Relationship to other equipment and components.
4. Roof drains and leader piping.
5. Fire protection piping and equipment.

D. Identify field dimensions. Show relation to adjacent or critical features of work or products.

E. Related requirements:
1. Ductwork shop drawings.

2. Coordination drawing specified in Division 26.

F. Submit shop drawings in plan, elevation and sections, showing equipment in mechanical equipment areas.

1.4 PRODUCT DATA AND INSTALLATION INSTRUCTION

A. Submit only pages which are pertinent to the project. All options which are indicated on the product data shall become part of the contract and shall be required whether specified are not.

B. Mark each copy of standard printed data to identify pertinent products, referenced to specification section and article number.

C. Show reference standards, performance characteristics and capacities; wiring and piping diagrams and controls; component parts; finishes; dimensions and required clearances.

D. Modify manufacturer's standard schematic drawings and diagrams to supplement standard information and to provide information specifically applicable to the work. Delete information not applicable.

E. Mark up a copy of the specifications for the product. Indicate in the margin of each paragraph the following: “Comply, ”Do Not Comply”, or “Not Applicable”. Explain all “Do Not Comply” statements.

F. Provide a separate transmittal for each submittal item. Transmittals shall indicate product by specification section name and number. Separate all submittals into appropriate specification section number. Do not combine specification sections.

1.5 MANUFACTURERS INSTRUCTIONS

A. Submit Manufacturer's instructions for storage, preparation, assembly, installation, start-up, adjusting, calibrating, balancing and finishing.

1.6 CONTRACTOR RESPONSIBILITIES

A. Review submittals prior to transmittal.

B. Determine and verify:
1. Field measurements.
2. Field construction criteria.
3. Manufacturer's catalog numbers.
4. Conformance with requirements of Contract Documents.

C. Coordinate submittals with requirements of the work and of the Contract Documents.

D. Notify the Architect / Engineer in writing at time of submission of any deviations in the submittals from requirements of the Contract Documents.

E. Do not fabricate products, or begin work for which submittals are specified, until such submittals have been produced and bear contractor's stamp. Do not fabricate products or begin work scheduled to have submittals reviewed until return of reviewed submittals with Architect / Engineer's acceptance.

F. Contractor's responsibility for errors and omissions in submittals is not relieved whether Architect / Engineer reviews submittals or not.

G. Contractor's responsibility for deviations in submittals from requirements of Contract Documents is not relieved whether Architect / Engineer reviews submittals or not, unless Architect / Engineer gives written acceptance of the specific deviations on reviewed documents.

H. Submittals shall show sufficient data to indicate complete compliance with Contract Documents:
   1. Proper sizes and capacities.
   2. That the item will fit in the available space in a manner that will allow proper service.
   3. Construction methods, materials and finishes.

I. Schedule submissions at least 15 days before date reviewed submittals will be needed.

1.7 SUBMISSION REQUIREMENTS

A. Make submittals promptly in accordance with approved schedule, and in such sequence as to cause no delay in the Project or in the work of any other Contractor.

B. Number of submittals required:
   1. Shop Drawings and Coordination Drawings: Submit one reproducible transparency and three opaque reproductions.
   2. Product Data: Submit the number of copies which the contractor requires, plus those which will be retained by the Architect / Engineer.

C. Accompany submittals with transmittal letter, in duplicate, containing:
   1. Date.
   2. Project title and number.
   3. Contractor's name and address.
   4. The number of each Shop Drawing, Project Datum and Sample submitted.
   5. Other pertinent data.

D. Submittals shall include:
   1. The date of submission.
   2. The project title and number.
   3. Contract Identification.
   4. The names of:
      a. Contractor.
      b. Subcontractor.
      c. Supplier.
      d. Manufacturer.
   5. Identification of the product.
   6. Field dimensions, clearly identified as such.
   7. Relation to adjacent or critical features of the work or materials.
   8. Applicable standards, such as ASTM or federal specifications numbers.
   9. Identification of deviations from contract documents.
   10. Suitable blank space for General Contractor and Architect / Engineer stamps.
   11. Contractor's signed and dated Stamp of Approval.

E. Coordinate submittals into logical groupings to facilitate interrelation of the several items:
   1. Finishes which involve Architect / Engineer selection of colors, textures or patterns.
   2. Associated items which require correlation for efficient function or for installation.

1.8 SUBMITTAL SPECIFICATION INFORMATION

A. Every submittal document shall bear the following information as used in the project manual:
   1. The related specification section number.
   2. The exact specification section title.

B. Submittals delivered to the Architect / Engineer without the specified information will not be processed. The Contractor shall bear the risk of all delays, as if no submittal had been delivered.

1.9 RESUBMISSION REQUIREMENTS

A. Make re-submittals under procedures specified for initial submittals.
   1. Indicate that the document or sample is a re-submittal.
   2. Identify changes made since previous submittals.

B. Indicate any changes which have been made, other than those requested by the Architect / Engineer.

1.10 CONTRACTOR'S STAMP OF APPROVAL

A. Contractor shall stamp and sign each document certifying to the review of products, field measurements and field construction criteria, and coordination of the information within the submittal with requirements of the work and of Contract Documents.

B. Contractor's stamp of approval on any submittal shall constitute a representation to Owner and Architect / Engineer that Contractor has either determined and verified all quantities, dimensions, field construction criteria, materials, catalog numbers, and similar data or assumes full responsibility for doing so, and that Contractor has reviewed or coordinated each submittal with the requirements of the work and the Contract Documents.

C. Do not deliver any submittals to the Architect / Engineer that do not bear the Contractor's stamp of approval and signature.

D. Submittals delivered to the Architect / Engineer without Contractor's stamp of approval and signature will not be processed. The Contractor shall bear the risk of all delays, as if no submittal had been delivered.

1.11 ARCHITECT / ENGINEER REVIEW OF IDENTIFIED SUBMITTALS

A. The Architect / Engineer will:
   1. Review identified submittals with reasonable promptness and in accordance with schedule
   2. Affix stamp and initials or signature, and indicate requirements for re-submittal or approval of submittal
   3. Return submittals to Contractor for distribution or for resubmission

B. Review and approval of submittals will not extend to design data reflected in submittals which is peculiarly within the special expertise of the Contractor or any party dealing directly with the Contractor.

C. Architect / Engineer's review and approval is only for conformance with the design concept of the project and for compliance with the information given in the contract.

1. The review shall not extend to means, methods, sequences, techniques or procedures of construction or to safety precautions or programs incident thereto.
2. The review shall not extend to review of quantities, dimensions, weights or gauges, fabrication processes or coordination with the work of other trades.

D. The review and approval of a separate item as such will not indicate approval of the assembly in which the item functions.

1.12 SUBSTITUTIONS

A. Do not make requests for substitution employing the procedures of this Section.

B. The procedure for making a formal request for substitution is specified in Div. 1.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION - NOT USED

END OF SECTION

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SECTION 21 10 00

FIRE SPRINKLER SYSTEMS

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Design coordination of sprinkler work with the installations of other trades as shown on their drawings; all mechanical, electrical, plumbing and sprinkler work must fit the space requirements. The sprinkler work shall comply with other Sections of this specification; and fit the structure finishes. The Sprinkler Contractor will comply with all the codes and underwriter authorities, and the requirements for the installation of inside and outside piping; including sprinkler heads, valves, tamper switches, flow switches, hangers and supports, sleeves, fire department connections, inspector test connections, main drain and accessories, signs, and any other component parts reasonably incidental to providing a complete protection system. Provide 100 percent coverage for the areas indicated on the plans.

B. A wet system shall be installed in heated areas and dry pipe systems in areas subject to freezing. When heated areas are not available and dry pipe system not used, provide heat tracing and / or insulation installed per NFPA and per local Fire Marshall Requirements, or as indicated on drawings.

C. Furnish all articles of a completed sprinkler system including all materials, labor, tools, equipment, transportation services and supervision fees.

D. The plans provide a riser assembly location at water entry into building for flow switch locations, valve locations (with tamper switches), fire department test assemblies and fire department Siamese connections. These are a guide for subsequent preparation of the Contractor’s detailed installation drawings of the complete fire protection sprinkler system which shall be submitted to the Architect / Engineer for review. Submit only drawings and calculations bearing the approval of the authority having jurisdiction.

E. Do not exceed 52,000 square feet of building for each individual sprinkler system.

F. Install fire protective system identification signs in accordance with NFPA-13.

G. It shall be the fire protection installer’s responsibility to verify pressure at the project site by performing a flow test. Determine if the available static pressure, residual pressure, and flow rate will adequately provide the fire extinguishing system with the necessary operating requirements or if a fire pump, storage tank and necessary appurtenances are required. Notify Architect and Engineer if low water flow / pressure condition exist and inform them of all options prior to proceeding.

H. The installation of the entire Sprinkler Systems shall comply with all rules and regulations of the National Board of Fire Underwriters, the Local Building Code, Local Fire Marshall, and Requirements of NFPA Pamphlet 13, and other local authorities exercising jurisdiction.

I. Study the general, structural, electrical, and mechanical drawings and specifications, in order to become familiar with the building and details as they apply to the work of this Section. Cooperate with all Trades so that there will be no conflict of space. Plumbing flow lines, large ductwork HVAC piping and electrical service feeders shall take precedence over Fire Protection work, except where it is absolutely necessary to

maintain coverage protection.

J. Provide a water curtain sprinkler system along glazing to create a 1-hour rating, as outlined in NFPA 13. Refer to Architecture plans for locations. Water demand for water curtain shall be added to the ceiling sprinkler water demand at the point of connection, per NFPA 13. Sprinkler heads shall be spaced at 6’-0” o.c., minimum 6 inches and maximum 12 inches from glazing.

1.2 BASIS OF DESIGN

A. National Fire Protection Association (NFPA), latest edition of NFPA 13, Standard for the Installation of Sprinkler Systems.

B. Vertical zone valves installed in horizontal position are not acceptable. All zone valves are to be located at water entry into building and mounted in the vertical riser.

1.3 QUALITY ASSURANCE

A. Sprinkler equipment and installation to be in accordance with recommendations of and approved by local, state, and federal fire authorities.

B. Equipment and installation to meet requirements of NFPA No. 13, 14, 20, 24, 25, 70 and 72.

C. Use materials and equipment that are new and of unused, approved by NFPA and as listed in the UL list of "Inspected Fire Protection Equipment and Materials."

1.4 SHOP DRAWINGS

A. Make complete shop drawings and working drawings of equipment furnished, including detailed drawings of piping and sprinkler head locations. Drawings shall show construction details and dimensions of each piece of equipment and work to be installed. The location of all heads shall be as approved. Where additional heads are required to meet NFPA 13, provide at no additional cost.

B. Before the shop drawings are submitted to Architect / Engineer, submit drawings to the jurisdictions for approval. All approvals shall be noted on the drawings or by letter from the departments.

C. The Architect's approval of shop drawings shall not relieve the responsibility of correctly figured dimensions or any errors that may be contained in these drawings. The omission of any material shown on the contract drawings, or specified from the shop drawings, even though approved, shall not relieve the responsibility to furnish and erect them.

D. Provide ¼ scale drawings to show the location of the water entry into building with all zone valves, and shut-off valves, with alarms and drains at this location. Prepare the sprinkler drawings under the work of this Section.

E. Submit samples of all sprinkler types for approval.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Johnson Controls (Tyco Fire Products)
   1. Gem/Grinnell.
   2. Central.

3. Star Sprinkler.

B. Automatic Sprinkler Company of America.

C. Potter Roemer, Inc.

D. The Reliable Automatic Sprinkler Company.

E. Viking Corporation.

F. Victaulic Company of America.

G. Globe Fire Sprinkler Corporation.

2.2 PIPING AND FITTINGS

A. Above Slab Inside Building.
1. Pipe 2" and Smaller: Schedule 40, black steel pipe conforming to ASTM A 795 or ASTM A135 joined with threaded fittings.
2. Pipe 2-1/2" and larger, provide ASTM A795 or ASTM A135 UL and FM listed.
a. Light wall having a minimum corrosion resistance ratio (CRR) or 1.00 or greater.
a. Schedule. 40, black steel pipe joined with rolled grooved fittings.

B. All piping shall be black carbon steel, except in dry systems where pipe shall be galvanized per ASTM A53.

C. Fittings used to join pipe shall be listed fabricated fittings or manufactured in accordance with the material and dimension standards listed in table 6.4.1 NFPA 13 and 2.2.1 NFPA 14.

2.3 SPRINKLER HEAD

A. All sprinklers shall comply with the latest requirements of NFPA 13 with respect to orifice size.

B. All heads shall be UL listed and/or FM approved and comply with the latest requirements of NFPA 13 with respect to orifice size unless otherwise noted. Sprinkler heads with “O” ring design shall not be acceptable.

C. Exposed areas:
1. Standard upright type with brass finish and escutcheon. Provide temperature rating per NFPA 13 and UL/FM approvals.

D. Sidewall applications:
1. Horizontal sidewall type with brass finishes and chrome escutcheon.
2. Unfinished areas and recessed with chrome plated escutcheon. Provide temperature rating per NFPA 13 and UL/FM approvals.

E. Suspended ceilings:
1. Semi-recessed pendant type with matching push on escutcheon plate with manufacturer painted white finish with glass bulb fusible link. Provide temperature rating per NFPA 13 and UL/FM approvals.

F. Sprinklers subject to mechanical injury shall be protected with fusible solder type sprinklers and listed heavy duty bolt on guards. Bulb type sprinklers shall have wire

guards for these locations.

1. Storage rooms with exposed structure.
2. Mechanical and Electrical rooms.

2.4 INSPECTOR'S TEST CONNECTION

A. Provide inspector's test connection as required by NFPA 13.

1. Ductile iron module housing with combination sight glass, orifice, and bonnet assembly
2. UL listed
3. Victaulic No. 718
4. Globe Model UTD
5. Tyco, or approved equal.

2.5 TAMPER SWITCH / SUPERVISORY SWITCH

A. Tamper switch on each valve

1. Controlling or shutting off sprinkler system or any portion thereof.
2. Tamper switch with either one single pole, double throw switch or two single pole, double throw switches as required.
3. Switch shall be compatible with installed valve for standard mounting.
4. Potter-Roemer Fig. 6220, 6221, 6222, 6223 or approved equal.

2.6 FLOW SWITCH

A. Vane type flow switch.

1. Self-contained pneumatic, adjustable retard.
2. Two, single pole, double throw switches.
3. Red enamel tamper proof switch housing with flow paddle.
4. Potter Roemer Model No. 6200 or approved equal.

2.7 FLOORS AND CEILING PLATES

A. Provide chrome-plated floor and ceiling plates around pipes exposed to view when passing through walls, floors, partitions, or ceilings in finished areas; size plates to fit pipe or insulation and lock in place.

2.8 DOMESTIC MANUFACTURE

A. All piping material, pipe and pipe fittings shall be manufactured in the United States of America.

2.9 COUPLINGS

A. Use listed rolled grooved mechanical couplings to engage and lock grooved, or shouldered pipe ends and to allow for some angular deflection, contraction, and expansion. Coupling consists of ductile iron housing, c-shaped composition sealing gasket and steel bolts. Gasket Material for dry pipe systems shall be silicone and listed for dry pipe service.

2.10 VALVES

A. Use valves suitable for 175 psig WOG.

B. Valves to be UL listed and FM approved.

C. Valve Connections:
   1. Provide valves suitable to connect adjoining piping as specified for pipe joints. Use full line size valves unless noted otherwise.
   2. Screwed ends for pipe sizes 2 inches and smaller.
   3. Flanged ends for pipe sizes 2-1/2 inches and larger.
   4. Solder or screw to solder adapters for copper tubing.
   5. Use grooved body valves with mechanical grooved jointed piping.

D. Gate Valves:
   1. Up to 2 inches, bronze, outside screw and yoke, rising stem, solid wedge, screwed ends, manufactured by: Mueller, or approved equal.
   2. Over 2 inches, iron body, bronze trim, outside screw and yoke, rising stem, solid wedge, flanged ends; manufactured by Mueller, or approved equal.

E. Ball Valves:
   1. Up to and including 2 inches, Bronze two piece body, brass, chrome plated bronze, or stainless steel ball, teflon seats and stuffing box ring, lever handle and balancing stops, threaded ends with union. Watts or approved equal.
   2. Over 2 inches, cast steel body, chrome plated steel ball, teflon seat and stuffing box seals, lever handle. Watts or approved equal.

F. Check Valves:
   1. Up to 2-inch, bronze, regrind bronze swing disk, solder, or screwed ends; 200 WOG, manufactured by Mueller, or approved equal.
   2. Over 2-inch, iron body bronze trim, swing disk, regrind – renew bronze disk and seat, flanged ends; 200 WOG, manufactured by Mueller, Globe Model RCV, or approved equal.

G. Butterfly Valve: Lug body style, bubble-tight shutoff, cast iron body, ASTM B 148 bronze disk, with integral tamper switch, manufactured by Anvil Model No. 8000 FP, or approved equal.

H. Double Check Valves (backflow preventer).
   1. 2 1/2” inches and over: ASSE 1015, double check backflow preventer with 2 independent spring loaded check valves, 2 isolation ball, OS&Y or butterfly valves with normally open tamper switch with double wire leads, 4 valve test ports. Constructed of bronze or epoxy coated cast iron or stainless steel body with bronze and plastic internal parts, stainless steel springs, silicone rubber valve discs, bronze seats, rated for 175 PSIG.

I. Freestanding Indicating Post: Install adjustable indicating post and valve outside building where shown on Civil drawings, consisting of UL/FM, non-rising stem gate valve and indicating post. Gate valve shall be iron body, non-rising stem, bronze mounted. Indicator flange, 175-psi non-shock rating, flanged end. Indicator shall be UL/FM approved cast iron body, Plexiglas window and 18-inch adjustment span with handle and tamper switch wired to main fire alarm control panel, manufactured by Mueller, Valve No. A-2052, Indicating Post No. A20800, or approved equal.

2.11 ELECTRIC ALARM BELL

A. 10-inch round red enamel steel bell with electrically operated vibrating outdoor alarm bell, UL listed, red enamel steel, manufactured by Simplex, or approved equal.

2.12 GAUGES

A. Gauges shall be bourdon tube type with minimum 4-1/2-inch dial and die cast aluminum

case with screwed ring and black enamel finish. The movement shall be all stainless steel with Grade A phosphor bronze bourdon tube, brazed at socket and tip. The accuracy of the gauge shall be within one-half of one percent of the scale range. The pointer shall be the micrometer adjustment type recalibrated from the front. Pressure and compound gauges shall have suitable scale ranges and graduations. Suitable for temperatures up to 120 degrees F.

B. Gauges shall have ¼ inch connections and be mounted with combination stop / snubber needle valve with suitable pressure rating. Scale ranges: 0-200 psi.

C. Gauge range shall be such that system normal operating pressure falls with 25 percent and 75 percent of the full-scale range.

D. Pressure scale graduations shall read in psig. Figure intervals shall be in – 20 psig increments, with minor divisions in 2 psig increments.

E. The accuracy of the gauge shall be at least 0.5 percent of the scale range. Gauge shall be made in accordance with ASME B40.1 accuracy grade 2A.

F. Manufactured by:
1. Trerice Model No. 4500 Series.
2. Ashcroft.
3. Marsh.
4. Weksler.

2.13 SPARE SPRINKLER HEAD BOX

A. Provide baked enamel steel box to store 36 sprinkler heads (Minimum of 3 of each type used) for emergency replacement. Provide sprinkler wrench.

2.14 ALARM CHECK VALVE

A. Provide UL listed check valve.
a. Variable for City Supplied systems pressure trim set.
b. Constant for Fire Pump Systems pressure trim set.
c. Tyco AV-1, Globe Model H, or approved equal.

2.15 SIAMESE FIRE DEPARTMENT CONNECTION

A. Siamese remote free standing fire department connection with chrome plated finish, local fire department thread, dust caps and chains, escutcheon, body, and ¾ inch automatic drip marked SPRINKLER – FIRE DEPARTMENT CONNECTION

PART 3 - EXECUTION

3.1 DESIGN

A. Design, spacing of sprinkler heads and selection sizes shall conform to the requirements of NFPA 13 for the indicated occupancy.

B. Uniform discharge density design shall be based on hydraulic calculations using the method outlined in NFPA 13. Density of discharge from sprinkler heads shall conform to NFPA 13.

C. Friction losses in pipe will be based on a value of “C” = 120 in the Hazen and Williams formula.

D. Design and install the system so that no part will interfere with doors, windows, heating, mechanical, lighting, or electrical equipment. Do not locate sprinkler heads closer than 3 feet to lighting fixtures or other obstructions.

3.2 LOCATION

A. Heads shown, if indicated on reflected ceiling plans, are an integral part of the ceiling design. Where heads are not shown or indicated, locate them in the exact center of acoustical ceiling tile unless noted otherwise. In rooms with monolithic plaster or gypsum drywall ceilings, locate the sprinkler heads symmetrically arranged with respect to both axes of the room. Locate sprinkler heads in relation to specialty ceiling elements such as slats, ribs, panels, grids, etc., if not shown on the drawings. Generally, locate heads in the exact center of, or spaced between, such elements. Center heads in corridors.

B. Locate heads as may be required for coordinated ceiling pattern, even through number of heads exceed minimum code requirements.

C. Sprinkler heads located in utility or mechanical rooms, penthouses, service corridors, or other such spaces not subject to public view need not be centered in ceiling patterns and may use a straight drop from branch line.

3.3 PREPARATION

A. Ream pipes and tubes, clean off scale, rust, oxide, and dirt, inside and outside, before assembly. Remove welding slag or other foreign material from piping.

B. Pipe beveled each end, per approved procedures.

C. Hammer clean and flush out piping after welding to remove scale, welding slag and other debris.

3.4 CONNECTION

A. Make screwed joints with square, clean full cut standard taper pipe threads. Ream after cutting and threading. Red lead and linseed oil or other approved non-toxic joint compound applied to male threads only.

B. Nipples: Shoulder type; extra heavy where less than 1-1/2 inch is unthreaded.

C. Clamp cast iron water pipe at fittings with ¾ inch rods and properly anchor and support.

D. Use grooved mechanical couplings and mechanical fasteners only in accessible locations.

3.5 COORDINATION

A. Coordinate the installation schedule for this work with the construction schedule for the Work to ensure orderly progress with minimum delay.

B. Coordinate interface of fire sprinkler system with the work of other trades to ensure proper and adequate provision for the installation and connection of this system.

C. Coordinate location and quantity of Siamese connections required for fire department connection with Architect and local fire officials.

3.6 SURFACE CONDITIONS

A. Before starting each stage of the fire sprinkler systems installation, inspect the installed work of other trades and determine that work is complete enough to allow installation to begin. Ensure that work of other trades has been installed in a manner to permit work of this Section in accordance with approved design.

3.7 INSTALLATION

A. Run piping concealed above furred ceilings and in joists to minimize obstructions. Expose only heads.

B. Protect sprinkler heads against mechanical injury with heavy duty bolt-on guards.

C. Locate system drains and inspector’s test connections in utility rooms, mechanical rooms or other readily accessible areas not requiring access through ceiling. Coordinate sprinkler system drain flow rates with plumbing system drainage capacities.

D. Where low points or drains occur above ceilings or in otherwise finished spaces, furnish drain valve with brass cap and chain.

E. Locate outside alarms on wall of building and coordinate with Architect.

F. Provide on interior wall near sprinkler valve, cabinet containing extra sprinkler heads of each type and wrench suitable for each head type.

G. Provide a minimum 18-inch radius swing joint for each drop to sprinkler heads located in ceilings.

H. Provide Easy-Flex or Flexhead Industries sprinkler hose fittings for each sprinkler head installation for hydraulically designed wet, pre-action, deluge, or dry pipe sprinkler connections per NFPA 13. Allow a 3” minimum bend radius per UL.

I. Install pipe markers to identify fire protection.

J. Provide shield or deflector for sprinklers or equipment where electrical switchgear, switchboards and motor control centers are in sprinkler protected spaces.

K. Install valves with stems upright or horizontal, not inverted.

L. Sprinkler heads shall be installed above and below ductwork over 48 inches wide, in exposed areas, per NFPA 13.

M. Install the complete fire sprinkler system in accordance with the approved shop drawings.

N. Perform piping installation in accordance with the provisions of the specifications, including furnishing of required sleeves for fire sprinkler system pipes passing through rated walls, floors, and other parts of the building. Provide scheduled 40 galvanized pipe sleeve for concrete or CMU penetrations. Furnish size required for fireproofing and or insulation. Furnish and install split wall plates and chrome plated escutcheons for exposed fire sprinkler system pipes. Where pipes pass through concrete floors, furnish, and install wrought iron or steel pipe sleeves made flush with the ceiling below and extending 2" above the finished floor.

O. Do not cut or make holes in any part of the building except where shown on the approved shop drawings.

P. Furnish and install, next to the sprinkler riser main, a print sheet protected by glass or a transparent plastic cover, giving brief instructions regarding control, emergency procedure, and other data required by NFPA #13. For hydraulically designed sprinkler systems, a placard is to be permanently attached to the riser indicating the location, and the basis of design (discharge density and system demand).

Q. Do not install exposed piping below structure in public area.

R. Provide heat tracing and insulation on wet piping systems exposed to freezing when not installed in a heated space or installed by other acceptable methods of maintaining the piping from freezing. Installation of heat tracing and insulation shall be in accordance with the latest edition of NFPA 13 and the local code authorities. Coordinate electrical requirements with Division 26.

3.8 SECURING AND SUPPORTING

A. Support piping to maintain line and grade, with provision for expansion and contraction. Use approved adjustable ring type or trapeze-type hangers connected to structural members of the building. Single pipe runs to be supported by approved adjustable ring type hangers. Multiple pipe runs to be supported by approved trapeze type hangers. Do not support piping from other piping or structural joist bridging.

B. Provide supports both sides of elbows for pipe 6" and larger. Provide supports on smaller pipe at maximum of 12 inches from elbows and take-offs.

C. Support vertical risers with steel strap pipe clamps of approved design and size, supported at each floor. Support piping assemblies in chases so they are rigid and self-supported before the chase is closed.

D. Support spacing: As recommended by the project structural engineer and support manufacturer, but not more than listed below. Not to exceed spacing requirements of smallest pipe.

Pipe Size	Steel Max. Support Spacing, Feet	Minimum Rod Diameter, Inches
1" & smaller	6	3/8
1-1/4" & 1-1/2"	8	3/8
2"	10	3/8
3"	10	1/2
4" & 5"	10	5/8
6" and above	10	3/4

3.9 PIPE SUPPORTS

A. Provide P1001 or P 5000 Unistrut metal framing members and appurtenances for pipe support. Hot-dip galvanize members and appurtenances when located outside. Sagging of pipes or supports is not acceptable.

B. Adjustable ring type hangers shall be used for single pipe supports; Erico Model 115 NFPA UL/FM. When oversized clevis is used, a nipple shall be placed over the clevis bolt as a spacer to assure that the lower U-strap will not move in on the bolt. All parts shall be

zinc plated carbon steel, or galvanized.

3.10 PIPE SLEEVES

A. Sleeves through masonry and concrete construction:
   1. Fabricate sleeves of Schedule 40 galvanized steel pipe.
   2. Size sleeve large enough to allow for movement due to expansion and to provide continuous insulation.

B. Sleeves through gypsum wall construction.
   1. Fabricate sleeves of 16-gauge galvanized sheet metal.

C. Sleeves through elevated slab construction.
   1. Fabricate sleeves of Schedule 40 galvanized steel pipe with welded center flange in floor.

D. Extend each sleeve through the floor or wall. Cut the sleeve flush with each wall surface. Sleeves through floors shall extend 2” above floor lines for waterproofing purposes. Slab on grade floors shall not be sleeved except where penetrating waterproofing membrane or insect control is required.

E. Caulk sleeves water and airtight. Seal annular space between pipes and sleeves with mastic compound to make the space water and airtight.

F. Provide chrome plated escutcheon plates on pipes passing through walls, floors or ceilings exposed to view. At exterior walls, stainless steel sheet metal is to be used.

G. For sleeves through fire and smoke rated walls, seal with a UL through-penetration firestop, rated to maintain the integrity of the time rated construction. Install in accordance with the manufacturer's installation instructions. Comply with UL and NFPA standards for the installation of firestops. Refer to Architectural drawings for all fire and smoke rated partitions, walls, floors, etc.

3.11 CLEANING OF PIPING SYSTEMS

A. General cleaning of piping systems. Purge pipe of construction debris and contamination before placing the systems in service. Provide and install temporary connections as required to clean, purge, and circulate.

3.12 FLUSHING AND TESTING

A. Testing and flushing of installation of sprinkler system shall be in accordance with NFPA 13, and NFPA 25.

B. Flush sprinkler piping in accordance with NFPA 13. Additionally, flush all alarm valves, and all main piping up to valve.

C. In addition to NFPA 13 required tests, provide flow switch test and tamper switch test for each device, and verify alarm valve operation.

D. All tests shall be witnessed by Architect / Engineer. Contractor shall notify Architect / Engineer 7 working days in advance.

3.13 EXCAVATING, TRENCHING, AND BACKFILLING

A. Perform excavation, trenching, and backfilling for this portion of the work in accordance

with the specifications.

3.14 PIPE MARKERS

A. Identify interior exposed piping and piping in accessible chases or plenums with Opti-Code Brady Pressure Sensitive Adhesive Pipe Markers, consisting of pipe marker and direction of flow arrow tape. Clean pipe prior to installation. Background colors of markers, arrows, and tape for each type of system shall be the same. Meet ANSI/OSHA standards and clearly identify each system. Provide minimum 2-1/4-inch letters through 4-inch pipe and 4-inch letters for 5-inch pipe and larger.

B. Identify exterior and mechanical room piping with Snap Around pipe markers through 4-inch pipe and Strap Around markers 5-inch pipe and larger. Pipe markers consisting of pipe marker and direction of flow arrow tape; background colors of markers, arrows, and type for each type of system shall be the same. Meet ANSI / OSHA standards and clearly identify each system. Provide minimum 2-1/4-inch letters through 4-inch pipe and 4-inch letters for 5-inch pipe and larger.

C. Install identification in the following locations:
   1. Both sides of penetrations through walls, floors, and ceilings.
   2. Close to valves or flanges.
   3. Intervals on straight pipe runs not to exceed 50 feet.
   4. Apply marker where view is obstructed.

D. Pipe markers shall meet or exceed the specifications of the ASME A13.1 “Scheme for Identification of Piping Systems”.

3.15 TESTING AND ACCEPTANCE

A. Prior to connecting to the overhead sprinkler piping, flush the underground main. Secure required approvals of the flushing operations.

B. Upon completion of the fire sprinkler system installation, test and retest the complete installation and make corrections as necessary to obtain acceptance by the Fire Marshall and/or any other authority having jurisdiction. Furnish test equipment and personnel required.

3.16 TRAINING

A. At a time mutually agreed upon, provide 4 hours of instruction to the Owner’s designated personnel on the operation and maintenance of the automatic sprinkler system and associated equipment. Owner’s Operation and Maintenance Manual prepared for this project shall be used during the instruction.

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SECTION 22 01 00

PLUMBING OPERATING AND MAINTENANCE MANUALS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Compilation product data and related information appropriate for Owner's operation and maintenance of products furnished under Contract. Prepare operating and maintenance data as specified.

B. Instruct Owner's personnel in operation and maintenance of equipment and systems.

C. Submit three copies of complete manual in final form.

1.2 SUBMITTALS

A. Thirty (30) days after the Contractor has received the final scheduled identified submittals bearing the Architect/Engineer's stamp of acceptance (including resubmittals), submit for review one copy of the first draft of the Operating and Maintenance Manual. This copy shall contain as a minimum:
   1. Table of Contents for each element.
   2. Contractor information.
   3. All submittals, coordination drawings and product data, reviewed by the Architect / Engineer; bearing the Architect / Engineer's stamp of acceptance. (When submittals are returned from Engineer "Correct as Noted", corrected inserts shall be included.)
   4. All parts and maintenance manuals for items of equipment.
   5. Warranties (without starting dates)
   6. Certifications that have been completed. Submit forms and outlines of certifications that have not been completed.
   7. Operating and maintenance procedures.
   8. Form of Owner's Training Program Syllabus (including times and dates).
   9. Control operations/equipment wiring diagrams.
   10. Other required operating and maintenance information that are complete.

B. Copy will be returned to the Contractor within 15 days with comments for corrections.

C. Submit completed manuals in final electronic form to the Architect / Engineer one day after substantial completion, and prior to Owner's instructions. Include all specified data, test and balance reports, drawings, dated warranties, certificates, reports, along with other materials and information.

D. The Architect/Engineer will review the manuals for completeness within fifteen (15) days.

E. The Contractor shall be notified of any missing or omitted materials. The Manuals shall be reworked by the Contractor, as required, in the office of the Architect / Engineer. The manuals will not be retransmitted.

F. Complete electronic manuals will be delivered to the Owner.

PART 2 - PRODUCTS

2.1 BINDERS

A. Commercial quality black three-ring binders with clear overlay plastic covers.

B. Minimum ring size: 1 inch; Maximum ring size: 3 inches.

C. When multiple binders are used, correlate the data into related groupings.

D. Label contents on spine and face of binder with full size insert. Label under plastic cover.

PART 3 - EXECUTION

3.1 OPERATION AND MAINTENANCE MANUAL

A. Form for Manuals:
1. Prepare data in form of an instructional manual for use by Owner's personnel.
2. Format:
a. Size: 8-1/2 inch x 11 inch.
b. Text: Manufacturer's printed data or neatly typewritten.
3. Drawings:
a. Provide reinforced punched binder tab and bind in text.
b. Fold larger drawings to size of text pages.
4. Provide flyleaf indexed tabs for each separate product or each piece of operating equipment.
5. Cover: Identify each volume with typed or printed title "Operating and Maintenance Instructions". List:
a. Title of Project.
b. Identity of separate structures as applicable.
c. Identity of general subject matter covered in the manual.
6. Binder as specified.

B. Content of Manual:
1. Neatly typewritten Table of Contents for each volume arranged in systematic order as outlined in the specifications.
a. Contractor, name of responsible principal, address and telephone number.
b. A list of each product required to be included, indexed to content of the volume.
c. List with each product, name, address and telephone number of:
1) Subcontractor or installer.
2) Maintenance contractor as appropriate.
3) Identify area of responsibility of each.
4) Local source of supply for parts and replacement.
d. Identify each product by product name and other identifying symbols as set forth in Contract Documents.
2. Product Data:
a. Include those sheets pertinent to the specific product.
b. Annotate each sheet to:
1) Identify specific product or part installed.
2) Identify data applicable to installation.
3) Delete references to inapplicable information. (All options not supplied with equipment shall be marked out indicated in some manner.
3. Drawings:
a. Supplement product data with drawings as necessary to illustrate:
1) Relations of component parts of equipment and systems.
2) Control and flow diagrams.
b. Coordinate drawings with information in Project Record Documents to assure correct illustration of completed installation.
c. Do not use Project Record Documents as maintenance drawings.

4. Written text, as required to supplement product data for the particular installation:
    a. Organize in consistent format under separate headings for different procedures.
    b. Provide logical sequence of instructions for each procedure.
5. Copy of each warranty, bond and service contract issued.
    a. Provide information sheet for Owner's personnel, giving:
        1) Proper procedures in event of failure.
        2) Instances that might affect validity of warranties or bonds.
6. Shop drawings, coordination drawings and product data as specified.

C. Sections for Equipment and Systems.
1. Content for each unit of equipment and system as appropriate:
    a. Description of unit and component parts.
        1) Function, normal operating characteristics, and limiting conditions.
        2) Performance curves, engineering data and tests.
        3) Complete nomenclature and commercial number of replaceable parts.
    b. Operating procedures:
        1) Start up, break-in, routine and normal operating instructions.
        2) Regulation, control, stopping, shut down and emergency instructions.
        3) Summer and winter operating instructions.
        4) Special operating instructions.
    c. Maintenance procedures:
        1) Routine operations
        2) Guide to trouble-shooting.
        3) Disassembly, repair and reassembly.
        4) Alignment, adjusting and checking.
        5) Routine service based on operating hours.
    d. Servicing and lubrication schedule. List of lubricants required.
    e. Manufacturer's printed operating and maintenance instructions.
    f. Description of sequence of operation by control manufacturer.
    g. Original manufacturer's parts list, illustrations, assembly drawings and diagrams required for maintenance.
        1) Predicted life of part subject to wear.
        2) Items recommended to be stocked as spare parts.
    h. As installed control diagrams by controls manufacturer.
    i. Complete equipment internal wiring diagrams.
    j. Each Contractor's coordination drawings.
    k. As installed color coded piping diagrams.
    l. Charts of valve tag number, with location and function of each valve.
    m. List of original manufacturer's spare parts and recommended quantities to be maintained in storage.
    n. Other data as required under pertinent sections of the specifications.
2. Prepare and include additional data when the need for such data becomes apparent during instruction of Owner's personnel.
3. Additional requirements for operating and maintenance data as outlined in respective sections of specifications.
4. Provide complete information for products specified in Division 22.
5. Provide certificates of compliance as specified in each related section.
6. Provide start up reports as specified in each related section.
7. Provide signed receipts for spare parts and material.
8. Provide training report and certificates.
9. Provide backflow preventer certified test reports.
10. Provide gas piping pressure test reports.

END OF SECTION

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SECTION 22 05 00

PLUMBING GENERAL PROVISIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Except as modified in this Section, General Conditions, Supplementary Conditions, applicable provisions of the General Requirements, and other provisions and requirements of the contract documents apply to work of Division 22 Plumbing.

B. Applicable provisions of this section apply to all sections of Division 22, Plumbing.

1.2 CODE REQUIREMENTS AND FEES

A. Perform work in accordance with applicable statutes, ordinances, codes and regulations of governmental authorities having jurisdiction.

B. Plumbing work shall comply with applicable inspection services:
1. Underwriters Laboratories.
2. National Fire Protection Association.
3. State Health Department.
4. Local Municipal Building Inspection Department.

C. Resolve any code violations discovered in contract documents with the Engineer prior to award of the contract. After Contract award, any correction or additions necessary for compliance with applicable codes shall be made at no additional cost to the Owner.

D. This Contractor shall be responsible for being aware of and complying with asbestos NESHAP regulations, as well as all other applicable codes, laws and regulations.

E. Obtain all permits required.

1.3 CONTRACTOR'S QUALIFICATIONS

A. An approved contractor for the work under this division shall be:
1. A licensed specialist in this field and have the personnel, experience, training, skill, and organization to provide a practical working system
2. Able to furnish evidence of having contracted for and installed not less than three systems of comparable size and type that has served their Owners satisfactorily for not less than three years.

1.4 REFERENCE SPECIFICATIONS AND STANDARDS

A. Materials which are specified by reference to Federal Specifications; ASTM, ASME, ANSI, or AWWA Specifications; Federal Standards; or other standard specifications must comply with latest editions, revisions, amendments or supplements in effect on date bids are received. Requirements in reference specifications and standards are minimum for all equipment, material, and work. In instances where specified capacities, size, or other features of equipment, devices, or materials exceed these minimums, meet specified capacities.

1.5 CONTRACT DRAWINGS

A. Contract drawings are diagrammatic only and do not give fully dimensioned locations of various elements of work. Determine exact locations from field measurements.

1.6 PROJECT RECORD DOCUMENTS

A. Maintain at the job site a separate set of white prints (blue line or black line) of the contract drawings for the sole purpose of recording the "as-built" changes and diagrams of those portions of work in which actual construction is at variance with the contract drawings. Mark the drawings with a colored pencil. Prepare, as the work progresses and upon completion of work, reproducible drawings clearly indicating locations of various lines, valves, ductwork, traps, equipment, and other pertinent items, as installed. Include flow-line elevation of sewer lines. Record existing and new underground and under slab piping with dimensioned locations and elevations of such piping.

B. At the conclusion of project, obtain without cost to the Owner, the original drawings and transfer as-built changes to these. Prior to transmittal of corrected drawings, obtain three sets of blue-line prints of each drawing, regardless of whether corrections were necessary and include in the transmittal (two sets are for the Owner's use and one set is for the Architect / Engineer's records). Delivery of these as-built prints and reproducibles is a condition of final acceptance. Provide record drawings prints and electronic drawings on AutoCad 2012 / Revit CAD files.

C. As-Built drawings should indicate the following information as a minimum:
1. Indicate all addendum changes to documents.
2. Remove Engineer’s seal, name, address and logo from drawings.
3. Mark documents RECORD DRAWINGS.
4. Clearly indicate: DOCUMENT PRODUCED BY
5. Indicate all changes to construction during construction. Indicate actual routing of all piping, ductwork, etc. that were deviated from construction drawings.
6. Indicate exact location of all underground plumbing and flow line elevation.
7. Indicate exact location of all underground plumbing piping and elevation.
8. Indicate exact location of all underground electrical raceways and elevations.
9. Correct schedules to reflect (actual) equipment furnished and manufacturer.
10. During the execution of work, maintain a complete set of drawings and specifications upon which all locations of equipment, ductwork, piping, devices, and all deviations and changes from the construction documents in the work shall be recorded.
11. Location and size of all ductwork and mechanical piping above ceiling including exact location of isolation of domestic and plumbing valves.
12. Exact location of all electrical equipment in and outside of the building.
13. Fire Protection System documents revised to indicate exact location of all sprinkler heads and zone valves.
14. Exact location of all roof mounted equipment, wall, roof and floor penetrations.
15. Cloud all changes.

1.7 SPACE REQUIREMENTS

A. Consider space limitations imposed by contiguous work in selection and location of equipment and material. Do not provide equipment or material that is not suitable in this respect.

1.8 RELATION WITH OTHER TRADES

A. Carefully study all matters and conditions concerning the project. Submit notification of conflict in ample time to prevent unwarranted changes in any work. Review other Divisions of these specifications to determine their requirements.

B. Because of the complicated relationship of this work to the total project, conscientiously

study the relation and cooperate as necessary to accomplish the full intent of the documents.

C. Provide sleeves and inserts in forms as required for the work. Stub up and protect open ends of pipe before any concrete is placed. Furnish sizes of required equipment pads. Furnish and locate bolts and fittings required to be cast in them.

D. Locate and size openings required for installation of work specified in this Division in sufficient time to prevent delay in the work.

E. Refer to other Divisions of the specifications for the scope of required connections to equipment furnished under that Division. Determine from the Contractor for the various trades, the Owner, and by direction from the Architect / Engineer, the exact location of all items.

1.9 CONCEALED AND EXPOSED WORK

A. When the word "concealed" is used in connection with insulating, painting, piping, ducts and the like, the work is understood to mean hidden from sight as in chases, furred spaces or above ceilings. "Exposed" is understood to mean open to view.

1.10 GUARANTEE

A. Guarantee work for one year from the date of substantial completion of the project. During that period make good any faults or imperfections that may arise due to defects or omissions in material, equipment or workmanship. At the Owner's option, replacement of failed parts or equipment shall be provided.

1.11 MATERIAL AND EQUIPMENT

A. Furnish new and unused materials and equipment meeting the requirements of the paragraph specifying acceptable manufacturers. Where two or more units of the same type or class of equipment are required, provide units of a single manufacturer.

1.12 NOISE AND VIBRATION

A. Select equipment to operate with minimum noise and vibration. If objectionable noise or vibration is produced or transmitted to or through the building structure by equipment, piping, ducts or other parts of work, rectify such conditions at no additional cost. If the item of equipment is judged to produce objectionable noise or vibration, demonstrate at no additional cost that equipment performs within designated limits on a vibration chart.

1.13 ACCEPTABLE MANUFACTURERS

A. Manufacturers names and catalog number specified under sections of Division 22 are used to establish standards of design, performance, quality and serviceability and not to limit competition. Equipment of similar design, equal to that specified, manufactured by a named manufacturer will be acceptable on approval. A request for prior approval of equipment not listed must be submitted ten (10) days before bid due date. Submit complete design and performance data to the Engineer.

1.14 OPERATING TESTS

A. After all plumbing systems have been completed and put into operation, subject each system to an operating test under design conditions to ensure proper sequencing and operation throughout the range of operation. Tests shall be made in the presence of the Architect / Engineer. Make adjustments as required to ensure proper functioning of all systems. Special

tests on individual systems are specified under individual sections. Submit three copies of all certifications and test reports adequately in advance of completion of the work to allow for remedial action as required to correct deficiencies discovered in equipment and systems.

1.15 WARRANTIES

A. Submit three copies of all warranties and guarantees for systems, equipment, devices and materials. These shall be included in the Operating and Maintenance Manuals.

1.16 BUILDING CONSTRUCTION

A. It shall be the responsibility of each sub-contractor to consult the Architectural and Engineering drawings, details, and specifications and thoroughly familiarize himself with the project and all job related requirements. Each subcontractor shall cooperate with the General Contractor to verify that all piping and other items are placed in the walls, furred spaces, chases, etc., so there will be no delays in the job.

PART 2 - PRODUCTS – NOT USED

PART 3 - EXECUTION

3.1 OPENINGS

A. Framed, cast or masonry openings for ductwork, equipment or piping are specified under other divisions. Drawings and layout work for exact size and location of all openings are included under this division.

3.2 HOUSEKEEPING PADS

A. Provide equipment housekeeping pads under all floor mounted and ground mounted plumbing equipment, and as shown on the drawings.

B. Concrete work as specified in Division 3.

C. Concrete pads:
1. 4 inch high, rounded edges, minimum 2500 psi unless otherwise indicated on the drawings
2. Chamfer strips at edges and corner of forms.
3. Smooth steel trowel finish.
4. Doweled to existing slab

D. Install concrete curbs around multiple pipe penetrations.

3.3 VANDAL RESISTANT DEVICES

A. Provide a handle for each loose keyed operated valve and hose bibb on the project.
B. Where vandal resistant screws or bolts are employed on the project, deliver to the Owner two suitable tools for use with each type of fastener used.
C. Proof of delivery of these items to the Owner shall be included in the Operating and Maintenance Manuals.

3.4 INSTRUCTION OF OWNER'S PERSONNEL

A. Prior to final inspection, conduct an on-site training program to instruct the Owner's operating personnel in the operation and maintenance of the plumbing systems.
1. Provide the training during the Owner's regular working day.

2. The Instructors shall each be experienced in their phase of operation and maintenance of building plumbing systems and with the project.

B. Time to be allocated for instructions.
1. Minimum of 8 hours dedicated instructor time.
2. 4 hours on each of 2 days.

C. Before proceeding with the on-site training program, submit the program syllabus; proposed time and dates; and other pertinent information for review and approval.
1. One copy to the Owner.
2. One copy to the Architect / Engineer.

D. The Owner will provide a list of personnel to receive instructions, and will coordinate their attendance at the agreed upon times.

E. Use the operation and maintenance manuals as the basis of instruction. Review contents of manual with personnel in detail to explain all aspects of operation and maintenance.

F. Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, maintenance, and shut down of each item of equipment.

G. Demonstrate equipment functions (both individually and as part of the total integrated system).

H. Prepare and insert additional data in the operating and maintenance manuals when the need for additional data becomes apparent during instructions.

I. Submit a report within one week after completion of the training program that instructions have been satisfactorily completed. Give time and date of each demonstration and hours devoted to the demonstration, with a list of people present.

J. At the conclusion of the on-site training program, have the person designated by the Owner sign a certificate to certify that he/she has a proper understanding of the system, that the demonstrations and instructions have been satisfactorily completed, and the scope and content of the operating and maintenance manuals used for the training program are satisfactory.

K. Provide a copy of the report and the certificate in an appropriately tabbed section of each Operating and Maintenance Manual.

3.5 EQUIPMENT IDENTIFICATION

A. Provide a laminated engraved plastic nameplate on each piece of equipment and starter.
1. Designation approved by Architect / Engineer.
2. Equipment includes, but is not limited to, water heaters, pumps, boilers and utility controllers.
3. Submit schedule of equipment to be included and designations.

B. Provide nameplates with ½ inch high letters and fastened with epoxy or screws.

3.6 OBSTRUCTIONS

A. The drawings indicate certain information pertaining to surface and subsurface obstructions which has been taken from available drawings. Such information is not guaranteed, however, as to accuracy of location or complete information.
1. Before any cutting or trenching operations are begun, verify with Owner's

representative, utility companies, municipalities, and other interested parties that all available information has been provided.

2. Should obstruction be encountered, whether shown or not, alter routing of new work, reroute existing lines, remove obstruction where permitted, or otherwise perform whatever work is necessary to satisfy the purpose of the new work and leave existing services and structures in a satisfactory and serviceable condition.

B. Assume total responsibility for and repair any damage to existing utilities or construction, whether or not such existing facilities are shown.

3.7 PROTECTION

A. Protect work, equipment, fixtures, and materials. At work completion, work must be clean and in original manufacturer's condition.

END OF SECTION

SECTION 22 05 10

PLUMBING CONTRACT QUALITY CONTROL

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Contract quality control including workmanship, manufacturer's instructions and demonstrations.

1.2 QUALITY CONTROL PROGRAM

A. Maintain quality control over supervision, subcontractors, suppliers, manufacturers, products, services, site conditions and workmanship to produce work in accordance with contract documents.

1.3 WORKMANSHIP

A. Comply with industry standards except when more restrictive tolerances or specified requirements indicate more rigid standards or more precise workmanship.

B. Perform work by persons qualified to produce workmanship of specified quality.

C. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, and racking. Under no conditions shall material or equipment be suspended from structural bridging.

D. Provide finishes to match approved samples. All exposed finishes shall be approved by the Architect. Submit color samples as required.

1.4 MANUFACTURER'S INSTRUCTIONS

A. Comply with instructions in full detail, including each step in sequence.

B. Should instruction conflict with Contract Documents, request clarification from Architect / Engineer before proceeding.

1.5 MANUFACTURER'S CERTIFICATES

A. When required in individual Specification Sections, submit manufacturer's certificate in duplicate, certifying that products meet or exceed specified requirements.

1.6 MANUFACTURER'S FIELD SERVICES

A. When required in individual Specification Sections, manufacturer shall provide qualified personnel to observe:
   1. Field conditions.
   2. Condition of installation.
   3. Quality of workmanship.
   4. Start-up of equipment.
   5. Testing, adjusting, and balancing of equipment.

B. Representative shall make written report of observations and recommendations to Architect / Engineer.

PART 2 - PRODUCTS

2.1 REFERENCE APPLICABLE SPECIFICATION SECTIONS

PART 3 - EXECUTION

3.1 PROTECTION OF EQUIPMENT

A. Do not deliver equipment to the project site until progress of construction has reached the stage where equipment is actually needed or until building is closed in enough to protect the equipment from weather. Equipment allowed to stand in the weather will be rejected, and the Contractor is obligated to furnish new equipment of a like kind at no additional cost to the Owner.

B. Adequately protect equipment from damage after delivery to the project. Cover with heavy tarpaulins, drop cloths or other protective coverings as required to protect from plaster, paint, mortar and/or dirt. Do not cover with plastic materials and trap condensate and cause corrosion.

END OF SECTION

SECTION 22 05 12

PLUMBING SHOP DRAWINGS, COORDINATION DRAWINGS & PRODUCT DATA

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Prepare submittals as required by Division 1.

B. The term submittal, as used herein, refers to all:
1. Shop Drawings.
2. Coordination Drawings.
3. Product data.

C. Submittals shall be prepared and produced for:
1. Distribution as specified.
2. Inclusion in the Operating and Maintenance Manual, as specified, in the related section.

1.2 SHOP DRAWINGS

A. Present drawings in a clear and thorough manner. Identify details by reference to sheet and detail, schedule, or room numbers shown on Contract Drawings.

B. Show all dimensions of each item of equipment on a single composite Shop Drawing. Do not submit a series of drawings of components.

C. Identify field dimensions; show relationship to adjacent features, critical features, work, or products.

D. Submit shop drawings in plan, elevation and sections, showing equipment in mechanical equipment areas.

1.3 COORDINATION DRAWINGS

A. Present in a clear and thorough manner. Title each drawing with project name. Identify each element of drawings by reference to sheet number and detail, or room number of contract documents. Minimum drawing scale: ¼ inch = 1 foot - 0 inch.

B. Prepare coordination drawings to coordinate installations for efficient use of available space, for proper sequence of installation, and to resolve conflicts. Coordinate with work specified in other sections and other divisions of the specifications.

C. For each mechanical room and for each outside equipment pad where equipment is located, submit plan and elevation drawings. Show:
1. Actual mechanical equipment and components to be furnished.
2. Service clearance.
3. Relationship to other equipment and components.
4. Roof drains and leader piping.
5. Fire protection piping and equipment.

D. Identify field dimensions. Show relation to adjacent or critical features of work or products.

E. Related requirements:
1. Ductwork shop drawings.

2. Coordination drawing specified in Division 26.

F. Submit shop drawings in plan, elevation and sections, showing equipment in mechanical equipment areas.

G. Gas piping sketch indicating proposed location of piping prior to proceeding with the installation.

1.4 PRODUCT DATA AND INSTALLATION INSTRUCTION

A. Submit only pages which are pertinent to the project. All options which are indicated on the product data shall become part of the contract and shall be required whether specified are not.

B. Mark each copy of standard printed data to identify pertinent products, referenced to specification section and article number.

C. Show reference standards, performance characteristics and capacities; wiring and piping diagrams and controls; component parts; finishes; dimensions and required clearances.

D. Modify manufacturer's standard schematic drawings and diagrams to supplement standard information and to provide information specifically applicable to the work. Delete information not applicable.

E. Mark up a copy of the specifications for the product. Indicate in the margin of each paragraph the following: “Comply, ”Do Not Comply”, or “Not Applicable”. Explain all “Do Not Comply” statements.

F. Provide a separate transmittal for each submittal item. Transmittals shall indicate product by specification section name and number. Separate all submittals into appropriate specification section number. Do not combine specification sections.

1.5 MANUFACTURERS INSTRUCTIONS

A. Submit Manufacturer's instructions for storage, preparation, assembly, installation, start-up, adjusting, calibrating, balancing and finishing.

1.6 CONTRACTOR RESPONSIBILITIES

A. Review submittals prior to transmittal.

B. Determine and verify:
1. Field measurements.
2. Field construction criteria.
3. Manufacturer's catalog numbers.
4. Conformance with requirements of Contract Documents.

C. Coordinate submittals with requirements of the work and of the Contract Documents.

D. Notify the Architect/Engineer in writing at time of submission of any deviations in the submittals from requirements of the Contract Documents.

E. Do not fabricate products, or begin work for which submittals are specified, until such submittals have been produced and bear contractor's stamp. Do not fabricate products or begin work scheduled to have submittals reviewed until return of reviewed submittals with Architect/Engineer's acceptance.

F. Contractor's responsibility for errors and omissions in submittals is not relieved whether Architect/Engineer reviews submittals or not.

G. Contractor's responsibility for deviations in submittals from requirements of Contract Documents is not relieved whether Architect/Engineer reviews submittals or not, unless Architect/engineer gives written acceptance of the specific deviations on reviewed documents.

H. Submittals shall show sufficient data to indicate complete compliance with Contract Documents:
   1. Proper sizes and capacities.
   2. That the item will fit in the available space in a manner that will allow proper service.
   3. Construction methods, materials and finishes.

I. Schedule submissions at least 15 days before date reviewed submittals will be needed.

1.7 SUBMISSION REQUIREMENTS

A. Make submittals promptly in accordance with approved schedule, and in such sequence as to cause no delay in the Project or in the work of any other Contractor.

B. Shop drawing submittals required:
   1. Shop drawing submittals shall be individually submitted by specification section number in PDF format. Combined submittals will be returned for contractor to divide.
   2. Product Data: Submit the number of copies which the contractor requires, plus those which will be retained by the Architect/Engineer.

C. Accompany submittals with transmittal letter, containing:
   1. Date.
   2. Project title and number.
   3. Contractor's name and address.
   4. The number of each Shop Drawing, Project Datum and Sample submitted.
   5. Other pertinent data.

D. Submittals shall include:
   1. The date of submission
   2. The project title and number
   3. Contract Identification
   4. The names of:
      a. Contractor.
      b. Subcontractor.
      c. Supplier.
      d. Manufacturer.
   5. Identification of the product.
   6. Field dimensions, clearly identified as such.
   7. Relation to adjacent or critical features of the work or materials.
   8. Applicable standards, such as ASTM or federal specifications numbers.
   9. Identification of deviations from contract documents.
   10. Suitable blank space for General Contractor and Architect/Engineer stamps.
   11. Contractor's signed and dated Stamp of Approval.

E. Coordinate submittals into logical groupings to facilitate interrelation of the several items:
   1. Finishes which involve Architect/Engineer selection of colors, textures or patterns
   2. Associated items which require correlation for efficient function or for installation

1.8 SUBMITTAL SPECIFICATION INFORMATION

A. Every submittal document shall bear the following information as used in the project manual:
   1. The related specification section number.
   2. The exact specification section title.

B. Submittals delivered to the Architect/Engineer without the specified information will not be processed. The Contractor shall bear the risk of all delays, as if no submittal had been delivered.

1.9 RESUBMISSION REQUIREMENTS

A. Make re-submittals under procedures specified for initial submittals.
   1. Indicate that the document or sample is a re-submittal.
   2. Identify changes made since previous submittals.

B. Indicate any changes which have been made, other than those requested by the Architect / Engineer.

1.10 CONTRACTOR'S STAMP OF APPROVAL

A. Contractor shall stamp and sign each document certifying to the review of products, field measurements and field construction criteria, and coordination of the information within the submittal with requirements of the work and of Contract Documents.

B. Contractor's stamp of approval on any submittal shall constitute a representation to Owner and Architect/Engineer that Contractor has either determined and verified all quantities, dimensions, field construction criteria, materials, catalog numbers, and similar data or assumes full responsibility for doing so, and that Contractor has reviewed or coordinated each submittal with the requirements of the work and the Contract Documents.

C. Do not deliver any submittals to the Architect/Engineer that do not bear the Contractor's stamp of approval and signature.

D. Submittals delivered to the Architect/Engineer without Contractor's stamp of approval and signature will not be processed. The Contractor shall bear the risk of all delays, as if no submittal had been delivered.

1.11 ARCHITECT/ENGINEER REVIEW OF IDENTIFIED SUBMITTALS

A. The Architect/Engineer will:
   1. Review identified submittals with reasonable promptness and in accordance with schedule.
   2. Affix stamp and initials or signature, and indicate requirements for re-submittal or approval of submittal.
   3. Return submittals to Contractor for distribution or for resubmission.

B. Review and approval of submittals will not extend to design data reflected in submittals which is peculiarly within the special expertise of the Contractor or any party dealing directly with the Contractor.

C. Architect/Engineer's review and approval is only for conformance with the design concept of the project and for compliance with the information given in the contract.
   1. The review shall not extend to means, methods, sequences, techniques or procedures of construction or to safety precautions or programs incident thereto.

2. The review shall not extend to review of quantities, dimensions, weights or gauges, fabrication processes or coordination with the work of other trades.

D. The review and approval of a separate item as such will not indicate approval of the assembly in which the item functions.

1.12 SUBSTITUTIONS

A. Do not make requests for substitution employing the procedures of this Section.

B. The procedure for making a formal request for substitution is specified in Div. 1.

PART 2 - PRODUCTS - NOT USED.

PART 3 - EXECUTION - NOT USED

END OF SECTION

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SECTION 22 05 13

ELECTRICAL PROVISIONS OF PLUMBING WORK

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Electrical provisions to be provided as plumbing work are indicated in other Division 22 sections, on drawings, and as specified.

B. Types of work, normally recognized as electrical but provided as plumbing, specified or partially specified in this Section, include but are not necessarily limited to the following:
   1. Motors for plumbing equipment.
   2. Starters for motors of plumbing equipment, but only where specifically indicated to be furnished integrally with equipment.
   3. Wiring from motors to disconnect switches or junction boxes for motors of plumbing equipment, but only where specifically indicated to be furnished integrally with equipment.
   4. Wiring of field-mounted float control switches, flow control switches, and similar plumbing-electrical devices provided for plumbing systems, to equipment control panels.
   5. Pipe heat tracing.

C. Refer to Division 22 sections for specific individual plumbing equipment electrical requirements.

D. Refer to Division 26 sections for motor starters and controls not furnished integrally with plumbing equipment.

E. Refer to Division 26 sections for junction boxes and disconnect switches required for motors and other electrical units of plumbing equipment.

1.2 RELATED WORK

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Specification Sections, apply to work of this Section.

1.3 QUALITY ASSURANCE

A. Wherever possible, match elements of electrical provisions of plumbing work with similar elements of electrical work specified in Division 26 sections for electrical work not otherwise specified.

B. For electrical equipment and products, comply with applicable NEMA standards, and refer to NEMA standards for definitions of terminology. Comply with National Electrical Code (NFPA 70) for workmanship and installation requirements.

1.4 SUBMITTALS

A. Include in listing of motors, voltage, notation of whether motor starter is furnished or installed integrally with motor or equipment containing motors.

PART 2 - PRODUCTS

2.1 MOTORS

A. Motor Characteristics. Except where more stringent requirements are indicated, and except where required items of plumbing equipment cannot be obtained with fully complying motors, comply with the following requirements for motors of plumbing work:

B. Temperature Rating. Rated for 40 deg. C environment with maximum 50 deg. C temperature rise for continuous duty at full load (Class A Insulation).

C. Provide each motor capable of making starts as frequently as indicated by automatic control system, and not less than 5 starts per hour for manually controlled motors.

D. Phases and Current Characteristics. Provide squirrel-cage induction polyphase motors for ¾ hp and larger, and provide capacitor-start single-phase motors for ½ hp and smaller, except 1/6 hp and smaller may, at equipment manufacturer's option, be split-phase type. Coordinate current characteristics with power specified in Division 26 sections, and with individual equipment requirements specified in other Division 22 requirements. For 2-speed motors provide two separate windings on polyphase motors. Do not purchase motors until power characteristics available at locations of motors have been confirmed, and until rotation directions have been confirmed.

E. Service Factor. 1.15 for polyphase motors and 1.35 for single-phase motors.

F. Motor Construction. Provide general purpose, continuous duty motors, Design "B" except "C" where required for high starting torque.
1. Frames. NEMA #56.
2. Bearings are to be ball or roller bearings with inner and outer shaft seals, regreasable except permanently sealed where motor is inaccessible for regular maintenance. Where belt drives and other drives produce lateral or axial thrust in motor, provide bearings designed to resist thrust loading. Refer to individual section of Division 22 for fractional-hp light-duty motors where sleeve-type bearings are permitted.
3. Except as indicated, provide open drip-proof motors for indoor use where satisfactorily housed or remotely located during operation, and provide guarded drip-proof motors where exposed to contact by employees or building occupants. Provide weather-protected Type I for outdoor use, Type II where not housed. Refer to individual sections of Division 22 for other enclosure requirements.
4. Provide built-in thermal overload protection and, where indicated, provide internal sensing device suitable for signaling and stopping motor at starter.
5. Noise Rating: Provide "Quiet" rating on motors.

G. All motors shall be premium efficiency.

2.2 EQUIPMENT FABRICATION

A. Fabricate plumbing equipment for secure mounting of motors and other electrical items included in work. Provide either permanent alignment of motors with equipment, or adjustable mountings as applicable for belt drives, gear drives, special couplings and similar indirect coupling of equipment. Provide safe, secure, durable, and removable guards for motor drives. Arrange for lubrication and similar running-maintenance without removal of guards.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install motors on motor mounting systems in accordance with motor manufacturer's instructions, anchored to resist torque, drive thrusts, and other external forces inherent in plumbing work. Secure sheaves and other drive units to motor shafts with keys and Allen set screws on flat surface of shaft. Unless otherwise indicated, set motor shafts parallel with machine shafts.

B. Verify voltage with Electrical Plans.

END OF SECTION

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SECTION 22 05 15

PLUMBING EARTHWORK

PART 1 - GENERAL

A. Excavate and backfill for pipe trenches for underground piping, and excavate for structures installed as part of plumbing work.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION

3.1 EXCAVATION

A. Excavate trenches for underground piping to the required depth to ensure 2 foot minimum coverage over piping.

B. Cut the bottom of the trench or excavation to uniform grade.

C. Should rock be encountered, excavate 6 inches below grade, fill with bedding material and tamp well.

D. Lay out alignment of pipe trenches to avoid obstructions. Assure that proposed route of pipe will not interfere with building foundation before any cutting is begun. Should interference be found, contact the Architect/Engineer before proceeding.

3.2 BACKFILL

A. Backfill shall not be placed until the work has been inspected, tested and approved. Complete backfill to the surface of natural ground or to the lines and grades shown on drawings. Except where special materials are requested, use suitable friable soils from other excavation as backfill material. Do not use peat, silt, muck, debris or other organic materials. Deposit backfill in uniform layers and compact each layer as specified in Division 2.

B. Compacting Backfill. Place material in uniform layers of prescribed maximum thickness and wet or dry the material to optimum moisture content. Compact with power-driven tampers to the prescribed density. Place regular backfill in 8 inch maximum layers, loose measure. Compact to not less than 95 percent of maximum soil density as determined by ASTM D-698 Standard Proctor.

C. Restoration. Compact backfill, where trenching or excavation is required in improved areas such as pavements, walks, and similar areas, to a condition equal to the adjacent undisturbed earth, and restore surface of the area to the condition existing prior to trenching or excavating operation.

D. Provide 6 inch stabilized sand bed with 4 inch stabilized sand cover around each pipe.

3.3 DISPOSAL OF EXCESS MATERIAL

A. Remove excess excavation material or material unsuitable for backfill. Excess material can be spread on grade, or shall be removed from site as directed by the Owner/Architect.

END OF SECTION

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SECTION 22 05 17

PLUMBING ACCESS DOORS

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Furnish and install access doors in wall or ceiling locations as required or shown for access to valves, controls, regulating devices, water arresters and other equipment requiring maintenance, adjustment or operation.

PART 2 - PRODUCTS

2.1 NON-FIRE RATED ACCESS DOORS

A. 16-Gauge frames.

B. 14-gauge steel panels.

C. Continuous fully concealed hinges.

D. Cylinder lock with key.

E. Prime coat finish.

F. Brushed satin stainless steel finish for restroom, kitchen or cafeteria installation.

G. Material suitable for wall and/or ceiling mounting.

2.2 FIRE RATED ACCESS DOORS

A. UL listed, 1-1/2 hour Label “B”, access doors.

B. 16-Gauge stainless steel.

C. 20-Gauge insulated sandwich-type door panel.

D. Two inch thick with fire rated insulation.

E. Continuous fully concealed hinge.

F. Automatic closing and latching mechanism.

G. Knurled knob and recessed key operation for Owner selection.

H. Interior latch release slide for opening from inside.

I. Prime coat finish.

J. Material suitable for wall and/or ceiling mounting.

2.3 ACCEPTABLE MANUFACTURERS

A. Milcor.
B. MIFAB.

C. Acudor.
D. Elmdor.
E. Or approved equal.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Access doors specified in Division 22 will be installed by other crafts. Not all required access doors are shown. Coordinate with the Contractor to locate access doors for ease of operation and maintenance of concealed equipment.

B. Installation shall be in accordance with the manufacturer's printed instructions.

C. Minimum size required:
1. 24 inch x 24 inch for plumbing multiple isolation valves and electrical related items in ceilings.
2. 12 inch x 12 inch for plumbing for single isolation valve, hub drain or shock arrestor.

END OF SECTION

SECTION 22 05 19

PRESSURE AND TEMPERATURE INSTRUMENTS

PART 1 - GENERAL

1.1 WORK INCLUDED

A. This section specifies gauges, thermometers, wells and/or pressure and temperature test stations to be installed as specified.

1.2 RELATED WORK

A. Division 22, Plumbing
   1. Plumbing General Provisions.
   2. Pipe and Pipe Fittings, General.
   3. Valves, Strainers and Vents.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS - GAUGES AND THERMOMETERS

A. Trerice.
B. Taylor.
C. Marsh.
D. Weksler.
E. Weiss.
F. or approved equal.

2.2 PRESSURE GAUGES

A. Case and Ring: 4 inch type 304 stainless steel; liquid filled case with stainless steel bayonet ring.

B. Dial: White aluminum with black markings.

C. Window: Clear acrylic.

D. Tube: Phosphor bronze and forged brass socket.

E. Gauge accuracy: +/- 1 percent over operating range.

F. For pulsating service, provide impulse dampers.

G. Without flange for pipe mounting.

H. With flange for wall mounting.

I. Weiss Model: Domestic Water 4CTS LF (Lead Free) 0-100 PSI.

2.3 THERMOMETER WELLS

A. Brass or type 300 stainless steel. Machined bar stock, 1-piece construction (Lead Free).

B. Where installed in insulated piping or vessels, provide with extension neck to match insulation thickness.

C. Provide metal-to-metal contact with bulb chamber for maximum sensitivity.

D. Wells shall be sized to extend a minimum of 50 percent into pipe.

2.4 THERMOMETERS IN PIPING SYSTEMS OR VESSELS

A. Die cast aluminum case with baked epoxy finish.

B. Adjustable angle 9 inch scale length.

C. Clear acrylic window.

D. Brass stem, length to match well.

E. Red or blue reading organic spirit filled-in magnifying glass column.

F. White background with black figures and markings.

G. Brass stems and union connections (Lead Free).

H Accuracy: +/- 1 percent of scale range.

I. Range:
1. Hot water lines: 30 deg. F to 240 deg. F.

2.5 PRESSURE AND TEMPERATURE TEST STATIONS

A. "Test Station" fitting to receive either a temperature or pressure probe. Fitting shall be solid brass with two valve cores of Nordel (Lead Free).
1. Fitted with a color coded cap strap with gasket.
2. Acceptable Manufacturer: Peterson Equipment Company.
3. Provide with extension neck to match insulation thickness.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install in accordance with drawing details and manufacturer's recommendations.

B. Provide a ball valve at each gauge (Lead Free).

C. Locate gauges and thermometers to be easily readable from the floor at a 5 foot-6 inch eye level. Use adjustable angle or rigid stem as required. Install gauges in upright position.

D. Install pressure gauges in the following locations: across pumps, domestic water service entrance. Pressure scale range 0 to 160 PSI.

E. Install thermometer in the following locations: At hot water supply at water heater, and hot water return line at circulation pump.
1. Hot water lines: 30 deg. F to 240 deg. F.

END OF SECTION

SECTION 22 05 23

VALVES, STRAINERS AND VENTS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Plumbing Valves

B. Pipe strainer and suction diffusers.

PART 2 - PRODUCTS

2.1 VALVES

A. Pressure Ratings:
1. Unless otherwise indicated, use valves suitable for 125 minimum psig working steam pressure (WSP) and 450 deg. F.
2. The pressure temperature rating of valves shall be not less than the design criteria applicable to components of the system.

B. Balancing Valves (Manual)
1. Provide balancing valves with:
a. Corrosion resistant plug with resilient seal when required.
b. O-ring stem seal.
c. Permanently lubricated, corrosion resistant bearings.
2. Connections
a. Through 2-inch pipe size use threaded connections.
b. For valves 2-1/2-inch pipe size and larger shall be provided with 150 psig flange connections.
3. Provide each valve with:
a. Memory stop.
b. Plastic drip cap.
c. 1/8-inch gauge tap.
4. All valves for domestic use must be lead free.

C. Thermal Balancing Valves (adjustable Temperature)
1. Adjustable thermal balancing valve used for automatic balancing of circulation circuits in domestic hot water systems. Modulates flow rate in each circuit so hot water temperature at fixtures remains constant.
2. Standards:
a. NSF/ANSI/CAN 372 low-lead laws, as certified by ICC-ES.
b. NSF/ANSI/CAN 61, commercial hot water 180 deg. F. as certified by ICC-ES.
c. Meets codes IPC and UPC.
3. Maximum Working Pressure: 230 psig.
4. Body Material: DZR low-lead brass.
5. Connections: NPT female threaded.
6. Hydraulic Seals: Peroxide-cured EPDM.
7. Adjustable Balancing Cartridge: Stainless steel and copper.
8. ABS Adjustable Knob: Temperature adjustment scale for manual setting and tamper-proof adjustment locking screw.
9. Factory Setting: 130 deg. F.
10. Outlet Temperature gauge: 2-inch diameter with optional dual-scale outlet, 30 to 180 deg. F.

11. Check Valve.
12. Isolation Ball Valves: Inlet and outlet low-lead brass.
13. Manufacturers:
    a. Caleffi.
    b. Acorn.
    c. Cimberio Valve.
    d. Or approved equal.

D. Ball Valves
1. Provide ball valves with:
    a. Blowout proof stem.
    b. Full size port, 316 stainless steel ball and stem.
    c. Cast bronze body.
    d. Threaded ends.
2. Seat, seals, thrust washers and packing shall be suitable for the intended service.
3. Service rating:
    a. 150 psi saturated steam.
    b. 600 psi WOG.
4. Provide with memory stop for balancing valves.
5. Where Viega ProPress fittings are used, Viega ProPress ball valves may be used.
6. All valves for domestic use must be lead free.

E. Thermostatic Mixing Valves
1. Manufacturers:
    a. Watts.
    b. Caleffi.
    c. Lawler.
    d. Or approved equal.
2. Valve: Lead free brass body, stainless steel or copper alloy, integral temperature adjustment, check valves. At fixture ASSE 1070.

F. Valve Connections
1. Provide valves suitable to connect to adjoining piping as specified for pipe joints. Use pipe size valves. Sweated joints are not allowed.
2. Thread pipe sizes 2 inches and smaller.
3. Flange pipe sizes 2-1/2 inches and larger.
4. Use screw to solder adapters for copper tubing.
5. Use grooved body valves with mechanical grooved jointed piping.
6. Use press valves when using copper press systems.

G. Check Valves
1. Bronze body, 2 inches and smaller, bronze disc (Teflon disc for steam service), regrinding swing check, screw-in cap, threaded connection (Lead Free).
2. Iron body, 2-1/2 inches and larger, bronze trim, non-slam: stainless steel pins and springs, and bronze plate or bronze mounted, regrind-renew check, bronze seat ring and disc. Provide either wafer or threaded lug (Lead Free).
3. Acceptable Manufacturers (All listed must be lead free):
    a. Apollo.
    b. Milwaukee.
    c. Nibco.
    d. Or approved equal.

H. Backflow Preventer (All valves for domestic use must be lead free):
1. Intermediate Atmospheric Vented Backflow Preventers: Lead-free, ASSE 1012,

same size as pipe, with intermediate atmospheric vent between independent check valves, bronze body with union ends, stainless steel springs, rated for 175 psig and 210°F. Watts LF9D or equal.

2. Acceptable Manufacturers (All listed must be lead free):
   a. Watts.
   b. Wilkins.
   c. Or approved equal.

I. Provide valves of same manufacturer throughout where possible.

J. Provide valves with manufacturer's name and manufacturing location, duty and pressure rating clearly marked on outside of body.

K. Where valves are installed in insulated piping, provide with extended neck so valve operator and stop plate clears the full thickness insulation.

L. Provide valve, seat and trim materials suitable for the intended service.

M. Provide memory stops for all valves used for throttling service. Valves for throttling service shall be butterfly, plug, globe or ball type.

2.2 PIPE SYSTEMS STRAINERS

A. Body:
   1. Bronze "Y" pattern or basket as shown on the drawings.
   2. Line size.
   3. Threaded strainer blow down port.
   4. ASTM A #126 Class B Cast Iron Body.

B. Construction:
   1. 2 inch size and smaller with screw connections rated 400 psi WOG.
   2. Over 2 inch size with flanged connections, rated 125 psi WOG.

C. Fabricate screens of Monel or type 304 stainless steel:
   1. With 20 mesh woven wire in piping systems through 2 inches.
   2. With 0.045 perforations in piping systems 2-1/2 inches and 3 inches.
   3. With 0.125 perforations in piping systems 4 inches and larger.

D. Start-up:
   1. Provide an additional fine mesh disposable screen for use during start-up operations.
   2. Remove after 30 days.
   3. Attach to piping for Owner’s review.

E. Acceptable Manufacturers (All listed must be lead free):
   1. Apollo.
   2. Crane.
   3. Mueller.
   4. Nibco.
   5. Zurn.
   6. Or approved equal.

2.3 VALVE SCHEDULE

A. Domestic Service
   1. Gas shut-off service: UL approved for natural gas service.
      a. Nibco Ball Valve, full port through 1 inch: T-585-70-UL.
      b. Nibco Ball Valve conventional port 1-1/4 inch through 3 inch: T-580-70-UL.
         Mueller 1-1/4 inch through 4 inch: Lub-O-seal.
      c. Milwaukee Full Port ¼ inch-2 inch.
      d. Or approved equal.
   2. Cold and Hot water service (all listed must be Lead Free):
      a. Nibco Ball Valve full port through 2 inch: T-585-66-LF.
      b. Nibco Ball Valve 2-1/2 inch and 3 inch conventional port: T-580-66-LF.
      c. Viega ProPress Bronze Ball Valves (where Viega ProPress fittings are used).
      d. Milwaukee Full Port ¼ inch-2 inch.
      e. Milwaukee Standard Port 2-1/2 inch & 3 inch.
      f. Apollo Press Bronze Ball valves – 77 WLF.
      g. Or approved equal.
   3. Check Valve (All listed must be Lead Free):
      a. Nibco Check Valve: T - 413 - Y -LF (Teflon Seats).
      b. Milwaukee Valve – 509T.
      c. Apollo Check Valve: 163TLF.
      d. Apollo Press Check Valve: 163TPR-LF.
      e. Apollo Check Valve 2 inch and larger 910WE-LF (Wafer).
      f. Or approved equal.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install valves with stems upright or horizontal, not inverted.

B. Install valves for shut-off and isolating service at each piece of equipment, at vertical risers, and where shown on the drawings.

C. Use ball valves in domestic hot water and domestic cold water systems.

D. Use ball valves in circulating water systems, for balancing duty.

E. Provide drain valves at main shut-off valves and low points of piping and apparatus so the systems can be entirely drained.
   1. 1 inch valve for pipes 6 inch and larger.
   2. 3/4 inch valve for pipes smaller than 6 inch.
   3. Terminate with pipe plug.
   4. Drain valves shall be ball valves.

F. Provide isolation valves in domestic water lines to isolate all equipment, restrooms, hose bibbs, and where shown on the drawings.

G. Where valves are installed in insulated pipe, valve operator shall have an insert so the lever or handle will not damage the insulation. Install handles so the lever or handles will not damage the insulation.

H. Provide clearance for installation of insulation and access to valves.

I. Provide access where valves are not exposed.

J. Install backflow preventers in accordance with Oklahoma requirements maintaining minimum clearance distances for servicing and testing. Provide indirect waste piping with air gap installation from relief opening to above hub drain or floor drain.

3.2 VALVE TAGS

A. Furnish valves with 1-1/2 inch diameter brass valve tags with stamped, black or red-filled numbers. Service designations shall be 1/4 inch letters, and valve numbers shall be 2 inch letters. Engineer shall approve Service designations. Secure tags to valves by use of brass "S" hooks or brass chain. Secure chain to valve by use of copper or Monel meter seals. Valve tags are not required if the valve is located within 3 feet of the equipment being served and the service is obvious.

B. Mount charts and drawings listing functions of each valve and its location in a metal and glass frame. Place charts and drawings as directed; in addition, on the record drawings mark the symbols and furnish a valve schedule properly identifying the valve number, service, exact location, the material being piped, and the room number of area that the valve services. This schedule shall be furnished on reproducible drafting paper or film suitable for reproduction on an Ozalid machine. The Owner shall approve the size of drafting paper. Provide a copy of the valve chart in the Operating and Maintenance Manuals.

3.3 PIPE SYSTEMS STRAINERS

A. Provide strainers in supply piping to circulating pumps, thermostatic mixing valves, before solenoid valves and trap primer valves.

END OF SECTION

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SECTION 22 07 19

PLUMBING PIPING INSULATION

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Furnish and install piping insulation, jackets, accessories and covering of specified materials. The insulation shall be used for high and low temperature piping applications including domestic hot and cold water, roof and overflow drain sump bodies and rain leaders, horizontal sanitary and drain piping which receives condensate.

1.2 QUALITY ASSURANCE

A. The intent of insulation specifications is to obtain superior quality workmanship resulting in an installation that is absolutely satisfactory in both function and appearance. Provide insulation in accordance with the specifications for each type of service and apply as recommended by the manufacturer and as specified.

B. An approved contractor for this work under this Division shall be:
   1. A specialist in this field and have the personnel, experience, training, skill, and the organization to provide a practical working system.
   2. Able to furnish evidence of having contracted for and installed not less than 3 systems of comparable size and type that have served their owners satisfactorily for not less than 3 years.

C. All piping insulation used on the project inside the building must have a flame spread rating not exceeding 25 and a smoke developed rating not exceeding 50, as determined by test procedures ASTM E 84, NFPA 255 and UL 723. These ratings must be as tested on the composite of insulation, jacket or facing, and adhesive. Components such as adhesives, mastics and cements must meet the same individual ratings as the minimum requirements and bear the UL label.

D. Condensation on any insulated piping system is not acceptable.

E. Replace insulation damaged by either moisture or other means. Insulation that has been wet, whether dried or not, is considered damaged. Make repairs where condensation is caused by improper installation of insulation. Also repair any damage caused by the condensation.

1.3 APPROVALS

A. Submit product data on each insulation type, adhesive, and finish to be used in the work. Make the submittal as specified in Division 1 General Requirements and obtain approval before beginning installation. Include product description, list of materials and thickness for each service and location and the manufacturer's installation instructions for each product.

B. Make a field application of each type of insulation to display the material, quality and application method. Obtain approval of the sample application before proceeding with installation of the work.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Glass fiber pipe insulation:
   1. Johns-Manville Micro-Lok AP-T.

2. Owens-Corning ASJ/SSL.
3. Knauf ASJ/SSL.

B. Cellular Glass Insulation (Foamglass):
1. Pittsburg Corning.
2. Cell-U-Foam.

C. Aluminum Jacketing:
1. Childers.
2. Pabco.
3. RPR.

D. Fiberglass reinforcing cloth mesh:
1. Perma Glass Mesh.
2. Alpha Glass Mesh.
3. Childers Chil-Glas.
4. Vimasco.

E. Mastics and Adhesives
1. Childers.
2. Foster.
3. Vimasco.
4. Armstrong 520 Adhesive.

F. Elastomeric Insulation
1. Armacell.

2.2 FIBERGLASS PIPE INSULATION

A. Heavy density, dual temperature fiberglass insulation with factory applied, all service, reinforced vapor barrier jacket having integral laminated vapor barrier. Provide with a factory applied pressure sensitive tape closure system and matching butt strips. Supply in thickness as shown.
1. Thermal conductivity 0.23 @ 75°F mean (ASTM 335).

2.3 ELASTOMERIC INSULATION

A. Insulation material shall be flexible, closed-cell elastomeric insulation in tubular or sheet form. Material shall have a flame spread rating of 25 or less and a smoke developed rating of 50 or less when tested in accordance with ASTM E84, latest revision. Sheet material with a thickness greater than ¾" shall have a flame spread rating of 25 or less and a smoke developed rating of 100 or less when tested in accordance with ASTM E84, latest revision. In addition, the product, when tested, shall not melt or drip flaming particles, and the flame shall not be progressive. In addition, all materials shall pass simulated end-use fire test. Minimum ¾" thick.
1. Thermal conductivity 0.27 at 75°F mean (ASTM C177 or C518).

2.4 CELLULAR GLASS INSULATION

A. ASTM C552:
1. "k" value of 0.35 @ 75°F ("ksi" value of 0.047 @ 24°C);
2. 8.0 lb./cu.ft. (128 kg/cu.m.) density.

2.5 INSULATION/SHIELD AT HANGERS

A. Field fabricated: Use 360° sections of rigid foamglass insulation that will support the bearing

area at hangers and supports. Further support insulation at hangers and supports with a shield of galvanized metal covering at least half of the pipe circumference, and conforming to the schedule. Insulation shall extend at least 1" beyond metal shield on each end. When pipe is guided at top and bottom, metal shields shall cover the whole pipe circumference. Adhere metal shield to insulation so that metal will not slide with respect to insulation with ½" aluminum bands (2) per shield.

1. Sections of foam glass insulation may be used of the same outside diameter of the adjoining pipe insulation.
2. Minimum thickness of foam glass insulation shall not be less than 1" thick.

B. Pipe saddles: Formed galvanized sheets at each support point for insulated pipe, shaped to fit pipe, and covering bottom half of pipe. Length at saddle shall be not less than twice the insulation outside diameter or more than 22". Provide 18 gauge through 4" pipe and 16-gauge 5" pipe and above.

2.6 SEALANT, ADHESIVE AND FINISH

A. Lap Adhesive. Provide Childers CP-82 adhesive.

B. Vapor Barrier Finish:
1. Indoors: Provide as insulation coating Childers CP-35, white.
2. Outdoors: Provide as insulation coating Childers Encacel X.
3. Underground: Provide Childers CP-22/24 for fittings and areas. Pittwrap cannot be used.

C. Sealant. Provide Childers CP-76 vapor barrier sealant.

D. Lagging Adhesive. Provide Childers CP-50.

E. Other products of equal quality will be acceptable only upon approval.

2.7 GLASS FIBER BLANKET INSULATION

A. Minimum density of 1.0 PCF, 2" thick, installed R value to be 6.0 or better at 75°F mean, facing of 0.35 mil foil reinforced with glass yarn mesh and laminated to 40 lbs fire resistant kraft.

PART 3 - EXECUTION

3.1 INTERIOR PIPING

A. Cover all piping with glass fiber, heavy density, dual temperature pipe insulation with a vapor barrier jacket. Apply insulation to clean, dry pipes. Longitudinal seams shall be joined firmly together and sealed with self-sealing lap joints. Butt insulation joints firmly together and seal with a 3" wide ASJ butt strip seal. Longitudinal seams and butt strip laps shall be coated and sealed with CP-35 vapor barrier coating for chilled water piping applications.

B. Install hanger with protective shield, on the outside of all insulation.

C. Where domestic water pipes (1/2" & ¾" pipe sizes) are installed on trapeze type hangers, provide galvanized sheet metal protection shields at these locations. Place insulation jacket directly on hanger. Incompressible, load bearing insulation segments are not required.

D. Pipe Saddles: Formed galvanized sheets at each support point for insulated pipe, shaped to fit pipe, and covering bottom half of pipe. Length at saddle shall be not less than twice the insulation outside diameter. Provide 18-gauge through 4" pipe and 16-gauge for 5" pipe and

above.

E. Seal ends of pipe for drinking chilled water insulation with vapor barrier mastic at valves, flanges, fittings and every 21' on straight runs of piping. Mastic should extend on top of ASJ jacket, across the glass, down onto the pipe making a complete seal.

F. Apply a smooth flood coat of white lagging Foster 8142W over all exposed insulation.

G. Piping to be insulated as specified above:
1. All hot and cold water.
2. Make-up water
3. Horizontal sanitary drain piping that receives condensate
4. Exposed to view storm drainage system including roof and overflow drain bodies, vertical piping from drain body and all horizontal rain leaders to first elbow turning down

3.2 FLANGE, VALVE AND FITTING INSULATION

A. Cover valves and flanges with fabricated segments, fittings with two-piece factory molded fittings, and both of matching pipe insulation type and thickness equal to that of the adjoining pipe. Fittings and fabricated segments shall be securely held in place.
1. Apply a tack coat of insulating mastic to the insulated fitting to produce a smooth surface.
2. After mastic is dry, apply a second coat of vapor barrier mastic. Neatly embed with 10 x 10 fiberglass cloth into the tack coat.
3. Overlap mastic and fiberglass cloth by 2” on adjoining sections of pipe insulation.
4. Apply a second coat of mastic over the fiberglass cloth to present a smooth surface.
5. Apply mastic to a wet film thickness of 3/64”.
6. Fabric shall not be visible after completion.
7. Vapor seal flanges, valves and fittings with Childers CP-35.

B. PVC fitting covers are not acceptable.

3.3 CONCEALED STORM DRAIN PIPING

A. Provide flexible glass fiber insulation with factory-applied, reinforced UL labeled Foil-Skrim-Kraft (FSK) facing. Install insulation on clean, dry piping.

B. Insulation shall be wrapped tightly on the piping with all circumferential joints and longitudinal joints overlapped a minimum of 2” with facing to the outside to obtain specified R-value using a maximum of 25% compression.

C. Provide vapor retarder at penetrations, joints, seams and damage to the facing with staples and FSK foil tape. The facing shall be taped with a minimum 3” wide strip of reinforced foil tape. Pressure-sensitive tape shall be a minimum 3” (76mm) wide and shall be applied with moving pressure using an appropriate sealing tool. Staples shall be outward cinch and placed 6” (152mm) on center.

D. Mechanical / Electrical rooms and above ceilings are considered concealed spaces.

3.4 MISCELLANEOUS

A. Install materials after piping has been tested and approved.

B. Apply insulation on clean, dry surfaces only.

C. Apply weather protective finish on elastomeric insulation installed in non-conditioned spaces. Provide a minimum of three coats.

3.5 INSULATION THICKNESS

INSULATED UNIT	THICKNESS (Inches)
Roof Drain Bodies and Horizontal Roof Drain Leaders	1
Roof Overflow Drain Bodies and Horizontal Drain Leaders	1
Domestic Cold Water.	1
Horizontal Sanitary Drain Piping Which Receives Condensate	1
Domestic Hot Water Piping, 1-1/2” Pipe and Smaller	1
Domestic Hot Water Piping, 2” Pipe and Larger	1-1/2

END OF SECTION

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SECTION 22 08 00

PLUMBING COMMISSIONING COORDINATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section outlines commissioning requirements and activities of Contractor, Owner, CxA and Design Professionals as related to the Division 22 Plumbing.

B. Related Sections:
1. Division 01 – General Requirements and Specification Section 01 91 13, General Commissioning.
2. Division 22 – Plumbing.
3. Division 23 – Mechanical.
4. Division 26 – Electrical .

1.2 DEFINITIONS

A. Refer to Specification Section 01 91 13, General Commissioning for definitions.

1.3 CONTACT INFORMATION

A. The Owner will contract directly for commissioning services.
1. Commissioning Agent fee will be paid for directly by the owner.
2. Cost of contractor coordination with the CxA is specified in this section.

PART 2 - PRODUCTS

2.1 TEST EQUIPMENT

A. Contractor shall provide all standard and specialized testing equipment required to perform Start-up and Functional Performance Testing. Test equipment required for Functional Performance Testing is listed below. Data logging equipment and software required to test equipment shall be provided by the Contractor.

B. All testing equipment shall be of sufficient quality and accuracy to test and/or measure system performance with the tolerances specified in the Specifications. If not otherwise noted, the following minimum requirements apply: Temperature sensors and digital thermometers shall have a certified calibration within the past year to an accuracy of 1.0ºF and a resolution of + or - 0.2ºF). Pressure sensors shall have an accuracy of + or - 2.0% of the value range being measured (not full range of meter) and have been calibrated within the last year. All equipment shall be calibrated according to the manufacturer's recommended intervals and following any repairs to the equipment. Calibration tags shall be affixed or certificates readily available.

2.2 OTHER CONTRACTOR PROVIDED EQUIPMENT:

A. Ladders and/or lifts and appropriate fall protection as required by Contractor site requirements.

PART 3 - EXECUTION

3.1 COORDINATION - GENERAL

A. Except for the activities to be performed by the CxA called for herein, all component and

system installation work required by the Division 22, 23 and 26 specifications including specific contractor furnished items indicated by this Section shall be provided by the Contractor.

3.2 SUBMITTALS

A. Plumbing
1. Plumbing Equipment.

3.3 EQUIPMENT START-UP

A. Notification
1. Contractor shall provide ten Owner business days' notice to CxA, Owner and Design Team of start-up dates.

B. Prior to start-up, contractor shall:
1. Verify that equipment and systems are complete, accessible, correctly connected to utilities and ready for operation. Perform all pre-start inspections and tests as called for in Division 22.
2. Comply with pre-start requirements of manufacturer and complete applicable documentation.
3. Complete applicable sections of Pre-functional Checklists.
4. Coordinate start-up attendance by manufacturer or authorized representative as required by specifications or manufacturer.

C. At start-up, contractor shall:
1. Supervise the activities of the authorized start-up technician or manufacturer's representative.
2. Verify proper voltage, phase, drive rotation and any other conditions that may cause damage if not correct.
3. Execute start-up under supervision of qualified contractor and equipment manufacturer personnel and in accordance with the manufacturer's instruction.
4. Complete manufacturer start-up requirements and documentation. Provide a copy of documentation to the CxA for inclusion in the Cx Manual.
5. Complete PFC's and provide documentation to CxA.
6. Provide documentation of any issues noted during start-up to CxA, Owner and Design Team. Outline recommendations for corrective action.

3.4 PRE-FUNCTIONAL CHECKLISTS

A. Contractor shall forward completed copies of PFC's to the CxA for inclusion into the Cx documentation. PFC's will be provided by the CxA. As an alternate, contractor shall submit their versions of the PFC's to the CxA for review and comment.

B. Contractor shall complete PFC for each of the following equipment:
1. Plumbing:
a. Domestic Hot Water Heater/Converter.
b. Recirculation Pump.
c. Mixing Valve.

3.5 FUNCTIONAL TESTING

A. General.
1. Contractor shall organize and schedule Construction Team members to execute the functional testing, which will be directed by CxA.

B. Recirculation Pump
   1. Graphics.
   2. Start/Stop/Schedule.
   3. Pump Operation (On/Off/Hand/Auto).
   4. Temperature Sensor Calibration.

C. Domestic Water Heater
   1. Graphics.
   2. Start/Stop Schedule.
   3. Discharge Temperature.

END OF SECTION

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SECTION 22 11 16

DOMESTIC WATER PIPING AND APPURTENANCES

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Furnish and install domestic hot and cold water piping.

1.2 RELATED WORK

A. Division 22 Plumbing
1. Valves, Strainers and Vents.
2. Pipe and Pipe Fittings – General.
3. Plumbing Piping Insulation.
4. Plumbing Fixtures and Fixture Carriers.

PART 2 - PRODUCTS

2.1 PIPING AND FITTINGS

A. Below Slab on Grade Piping for Water Entries:
1. 2-inch and smaller, provide ASTM B88 Type K (heavy wall) annealed tempered (soft) seamless copper water tube. No joints below slab entries.
2. 2-1/2-inch and 3-inch, provide ASTM B88 Type K (heavy wall) annealed tempered (soft) seamless copper water tube, 20 ft. straight lengths. One joint allowed below slab entry using wrought copper, solder-joint pressure fittings: ASME B16.22 with an approved brazing filler metal or pipe can be shop bent for no joint installation by using a “bending” temper tubing.
3. 4-inch and larger, provide ductile iron pipe with mechanical joints, ANSI A21.6.
4. 3 inch and larger, provide one-piece stainless steel IBR (in building riser), Watts or Ames.

B. Below Slab on Grade Piping. Furnish ASTM B 88 and ANSI/NSF Standard 61 annealed tempered (soft), Type K copper water tube. Run continuous with no joints under the floor slab. Provide copper pipe corrosion protection as specified in this Section.

C. Below Slab on Grade Piping: PEX tubing. Refer to section 22 11 21.

D. Above Slab Piping. Provide seamless ASTM B 88 and ANSI/NSF Standard 61 drawn tempered (hard) Type L copper water tube with wrought copper or bronze fittings with solder-joints, ANSI B16.22. Solder material shall be 95-5 (lead free) (Tin-Antimony-Grade 95TA) ASTM B 32.

E. Above Slab Piping: PEX tubing. Refer to section 22 11 21.

F. Unions. Provide 150 lb. standard unions with ground joint and bronze seat. Flange joints larger than 2 inches. Provide dielectric isolating unions at junctions or connection between metallic piping of dissimilar metal. Provide pipe threads with standard taper pipe threads ANSI B2.1.

G. Alternate Method of Joining Copper Pipe and Tubing: Press Fittings: Copper press fitting shall conform to the material and sizing requirements of ASME B16.51. O-rings for copper press fittings shall be EPDM. VIEGA. The system intended for use shall be approved by submittal. Systems from various manufacturers may vary in technology. The field personnel

shall carry training credentials from the approved manufacturer for the project. Mixing of fittings from different manufacturers is strictly prohibited.

2.2 WATER HAMMER ARRESTORS

A. Provide piston type hydraulic engineered/manufactured water hammer arrestors in cold and hot water supply lines in chases or walls to each fixture branch or battery of fixtures serving quick closing valves of electrical, pneumatic, spring loaded type, or quick hand closure valves on fixture trim. Provide water hammer arrestors at the end of the branch line between the last two fixtures served. Provide Precision Plumbing Products, Inc., or equal. Size units according to water hammer arrestor's Standard PDI WH-201; refer to schedule on drawings.

B. Install all water hammer arrestors so as to attain 100% effectiveness according to Plumbing and Drainage Institute PDI-WH201 Table 5, 6 and 6-A for water hammer arrestors.

C. All water hammer arrestors shall be installed in a vertical position.

D. All water hammer arrestors shall be accessible and shall have access panels where required. Arrestors located above ceilings in fixture drops will not be acceptable. Refer to sizing and placement data as indicated in PDI Standard PDI-WH-201.

PART 3 - EXECUTION

3.1 DRAINAGE

A. Install water piping systems with uniform horizontal grade of 1/8 inch per 10 foot, minimum, to low points to provide complete system drainage. Where constant pitch cannot be maintained for long runs, establish intermediate low points and rise to new level. Grade branches to drain to mains or risers. Unless otherwise indicated, terminate low points of risers with drain valve piped to nearest hub or floor drain.

3.2 STERILIZATION

A. Prior to starting work, verify system is complete, flushed and clean.

B. Disinfect water distribution system as required per state and local codes.

C. Take samples no sooner than 24 hours after flushing, from 10 percent of outlets and from water entry, and analyze in accordance with AWWA C651, AWWA C652 or local authority having jurisdiction
   1. Obtain a minimum of one water sample flushing from at least 10% of the outlets and from the water entry.
   2. Take samples from faucets located at highest point in the building, and farthest point from the main water supply.

D. After final flushing, remove aerators, clean and replace.

3.3 TESTING

A. Test under a cold water hydrostatic pressure not less than operating pressure of system and carefully check for leaks. Test shall conform to requirements of IPC and local codes.
   a. Repair leaks and retest system until proven watertight.

B. Test the domestic water piping system at pressure, maintained for minimum of 15 minutes.

C. Use only potable water for the test.

D. Perform the test before fixtures, faucets, trim or final connections are made to equipment.

E. If the system is tested in sections, the entire domestic water piping system shall be submitted to a final test, employing the specified procedure.

F. Do not insulate or conceal piping systems until tests are satisfactorily complete.

G. If any leaks or other defects are observed, suspend the test and correct the condition at once. Repeat testing until leaks are eliminated and the full test period is achieved.

H. The satisfactory completion of testing does not relieve the Contractor of responsibility for ultimate proper and satisfactory operation of piping systems and their accessories.

END OF SECTION

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SECTION 22 11 21

PEX PIPE AND FITTINGS
Uponor (Pipe Sizes ½" Through 3" Copper Tube Sizes)

PART 1 – GENERAL

1.1 PIPE

A. All hot and cold water PEX piping shall be manufactured by Uponor North America as AquaPEX and manufactured in a Standard Dimensional Ratio of 9 (SDR 9) and satisfy ASTM F876. As recognized in IAPMO Research and Testing File No. 3558, the tubing is produced from a cross-linked polyethylene compound complying with ASTM F877, has a 100 PSI pressure rating at 180 degrees.

1.2 TECHNICAL DATA

A. APPLICABLE STANDARDS
1. AquaPEX is available in nominal sizes of ¼" through 3" diameter.
2. Uncoated (natural) AquaPEX has a material designation of PEX 5106.
3. Coated (blue and Red) AquaPEX has a material designation of PEX 5206.
4. AquaPEX is recognized as conforming to ASTM F 877 by IAPMO R&T #3558, as well as conforming to NSF 61, NSF (J-00103652).

B. APPLICABLE CODES
1. 2018 International Plumbing Code (IPC).

1.3 FITTINGS

A. Uponor ProPEX®
1. Third-party certified to NSF 14 and ASTM F1960 cold expansion with PEX reinforcing ring and shall comply with ASTM F876 and ASTM F877, ½ inch through 3 inch nominal pipe size fittings manufactured from the following material types:
a. Reinforcing cold expansion rings shall be manufactured from the same source as PEX-a piping manufacturer and marked "F1960".
2. Uponor multiport tees and elbows: Multiple-outlet fitting complying with ASTM F877 (CAN/CSA B137.5); with ASTM F1960 inlets and outlets.
3. Uponor manifolds Multiple outlet assembly with ASTM F1960 outlets.
a. Type L copper branch manifold with lead-free brass valve outlets.
b. Type L copper branch manifold without valves, with lead-free brass outlets.

B. PEX-to-metal transition fittings:
1. Manufacturers: Provide fittings from the same manufacturer of the piping.
2. Third-party certified to NSF 14 and ASTM F1960 cold expansion with PEX reinforcing ring and shall comply with ASTM F876 and ASTM F877, 1/2 inch through 3 inch nominal pipe size fittings manufactured from the following material types:
a. PEX-a to thread transition: One-piece lead free (LF) brass fitting with male or female threaded adapter and ASTM F1960 cold expansion end, with PEX-a reinforcing cold-expansion ring.
b. PEX-a to copper sweat transition: One-piece lead free (LF) brass fitting with sweat adapter and ASTM F1960 cold expansion end, with PEX-a reinforcing cold expansion ring.

c. PEX-a to copper press transition: One-piece lead free (LF) brass fitting with one ASME B16.51 copper press end and one ASTM F1960 cold expansion end, with PEX-a reinforcing cold expansion ring.
d. PEX-a to flange transition: Tow-piece fitting with one steel flange conforming to ASME B16.5 and one lead free (LF) brass adapter conforming to ASTM F1960.
e. PEX-a to groove transition: One-piece lead free (LF) brass fitting with one CSA B242-05 groove end in either iron pipe size (IPS) or copper tube size (CTS) and one ASTM F1960 cold expansion end with PEX-a reinforcing cold expansion ring.
f. PEX-a to water meter transition: Two-piece fitting with one NPSM union thread and one ASTM F1960 cold expansion end, with PEX-a reinforcing cold expansion ring.

C. PEX-to-thermoplastic transition fittings:
1. PEX-a to CPVC transition: Thermoplastic fitting with one spigot or socket end and one ASTM F1960 cold expansion end, with PEX-a reinforcing cold expansion ring.

1.4 BASIC USE
A. Uponor's AquaPEX cross-linked polyethylene (PEX) tubing and fittings for use in potable hot and cold water distribution, water service in buildings of any type of construction allowed under the applicable code.

PART 2 – PRODUCTS

2.1 MATERIALS

A. The piping systems shall be constructed from a cross-linked polyethylene (PEX) tubing and fittings compounds.

2.2 MANUFACTURERS

A. PIPE AND/OR FITTINGS
1. Uponor North America.

2.3 SYSTEM DESIGN

A. System design shall be in accordance with standard industry practice for water distribution systems and the manufacturer's instructions. The design shall take into consideration such factors as pressure and flow requirements, friction loss, operating temperatures, support spacing, joining methods, and thermal expansion and contraction.

B. A Hazen-Williams C Factor of 150 shall be used in all hydraulic calculations.

C. AquaPEX:
1. PEX-a (Engel-method crosslinked polyethylene), ASTM F876 and F877 (CAN/CSA-B137.5), SDR 9, CTS, ½ inch through 3 inch nominal pipe size.
2. Tubing is certified to NSF Standards 14 and 61 and listed by the Hydrostatic Stress Board of PPI at 200 degrees F. at 80 PSI, 180 degrees F. at 100PSI and 73.4 degrees F. at 160 PSI.
3. Tubing sizes 2-inch, 2-1/2-inch and 3-inch reach out to manufacturer's representative for proper design flow and velocity sizing of pipe.

PART 3 – EXECUTION

3.1 INSTALLATION PROCEDURES

A. Installation practices such as pipe support spacing, bracing, allowance for thermal expansion/contraction, handling and storage shall be in accordance with the manufacturer's instructions and this specification.

B. Special requirements for PEX pressure pipe and fittings:
   1. Installing contractor shall have successfully completed the Uponor Commercial Piping Systems Training Course (previously AquaPEX Certification) as given by an Uponor employee or Uponor Manufacturer's Representative.
   2. Special installation requirements as indicated above for all PEX pipe systems.

C. Installers must be factory trained. The manufacturer's published installation instructions must be available on the job site if requested by Code officials.

D. Reference the use of Table 6-6 by manufacturer for sizing PEX-a F 1960 domestic water systems.
   1. Reference the use of Uponor Pressure Loss charts for sizing PEX-a domestic water systems that fall outside of Table 6-6 parameters.
   2. Refer to Uponor Plumbing Installation Manual for PEX pipe installation instructions with and without PEX pipe support to ensure proper support and clamping requirements.

3.2 WATER SERVICE AND WATER DISTRIBUTION

A. When installing pipe horizontally it must be laid or supported in a manner that assures the temperature expansion and contraction joints are securely accommodated for. The installation must comply with applicable codes and the manufacturer's published installation instructions.

3.3 LIMITATIONS

A. Pipe and fittings are intended for use at a maximum working pressure of 130 psi at 120°F

B. When installation is in fire resistive assemblies, evidence of compliance with IBC Section 713 (penetrations), UBC Section 709 (walls and partitions), and UBC Section 710 (floor / ceiling or roof / ceiling) and, as applicable, must be provided to the Code official for approval.

C. The tubing and fittings must be protected from exposure to direct sunlight as noted in the manufacturer's installation instructions.

D. Clearances from heat producing equipment must be in accordance with Section 802.10-5 of the IAPMO UMC, Section 503.10.5 of the 2009 International Fuel Gas Code® , Section M1306 of the IRC, and Section 304.6 of the 1997 UMC or, as applicable. In areas enforcing the Uniform codes PEX shall not be installed within 18 inches of a water heater.

E. The tubing must be maintained at the proposed operating pressure during placement of concrete, or prior to backfilling when used in buried applications.

F. Minimum bending radius is six times the outside tube diameter of the PEX tube. The outside diameter is the nominal diameter plus 1/8 inch (3.2 mm) or copper tube size (CTS).

G. Installation of tubing must be pressure-tested in the presence of the building official for any possible leaks.

H. The tubing must not be utilized as a source of electrical ground.

I. The products are produced under a quality control program in Apple Valley, Minnesota with inspection by IAPMO Uniform ES.

3.4 TESTING

A. Test under a cold water hydrostatic pressure of 1-1/2 times operating pressure (150 psig minimum) and carefully check for leaks. Repair leaks and retest system until proven watertight.

B. Test the domestic water piping system at 150psig hydrostatic pressure, maintained for 6 hours.

C. Use only potable water for the test. Do not use compressed air.

D. Perform the test before fixtures, faucets, trim or final connections are made to equipment.

E. If the system is tested in sections, the entire domestic water piping system shall be submitted to a final test, employing the specified procedure.

F. Do not insulate or conceal piping systems until tests are satisfactorily complete.

G. If any leaks or other defects are observed, suspend the test and correct the condition at once. Repeat testing until leaks are eliminated and the full test period is achieved.

H. The satisfactory completion of testing does not relieve the Contractor of responsibility for ultimate proper and satisfactory operation of piping systems and their accessories.

3.5 WARRANTY

A. Consult the manufacturer for specific 25 Year System Warranty information.

END OF SECTION

SECTION 22 11 23

DOMESTIC WATER PUMPS

PART 1 - GENERAL

1.1 WORK INCLUDED

A. General characteristics for pumps specified in Division 22 - Plumbing.

1.2 RELATED WORK

Requirements for pumps are specified in other sections of Division 22 - Plumbing, including the following:

A. Division 22 Plumbing - Electrical Provisions of Plumbing Work.

1.3 PUMP SELECTION

A. Select pumps conservatively for scheduled conditions. Furnish pumps that have reasonably high efficiencies, with peak efficiency at or near rated conditions. Select pumps that will operate stably at 15' suction lift despite substantial reduction in head or substantial increase in delivery.

B. If the pumps proposed are not considered suitable, submit manufacturer's data on other pumps, for review.

C. Scheduled design flow, design head, pump efficiency, and motor horsepower are the minimum acceptable.

D. The pump curve shall rise continuously from maximum flow to cut-off.

E. Shut-off head approximately 10 percent greater than design head, unless otherwise indicated in pump schedules.

F. Pump brake horsepower shall not exceed the motor horsepower rating over the entire operating range from shut-off to run-out.

G. Select the pump for operation at or near peak efficiency.

H. Cavitation-free at all points on the curve.

I. Impeller diameter shall not exceed 90 percent of the maximum published diameter.

1.4 PUMP SIZE AND TYPE

A. Provide motor-driven pumps of the type and speed scheduled. Select pumps that are not overloaded throughout the entire range of pump operation. Provide pump connection sizes as indicated.

B. Submit copies of manufacturer’s performance curves, as shop drawings on each pump. Clearly mark the curves for each pump to indicate the diameter of the impeller and the selection point.

1.5 CERTIFIED DATA

A. Submit factory certified pump curves showing pump performance characteristics with

pump and system operating points plotted. Curves shall include as a minimum, flow (gallons per minute), head (feet of water), all available impeller diameters (inches), efficiency (percent), net positive suction head required (feet of water), brake horsepower, pump size and pump model. Show pump curves with system curve plotted.

PART 2 - PRODUCTS

2.1 DOMESTIC HOT WATER CIRCULATING PUMPS (SMALL) FRACTIONAL HORSEPOWER

A. Pump Construction:
1. Wet-rotor, in-line, single stage.
2. Bronze housings with ½" and ¾" sweat connections.
3. Stainless steel housing with union threaded connections.
4. Variable speed ECM.
5. Integrated check valve inside union fitting on a sweat pump housing.
6. Built-in 5-foot, 115 volt AC line cord with NEMA 3 Prong male plug or line cord.
7. Timer control.
8. Aquastat thermostatic control.

B. Acceptable manufacturers:
1. Bell & Gossett.
2. Grundfos.
3. Armstrong.
4. Taco.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install the pumps in accordance with Manufacturer's "Installation, Start-up and Service Instructions".
1. Provide access space around pumps for service.
2. Lubricate pumps prior to start-up.
3. Install hot water circulator horizontally, properly supported to wall, in an accessible location for testing and maintenance at a height not to exceed 60" above finished floor. Install line size Ernst bronze rotating wheel, flow indicator with double window, downstream of circulator.

B. Provide a line size isolation valve and strainer on the pump suction and a line size silent check valve and balancing valve on the pump discharge.

C. Support piping adjacent to the pump such that no weight is carried on the pump casing. Decrease from pipe size with eccentric reducer on suction side and concentric increaser on discharge side.

D. Ensure pumps:
1. Operate at specified system fluid temperatures without vapor binding and cavitation.
2. Are non-overloading in parallel and individual operation.
3. Operate within 25 percent of midpoint of published maximum efficiency curve.

E. Refer to pump detail on the Contract Drawings for piping accessories to be provided.

3.2 MANUFACTURER START-UP SERVICE ALIGNMENT

A. After installation, the pumps and motors are to be aligned by the manufacturer or their

representative utilizing a dial indicator. After completion, a formal report must be submitted by the Manufacturer to the Engineer prior to final acceptance. This report must include pump serial number, location, beginning and final alignment at a minimum.

1. Technicians, as required, shall be trained and experienced in the work they perform (Contractor start-up / alignment is unacceptable).

B. Before starting pumps, but after connecting piping:

1. Align shafts and coupling with a precision dial indicator alignment instrument to the minimum tolerances .004 (TIR) per inch of coupling radius or as recommended by the manufacturer, whichever is the greater.
2. Tabulate the actual pump alignment reading with manufacturer's minimum tolerances.
3. Submit readings for approval.
4. Include the approved readings in the Owner's Maintenance Manual.

3.3 FINAL PUMP FLOW CALIBRATION

A. Based on the results of the final phases of the test and balance sequences, if the flow of the unthrottled pump is more than 10% above the scheduled values:

1. Request detailed instructions from the pump manufacturer for the correct impeller diameter.
2. Trim the impeller to the diameter recommended by the manufacturer, employing precision machinery.

B. Enter the information on the final configuration of the pump in the Owner's Manual.

1. Modify the pump nameplate to reflect the correct head and flow data and the impeller diameter.

3.4 SPARE PARTS

A. Provide the following spare parts and material to the Owner for his use after the warranty period.

1. A mechanical seal for each pump.
2. A set of bearings for each pump.

END OF SECTION

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SECTION 22 13 16

SOIL, WASTE AND SANITARY DRAIN PIPING, VENT PIPING AND APPURTENANCES

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Furnish and install piping in buildings and underground laterals to 5 foot outside of building.

1.2 RELATED WORK

A. Site Work:
1. Sanitary Sewers.
2. Excavation, Trenching and Backfilling for Utilities.

B. Division 22 Plumbing:
1. Pipe and Pipe Fittings.
2. Plumbing Fixtures and Fixture Carriers.
3. Drains, Cleanouts and Hydrants.
4. Earthwork.

1.3 REFERENCES

A. CISPI - Cast Iron Soil Pipe Institute.

B. ASTM - American Society for Testing and Materials

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. All No-Hub clamps must have 4 bands minimum.
1. No-Hub Clamps – Sanitary Waste:
a. Husky SD 4000.
2. No-Hub Clamps – Vents
a. Husky SD – 2000.
b. Mission Rubber Co., LLC Heavy Weight Couplings.
3. Clamp-All Hi-TorQ 80 or approved equal.

B. Provide Fernco “Pro-flex” shielded couplings Series 3000 with one piece neoprene gasket for all cast iron pipe transitions to Schedule 40 DWV pipe penetrations through slabs. Sizes 1-1/2” through 8” Series 3000.

C. Cast Iron Soil Pipe and Fittings:
1. AB&I.
2. Charlotte Pipe and Foundry Co.
3. Tyler Pipe / Soil Division.

D. PVC Soil Pipe and Fittings
1. Charlotte Pipe.
2. Westlake Pipe and Fittings.
3. JM Eagle.

2.2 DRAIN PIPE AND FITTINGS

A. Above Slab Piping:
   1. Schedule 40 PVC plastic pipe and DWV fittings with solvent welded joints.
   2. Pipe and fittings shall conform to ASTM D 1784-82.

B. Above Slab Piping – Commercial Kitchen Fixture Drain Piping.
   1. Copper Tube: ASTM B 306, DWV.
   2. Fittings: ASME B16.29, wrought copper, or ASME B16.32, solvent.
   3. Joints: ASTM B 32, alloy Sn50 solder.

C. Below Slab on Grade Pipe:
   1. Schedule 40 PVC plastic pipe and DWV fittings.
   2. Solvent welded DWV joints shall conform to IAPMO Installation Standard IS-9.
   3. Pipe and fittings shall conform to ASTM D 1784, ASTM D 1785, ASTM D 2665, ASTM D 3311 and NPS Standard 14 & 61.

D. Below Slab on Grade Piping for Grease Waste:
   1. Schedule 40 CPVC pipe and fittings
   2. Solvent welded DWV joints shall conform to ASTM D3311 and be produced to dimensions specified in ASTM F 2618, NSF International, UPC, IAPMO IGS 210 and International Plumbing Code.
   3. Solvent Cement, Heavy Body; mustard yellow color, as tested by ASTM F 2618 / ASTM F493.
   4. Manufacturer: Spears or equal.

E. Below Slab on Grade Piping for grease waste:
   1. Service weight/cast iron hub and spigot pipe and fittings
   2. Compression type, with neoprene gaskets shall conform to ASTM C-564.
   3. Pipe shall conform to requirements of ASTM A74.
   4. All Cast Iron Soil Pipe and Fittings shall be marked with the collective trademark of the Cast Iron Soil Pipe Institute.

2.3 VENT PIPE AND FITTINGS

A. Above Slab Piping. Provide Schedule 40 PVC plastic pipe and DWV fittings with solvent welded joints. Pipe and fittings shall conform to ASTM D 1784-82.

B. Below Slab on Grade Piping:
   1. Provide Schedule 40 PVC with DWV fittings with solvent welded joints. Pipe and fittings shall conform to ASTM D1784-82.

PART 3 - EXECUTION

3.1 INSTALLATION

A. All above and below slab soil, waste, sanitary drain and vent piping installation methods shall be in accordance with Cast Iron Soil Pipe Institute Standards.

B. Above ground installation in the horizontal position shall be supported at every hub (hub & spigot or hubless type). Hangers are to be placed within 12” of hub or coupling. For large diameter fittings, 5 inches and larger shall be braced to prevent horizontal movement. Every branch opening or change of direction, braces, blocks, rodding or other suitable method shall be used to prevent movement. Riser clamps to be used for vertical piping, not to exceed 15’-0” between clamps..

C. All above and below slab PVC sanitary waste and vent piping installation methods shall be in accordance with IAPMO Installation Standard 18-9 for Schedule 40 PVC-DWV, per manufacturer's recommendations and applicable standards.

D. Tracer wires shall be installed on all underground PVC sanitary sewer lines installed outside the building slab.

E. All PVC underground shall be installed in accordance with ASTM D2321.

3.2 GRADE

A. Give horizontal pipe grade of ¼-inch per foot where possible, but not less than 1/8 inch per foot unless otherwise shown.
B. Horizontal below grade 2" waste piping sloped at 1/4 inch per foot.
C. Grease waste piping below grade sloped at 1/4 inch per foot.

3.3 DRAIN PIPE AND FITTINGS

A. Offsets and Fittings.
   1. Use reduction fittings to connect two pipes of different diameter.
   2. Change directions by appropriate use of 45-degree wyes, long-sweep quarter-bends, and sixth-, eights-, and sixteenth-bends. Sanitary tees can be used on vertical stacks. Use long sweeps at the base of risers.
   3. Provide a separate trap at each fixture, unless a trap is built into the fixture. Provide a deep seal trap at each floor drain and hub drain. Place traps so that the discharge from any fixture will pass through only one trap before reaching a building drain.
   4. Refer to Sanitary Drainage Code section for acceptable fittings to be used for changes in direction of drainage flow. Double combo sanitary fittings or double wye and 1/8th bend fittings are not allowed for horizontal to horizontal piping systems per Code.

B. Hub Drains. Install hub drains where indicated, with the top of the hub 1/2 above the finished floor, unless otherwise indicated on the drawings.

C. Cleanouts. Install cleanouts the same size as the soil waste lines in which the cleanouts are placed; however, no cleanout should be larger than 4 inches in diameter. Provide cover with vandal-resistant securing screw.
   1. Where cleanouts occur in pipe chases, bring the cleanouts through the walls and install covers. Where cleanouts occur in floor slabs, set flush. Reference drawing schedule.
   2. Provide cleanouts where soil lines change direction, every 75 foot on long runs, or as shown on the drawings, at the end of each horizontal waste line, and at the base of each riser (and at each increase in pipe size).
   3. Cleanouts shall occur at the end of each battery of water closets, urinals, lavatories, sinks, and single water closets. Cleanouts shall be installed so as to access the main sanitary or soil line. Extend and offset above flood rim of water closet.
   4. Double sanitary tees and double quarter bends do not allow for easy access to main lines, therefore these types of fittings are not allowed.

3.4 VENT PIPING

A. Make vent connections to vent stacks with inverted wye fittings. Extend full-size vents through the roof to at least 12 inches above the roof.

B. Coordinate with roof contractor for installation of vents thru roof. Flashing at vent penetration shall comply with the roofing manufacturer's requirements. Reference the Architectural Drawings for exact requirements.

C. Locate vent piping through roof a minimum horizontal distance of not less than 10 feet from any air intake opening or supply fan.

3.5 TESTING

A. Below Slab on Grade and All Floors in Multi-Story Buildings:
1. Test pipe below slab on grade before backfilling and connecting to city sewers.
2. Maintain not less than 10 foot of hydrostatic head for1 hour without a leak.
3. Before acceptance of the work the contractor must ensure the piping is in working order before and after the slab is poured. To ensure this the contractor must test completed systems in the presence of the Architect, Engineer and authorities having jurisdiction after installation is complete.
4. Maintain the test on the system till after the slab is poured. Provide an accessible connection that may be reviewed by Architect, Engineer and authorities having jurisdiction prior to and after the slab is poured.
5. Test drainage piping systems in accordance with governing codes and the requirements specified. Provide equipment and materials and make test connections required to execute tests.
6. Test drainage and waste piping hydraulically by filling system to its highest point or, whichever is greater, at a static head of 10 feet. Leaks at any joint shall be sufficient cause for rejection.
7. Air tests may be substituted for hydraulic tests by forcing air into the closed system at a uniform pressure sufficient to balance a column of 10 inch hg in height.
8. Under any of the previously described tests, the water height shall remain constant, after stabilization, for not less than 15 minutes without any further addition of water.

B. System Test. After the various sections of soil, waste and vent piping are installed, but before fixtures are connected, test the system by:
1. Plugging outlets.
2. Filling vertical sections of multiple story buildings of not less than three floors at a time with water. Provide wyes as required to facilitate plugging.
3. Test for 6 hours without any drop in the water level.

3.6 RODDING SEWERS

A. All sanitary soil and waste lines, both in the building and out, shall be rodded out and flushed out after completion of construction and prior to finish floor being installed. All work must be completed prior to substantial completion. All floor drains and cleanout locations must be included in this work.

B. All sanitary soil and waste lines below building 3” and larger shall be internally videotaped at time of substantial completion. All videotaping shall include on-screen date and time, and include audio narration. All videotaping shall be provided by experienced individual in videotaping piping systems. An Owner’s Representative shall be present during video-taping. Three copies of the videotape shall be delivered to the Owner for future records.

C. This work shall be done in the presence of the Owner’s Representative, as part of the Contract, to ensure all lines are clear, and any obstruction that may be discovered shall be removed immediately. Rodding shall be accomplished by utilizing the proper rotary head to clear sewer. Pipe sizes 8 inches and larger shall be hydro-flushed.

3.7 SMOKE TESTING

A. Interior Plumbing Piping:
   1. Contractor shall perform smoke testing on all interior sanitary sewer piping and sanitary vent piping above and below floor prior to cover-up.
   2. Artificially created smoke used must be a persistent white tracer smoke and produced by thermogenic chemical reaction. All smoke candles or smoke pencils to be used must be non-toxic and EPA approved. Provided by Superior Signal Smoke Candles.
   3. All plumbing fixtures must be installed including floor drains with wetted trap seals.
   4. Smoke testing shall be performed after completion of any videotaping, rodding or flushing of the sanitary system. Test must be performed prior to ceiling installation in new construction projects. Smoke is usually injected into the building through the two-way cleanout in the main sewer line leaving the building or a plumbing roof vent or fixture. Smoke will travel through the sanitary sewer and vent system and through the air spaces in the sewer lines and emanate from any leaks in the system. The smoke must reach the last roof vent in the system to indicate the entire system has been completely filled with smoke. The smoke must travel the full length of the piping system. Contractor must provide manpower as necessary to visually trace the flow of smoke through the wall cavities, annular floor/ceiling spaces, inject the smoke, observe the roof vents and to identify the integrity problems.
   5. Contractor shall provide a detailed list of findings and a drawing indicating the location, fixture type, type and size of pipe, and or description of type of problems found.
   6. Typical findings from indoor smoke testing may include:
      a. Dry traps in floor drains.
      b. Improperly capped sewer lines or vents.
      c. Broken sewer lines or vents.
      d. Cross connected sewer vents and drains.
      e. The drawing of air emanating from sewer vents into intakes of air exchange systems.
      f. Poorly glued pipe joints.
      g. Loose no-hub couplings.
   7. An Owner's Representative shall be present during smoke testing.

3.8 SMOKE TESTING – LIQUID SMOKE SYSTEM

A. Interior Plumbing Piping:
   1. Contractor shall perform smoke testing for finding leaks in all interior of building sanitary sewer piping and sanitary vent piping above and below building slab prior to cover up.
   2. Contractor must use a laboratory tested safe liquid smoke with a patented liquid smoke generating system. The liquid smoke must be contained in a pressure tank with inline filter and quick disconnect.
   3. Smoke generating system must generate up to 3 hours or more of continuous and constant smoke. Generating system must have a metering valve to precisely control smoke flow and density. Smoke generating system must have a 4" x 6" industrial flexible mining duct for connection to vent stack or cleanout.
   4. Smoke generating system must be power full enough to push smoke through the smallest leaks.
   5. The liquid smoke must not leave any stains or odors.
   6. The liquid smoke shall not contain Zinc Chloride, a listed toxic compound in OSHA 1915,1000 – Air contaminants.

7. Smoke generating system must have a means to atomize the liquid smoke and have an enclosed fan system capable of up to 700 cfm with adjustable inlet damper control to adjust cfm as necessary for the size of system.
8. Provide Hurco “Power smoker “ with Hurco “LiquiSmoke” system or approved equal.
9. All plumbing fixtures must be installed including floor drains with wetted trap seals.
10. Smoke testing shall be performed after completion of any videotaping, rodding or flushing of the sanitary system. Test must be performed prior to ceiling installation in new construction projects. Smoke is usually injected into the building through the two-way cleanout in the main sewer line leaving the building or a plumbing roof vent or fixture. Smoke will travel through the sanitary sewer and vent system and through the air spaces in the sewer lines and emanate from any leaks in the system. The smoke must reach the last roof vent in the system to indicate the entire system has been completely filled with smoke. The smoke must travel the full length of the piping system. Contractor must provide manpower as necessary to visually trace the flow of smoke through the wall cavities, annular floor/ceiling spaces, inject the smoke, observe the roof vents and to identify the integrity problems.
11. Contractor shall provide a detailed list of findings and a drawing indicating the location, fixture type, type and size of pipe, and or description of type of problems found.
12. Typical findings from indoor smoke testing may include:
    a. Dry traps in floor drains.
    b. Improperly capped sewer lines or vents.
    c. Broken sewer lines or vents.
    d. Cross connected sewer vents and drains.
    e. The drawing of air emanating from sewer vents into intakes of air exchange systems.
    f. Poorly glued pipe joints.
    g. Loose no-hub couplings.
13. An Owner’s Representative shall be present during smoke testing.

END OF SECTION

SECTION 22 14 13

ROOF DRAINAGE PIPING AND APPURTENANCES

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Furnish and install roof drains, drain pipes and accessories.

1.2 RELATED WORK

A. Division 22 Plumbing
   1. Pipe and Pipe Fittings - General; for general piping requirements.
   2. Drains and Cleanouts.
   3. Plumbing Piping Insulation.
   4. Earthwork.

1.3 REFERENCES

A. CISPI – Cast Iron Soil Pipe Institute.
B. ASTM – American Society for Testing and Materials.

PART 2 - PRODUCTS

2.0 ACCEPTABLE MANUFACTURERS

A. Cast Iron Soil Pipe and Fittings
   1. AB&I.
   2. Charlotte Pipe and Foundry Co.
   3. Tyler Pipe / Soil Division.

2.1 STORM PIPE AND FITTINGS

A. Above Ground Pipe. Provide service weight cast iron Hub and Spigot soil pipe and fittings with compression type neoprene gaskets that conform to ASTM C-564. Pipe and fittings shall meet the requirements of ASTM A 74. All cast iron soil pipe and fittings shall be marked with the collective trademark of the Cast Iron Soil Pipe Institute.

B. Above Ground Piping. Provide Schedule 40 PVC plastic pipe and DWV fittings with solvent welded joints. Pipe and fittings shall conform to ASTM D 1784-82.

PART 3 - EXECUTION

3.1 INSTALLATION

A. All above slab storm piping installation methods shall be in accordance with the Cast Iron Soil Pipe Institute Standards.
B. Above ground installation in the horizontal position shall be supported at every hub (hub & spigot or hubless type). Hangers to be placed within 12” of hub or coupling. For large diameter fittings, 5 inches and larger shall be braced to prevent horizontal movement. Every branch opening or change of direction, braces, blocks, rodding or other suitable method shall be used to prevent movement. Riser clamps to be used for each floor, not to exceed 15’-0”.

C. All above slab PVC storm piping installation methods shall be in accordance with IAPMO

Installation Standard 18-9 for Schedule 40 PVC-DWV, per manufacturer's recommendations and applicable standards, and in accordance with ASTM D2321.

3.2 GRADE

A. Give horizontal lines minimum grade of 1/8 inch per foot.

3.3 TESTING

1. Test pipe below slab on grade before backfilling and connecting to city sewers.
2. Maintain not less than 10 foot of hydrostatic head for 1 hour without a leak.
3. Before acceptance of the work the contractor must ensure the piping is in working order before and after the slab is poured. To ensure this the contractor must test completed systems in the presence of the Architect, Engineer and authorities having jurisdiction after installation is complete.
4. Maintain the test on the system till after the slab is poured. Provide an accessible connection that may be reviewed by Architect, Engineer and authorities having jurisdiction prior to and after the slab is poured.
5. Test drainage piping systems in accordance with governing codes and the requirements specified. Provide equipment and materials and make test connections required to execute tests.
6. Test drainage and waste piping hydraulically by filling system to its highest point or, whichever is greater, at a static head of 10 feet. Leaks at any joint shall be sufficient cause for rejection.
7. Air tests may be substituted for hydraulic tests by forcing air into the closed system at a uniform pressure sufficient to balance a column of 10 inch hg in height.
8. Under any of the previously described tests, the water height shall remain constant, after stabilization, for not less than 15 minutes without any further addition of water.

B. System Test. After the various sections of soil, waste and vent piping are installed, but before fixtures are connected, test the system by:
1. Plugging outlets.
2. Filling vertical sections of multiple story buildings of not less than three floors at a time with water. Provide wyes as required to facilitate plugging.
3. Test for 6 hours without any drop in the water level.

3.4 RODDING SEWERS

A. All storm sewer lines, both in the building and out, shall be rodded out and flushed out after completion of construction and prior to finish floor being installed. All work must be completed prior to substantial completion. All floor drains and cleanout locations must be included in this work.

B. All storm lines below building 3" and larger shall be internally video-taped at time of substantial completion. An Owner's Representative shall be present during video-taping. Three copies of the video-tape shall be delivered to the Owner for future records.

C. This work shall be done in the presence of the Owner's Representative, as part of the Contract, to ensure all lines are clear, and any obstruction that may be discovered shall be removed immediately. Rodding shall be accomplished by utilizing a rotary cutter, which shall be full size of pipe being cleaned for pipe sizes up to 6 inches. Pipe sizes 8 inches and larger shall be hydro-flushed.

END OF SECTION

SECTION 22 20 00

PLUMBING PIPE AND PIPE FITTINGS - GENERAL

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Furnish and install pipe and pipe fittings for piping systems specified in Division 22 - Plumbing.

1.2 RELATED WORK

A. Division 22 Plumbing
1. Earthwork.
2. Valves, Strainers and Vents.
3. Insulation.
4. Other Piping Sections.

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PART 2 - PRODUCTS

2.1 PIPE AND FITTINGS

A. The particular type of pipe and fittings for each system is specified in the individual sections.

2.2 JOINTS

A. Make screwed joints using machine cut USASI taper pipe threads. Apply a suitable joint compound to the male threads only. Ream the pipe to full inside diameter after cutting. All-thread nipples are not permitted.

B. Dissimilar Metals. Make joints between copper and steel pipe and equipment using insulating unions or couplings such as Crane Company #1259; EPCO as manufactured by EPCO Sales, Inc.; or an approved equal.

C. Solder joints.
1. Prior to making joints, cut pipe square and ream to full inside diameter. Clean exterior of pipe and socket. Apply a thin coat of suitable fluxing compound to both pipe and socket, and fit parts together immediately.
2. Heat assembled joint only as required to cause the solder to flow. Run the joint full, slightly beaded on the outside, and wipe to remove excess solder.
3. Use silver brazing alloy or Sil-Fos on underground water entry piping. Use lead free solder on all other copper piping.

D. Make welded joints as recommended by the standards of the American Welding Society. Ensure complete penetration of deposited metal with base metal. Provide filler metal suitable for use with base metal. Keep inside of fittings free from globules of weld metal. The use of mitered joints is not approved.

E. Flanged.
1. Prior to installation of bolts, center and align flanged joints to prevent mechanical pre-stressing of flanges, pipe or equipment. Align bolt holes to straddle the vertical, horizontal or north-south centerline. Do not exceed 3/64" per foot inclination of the flange face from true alignment.
2. Use flat-face companion flanges only with flat-faced fittings, valves or equipment.

Otherwise, use raised-face flanges.

3. Install gaskets suitable for the intended service and factory cut to proper dimensions. Secure with manufacturers recommended gasket cement.
4. Use ANSI nuts and bolts, galvanized or black to match flange material. Use ANSI 316 stainless steel nuts and bolts underground. Tighten bolts progressively to prevent unbalanced stress. Draw bolts tight to ensure proper seating of gaskets.
5. Use carbon steel flanges conforming to ANSI B16.5 with pipe materials conforming to ASTM A 105 Grade II or ASTM A 108, Grade II, ASTM A 53, Grade B. Use slip-on type flanges on pipe only. Use welding neck type flanges on all fittings. Weld slip-on flanges inside and outside.
6. Keep flange covers on equipment while fabricating piping. Remove when ready to install in system.

F. No Hub. Hubless joints shall be made with wide body, neoprene sealing sleeve with stainless steel sleeve, coupling joints conforming to ASTM C 1277.

1. 4" pipe size and smaller coupling housing minimum of 3" width; 24 gauge Series 300 stainless steel with hi-torque clamps; neoprene coupling gasket.
2. 6" through 10" pipe size coupling housing minimum of 4" width.
3. Tighten clamps to within manufacturer's tolerances using preset torque wrench.

G. Mechanical Joints. Provide a stuffing box type mechanical joint adapted to use gasket, cast iron gland and bolts. Coat bolts with bitumastic enamel. Use joint parts similar in design to one of the following:

1. Doublex Simplex Joint manufactured by the American Cast Iron Pipe Company, Birmingham, Alabama.
2. U.S. joints manufactured by the United States Pipe and Foundry Company, Burlington, New Jersey.
3. Boltite Joint manufactured by the McWane Cast Iron Pipe Company, Birmingham, Alabama.
4. Flexlamp manufactured by the National Cast Iron Pipe Company, Birmingham, Alabama.

H. Compression Joints for Cast Iron Water Pipe. Use Beltite, Tyton or Grip-Tite compression joints. Install in accordance with the manufacturer's recommendations for compression joints. Provide adequate concrete thrust blocks at changes of direction, as recommended by the manufacturer.

I. Compression Gasket System. Bell and spigot cast iron pipe 4" and smaller, use flax-base lubricant, Tyler Ty-Seal Lubricant or Charlotte Regular Lubricant. 6" and larger use a neoprene base lubricant, Charlotte Adhesive Lubricant.

J. Ring-Tite Joints: Ring-Tite gasketed sewer fittings for sanitary and storm. Furnish joints for installation manufactured per ASTM/CSA, Ipex, and J.M Eagle C900. Provide adequate concrete thrust blocks at changes in direction, as recommended by manufacturer. JM Eagle pressure rated PVC water pipe. ASTM D2241 pressure rating, ASTM D3219 joints, gaskets ASTM F477.

K. Ball Joints. Where shown, provide flexible ball joints, made of carbon steel. Ball joints must have 15° of angular flexibility. Use welded or flanged ends, as required. Furnish with 11N gaskets.

L. Mechanically Formed Tee Fitting. Mechanically extracted collars shall be formed in a continuous operation consisting of drilling a pilot hole and drawing out the tube surface to form a collar having a height not less than three (3) times the thickness of the branch wall. The branch tube shall be notched to conform with the inner curve of the run tube and shall have two (2) dimple / depth stops to insure that penetration of the branch tube

into the collar is of sufficient depth for brazing and that the branch tube does not obstruct the flow in the main line tube. Dimple depth stops shall be in line with the run tube. The second dimple shall be one quarter (1/4) inch above the first and shall serve as a visual point of observation. All joints shall be brazed with silver brazing alloy or Sil-Fos. Soft soldered joints shall not be allowed.

M. Press fittings for copper pipe 1/2” to 4”: Copper press fittings shall conform to the material and sizing requirements of ASTM B16.18 or ASME B16.22. O-rings for copper press fittings shall be EPDM. Pro-Press System manufactured by VIEGA. The system intended for use shall be approved by submittal. Systems from various manufacturers may vary in technology. The field personnel shall carry training credentials from the approved manufacturer for the project. Mixing of fittings from different manufacturers is strictly prohibited.

N. Press fittings for steel pipe ½” to 2”: Where accepted by local code for specific applications, Cold Press Mechanical Joint Fittings shall conform to material requirements of ASTM A420 or ASME B16.3 and performance criteria of ANSI/CSA LC4. Sealing system shall be EPDM or HNBR as appropriate for a defined application. MegaPress system manufactured by VIEGA or approved equal and include “Smart Connect” assurance that unpressed fittings will not hold pressure. The system intended for use shall be approved by submittal. Systems from various manufacturers may vary in technology. The field personnel shall carry training credentials from the approved manufacturer for the project. Mixing of fittings from different manufacturers is strictly prohibited.

2.3 UNIONS

A. Use 150 lb. standard (300 lb. WOG) malleable iron, ground joint unions with bronze seat. Provide flanged joints on piping 2-1/2" and larger.
   1. Where pipe materials of different types join, use a dielectric union. Union shall be threaded, solder or as required for its intended use.

2.4 BRANCH CONNECTIONS

A. Pipe 2" and Smaller. For threaded piping, use straight size reducing tee. When branch is smaller than header, a nipple and reducing coupling or swagged nipple may be used.

B. 2-1/2" through 36": For welding piping, when branch size is the same as header size, use welding tee. Use Weld-o-let when branch is smaller than header. For threaded branch connections, use 3000 lb. full coupling or Thread-o-let welded to header.

2.5 GASKETS

A. High Temperature Piping. Provide 1/16" thick ring gaskets of aramid reinforced SBR such as Garlock #3200 or 3400 or equal by Advanced Products and Systems.

B. Other Piping. Provide ring rubber gaskets, Garlock #7992 or equal by Advanced Products and Systems. Use 1/8" thick cloth reinforced neoprene gaskets. For smaller than 6", use 1/16" thick gasket.

2.6 FLOORS AND CEILING PLATES

A. Provide chrome-plated floor and ceiling plates around pipes exposed to view when passing through walls, floors, partitions, or ceilings in finished areas; size plates to fit pipe or insulation and lock in place.

2.7 DOMESTIC MANUFACTURE

A. All piping material, pipe and pipe fittings shall be manufactured in the United States of America unless specifically named in these specifications.

PART 3 - EXECUTION

3.1 PIPE FABRICATION AND INSTALLATION

A. Make piping layout and installation in the most advantageous manner possible with respect to headroom, valve access, opening and equipment clearance, and clearance for other work. Give particular attention to piping in the vicinity of equipment. Preserve the required minimum access clearances to various equipment parts, as recommended by the equipment manufactured, for maintenance.

B. Cut all pipes to measurement determined at the site. After cutting pipe, remove burrs by reaming. Bevel plain ends of ferrous pipe.

C. Install piping neatly, free from unnecessary traps and pockets. Work into place without springing or forcing. Use fittings to make changes in direction. Field bending and mitering is prohibited. Make connections to equipment using flanged joints, unions or couplings. Make reducing connections with reducing fittings only.

D. Install piping without tapping out of the bottom of pipe.

E. Press Connections: Copper and steel press fittings ½” through 4” shall be applied in accordance with the manufacturer’s installation instructions. The tubing/pipe shall be fully inserted into the fitting and the tubing/pipe marked at the shoulder of the fitting. The fitting alignment shall be checked against the mark on the tubing/pipe to assure the tubing/pipe is fully engaged (inserted) in the fitting. The joints shall be pressed using the tool approved by the manufacturer. If soldering (thread adapters, etc.) near press fittings, take precautions to not damage the O-ring fittings. Maintain three pipe diameters or use a cooling agent. Viega-“Pro-Press”.

3.2 WELD

A. Weld and fabricate piping in accordance with ANSI Standard B31.1, latest edition, Code for Pressure Piping.

B. Align piping and equipment so that no part is offset more than 1/16". Set fittings and joints square and true, and preserve alignment during welding operation. Use of alignment rods inside pipe is prohibited.

C. Do not permit any weld to project within the pipe so as to restrict flows. Tack welds, if used, must be of the same material and made by the same procedure as the completed weld. Otherwise, remove tack welds during welding operation.

D. Do not split, bend, flatten or otherwise damage piping before, during or after installation.

E. Remove dirt, scale and other foreign matter from inside piping before tying into existing piping sections, fittings, valves or equipment.

F. Bevel ends of ferrous pipe.

3.3 OFFSETS AND FITTINGS

A. Due to the small scale of drawings, the indication of offsets and fittings is not possible. Investigate the structural and finish conditions affecting the work and take steps required to meet these conditions.

B. Install pipe close to walls, ceilings and columns so pipe will occupy minimum space. Provide proper spacing for insulation coverings, removal of pipe, special clearances, and offsets and fittings.

3.4 SECURING AND SUPPORTING

A. Support piping to maintain line and grade, with provision for expansion and contraction. Use approved clevis-type or trapeze-type hangers connected to structural members of the building. Single pipe runs to be supported by approved clevis type hangers. Multiple pipe runs to be supported by approved trapeze type hangers. Do not support piping from other piping or structural joist bridging.

B. Provide supports both sides of elbows for pipe 6" and larger. For smaller pipe provide support within 12” of elbows and tees.

C. Support vertical risers with steel strap pipe clamps of approved design and size, supported at each floor. Support piping assemblies in chases so they are rigid and self-supported before the chase is closed. Provide structural support for piping penetrating chase walls to fixtures. On cold water pipe, supports shall be outside the insulation.

D. Where insulation occurs, design hangers to protect insulation from damage. Pipe saddles and insulation shields, where required, are specified in the appropriate insulation section and are sized in accordance with the schedule on the drawings.

E. Install trapeze hangers, properly sized, to support the intended load without distortion.

F. Use electro-galvanized or zinc plated threaded rods, nuts, washers and hangers.

G. At outdoor locations, all supports, brackets and structural members shall be hot-dipped galvanized.

H. Support spacing: As recommended by the project structural engineer and support manufacturer, but not more than listed below. Not to exceed spacing requirements of smallest pipe.

Pipe Size	Copper & Steel Max. Support Spacing, Feet	Cast Iron Max. Support Spacing, Ft.	Minimum Rod Diameter, Inches
1" & smaller	6		3/8
1-1/4" & 1-1/2"	8	5	3/8
2"	10	5	3/8
3"	10	5	1/2
4" & 5"	10	5	5/8
6" and above	10	5	3/4

I. PEX Piping:
   a. Maximum hanger spacing, 2’-8”.
   b. Hanger rod diameter, 3/8 inch.
   c. Hanger spacing per piping manufacturer’s instructions when using horizontal

rigid metal channel to support piping.

3.5 PIPE SUPPORTS

A. Provide P1001 or P 5000 Unistrut metal framing members and appurtenances for pipe support. Hot-dip galvanize members and appurtenances when located outside. Sagging of pipes or supports is not acceptable.

B. Adjustable clevis hangers shall be used for single pipe supports; Anvil Fig. 260. When oversized clevis is used, a nipple shall be placed over the clevis bolt as a spacer to assure that the lower U-strap will not move in on the bolt. Provide adjustable clevis with a nut / washer above and below the hanger on the support rod. Ring type clevis hangers are not acceptable.

C. Provide Anvil Figure 45 galvanized or primed and painted channel assembly for trapeze hangers.

3.6 PIPE SUPPORTS ON ROOF

A. Support gas pipe on roof with Miro Industries Model 3-RAH-8 or approved equal with roller and fully adjustable height throughout pipe run. Base material shall be high density / high impact polypropylene with UV inhibitors and anti-oxidants. Provide with hot dip galvanized rod finish and framing. Nuts and washers shall be hot dip galvanized.

3.7 ANCHORS

A. Provide anchors as required. Use pipe anchors consisting of heavy steel collars with lugs and bolts for clamping to pipe and attaching anchor braces. Install anchor braces in the most effective manner to secure desired results. Do not install supports, anchors or similar devices where they will damage construction during installation or because of the weight or the expansion of the pipe. When possible, install sleeves in structural concrete prior to pouring of concrete.

3.8 FLOOR PENETRATIONS

A. At locations where pipe passes through floors, provide watertight concrete curb around penetration.

3.9 PIPE SLEEVES

A. Sleeves through masonry and concrete construction:
   1. Fabricate sleeves of Schedule 40 galvanized steel pipe.
   2. Size sleeve large enough to allow for movement due to expansion and to provide continuous insulation.

B. Sleeves through gypsum wall construction.
   1. Fabricate sleeves of 16 gauge galvanized sheet metal.

C. Sleeves through elevated slab construction.
   1. Fabricate sleeves of Schedule 40 galvanized steel pipe with welded center flange in floor.

D. Extend each sleeve through the floor or wall. Cut the sleeve flush with each wall surface. Sleeves through floors shall extend 2” above floor lines for waterproofing purposes. Slab on grade floors shall not be sleeved except where penetrating waterproofing membrane or insect control is required.

E. Caulk sleeves water and air tight. Seal annular space between pipes and sleeves with mastic compound to make the space water and air tight.

F. For sleeves below grades in outside walls, provide Thunderline Link-Seal or Advance Product and System Interlynx, with 316 stainless steel nuts and bolts, with cast iron pressure plate.

G. Provide chrome plated escutcheon plates on pipes passing through walls, floors or ceilings exposed to view. At exterior walls, stainless steel sheet metal is to be used.

H. For sleeves through fire and smoke rated walls, seal with a UL through-penetration firestop, rated to maintain the integrity of the time rated construction. Install in accordance with the manufacturer's installation instructions. Comply with UL and NFPA standards for the installation of firestops. Refer to Architectural drawings for all fire and smoke rated partitions, walls, floors, etc.

3.10 ISOLATION VALVES

A. Provide piping systems with line size shutoff valves located at the risers, at main branch connections to mains for equipment, to isolate central plant, and at other locations.

3.11 DRAIN VALVES

A. Install drain valves at low points of water piping systems so that these systems can be entirely drained. Install a line size drain valve for pipes smaller than 2" unless indicated otherwise. For pipes 2-1/2" and larger, provide 2" drain valves unless indicated otherwise. Drain valves shall be plugged when not in use and at completion.

3.12 CLEANING OF PIPING SYSTEMS

A. General cleaning of piping systems. Purge pipe of construction debris and contamination before placing the systems in service. Provide and install temporary connections as required to clean, purge and circulate.

B. Install temporary strainers at the inlet of pumps and other equipment as necessary where permanent strainers are not indicated. Keep strainers in service until the equipment has been tested, then remove either entire strainer or straining element only. Fit strainers with a line size blow down ball valve and pipe to nearest drain. Blow down strainers, remove and clean as frequently as necessary.

C. Phase One: Initial flushing of system. Remove loose dirt, mill scale, weld beads, rust and other deleterious substances without damage to system components. Open valves, drains, vents and strainers at all system levels during flushing procedures. Flush until “potable water clear” and particles larger than 5 microns are removed.

D. Connect dead-end supply and return headers, even if not shown on the drawings, and provide terminal drains in bottom of pipe end caps or blind flanges.

E. Dispose of water in approved manner.

F. Phase Two: Cleaning of Piping Systems. Remove, without chemical or mechanical damage to any system component, adherent dirt (organic soil), oil, grease, (hydrocarbons), soldering flux, mill varnish, piping compounds, rust (iron oxide) and other deleterious substances not removed by initial flushing. Flush system and replace with clean water.

G. Phase Three: Final flushing and rinsing: Flush and rinse until “potable water clear” and particles larger than 5 microns are removed. Operate valves to dislodge any debris in valve body. Dispose of water in approved manner.

H. Submit status reports upon completion of each phase of work on each system.

3.13 TESTING

A. Test piping after installation with water hydrostatic pressure of 1-1/2 times operating pressure (150 psig minimum) and carefully check for leaks. Repair leaks and retest system until proven watertight.

B. Do not insulate or conceal piping systems until tests are satisfactorily complete.

C. If any leaks or other defects are observed, suspend the test and correct the condition at once. Repeat testing until leaks are eliminated and the full test period is achieved.

D. The satisfactory completion of testing does not relieve the Contractor of responsibility for ultimate proper and satisfactory operation of piping systems and their accessories.

3.14 PIPE MARKERS

A. Identify interior exposed piping and piping in accessible chases or plenums with Opti-Code Brady Pressure Sensitive Adhesive Pipe Markers, consisting of pipe marker and direction of flow arrow tape. Clean pipe prior to installation. Background colors of markers, arrows and tape for each type of system shall be the same. Meet ANSI/OSHA standards and clearly identify each system. Provide minimum 2-1/4-inch letters through 4-inch pipe and 4-inch letters for 5-inch pipe and larger.

B. Identify exterior and mechanical room piping with Snap Around pipe markers through 4-inch pipe and Strap Around markers 5-inch pipe and larger. Pipe markers consisting of pipe marker and direction of flow arrow tape; background colors of markers, arrows and type for each type of system shall be the same. Meet ANSI / OSHA standards and clearly identify each system. Provide minimum 2-1/4-inch letters through 4-inch pipe and 4-inch letters for 5-inch pipe and larger.

C. Install identification in the following locations:
   1. Both sides of penetrations through walls, floors and ceilings.
   2. Close to valves or flanges.
   3. Intervals on straight pipe runs not to exceed 50 feet
   4. Apply marker where view is obstructed.

D. Pipe markers shall meet or exceed the specifications of the ASME A13.1 “Scheme for Identification of Piping Systems”.

END OF SECTION

SECTION 22 33 34

ELECTRIC WATER HEATER (Commercial - Non-ASME)

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Electric water heaters for domestic water systems.

1.2 RELATED WORK

A. Division 22 Plumbing
   1. Domestic Water Piping.
   2. Plumbing Piping Insulation.
   3. Division 26 Electrical.

1.3 WARRANTY

A. Provide standard manufacturer's 1 year commercial warranty for mechanical and electrical and 5 year warranty for leaks. Warranty shall start the date of the substantial completion certificate.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. A. O. Smith.

B. Bradford White.

C. Rheem/Ruud.

2.2 PRODUCTS

A. Provide electric water heaters with kilowatt, recovery ratings, and storage capacities as scheduled on drawings.

B. Provide a tank designed for 150 psig working pressure. Furnish glass-lined tank. Lining shall be corrosion-resistant.

C. Furnish factory-assembled, integral units equipped as follows:
   1. Extruded high density anode rod.
   2. Individually mounted thermostat at each element with a high temperature cutoff.
   3. High temperature limit switch (energy cutout).
   4. UL rated.
   5. Temperature and pressure relief valve.

D. Provide medium watt density elements having zinc-plated copper sheathing and prewired leads.

E. The outer jacket shall be baked enamel finish and shall be provided with full size control compartment for performance of service and maintenance through hinged front panels and shall enclose the tank with foam insulation.

F. Electrical junction box with heavy duty terminal block shall be provided.

G. Heater shall have a three year limited warranty.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Installation shall meet or exceed all applicable federal, state and local requirements, referenced standards and conform to codes and ordinances of authorities having jurisdiction.

B. All installations shall be in accordance with the manufacturer's published recommendations.

C. Furnish all supports required by the equipment included in this Contract.

D. Provide a wall support platform beneath heaters with integral drain pan.

E. Furnish and install all necessary valves, traps, gauges, strainers, unions, etc. to facilitate proper functioning and servicing of equipment.
   1. Install a line size shutoff valve in cold water inlet and hot water outlet close to each heater.
   2. Provide a temperature gauge in the domestic hot water piping within five feet of outlet to each heater, upstream of all shut-off valves. Size and locate gauges to be easily readable from a standing position.

F. Provide dielectric isolation device where copper lines connect to ferrous lines or equipment, such as dielectric coupling or dielectric flange fitting.

G. Pipe relief valve discharge and all equipment drains indirectly to appropriate floor drain.

H. Connect hot water return from circulation pump to cold water supply to heater.

I. Set thermostats on domestic water heaters to delivery maximum water temperature as indicated on Contract Drawings. Set the operating and safety controls.

J. Furnish and install an expansion tank on cold water supply to heater. Locate tank as close to water heater as possible between water heater and all check valves or backflow preventers. Expansion tank capacity shall be as scheduled on Contract Drawings. Install expansion tank in accordance with manufacturer's recommendations.

3.2 STARTUP

A. Startup shall be performed by factory trained and authorized personnel. The factory representative shall also provide a technical and practical operation and maintenance training seminar including a hands-on operation and maintenance demonstration, and classroom presentation with handouts and visual aids, for no less than three physical plant personnel.

END OF SECTION

SECTION 22 35 16

INSTANTANEOUS GAS-FIRED TANKLESS WATER HEATERS

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Tankless gas-fired water heaters for domestic water systems.

1.2 RELATED ITEMS

A. Division 22 Plumbing:
   1. Domestic Water Piping.
   2. Gas Piping.
   3. Flue Piping.
   4. Plumbing Piping Insulation.

PART 2 - PRODUCTS

2.0 ACCEPTABLE MANUFACTURERS

A. Navien
B. Rinnai Corp.
C. A. O. Smith.

2.1 PRODUCT SPECIFICATIONS

A. Commercial tankless, internally mounted, instantaneous, gas fired, direct vent water heater design certified to the ANSI Z21.10.3 / CSA 4.9 wall mounted for indoors.
   a. Basis of design manufacturer: Navien.

B. Adjustable hot water temperature range of 90°F to 140°F.

C. Flow rates of 0.5 GPM up to 9.3 GPM (199 cfh).

D. Heaters shall be microprocessor controlled (standard digital controller) and utilize a direct electronic ignition system (with no standing pilot) modulating gas valve, flow meter, flow control valve and temperature thermistors to maintain outlet water temperature between +/- 2°F of setpoint temperature.

E. Safety Devices:
   1. Flame failure lockout.
   2. Boiling protection lockout.
   3. Thermal overheat protection.
   4. Lockout protection in the event of a blocked flue.

F. Accessories:
   1. Temperature and Pressure Relief Valve: ASME labeled.
   2. Wall mounted support.
   3. Ball valves and unions at pipe connection points.
   4. Condensate drain neutralizer kit piped to floor sink.
   5. Provide a properly sized thermal expansion tank as scheduled on drawing.

2.2 FLUE

A. This water heater(s) shall be suitable for sealed combustion direct-venting air intake pipe

and exhaust pipe per manufacturer’s instructions. Provide roof concentric vent kit.

2.3 ELECTRONIC DESCALER

A. Electronic descaler to prevent calcium build-up in piping. Install unit on wall next to water heaters, coil wiring installed on cold water supply pipe to water heater per manufacturer’s instructions. Coordinate 120 volt outlet for power supply with electrical contractor.

B. Manufacturer: Clear Water Enviro technologies; model Scaleblaster SB-250 or approved equal.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install a line size valve in the cold water supply close to each heater and a line size plug cock in the gas supply close to each heater.

B. Install all flue exhaust and air intake material and manifolds per manufacturer’s instructions.

C. Install according to manufacturer's specifications and pipes as shown. Provide accessories as required for a complete operating system.

D. Coordinate with plumbing piping and related fuel piping, gas venting, ductwork and electrical work to achieve operating system. Locate equipment and arrange plumbing piping to provide access space for servicing all components.

3.2 WARRANTY

A. Heat Exchanger: 304 stainless steel burner or copper heat exchanger warranted for 5 years from date of purchase in a commercial application. Three years from date of purchase when used as a circulating water heater with a hot water circulation loop.

END OF SECTION

SECTION 22 40 00

PLUMBING FIXTURES AND FIXTURE CARRIERS

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Furnish and install water closets, urinals, lavatories, electric drinking fountains, fixture carriers and plumbing appurtenances.

1.2 RELATED WORK

A. Division 22 Plumbing
   1. Drains, Hydrants and Cleanouts.
   2. Domestic Water Piping.
   3. Soil, Waste and Sanitary Drain Piping and Vent Piping.

1.3 JOB REQUIREMENTS

A. Furnish plumbing fixtures and trim as shown and specified. Provide faucets, fittings, supply stops and similar devices of a single manufacturer. Furnish faucets and supply stops with renewable seats. Porcelain to steel and enameled cast iron fixtures shall be acid resistant. Wall hung fixtures shall be installed with a fixture carrier.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Plumbing Fixtures (Vitreous China):
   1. American Standard.
   2. Kohler.

B. Plumbing Faucets:
   1. American Standard.
   2. Chicago Faucets.
   3. Moen Commercial.

C. Supports and Carriers:
   1. Wade.
   2. Zurn.
   3. J.R. Smith.
   4. Watts.
   5. MIFAB.

D. Flush Valves:
   1. Sloan.

E. Supplies, Stops and Chrome Plated Tubular Brass:
   1. McGuire.
   2. Brasscraft.
   3. ProFlo.

F. Water Closet Seats:
   1. American Standard.
   2. Bemis.

3. Kohler.

G. Floor Drains & Floor Sinks:
1. Zurn.
2. J.R. Smith.
3. Sioux Chief.
4. MIFAB.

H. Cleanouts:
1. J.R. Smith.
2. Zurn.
3. MIFAB.
4. Sioux Chief.
5. Wade.

I. Shower Valves
1. Bradley.
2. Delta.
3. Symmons.

J. Stainless Steel Sinks:
1. Elkay.
2. Kohler.
3. Just.

K. Water Hammer Arrestors:
1. Precision Plumbing Products.
2. Sioux Chief.
3. Watts.

L. Thermostatic Mixing Valves
1. Watts.
2. Caleffi.
3. Powers.

M. Grease Interceptors
1. Schier.
2. Endura

N. Sanitary Sampling Port
1. Schier.
2. Thermaco.

O. Water Box & Ice Machine box.
1. Sioux Chief.
2. Oatey.

P. Trap Primer
1. Precision Plumbing Products.
2. Sioux Chief.

Q. Electric Water Cooler
1. Elkay
2. Oasis.

R. Trench Drains
   1. IMC – Teddy
   2. Advance Tabco.
   3. Eagle Group.

S. Commercial Kitchen Fixtures
   1. Kitchen fixtures furnished by others. Provide rough-in and final connections as required. Coordinate with Kitchen Equipment Contractor. Refer to Architectural drawings and Plumbing Fixture Schedule on plan.

2.2 REQUIREMENTS

A. Refer to the drawings for equipment to be supplied.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Installation shall be in accordance with the manufacturer's instructions. Set level and plumb. Secure in place to counters, floors and walls providing solid bearing and secure mounting. Bolt fixture carriers to floor and wall. Secure rough-in fixture piping to prevent movement of exposed piping. Cover exposed water closet bolts with bolt covers.

B. Make rough-in and final connection of service to each fixture provided under this Section and other Sections, Equipment furnished by others, Architectural and Plumbing Drawings.

C. Provide necessary stops, valves, traps, unions, vents, cold water, hot water, sanitary, etc. for a complete installation. Provide chrome plated rigid or stainless steel flexible supplies to fixtures with commercial grade quarter-turn loose key or removable handle stops, reducers, and escutcheons. Install fixture stops in readily accessible location for servicing.

D. Provide isolation valves in domestic water lines to isolate all equipment, restrooms, hose bibbs, and where shown on drawings. Piping stub outs for supply stops shall be type L copper.

E. Remove piping and services roughed-in incorrectly and install correctly, without cost.

F. Exposed piping, fittings and appurtenances shall be chrome-plated brass. Cover pipe penetrations with escutcheons. Exposed traps, stops, piping and escutcheons to be chrome plated brass and incased with ADA compliant covers.

G. Coordinate with the Equipment suppliers for locations and service required for equipment furnished or provided by others.

H. All floor drains and floor sinks shall have a trap primer connection for trap seal protection.

I. All floor drains and floor sink locations are to be coordinated with all equipment. Locate drains in mechanical equipment spaces to conform to drain locations of equipment furnished. Coordinate drain location with equipment and Architectural Drawings.

J. All floor drains and cleanout covers are to be provided with stainless steel vandal resistant screws.

K. Coordinate installation of exterior below grade grease interceptor and sampling port with site contractor.

L. Coordinate with Kitchen Equipment Contractor . Provide rough-in piping, traps, tailpieces, indirect waste lines and make final and necessary connections for foodservice equipment. Install faucets, drains, vacuum breakers, check valves, water inlet fittings, filters, and strainers, furnished by foodservice equipment contractor. Provide condensate drain piping from cooler/ freezer evaporator or ice machines. Make all final and necessary plumbing connections. Provide suitable access panel as required in non-accessible ceilings and walls.

M. Review millwork shop drawings. Confirm location and size of fixtures and openings before rough-in and installation.

N. Test fixtures to demonstrate proper operation. Replace malfunctioning units or components. Adjust valves for intended water flow rate to fixtures without splashing, noise or overflow.

O. Adjust stops or valves for intended water flow rate to fixtures without splashing, noise, or overflow.

P. Clean plumbing fixtures and equipment. Do not permit use of fixtures by construction personnel.

Q. Protect installed products from damage due to subsequent construction operations.

R. Repair or replace damaged products before Date of Substantial Completion.

END OF SECTION

SECTION 22 63 11

GAS PIPING AND APPURTENANCES

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Furnish and install steel gas pipe inside buildings and on roof, including the supply line from the meter, service lines to gas equipment and appliances, termination of the service line with a plug valve, drip leg, pressure regulator and final connection to equipment and appliances with unions.

B. Coordinate with Gas Company for gas meter capacity to handle increase in gas load.

C. Extend steel gas piping from meter to inside the building and on roof to all fixtures, appliances and equipment requiring gas.

1.2 RELATED WORK

A. Division 22 Plumbing
   1. Plumbing Pipe and Fittings.
   2. Valves and Vents.

1.3 UTILITY CONNECTIONS

A. Make arrangements for and pay all fees and connection charges for obtaining service to the building.

PART 2 - PRODUCTS

2.1 PIPE AND FITTINGS - ABOVE GRADE

A. Pipe 2 inch and Smaller:
   1. Schedule 40 ASTM A 53 black steel pipe.
   2. Factory fabricated socket weld fittings or threaded. NFPA 54, ASME B31.1.
   3. Where approved for a specific project and where accepted by local code, cold press mechanical joint fittings shall conform to material requirements of ASTM A420 or ASME B16.3 and performance criteria of ANSI/CSA LC4. Sealing elements shall be HNBR and the fittings shall bear the CSA stamp to confirm acceptability for fuel gas systems. MegaPress system manufactured by VIEGA including “Smart Connect” or approved equal to assure unpressed fittings will not hold pressure. Installers shall carry training credentials from the manufacturer to confirm they have been instructed in the correct installation procedures.

B. Pipe Larger than 2 inch:
   1. Schedule 40 ASTM A 53 black steel pipe.
   2. Factory fabricated butt weld fittings for welded steel pipes shall conform to ASTM A-234 WPB (seamless weld fittings).

C. Unions:
   1. Standard 150 lb. (300 lb. water, oil or gas) malleable iron.
   2. Ground joint unions, with bronze seat.
   3. Flange joints for pipe larger than 2 inch in diameter.

D. Flanges:
   1. Steel flanges. ANSI B16.5 and ASTM A-105.

2.2 VALVES

A. See Section 22 05 23.

2.3 GAS PRESSURE REGULATOR

A. Size the gas pressure regulator in accordance with the manufacturer's recommendations for flow quantities and reduced pressure as required for all equipment. Coordinate final equipment gas pressure requirements prior to ordering regulators. Provide Maxitrol or American Meter Company regulators or approved equal, suitable for indoor or outdoor installation. Regulators outside exposed to weather shall be installed with vent in vertical down position.

B. All line pressure regulators shall be listed in accordance with ANSI (American National Standard) Z21.80 and CSA (Canadian Standards Association Standard) 6.22.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Installation Standards: Install gas piping in accordance with recommendations of the National Fire Protection Association.

B. Drip Legs: Install a capped drip leg 6 inches long at the base of each vertical rise.

C. Coating and Wrapping. Coat and wrap underground piping in accordance with the service utility company standards.

D. Sleeves.
1. Encase gas piping running in or through solid partitions with thin wall metal conduit. Sleeve piping and fittings shall be two pipe sizes, but not less than 1 inch larger than encased gas piping.

E. Do not install gas piping exposed to view inside public area, or occupied spaces, without prior written approval.

F. Provide test ports and isolation valves to enable proper testing of system in the future.

G. Provide isolation valve and unions across regulators for proper removal.

H. Provide anodeless transition risers where below grade polyethylene pipe changes to steel pipe above grade.

I. Gas Pressure Regulators / Vents:
1. Piping shall be sized in accordance with the regulator manufacturer’s instructions. Never use pipe sizes smaller than the vent size; smaller pipe sizes restrict the gas flow. Where there is more than one regulator at a location, each regulator shall have a separate vent to the roof / outdoors or provide vent limiter.
2. Support the vent pipe to eliminate strain on the regulator diaphragm case.
3. Install vent piping from regulators to location to prevent gas smells from entering building. Do not locate the vent line terminus near windows, fans, or other ventilation equipment. See the installation instructions furnished with the regulator.
4. Install double elbows and insect screen at end of piping to prevent moisture and insects from entering. Always point outdoor vent pipes in the downward position

to reduce the possibility of rain, snow, sleet, and other moisture entering the pipe.

5. When installed inside building provide with vent limiter or route vents horizontally and terminate through building sidewall. The vent must be piped to the outside atmosphere using the shortest length of pipe, the fewest possible pipe elbows, and a pipe diameter as large as the vent size or larger. If a long gas run must be used, increase the pipe one nominal size every ten feet to keep the flow restriction as low as possible. Vents terminating through roof must have prior approval from Architect before installation. Through roof penetrations shall be minimized.
6. Regulators installed outside or on roof top: Install regulator vent turned downward with insect screen over vent opening. The vent shall be designed to prevent the entry of water, insects, or other foreign materials that could cause blockage.
7. Ensure the end of the vent line is away from ANY potential ignition sources. It is the installer's responsibility to ensure the vent line is exhausting to a safe environment
8. Adhere to all applicable codes and regulations.

3.2 TESTING GAS PIPING

A. Preliminary gas test as required by Code, but minimum test pressure of 3 PSI held for not less than eight hours without noticeable drop.

B. Test joints with a soap solution while lines are under pressure.

C. Repair leaks.

D. Final gas test shall be with a 24 inch column of mercury or a diaphragm gauge with a minimum dial size of 3-1/2 inches with a set hand and a pressure range not to exceed twenty (20) psig with 2/10-pound increments. The minimum test pressure shall not be less than 3 PSI and the maximum test pressure shall be 1.5 times system operating pressure. This test will be observed for no less than (30) thirty minutes with no drop in pressure.

E. Provide copy of gas pressure test reports in Operations & Maintenance Manual.

3.3 IDENTIFICATION CONDUCTOR

A. Spiral A #12 AWG insulated copper conductor the full length of the thermoplastic piping system. Fasten to the pipe at 3 foot intervals with plastic tie wraps.

B. Terminate at each end in a 12 inch x 12 inch x 4 inch FRP junction box.
   1. Bolted gasketed cover with stainless steel screws.
   2. Screw type terminal strip.
   3. Legend on cover "gas pipe identification conductor."

C. Set in concrete pad.

3.4 PAINT EXPOSED OUTSIDE GAS PIPE

A. Interior and Exterior Gas piping shall be protected from rust.

B. Paint pipe with a flat alkyd coating, clean pipe prior to painting by preparing surface by hand tool cleaning per SSPC-SP2-82, applying one coat of Glidden Y-590 Rustmaster Metal Primer White and top coat of Yellow Alkyd Flat Enamel.

END OF SECTION

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SECTION 22 63 12

LIQUEFIED PETROLEUM GAS SYSTEM

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Furnish and install a complete Liquefied Petroleum Gas System.
   1. Extend piping to gas consuming devices including final connections.
   2. Install a cutoff cock in the line serving each gas-consuming device.
   3. Install swing joints, offsets or approved flexible piping at equipment to compensate for expansion.
   4. Where shown on the drawings, install the piping in a Schedule 40 steel pipe sleeve. Terminate the sleeve as shown on the drawings.
   5. Interior propane storage tanks.
   6. Propane gas monitoring system with alarms.
   7. System shall be complete, in place, tested, and operational.

1.2 RELATED WORK

A. Pipe and pipe fittings.

1.3 STANDARDS

A. Install in accordance with:
   1. Standard for the storage and handling of liquefied petroleum bases (NFPA 58).
   2. National Fuel Gas code NFPA 54.
   3. International fuel Gas Code.

1.4 INSTALLER QUALIFICATIONS

A. An approved Installer for the work under this Section:
   1. Furnish proof of specializing with personnel, experience, training and skill, and the organization to provide a practical working system.
   2. Be able to furnish evidence of having contracted for and installed not less than three systems of comparable size and type to this one that have operated satisfactorily for not less than three years.

1.5 SUBMITTALS

A. Submit Shop Drawings and product data as specified.

B. Submit manufacturer's installation, start-up, and service instructions on all accessories.

PART 2 - PRODUCTS

2.1 LIQUEFIED PETROLEUM GAS STORAGE TANK

A. Provide the tanks to ASME Code for unfired pressure vessels.
   1. Bear the ASME Stamp.
   2. Submit inspection certificates for pressure vessels.

B. Comply with applicable government regulations.

C. Provide tank with tappings for installation of accessories. Field welding of tank is not

approved.

D. Flush and clean tank prior to delivery to site and keep sealed during construction.

E. Install the tanks in accordance with manufacturer's recommendations for interior above grade location in generator enclosure. Provide support straps fastened to wall.

F. Provide two stage pressure regulator with 11” water column outlet pressure at tank outlet fitting. Install dielectric fitting between regulator and above grade propane piping.

2.2 DIELECTRIC ISOLATION

A. Provide a dielectric isolating flange, coupling, or union:
   1. At each juncture of dissimilar metals.
   2. At each gas pipe connection to equipment.

2.3 HIGH PRESSURE GAS PIPING MATERIALS

A. High pressure gas piping covers piping for conveying vapor or liquid L.P. gas from the supply tanks to two stage pressure regulator.

B. Copper pipe type K with brazed fittings or press connect fittings listed to ANSI LC 4..

2.4 LOW PRESSURE GAS PIPING MATERIALS

A. Low pressure gas piping covers piping downstream from the two stage regulator to equipment connection. Pressure of 11” water column.

B. Piping above grade
   1. Schedule 40 black steel, with welded fittings or press connect fittings listed to ANSI LC 4.

2.5 LIQUEFIED PETROLEUM GAS SYSTEM ACCESSORIES

A. Valves, specialties, accessories, and connections shall be of approved type suitable for use with liquefied petroleum gas and designed for not less than the maximum pressure to which they may be subjected.

B. Relief valves.

C. Pressure gauges with shut-off valve.

D. Tank propane level indicating gauge.

E. Wire braid reinforced hose for equipment connection per generator manufacturer’s recommendations.

F. Pressure Regulators. Emerson Fisher, Marshall Excelsior or equal.

G. Bypass Valves.

2.6.1 GAS MONITOR SYSTEM.

A. Refer to section 22 63 13.

PART 3 - EXECUTION

3.1 PREPARATION OF PIPING

A. Ream pipe and tube ends. Remove burrs.

B. Remove scale and dirt, inside and outside, before assembly.

C. Remove welding slag or foreign material from pipe and fitting materials.

3.2 SCREWED PIPE ASSEMBLY

A. Die cut screwed joints with full cut standard taper pipe threads.

B. Make joints with compound of an approved type resistant to the action of Liquefied Petroleum gases. Apply to male threads only.

C. Caulking of threaded joints to stop leaks is not approved.

3.3 PIPE AND TUBING ASSEMBLY, GENERAL

A. In general, use the specified materials in fabricating the various piping stems.

B. Methods of assembly shall be varied only to meet special conditions where it is impossible to comply with the specified methods of joining piping.

C. Where special classes of piping are involved and are not listed, request exact instructions from the Architect/Engineer as to the class of material involved and the method of fabricating it before ordering the material.

3.4 GROUNDING

A. Ground the above grade storage tank by a separate and adequate ground. Coordinate with Electrical Contractor.

3.5 TESTING OF PIPING SYSTEMS

A. Piping systems shall be tested for leaks.

B. Make the following minimum tests.
   1. Test gas piping and connections as specified in the fuel gas codes and NFPA.
   2. Make final test on piping under pressure with soap solution.

C. All leaks or other defects:
   1. Corrected at once.
   2. Remove all defective material.
   3. Replace with sound material.
   4. Repeat test until leaks are eliminated.

3.6 GAS DETECTION SYSTEM

A. Refer to section 22 63 13.

3.6 CERTIFICATION AND APPROVAL

A. Prior to the installation of the liquefied petroleum gas system, submit the drawings and manufacturer's data reports to the AHJ for examination and review.

B. Obtain a written approval of the installation from Fire Marshal official authorized to sign the instrument.

C. Final approval will follow a physical inspection of the completed installation by an inspector of the LP Gas Division or AHJ.

END OF SECTION

SECTION 22 63 13

GAS DETECTION SYSTEM

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary General Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Provide a complete installation of a toxic / hazardous propane gas detection system to protect the designated area from harmful gas build up. System to include stand-alone sensors and audible/visual alarm devices to communicate the state of the alarm condition to BMS or Fire alarm systems.

B. The system shall include, but not be limited to, the following:
1. Future expandability.
2. Gas Valve and Electrical Power Control Circuits.
3. Display of Alarm Status.
4. Display of Toxic / Hazardous Gas Levels.
5. Remote Panic Buttons.
6. Relay Outputs to BMS / F.A.C.P.
7. Re-Set and Test Functions.

PART 2 - PRODUCTS

2.1 Gas Detection Device type AGS Mini Merlin LPGCO or approved equal.

A. The device will be 120 Vac powered, individually powered and capable of accepting the inputs of multiple devices. The unit will clearly display the condition of an alarm and provide hazardous or toxic gas levels via PPM or % of VOL. The device shall provide a reset and test function. The device shall incorporate dual sensor technology to detect LPG and CO (Carbon Monoxide) without the requirement for additional components. The unit shall be UL certified and listed. Mount the panel per manufacturer's instructions and recommendations.

B. The device panel will be capable of transmitting alarm conditions to a BMS system through its dry contact relay output. For local activation of fans or louvers (or other equipment), the relay will change state in alarm and revert back once the alarm has been removed.

C. The device panel will be capable of operating within relative humidity ranges of 5-95% non-condensing and temperature ranges of -4° F to 140° F (-20° C to 60° C).

D. The device will be certified and listed to ANSI/UL 61010-1 3rd edition and CAN/CSA-C22.2 No. 61010-1.

E. The device will energize a 120V output to control gas solenoid valves and electrical contactors. In alarm the device shall de-energize this control output. For local activation of audible alarms, the transmitter shall have an on-board device able to generate an audible output of 85 dBA at 10 ft.

F. The unit shall provide a traffic signal type colored TFT display, Green – all clear, Yellow – warning (low alarm) Red – Alarm.

G. Detector alarm levels are to be activated, and the unit is to be installed in accordance with the following parameters:

GASES	TDLR Code Required Limits		PART SUFFIX	MOUNTING HEIGHT	COVERAGE RADIUS
Carbon Monoxide (CO)	20ppm	35ppm	-35	Per Manufacturer's Instructions	25 ft
	25ppm	50ppm	-50		
	20ppm	20ppm @ 2 hours 50ppm @ 1 hour 100ppm @ 10 min 300ppm @ 1 min	-TWA		
	PRE-ALARM SET POINT	FULL ALARM SET POINT		MOUNTING HEIGHT	COVERAGE RADIUS
LPG	8% of LEL 4% of VOL	10% of LEL 5% of VOL		Per Manufacturer's Instructions	25 ft

H. The sensors shall be UL listed to comply with UL2075 and incorporate filters to only look for the desired hazardous or toxic gases selected.

I. Local Building Codes recommendations take precedence over these parameters. Coverage can differ depending on application.

2.2 ACCESSORIES

A. Detector Guards type (AGSGUARD)
1. Made of a 9-gauge steel wire.
2. Designed to allow calibration without removing the guards.

B. Remote Panic Button (AGSESOTW)
1. Locate inside of each exit, or per floor plans.
2. Panic Button will be constructed of tough polycarbonate with a stainless-steel back plate
3. Operate within relative humidity ranges of 0-100% and temperature ranges of -40° F to 250° F (-40° C to 121° C).
4. Clearly labeled with 5/8" black text on yellow background with red mushroom type button.
5. Shall be twist release manual reset type.
6. Shall come with one (1) N.O. min 10A contact and one (1) N.C. min

10A contact.

7. Certified and listed to UL safety standards and be ADA compliant.

C. Gas Solenoid Valve (AGSGSV)
   1. Shall be 120V actuated flanged gas solenoid with an operating pressure of 0-5PSI.
   2. Constructed of die-cast aluminum with a fluid powered actuator.
   3. Certified and UL YIOZ listed for closing time of <1second.

D. Electric Contactor (AGS4P50ANO)
   1. Shall be 120V energized electrically held normally open contactor
   2. Provide 4 Poles (circuits) at 50 AMP at 120v 50/60HZ.
   3. Contactor shall be UL listed.

E. Remote audible and visual alarm strobes. (AGSAAB)
   1. Locate outside of each exit, or per floor plans.
   2. 24VDC Power supply
   3. Minimum of 85dBA at 1ft
   4. Visual strobe
   5. Adjustability of strobe and sounder settings.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install hazardous / toxic propane gas monitoring equipment including sensors as shown on Contract Drawings, and as recommended by manufacturer of equipment, and as required by authorities having jurisdiction.

B. Install conduit and wiring from device, gas valve, contactor and remote panic buttons as recommended by manufacturer of equipment.

3.2 SEQUENCE OF OPERATION

A. If LPG Sensor detects 8% of LEL, the detector shall indicate Low Alarm level via TFT screen. If the hazardous gas level reaches 10% of LEL the detector shall indicate High Alarm level via TFT screen and audible alarm. The high alarm shall de-energize the power output to the gas valve and electrical contactor isolating the gas supply to the boiler room and the electrical power to the appliances. The internal relay outputs shall change state communicating the alarm condition to the BMS and F.A.C.P.

B. If CO sensor detects Carbon Monoxide the detector shall indicate Low Alarm level via TFT screen. If CO levels continue to rise or trigger alarm thresholds as per the OSHA Dept of Labor TWA alarm thresholds the detector shall indicate High Alarm via TFT screen and audible alarm. The high alarm shall de-energize the power output to the gas valve and electrical contactor isolating the gas supply to the boiler room and the electrical power to the appliances. The internal relay outputs shall change state communicating the alarm condition to the BMS and F.A.C.P.

C. Remote Panic Button shall activate high alarm protocol.

D. The device shall provide a Reset function that will re-energize the gas valve and electrical power outputs allowing the gas supply and the appliances to resume. The Reset function shall only be permitted by the device if all detectors are reporting a clean and safe condition.

3.3 COMMISSIONING

A. After installation, test equipment to demonstrate operation of functions described above under sequence of operation by manufactures certified service technician.

B. Provide testing kits (including gas bottles) for testing and calibration by Commission technician.

3.4 WARRANTY.

A. Limited Warranty

1. American Gas Safety, LLC. warrants to the original purchaser and/or ultimate customer ("Purchaser") of AGS products ("Product") that if any part thereof proves to be defective in material or workmanship within thirty six (36) months, such defective part will be repaired or replaced, free of charge, at AGS' discretion if shipped prepaid to AGS 6304 Benjamin Road, Suite 502, Tampa, FL 33634, in a package equal to or in the original container. The Product will be returned freight prepaid and repaired or replaced if it is determined by AGS that the part failed due to defective materials or workmanship. The repair or replacement of any such defective part shall be AGS' sole and exclusive responsibility and liability under this limited warranty.

END OF SECTION

SECTION 23 05 00

MECHANICAL GENERAL PROVISIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Except as modified in this Section, General Conditions, Supplementary Conditions, applicable provisions of the General Requirements, and other provisions and requirements of the contract documents apply to work of Division 23 Mechanical.

B. Applicable provisions of this section apply to all sections of Division 23, Mechanical.

1.2 CODE REQUIREMENTS AND FEES

A. Perform work in accordance with applicable statutes, ordinances, codes and regulations of governmental authorities having jurisdiction.

B. Mechanical work shall comply with applicable inspection services:
1. Underwriters Laboratories.
2. National Fire Protection Association.
3. State Health Department.
4. Local Municipal Building Inspection Department.
5. Texas Department of Licensing & Regulations (ADA).

C. Resolve any code violations discovered in contract documents with the Engineer prior to award of the contract. After Contract award, any correction or additions necessary for compliance with applicable codes shall be made at no additional cost to the Owner.

D. This Contractor shall be responsible for being aware of and complying with asbestos NESHAP regulations, as well as all other applicable codes, laws and regulations.

E. Obtain all permits required.

1.3 CONTRACTOR'S QUALIFICATIONS

A. An approved contractor for the work under this division shall be:
1. A specialist in this field and have the personnel, experience, training, skill, and organization to provide a practical working system.
2. Able to furnish evidence of having contracted for and installed not less than 3 systems of comparable size and type that has served their Owners satisfactorily for not less than 3 years.

1.4 REFERENCE SPECIFICATIONS AND STANDARDS

A. Materials which are specified by reference to Federal Specifications; ASTM, ASME, ANSI, or AWWA Specifications; Federal Standards; or other standard specifications must comply with latest editions, revisions, amendments or supplements in effect on date bids are received. Requirements in reference specifications and standards are minimum for all equipment, material, and work. In instances where specified capacities, size, or other features of equipment, devices, or materials exceed these minimums, meet specified capacities.

1.5 CONTRACT DRAWINGS

A. Contract drawings are diagrammatic only and do not give fully dimensioned locations of various elements of work. Determine exact locations from field measurements.

1.6 PROJECT RECORD DOCUMENTS

A. Maintain at the job site a separate set of white prints (black line) of the contract drawings for the sole purpose of recording the "as-built" changes and diagrams of those portions of work in which actual construction is at variance with the contract drawings. Mark the drawings with a colored pencil. Prepare, as the work progresses and upon completion of work, reproducible drawings clearly indicating locations of various lines, valves, ductwork, traps, equipment, and other pertinent items, as installed. Include flow-line elevation of sewer lines. Record existing and new underground and under slab piping with dimensioned locations and elevations of such piping.

B. At the conclusion of project, obtain without cost to the Owner, erasable mylars of the original drawings and transfer as-built changes to these. Prior to transmittal of corrected drawings, obtain 3 sets of blue-line prints of each drawing, regardless of whether corrections were necessary and include in the transmittal (2 sets are for the Owner's use and one set is for the Architect/Engineer's records). Delivery of these as-built prints and reproducibles is a condition of final acceptance. Provide record drawings on one set each (reproducible Dayrex mylar film positives) and AutoCad 2014 files on disk (CD Rom).

C. As-Built drawings should indicate the following information as a minimum:
1. Indicate all addendum changes to documents.
2. Remove Engineer’s seal, name, address and logo from drawings.
3. Mark documents RECORD DRAWINGS.
4. Clearly indicate: DOCUMENT PRODUCED BY.
5. Indicate all changes to construction during construction. Indicate actual routing of all piping, ductwork, etc. that were deviated from construction drawings.
6. Indicate exact location of all underground mechanical piping and elevation.
7. Indicate exact location of all underground electrical raceways and elevations.
8. Correct schedules to reflect (actual) equipment furnished and manufacturer.
9. Location and size of all ductwork and mechanical piping above ceiling including exact location of isolation of domestic and mechanical valves.
10. Exact location of all electrical equipment in and outside of the building.
11. Exact location of all roof mounted equipment, wall, roof and floor penetrations.
12. Cloud all changes.

1.7 SPACE REQUIREMENTS

A. Consider space limitations imposed by contiguous work in selection and location of equipment and material. Do not provide equipment or material that is not suitable in this respect.

1.8 RELATION WITH OTHER TRADES

A. Carefully study all matters and conditions concerning the project. Submit notification of conflict in ample time to prevent unwarranted changes in any work. Review other Divisions of these specifications to determine their requirements.

B. Because of the complicated relationship of this work to the total project, conscientiously study the relation and cooperate as necessary to accomplish the full intent of the documents.

C. Provide sleeves and inserts in forms as required for the work. Stub up and protect open ends of pipe before any concrete is placed. Furnish sizes of required equipment pads. Furnish and locate bolts and fittings required to be cast in them.

D. Locate and size openings required for installation of work specified in this Division in sufficient time to prevent delay in the work.

E. Refer to other Divisions of the specifications for the scope of required connections to equipment furnished under that Division. Determine from the Contractor for the various trades, the Owner, and by direction from the Architect/Engineer, the exact location of all items.

1.9 CONCEALED AND EXPOSED WORK

A. When the word "concealed" is used in connection with insulating, painting, piping, ducts and the like, the work is understood to mean hidden from sight as in chases, furred spaces or above ceilings. "Exposed" is understood to mean open to view.

1.10 GUARANTEE

A. Guarantee work for 1 year from the date of substantial completion of the project. During that period make good any faults or imperfections that may arise due to defects or omissions in material, equipment or workmanship. At the Owner's option, replacement of failed parts or equipment shall be provided.

1.11 MATERIAL AND EQUIPMENT

A. Furnish new and unused materials and equipment meeting the requirements of the paragraph specifying acceptable manufacturers. Where two or more units of the same type or class of equipment are required, provide units of a single manufacturer.

1.12 NOISE AND VIBRATION

A. Select equipment to operate with minimum noise and vibration. If objectionable noise or vibration is produced or transmitted to or through the building structure by equipment, piping, ducts or other parts of work, rectify such conditions at no additional cost. If the item of equipment is judged to produce objectionable noise or vibration, demonstrate at no additional cost that equipment performs within designated limits on a vibration chart.

1.13 ACCEPTABLE MANUFACTURERS

A. Manufacturers names and catalog number specified under sections of Division 23 are used to establish standards of design, performance, quality and serviceability and not to limit competition. Equipment of similar design, equal to that specified, manufactured by a named manufacturer will be acceptable on approval. A request for prior approval of equipment not listed must be submitted ten (10) days before bid due date. Submit complete design and performance data to the Engineer.

1.14 OPERATING TESTS

A. After all mechanical systems have been completed and put into operation, subject each system to an operating test under design conditions to ensure proper sequencing and operation throughout the range of operation. Tests shall be made in the presence of the Architect/Engineer. Make adjustments as required to ensure proper functioning of all systems. Special tests on individual systems are specified under individual sections. Submit 3 copies of all certifications and test reports adequately in advance of completion

of the work to allow for remedial action as required to correct deficiencies discovered in equipment and systems.

1.15 WARRANTIES

A. Submit 3 copies of all warranties and guarantees for systems, equipment, devices and materials. These shall be included in the Operating and Maintenance Manuals.

1.16 BUILDING CONSTRUCTION

A. It shall be the responsibility of each sub-contractor to consult the Architectural and Engineering drawings, details, and specifications and thoroughly familiarize himself with the project and all job related requirements. Each sub-contractor shall cooperate with the General Contractor to verify that all piping and other items are placed in the walls, furred spaces, chases, etc., so there will be no delays in the job.

PART 2 - PRODUCTS – NOT USED

PART 3 - EXECUTION

3.1 OPENINGS

A. Framed, cast or masonry openings for ductwork, equipment or piping are specified under other divisions. Drawings and layout work for exact size and location of all openings are included under this division.

3.2 AIR FILTERS AND PIPE STRAINERS

A. Immediately prior to substantial completion of the project, inspect, clean and service air filters and strainers. Replace air filters.

3.3 LUBRICATION, REFRIGERANT AND OIL

A. Provide a complete charge of correct lubricant for each item of equipment requiring lubrication.

B. Provide a complete and working charge of proper refrigerant, free of contaminants, into each refrigerant system. After each system has been in operation long enough to ensure completely balanced conditions, check the charge and modify for proper operation as required.

C. Provide a complete charge of special oil for refrigeration use, suitable for operation with refrigerant, in each system.

3.4 HOUSEKEEPING PADS

A. Provide equipment housekeeping pads under all floor mounted and ground mounted HVAC equipment, and as shown on the drawings.

B. Concrete work as specified in Division 3.

C. Concrete pads:
   1. 4" high, rounded edges, minimum 2500 psi unless otherwise indicated on the drawings
   2. Chamfer strips at edges and corner of forms.

3. Smooth steel trowel finish.
4. Doweled to existing slab.

D. Install concrete curbs around duct penetrations or multiple pipe penetrations.

3.5 INSTRUCTION OF OWNER'S PERSONNEL

A. Prior to final inspection, conduct an on-site training program to instruct the Owner's operating personnel in the operation and maintenance of the mechanical systems.
1. Provide the training during the Owner's regular working day.
2. The Instructors shall each be experienced in their phase of operation and maintenance of building mechanical systems and with the project.

B. Time to be allocated for instructions.
1. Minimum of 4 hours dedicated instructor time.

C. Before proceeding with the on-site training program, submit the program syllabus; proposed time and dates; and other pertinent information for review and approval.
1. One copy to the Owner.
2. One copy to the Architect/Engineer.

D. The Owner will provide a list of personnel to receive instructions, and will coordinate their attendance at the agreed upon times.

E. Use the operation and maintenance manuals as the basis of instruction. Review contents of manual with personnel in detail to explain all aspects of operation and maintenance.

F. Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, maintenance, and shut down of each item of equipment.

G. Demonstrate equipment functions (both individually and as part of the total integrated system).

H. Prepare and insert additional data in the operating and maintenance manuals when the need for additional data becomes apparent during instructions.

I. Submit a report within one week after completion of the training program that instructions have been satisfactorily completed. Give time and date of each demonstration and hours devoted to the demonstration, with a list of people present.

J. At the conclusion of the on-site training program, have the person designated by the Owner sign a certificate to certify that he/she has a proper understanding of the system, that the demonstrations and instructions have been satisfactorily completed, and the scope and content of the operating and maintenance manuals used for the training program are satisfactory.

K. Provide a copy of the report and the certificate in an appropriately tabbed section of each Operating and Maintenance Manual.

3.6 EQUIPMENT IDENTIFICATION

A. Provide a laminated engraved plastic nameplate on each piece of equipment and starter.
1. Designation approved by Architect/Engineer.
2. Equipment includes, but is not limited to, air handling units, fan coil units, variable

volume boxes, fans, pumps, boilers and chillers.

3. Submit schedule of equipment to be included and designations.

B. Provide nameplates with 1/2" high letters and fastened with epoxy or screws.

3.7 OBSTRUCTIONS

A. The drawings indicate certain information pertaining to surface and subsurface obstructions which has been taken from available drawings. Such information is not guaranteed, however, as to accuracy of location or complete information.

1. Before any cutting or trenching operations are begun, verify with Owner's representative, utility companies, municipalities, and other interested parties that all available information has been provided.

2. Should obstruction be encountered, whether shown or not, alter routing of new work, reroute existing lines, remove obstruction where permitted, or otherwise perform whatever work is necessary to satisfy the purpose of the new work and leave existing services and structures in a satisfactory and serviceable condition.

B. Assume total responsibility for and repair any damage to existing utilities or construction, whether or not such existing facilities are shown.

3.8 PROTECTION

A. Protect work, equipment, fixtures, and materials. At work completion, work must be clean and in original manufacturer's condition.

3.9 INDOOR AIR QUALITY

A. All equipment and ductwork shall be installed to allow sufficient space for testing, maintenance, and commissioning functions. Access doors or panels shall be installed in ventilation equipment, ductwork, and plenum enclosures for inspection and cleaning of outdoor air intakes, mixing plenums, up and downstream of coils, filters, drain pans and fans.

B. Practice source control and eliminate potential contaminants in material selection, installation, and maintenance.

C. Provide installation and disposal instructions for all materials and chemicals that are potential contaminants.

D. Obtain and conform to the requirements of the Material Safety Data Sheets (MSDSs) in the use of materials.

E. Utilize manufacturer’s recommendations and provide installation instructions for all chemicals, compounds, and potential contaminants including pre-installation degassing if required.

F. Ventilate completed building prior to final completion using no less than design outside air for at least 48 hours before occupancy.

G. Make provisions for controls to prevent the entry of air contaminants into the HVAC air distribution system.

H. Steps shall be taken to ensure that the HVAC system continues to function effectively and are not damaged or contaminated during construction activities.

END OF SECTION

SECTION 23 05 12

HVAC SHOP DRAWINGS, COORDINATION DRAWINGS & PRODUCT DATA

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Prepare submittals as required by these specifications as outlined below.

B. The term submittal, as used herein, refers to all:
1. Shop Drawings.
2. Coordination Drawings.
3. Product data.

C. Submittals shall be prepared and produced for:
1. Distribution as specified.
2. Inclusion in the Operating and Maintenance Manual, as specified, in the related section.

1.2 SHOP DRAWINGS

A. Present drawings in a clear and thorough manner. Identify details by reference to sheet and detail, schedule, or room numbers shown on Contract Drawings.

B. Show all dimensions of each item of equipment on a single composite Shop Drawing. Do not submit a series of drawings of components.

C. Identify field dimensions; show relationship to adjacent features, critical features, work, or products.

D. Submit shop drawings in plan, elevation and sections, showing equipment in mechanical equipment areas.

1.3 COORDINATION DRAWINGS

A. Present in a clear and thorough manner. Title each drawing with project name. Identify each element of drawings by reference to sheet number and detail, or room number of contract documents. Minimum drawing scale: ¼” = 1’-0”.

B. Prepare coordination drawings to coordinate installations for efficient use of available space, for proper sequence of installation, and to resolve conflicts. Coordinate with work specified in other sections and other divisions of the specifications.

C. For each mechanical room and for each outside equipment pad where equipment is located, submit plan and elevation drawings. Show:
1. Actual mechanical equipment and components to be furnished.
2. Service clearance.
3. Relationship to other equipment and components.
4. Roof drains and leader piping.
5. Fire protection piping and equipment.

D. Identify field dimensions. Show relation to adjacent or critical features of work or products.

E. Related requirements:
   1. Ductwork shop drawings.
   2. Coordination drawing specified in Division 26.

F. Submit shop drawings in plan, elevation and sections, showing equipment in mechanical equipment areas.

G. Gas piping sketch indicating proposed location of piping prior to proceeding with the installation.

1.4 PRODUCT DATA AND INSTALLATION INSTRUCTION

A. Submit only pages which are pertinent to the project. All options which are indicated on the product data shall become part of the contract and shall be required whether specified are not.

B. Mark each copy of standard printed data to identify pertinent products, referenced to specification section and article number.

C. Show reference standards, performance characteristics and capacities; wiring and piping diagrams and controls; component parts; finishes; dimensions and required clearances.

D. Modify manufacturer's standard schematic drawings and diagrams to supplement standard information and to provide information specifically applicable to the work. Delete information not applicable.

E. Mark up a copy of the specifications for the product. Indicate in the margin of each paragraph the following: COMPLY, DO NOT COMPLY, or NOT APPLICABLE. Explain all DO NOT COMPLY statements.

F. Provide a separate transmittal for each submittal item. Transmittals shall indicate product by specification section name and number. Separate all submittals into appropriate specification section number. Do not combine specification sections.

1.5 MANUFACTURERS INSTRUCTIONS

A. Submit Manufacturer's instructions for storage, preparation, assembly, installation, start-up, adjusting, calibrating, balancing and finishing.

1.6 CONTRACTOR RESPONSIBILITIES

A. Review submittals prior to transmittal.

B. Determine and verify:
   1. Field measurements.
   2. Field construction criteria.
   3. Manufacturer's catalog numbers.
   4. Conformance with requirements of Contract Documents.

C. Coordinate submittals with requirements of the work and of the Contract Documents.

D. Notify the Architect/Engineer in writing at time of submission of any deviations in the submittals from requirements of the Contract Documents.

E. Do not fabricate products, or begin work for which submittals are specified, until such submittals have been produced and bear contractor's stamp. Do not fabricate products or

begin work scheduled to have submittals reviewed until return of reviewed submittals with Architect / Engineer's acceptance.

F. Contractor's responsibility for errors and omissions in submittals is not relieved whether Architect / Engineer reviews submittals or not.

G. Contractor's responsibility for deviations in submittals from requirements of Contract Documents is not relieved whether Architect/Engineer reviews submittals or not, unless Architect / Engineer gives written acceptance of the specific deviations on reviewed documents.

H. Submittals shall show sufficient data to indicate complete compliance with Contract Documents:
   1. Proper sizes and capacities.
   2. That the item will fit in the available space in a manner that will allow proper service.
   3. Construction methods, materials and finishes.

I. Schedule submissions at least 15 days before date reviewed submittals will be needed.

1.7 SUBMISSION REQUIREMENTS

A. Make submittals promptly in accordance with approved schedule, and in such sequence as to cause no delay in the Project or in the work of any other Contractor.

B. Number of submittals required:
   1. Shop Drawings and Coordination Drawings: Submit one reproducible transparency and three opaque reproductions.
   2. Product Data: Submit the number of copies which the contractor requires, plus those which will be retained by the Architect/Engineer.

C. Accompany submittals with transmittal letter, in duplicate, containing:
   1. Date.
   2. Project title and number.
   3. Contractor's name, address and contact number.
   4. The number of each Shop Drawing, Project Datum and Sample submitted.
   5. Other pertinent data.

D. Submittals shall include:
   1. The date of submission.
   2. The project title and number.
   3. Contract Identification.
   4. The names of:
      a. Contractor.
      b. Subcontractor.
      c. Supplier.
      d. Manufacturer.
   5. Identification of the product.
   6. Field dimensions, clearly identified as such.
   7. Relation to adjacent or critical features of the work or materials.
   8. Applicable standards, such as ASTM or federal specifications numbers.
   9. Identification of deviations from contract documents.
   10. Suitable blank space for General Contractor and Architect/Engineer stamps.
   11. Contractor's signed and dated Stamp of Approval.

E. Coordinate submittals into logical groupings to facilitate interrelation of the several items:
   1. Finishes which involve Architect/Engineer selection of colors, textures or patterns.
   2. Associated items which require correlation for efficient function or for installation.

1.8 SUBMITTAL SPECIFICATION INFORMATION

A. Every submittal document shall bear the following information as used in the project manual:
   1. The related specification section number.
   2. The exact specification section title.

B. Submittals delivered to the Architect/Engineer without the specified information will not be processed. The Contractor shall bear the risk of all delays, as if no submittal had been delivered.

1.9 RESUBMISSION REQUIREMENTS

A. Make re-submittals under procedures specified for initial submittals.
   1. Indicate that the document or sample is a re-submittal.
   2. Identify changes made since previous submittals.

B. Indicate any changes which have been made, other than those requested by the Architect / Engineer.

1.10 CONTRACTOR'S STAMP OF APPROVAL

A. Contractor shall stamp and sign each document certifying to the review of products, field measurements and field construction criteria, and coordination of the information within the submittal with requirements of the work and of Contract Documents.

B. Contractor's stamp of approval on any submittal shall constitute a representation to Owner and Architect/Engineer that Contractor has either determined and verified all quantities, dimensions, field construction criteria, materials, catalog numbers, and similar data or assumes full responsibility for doing so, and that Contractor has reviewed or coordinated each submittal with the requirements of the work and the Contract Documents.

C. Do not deliver any submittals to the Architect/Engineer that do not bear the Contractor's stamp of approval and signature.

D. Submittals delivered to the Architect/Engineer without Contractor's stamp of approval and signature will not be processed. The Contractor shall bear the risk of all delays, as if no submittal had been delivered.

1.11 ARCHITECT / ENGINEER REVIEW OF IDENTIFIED SUBMITTALS

A. The Architect / Engineer will:
   1. Review identified submittals with reasonable promptness and in accordance with schedule.
   2. Affix stamp and initials or signature, and indicate requirements for re-submittal or approval of submittal.
   3. Return submittals to Contractor for distribution or for resubmission.

B. Review and approval of submittals will not extend to design data reflected in submittals which is peculiarly within the special expertise of the Contractor or any party dealing directly with the Contractor.

C. Architect / Engineer's review and approval is only for conformance with the design concept of the project and for compliance with the information given in the contract.
   1. The review shall not extend to means, methods, sequences, techniques or procedures of construction or to safety precautions or programs incident thereto.
   2. The review shall not extend to review of quantities, dimensions, weights or gauges, fabrication processes or coordination with the work of other trades.

D. The review and approval of a separate item as such will not indicate approval of the assembly in which the item functions.

1.12 SUBSTITUTIONS

A. Do not make requests for substitution employing the procedures of this Section.

B. The procedure for making a formal request for substitution is specified in Div. 1.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION - NOT USED

END OF SECTION

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SECTION 23 05 13

ELECTRICAL PROVISIONS OF HVAC WORK

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Electrical provisions to be provided as mechanical work are indicated in other Division 23 sections, on drawings, and as specified.

B. Types of work, normally recognized as electrical but provided as mechanical, specified or partially specified in this Section, include but are not necessarily limited to the following:
   1. Motors for mechanical equipment.
   2. Starters for motors of mechanical equipment, but only where specifically indicated to be furnished integrally with equipment.
   3. Wiring from motors to disconnect switches or junction boxes for motors of mechanical equipment, but only where specifically indicated to be furnished integrally with equipment.
   4. Wiring of field-mounted float control switches, flow control switches, and similar mechanical-electrical devices provided for mechanical systems, to equipment control panels.
   5. Wiring of smoke detectors for shutdown of air handling equipment when a fire alarm system is not included in the project.
   6. Wiring of oil pump, vibration and oil level limit switches for cooling towers.
   7. Refrigerant monitor/sensor/alarming and field installed visual/audible display alarms.
   8. Pipe heat tracing.
   9. Cooling tower vibration switch/interlock/reset.
   10. Field interlock wiring from chiller: flow switches, pump aux. Contacts, pump start/stop.
   11. Power supply 120 VAC and control signal from chiller control panel to condenser water flow control valve installed in piping leaving chiller.
   12. Wiring of all related circulating water system chemical treatment devices.
      a. Low voltage electric contacting water meter.
      b. Solenoid valve/blow-down assembly.
   13. Radiant heater timer switches and/or thermostats.
   14. Low Voltage thermostat wiring.

C. Refer to Division 23 Controls Sections for related control system wiring.

D. Refer to Division 23 sections for specific individual mechanical equipment electrical requirements.

E. Refer to Division 26 sections for motor starters and controls not furnished integrally with mechanical equipment.

F. Refer to Division 26 sections for junction boxes and disconnect switches required for motors and other electrical units of mechanical equipment.

1.2 RELATED WORK

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Specification Sections, apply to work of this Section.

1.3 QUALITY ASSURANCE

A. Wherever possible, match elements of electrical provisions of mechanical work with similar elements of electrical work specified in Division 26 sections for electrical work not otherwise specified.

B. For electrical equipment and products, comply with applicable NEMA standards, and refer to NEMA standards for definitions of terminology. Comply with National Electrical Code (NFPA 70) for workmanship and installation requirements.

1.4 SUBMITTALS

A. Include in listing of motors, voltage, notation of whether motor starter is furnished or installed integrally with motor or equipment containing motors.

PART 2 - PRODUCTS

2.1 MOTORS

A. Provide motors for mechanical equipment manufactured by one of the following:
1. Baldor Electric Company.
2. Century Electric Div., Inc.
3. General Electric Co.
4. Louis Allis Div.; Litton Industrial Products, Inc.
5. Lincoln Electric.
6. Marathon Electric Mfg. Corp.
7. Reliance Electric Co.
8. Westinghouse Electric Corp.
9. WEG.

B. Motor Characteristics. Except where more stringent requirements are indicated, and except where required items of mechanical equipment cannot be obtained with fully complying motors, comply with the following requirements for motors of mechanical work:

C. Temperature Rating. Rated for 40 Degrees C environment with maximum 50 Degrees C temperature rise for continuous duty at full load (Class A Insulation).

D. Provide each motor capable of making starts as frequently as indicated by automatic control system, and not less than 5 starts per hour for manually controlled motors.

E. Phases and Current Characteristics. Provide squirrel-cage induction polyphase motors for 3/4hp and larger, and provide capacitor-start single-phase motors for 1/2hp and smaller, except 1/6hp and smaller may, at equipment manufacturer's option, be split-phase type. Coordinate current characteristics with power specified in Division 26 sections, and with individual equipment requirements specified in other Division 23 requirements. For 2-speed motors provide 2 separate windings on polyphase motors. Do not purchase motors until power characteristics available at locations of motors have been confirmed, and until rotation directions have been confirmed.

F. Service Factor. 1.15 for polyphase motors and 1.35 for single-phase motors.

G. Motor Construction. Provide general purpose, continuous duty motors, Design "B" except "C" where required for high starting torque.
1. Frames. NEMA #56.

2. Bearings are to be ball or roller bearings with inner and outer shaft seals, regreasable except permanently sealed where motor is inaccessible for regular maintenance. Where belt drives and other drives produce lateral or axial thrust in motor, provide bearings designed to resist thrust loading. Refer to individual section of Division 23 for fractional-hp light-duty motors where sleeve-type bearings are permitted.
3. Except as indicated, provide open drip-proof motors for indoor use where satisfactorily housed or remotely located during operation, and provide guarded drip-proof motors where exposed to contact by employees or building occupants. Provide weather-protected Type I for outdoor use, Type II where not housed. Refer to individual sections of Division 23 for other enclosure requirements.
4. Provide built-in thermal overload protection and, where indicated, provide internal sensing device suitable for signaling and stopping motor at starter.
5. Noise Rating: Provide "Quiet" rating on motors.

H. All motors shall be premium efficiency.

I. Provide an inverter duty motor on all equipment that utilizes a variable frequency drive.

2.2 EQUIPMENT FABRICATION

A. Fabricate mechanical equipment for secure mounting of motors and other electrical items included in work. Provide either permanent alignment of motors with equipment, or adjustable mountings as applicable for belt drives, gear drives, special couplings and similar indirect coupling of equipment. Provide safe, secure, durable, and removable guards for motor drives. Arrange for lubrication and similar running-maintenance without removal of guards.

2.3 GENERAL REQUIREMENTS – SHAFT GROUNDING RINGS

A. All motors operated on variable frequency drives shall be equipped with a maintenance-free, conductive microfiber shaft grounding ring to meet NEMA MG-1, 3.4.4.4.3 requirements, with a minimum of two rows of circumferential microfibers to discharge damaging shaft voltages away from the bearings to ground. SGR’s Service Life: Designed to last for service life of motor. Provide AEGIS SGR Conductive MicroFiber Shaft Grounding Ring, or approved equal.

B. Application Note: Motors up to 100 HP shall be provided with one shaft ground ring installed on either the drive end or non-drive end. Motors over 100 HP shall be provided with an insulated bearing on the non-drive end and a shaft grounding ring on the drive end of the motor with the exception of line contact bearings in the drive end of the machine. In this instance the line contact bearing must be electrically insulated and the AEGIS Bearing Protection Ring installed on the opposite drive end of the motor. Grounding rings shall be provided and installed by the motor manufacturer’s recommendations.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install motors on motor mounting systems in accordance with motor manufacturer’s instructions, anchored to resist torque, drive thrusts, and other external forces inherent in mechanical work. Secure sheaves and other drive units to motor shafts with keys and Allen set screws on flat surface of shaft. Unless otherwise indicated, set motor shafts parallel with machine shafts.

B. Verify voltage with Electrical Plans.

END OF SECTION

SECTION 23 05 14

HVAC CONDENSATE DRAIN PIPING SYSTEM

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Provide and install air conditioning condensate drains.

1.2 RELATED WORK

A. Division 23 - Mechanical
   1. Insulation.
   2. Fan/Coil Units.
   3. Equipment Drain Pans.

PART 2 - PRODUCTS

2.1 PIPE MATERIAL

A. Type “L” copper with drainage pattern fittings.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install the system to facilitate easy removal.
   1. Use threaded plugged tee at each change of direction to permit cleaning.
   2. Install a cleanout every 50 feet of straight run piping.
   3. Maintain a positive slope on all piping.

B. Install a water seal trap leg based on the fan pressure.
   1. Size the length of the trap leg 1 inch larger than the actual system pressure.

C. Install traps and cleanout as shown in the drawing details.
   1. Confirm requirements with manufacturer's installation instructions

3.2 SIZE PIPE AS SHOWN ON DRAWINGS.

A. Do not install piping sized smaller than the unit drain connection size.

3.3 SECONDARY DRAINS

A. Provide secondary drains where required by code, shown on the drawings, or where equipment has secondary drain connections.

END OF SECTION

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SECTION 23 05 93

TESTING, BALANCING AND ADJUSTING (TAB) OF ENVIRONMENTAL SYSTEMS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Balance, adjust and test the air distribution system including the exhaust system.

B. Balance, adjust and test the hydronic system.

C. Verify and record the duct test results performed by the mechanical contractor.

1.2 RELATED SECTIONS

A. COORDINATION OF TESTING AND BALANCING

1.3 PAYMENT PROCEDURES

A. The work of this Section of the Specifications shall bid the project directly to the General Contractor.

1.4 SUBMITTALS

A. History of the TAB organization.

B. Agency certification.

C. Personnel qualifications.

D. TAB data forms.

E. Instrumentation list.

F. Name of the project supervising engineer.

G. Name and address and contact person of five successfully completed projects of similar size and scope.

H. To perform required professional services, the balancing agency shall have a minimum of one test and balance engineer certified by the Associated Air Balance Council.

1.5 TAB FIRM QUALIFICATIONS

A. The organization performing the work shall be a Certified member in good standing of the (AABC) Associated Air Balance Council.

B. Able to furnish evidence of having contracted for and completed not less than five systems of comparable size and type that have served their Owners satisfactorily for not less than five years.

C. A specialist in this field and have the personnel, experience, training, skill, and the organization to perform the work.

D. The balancing agency shall furnish all necessary calibrated instrumentation to adequately

perform the specified services. An inventory of all instruments and devices in possession of the balancing agency may be required by the engineer to determine the balancing agency's performance capability.

E. The balancing agency shall have operated for a minimum of five years under its current name.

F. Personnel:
1. The project supervisor shall be a Professional Engineer registered in Texas.
   a. Extensive knowledge of the work involved.
   b. At least five years experience conducting tests of the type specified.
   c. This test and balance engineer shall be responsible for the supervision and certification of the total work herein specified.
2. All work shall be conducted under the direct supervision of the supervising engineer.
3. Technicians shall be trained and experienced in the work they conduct.

1.6 WARRANTY

A. Provide (AABC) guarantee in writing.

B. Extended warranty.
1. Include an extended warranty of 2 years after completion of test and balance work, during which time the Architect/Engineer may request a retest or resetting of any outlet or other items as listed in the test report.
2. Provide technicians and instruments to assist the Architect/Engineer in making any tests he may require during this period.
3. The balancing agency shall perform an inspection of the HVAC system during the opposite season from that which the initial adjustments were made. The balancing agency shall make any necessary modifications to the initial adjustments to produce optimum system operation.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION

3.1 TAB TOLERANCES

A. The water, outside air, supply air, return air, and exhaust air for each system shall be adjusted to within +/- 5% of the value scheduled on the drawings.

3.2 SITE VISITS

A. During construction, the balancing agency shall inspect the installation of the piping systems, sheetmetal work, temperature controls, energy management system, and other component parts of the heating, ventilating, and air conditioning systems. One inspection shall take place when 60% of the ductwork is installed and another inspection shall take place when 90% of the equipment is installed. The balancing agency shall submit a brief written report of each inspection to the architect and engineer.

B. Upon completion of the installation and start-up of the mechanical equipment by the mechanical contractor, the balancing agency shall test and balance the system components to obtain optimum conditions in each conditioned space of the building. If construction deficiencies are encountered that preclude obtaining optimum conditions, and the deficiencies cannot be corrected by the mechanical contractor within a reasonable period of time, the balancing agency shall cease testing and balancing

services and advise the architect, engineer, general contractor and owner, in writing, of the deficiencies.

C. Note proper piping installation, location of valves, and flow measuring instruments.

D. Make one series of visits, phased as required by construction progress, prior to installation of the ceiling. Note proper installation of balancing dampers.

E. Continue the site visits up to completion of project. In each succeeding report, list corrections made from previous reports.

3.3 TESTING INSTRUMENTS

A. Submit a list of all instruments to be used for the test and balance procedures.
1. Catalog sheets.
2. Certificate of last calibration.
3. Calibration within a period of six months prior to balancing.

B. Testing equipment shall be in good working order and tested for accuracy prior to start of work.

3.4 COORDINATION WITH OTHER SPECIFICATION SECTIONS

A. Review the related ductwork shop drawings and piping shop drawings. Make recommendations concerning suitability with respect to the testing, balancing and adjusting work.

B. Make tests to verify proper placement of the static pressure sensors for the variable air volume fan system control.

C. In cooperation with the work specified in Building Management and Control System section, a systematic listing of the testing and verification shall be included in the final TAB report. The TAB firm shall provide a laptop computer to operate with the Building Management and Control System. Building Management and Control System shall provide all necessary software and special interface cables, as required, to communicate with the DDC system:
1. Work with the temperature control contractor to ensure the most effective total system operation within the design limitations, and to obtain mutual understanding of the intended control performance.
2. Verify that all control devices are properly connected.
3. Verify that all dampers, valves, and other controlled devices, are operated by the intended controller.
4. Verify that all dampers and valves are in the position indicated by the controller (open, closed or modulating).
5. Verify the integrity of valves and dampers in terms of tightness of close-off and full open positions. This includes dampers in multizone units, terminal boxes and fire/smoke dampers.
6. Observe that all valves are properly installed in piping system in relation to direction of flow and location.
7. Observe the calibration of all controllers.
8. Verify the proper application of all normally opened and normally closed valves.
9. Observe the locations of all thermostats and humidistats for potential erratic operation from outside influences such as sunlight, drafts or cold walls.
10. Observe the location of all sensors to determine whether their position will allow them to sense only the intended temperatures or pressures of the media. Control contractor will relocate as deemed necessary by the Engineer.

11. Verify that the sequence of operation for any control mode is in accordance with the approved shop drawings and specifications. Verify that no simultaneous heating and cooling occurs.
12. Verify the correct operation of all interlock systems and installation is per the manufacturer recommendations.
13. Check all dampers for free operation.
14. Verify that all controller setpoints meet the design intent.
15. Perform variable volume system verification to assure the system and its components track with changes from full flow to minimum flow.

D. Upon completion of the testing and balancing, submit three days prior notice that the systems are ready for a running test. A qualified representative of the test and balance organization shall be present, with a representative from the engineers office, to field verify TAB report readings. Specific and random selections of data recorded in the certified test and balance report will be reviewed.

3.5 INSTRUMENT TEST HOLES

A. When it is required to make holes in the field to measure temperature, static pressure or velocity in the ducts:
1. Drill holes, plug and tape external duct insulation.
2. Repair damaged insulation to Engineer’s approval.

3.6 TESTING THE AIR DISTRIBUTION SYSTEM

A. The TAB agency shall verify that all ductwork, dampers, grilles, registers, and diffusers have been installed per design and set full open. The TAB agency shall perform the following TAB procedures in accordance with the AABC National Standards and all results shall be recorded in the TAB report:
1. Supply Fans:
a. Fan speeds: Test and adjust fan RPM to achieve design CFM requirements.
b. Current and Voltage: Test and record motor voltage and amperage, and compare data with the nameplate limits to ensure fan motor is not in or above the service factor.
c. Pitot-Tube Traverse: Perform a Pitot-Tube traverse of the main supply and return ducts, as applicable, to obtain total CFM. If a Pitot-Tube traverse is not practical, an explanation of why a traverse was not made must appear on the appropriate data sheet. Measurements must be recorded with an Inclined Manometer or an Inclined/Vertical Manometer.
d. Outside Air: Test and adjust the outside air on applicable equipment using a Pitot-Tube traverse. If a Pitot-Tube traverse is not practical, an explanation of why a traverse was not made must appear on the appropriate data sheet. If a traverse is not practical, use the mixed air temperature method, if the inside and outside temperature difference is at least 20°F, or use the difference between Pitot-tube traverse of the supply and return ducts.
e. Static Pressure: Test and record system static pressure, including the static pressure profile of each supply fan.
2. All Other Fans:
a. Fan speeds: Test and adjust fan RPM to achieve design CFM requirements.
b. Current and Voltage: Test and record motor voltage and amperage, and compare data with the nameplate limits to ensure fan motor is not in or above the service factor.
c. Pitot-Tube Traverse: Perform a Pitot-Tube traverse of the main return

ducts, as applicable, to obtain total CFM. If a Pitot-Tube traverse is not practical, an explanation of why a traverse was not made must appear on the appropriate data sheet. Measurements must be recorded with an Inclined Manometer or an Inclined/Vertical Manometer.

d. Static Pressure: Test and record system static pressure, including the static pressure profile of each return fan.

4. Diffusers, Registers and Grilles:
   a. Tolerances: Test, adjust, and balance each diffuser, grille, and register to within 5% of design requirements. Minimize drafts. Observe throws are in direction as indicated on drawings.
5. Coils (including electric coils):
   a. Air Temperature: Once air flows are set to acceptable limits, take wet bulb (cooling coil only) and dry bulb air temperatures on the entering and leaving side of each coil. Calculate the sensible and latent (cooling coil only) capacity of the coil. Provide information in TAB report.

B. Record preliminary air handler data, including fan RPM and static pressures across filter, fans and coils.

C. Perform a velocity traverse of the main supply ducts using a pitot-tube and inclined manometer to establish initial air delivery. Perform a Pitot-tube traverse of main supply and return ducts, as applicable, to obtain total CFM. If a pitot-tube traverse is not practical, a detailed explanation of why a traverse was not made must appear on the appropriate data sheet.

D. Where air measuring stations are installed, use pitot tube traverse readings to verify and record the correct calibration of the stations output.

E. Make adjustments in fan RPM and damper settings, as required, to obtain design supply air, return air, and outside air.

F. Measure and adjust all supply and return branches to design air delivery.

G. Measure and adjust all diffusers to design air delivery to +/- 5% of design requirements.

H. Make a set of recordings showing final system conditions.

3.7 EQUIPMENT POWER READINGS

A. Record the following information for each motor:
1. Equipment designation.
2. Manufacturer.
3. Unit model number and serial number and frame.
4. Motor nameplate horsepower; nameplate voltage; phase and full load amperes.
5. Heater coil in starter.
   a. Rating in amperes.
   b. Manufacturer's recommendation.
6. Motor RPM/driven equipment RPM.
7. Power reading (voltage, amperes of all legs at motor terminals).

3.8 DUCT TEST

A. Test and Balancing Contractor shall verify and record the duct test results. A copy of the duct test results, as completed, shall be submitted to the engineer for review within five days. Provide a complete report of all the duct test results in the final TAB report.

3.9 DIRECT EXPANSION EQUIPMENT

A. With each unit operating at near design conditions, measure and record the following:
   1. Manufacturer, model number, serial number and all nameplate data.
   2. Ambient temperature, condenser discharge temperature.
   3. Amperage and voltage for each phase.
   4. Leaving and entering air temperatures.
   5. Suction and discharge pressures and temperatures.
   6. Tons of cooling.
   7. Verification that moisture indicator shows dry refrigerant.

3.10 TAB REPORT

A. The activities described in this specification shall be recorded in a report form; and four individually bound copies shall be provided to the Architect and Engineer. Neatly type and arrange data. Include with the data the date tested, personnel present, weather conditions, nameplate record of the test instruments used and list all measurements taken after all corrections are made to the system. Record all failures and corrective action taken to remedy any incorrect situation. The intent of the final report is to provide a reference of actual operating conditions for the Owner's operations personnel. Provide a "Preface" which shall include a general discussion of the system and any abnormalities or problems encountered.

B. All measurements and recorded readings (of air, water, electricity, etc.) that appear in the report must have been recorded on site by the permanently employed technicians or engineers of the TAB firm.

C. Submit reports on forms approved by the engineer that will include the following data as a minimum:
   1. Title Page
      a. Company Name.
      b. Company Address.
      c. Company telephone number.
      d. Project name.
      e. Project location.
      f. Project Manager.
      g. Project Engineer.
      h. Project Contractor.
      I. Project Identification Number.
   2. Summary of the TAB report data
   3. Index
   4. Instrument List
      a. Instrument.
      b. Manufacturer.
      c. Model.
      d. Serial Number.
      e. Range.
      f. Calibration Date.
      g. What test instrument is to be used for: .
   5. Fan Data
      a. Location.
      b. Manufacturer.
      c. Model.
      d. Air flow, specified and actual.
      e. Total static pressure (total external) specified and actual.
      f. Inlet pressure.

g. Discharge pressure.
h. Fan RPM.

6. Return Air/Outside Air Data
   a. Identification/location.
   b. Design return air flow.
   c. Actual return air flow.
   d. Design outside air flow.
   e. Actual outside air flow.
   f. Return air temperature.
   g. Outside air temperature.
   h. Required mixed air temperature.
   I. Actual mixed air temperature.
7. Electric Motors
   a. Manufacturer.
   b. HP/BHP.
   c. Phase, voltage, amperage, nameplate, actual.
   d. PM.
   e. Service Factor.
   f. Starter size, heater elements, rating.
8. V-Belt Drive
   a. Identification/location.
   b. Required driven RPM.
   c. Drive sheave, diameter and RPM.
   d. Belt, size and quantity.
   e. Motor sheave, diameter and RPM.
   f. Center-to-center distance, maximum, minimum and actual.
9. Duct Traverse
   a. System zone/branch.
   b. Duct size.
   c. Area.
   d. Design velocity.
   e. Design air flow.
   f. Test velocity.
   g. Test air flow.
   h. Duct static pressure.
   I. Air correction factor.
10. Air Monitoring Station Data
   a. Identification/location.
   b. System.
   c. Size.
   d. Area.
   e. Design velocity.
   f. Design air flow.
   g. Test velocity.
   h. Test air flow.
11. Air Distribution Test Sheet
   a. Air terminal number.
   b. Room number/location.
   c. Terminal type.
   d. Terminal size.
   e. Correction factor.
   f. Design velocity.
   g. Design air flow.
   h. Test (final) velocity.
   i. Test (final) air flow.
13. Cooling Coil Data

a. Identification/number.
b. Location.
c. Service.
d. Manufacturer.
e. Entering air DB temperature, design and actual.
f. Entering air WB temperature, design and actual.
g. Leaving air DB temperature, design and actual.
h. Leaving air WB temperature, design and actual.
i. Water pressure flow, design and actual.
j. Water pressure drop, design and actual.
k. Entering water temperature, design and actual.
l. Leaving water temperature, design and actual.
m. Air pressure drop, design and actual.
n. Capacity - sensible and latent.

14. Heating Coil Data
    a. Identification/number.
    b. Location.
    c. Service.
    d. Manufacturer.
    e. Entering air DB temperature, design and actual.
    f. Leaving air DB temperature, design and actual.
    g. Water pressure flow, design and actual.
    h. Water pressure drop, design and actual.
    i. Entering water temperature, design and actual.
    j. Leaving water temperature, design and actual.
    k. Air pressure drop, design and actual.
    l. Capacity.
15. Electric Coil Data
    a. Identification/number.
    b. Location.
    c. Service.
    d. Manufacturer.
    e. Entering air DB temperature, design and actual.
    f. Leaving air DB temperature, design and actual.
    g. Electrical Characteristics.
    h. Capacity.
16. Sound Level Report
    a. Location (Location established by the design engineer).
    b. N C curve for eight (8) bands-equipment off.
    c. N C curve for eight (8) bands-equipment on.
17. Vibration Test on equipment having 10 HP motors or greater in size.
    a. Location of points:
        1) Fan bearing, drive end.
        2) Fan bearing, opposite end.
        3) Motor bearing, center (if applicable).
        4) Motor bearing, drive end.
        5) Motor bearing, opposite end.
        6) Casing (bottom or top).
        7) Casing (side).
        8) Duct after flexible connection (discharge).
        9) Duct after flexible connection (suction).
    b. Test readings:
        1) Horizontal, velocity and displacement.
        2) Vertical, velocity and displacement.
        3) Axial, velocity and displacement.
    c. Normally acceptable readings, velocity and acceleration.

d. Unusual conditions at time of test.
e. Vibration source (if non-complying).

18. Control verification indicating date performed and any abnormalities identified.
    a. Point Location/Description.
    b. EMS Readout (Setpoint and Actual).
    c. Actual Readout of all points.
    d. Interlocks.
    e. Safeties.
    f. Variable speed drive tracking with EMS input.
    g. Variable speed drive Bypass operation.
    h. Sequence of operation.

END OF SECTION

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SECTION 23 07 13

EXTERNAL DUCT INSULATION

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Furnish and install external insulation on supply, return, exhaust and outside air ductwork.

B. External insulation of concealed and exposed ducts is included in this Section. Internal acoustic duct lining is specified under ductwork and not included in this Section.

1.2 RELATED WORK

A. Division 9 - FINISHES. Painting and Color Coding.

B. Division 23 - MECHANICAL.
1. Air Handling Units. Internal insulation for air units is specified in the sections on air handling units. The units do not require external insulation.
2. Internal Duct Liner. Internal duct liner is specified in the section on ductwork.
3. Insulation. Refer to specific sections on individual insulation types.
4. Refer to insulation and liner plan detail.

1.3 QUALITY ASSURANCE

A. The intent of insulation specifications is to obtain superior quality workmanship, resulting in an installation that is absolutely satisfactory in both function and appearance. Provide insulation in accordance with the specifications for each type of service and apply as recommended by the manufacturer and as specified.

B. An approved contractor for this work under this Division shall be:
1. A specialist in this field and have the personnel, experience, training, skill, and the organization to provide a practical working system.
2. Able to furnish evidence of having contracted for and installed not less than 3 systems of comparable size and type that have served their Owners satisfactorily for not less than 3 years.

C. All duct insulation used on the project inside the building must have a flame spread rating not exceeding 25 and a smoke developed rating not exceeding 50 as determined by test procedures ASTM E84, NFPA 255 and UL 723. These ratings must be as tested on the composite of insulation, jacket or facing, and adhesive. Components such as adhesives, mastics and cements must meet the same individual ratings as the minimum requirements and bear the UL label.

D. Condensation on any insulated system is not approved.

E. Replace insulation damaged by either moisture or other means. Insulation that has been wet, whether dried or not, is considered damaged. Make repairs where condensation is caused by improper installation of insulation. Also repair any damage caused by the condensation.

F. Where existing insulated ductwork or other services are tapped, remove existing insulation back to undamaged sections and replace with new insulation of the same type and thickness as existing insulation. Apply as specified for insulation of the same service.

1.4 APPROVALS

A. Submittals. Submit product data on each insulation type, adhesive, and finish to be used in the work. Make the submittal as specified in Division 1 General Requirements and obtain approval before beginning installation. Include product description, list of materials and thickness for each service and location, and the manufacturer's installation instructions for each product.

B. Sample Application. Make an application of each type of insulation to display the material, quality and application method. Obtain approval of the sample application before proceeding with installation of the work.

PART 2 - PRODUCTS

2.1 INSULATION

A. Glass fiber rigid duct insulation.
   1. Minimum density of 3 pcf, installed R value to be 6.0 (when located in a conditioned plenum) and minimum density of 0.75 pcf, installed R value to be 8.0 (when located in an unconditioned plenum) at 75°F mean, facing of 0.7 mil aluminum foil reinforced with glass yarn mesh and laminated to 40 lbs. fire-resistant Kraft. R-value to be indicated on exterior side of insulation to be verified by City inspector.
   2. Acceptable Manufacturers
      a. Schuller 814 spin-glas FSK.
      b. Owens-Corning Type 703 board RKF.
      c. Knauf 3 PCF FSK.

B. Glass fiber blanket duct insulation.
   1. Minimum density of 1.0 pcf, installed R value to be 6.0 (when located in a conditioned plenum) and minimum density of 0.75 pcf, installed R value to be 8.0 (when located in an unconditioned plenum) at 75°F mean, facing of 0.35 mil foil reinforced with glass yarn mesh and laminated to 40 lbs. fire resistant Kraft. R-value to be indicated on exterior side of insulation to be verified by City inspector.
   2. Acceptable Manufacturers
      a. Manville R-series Microlite FSKL.
      b. Owens-Corning ED100 RKF.
      c. Knauf 1.0 PCF FSK.

C. Fireboard Insulation
   1. Totally encapsulated with foil facing.
   2. Two hour rated fire protection.
   3. Zero clearance to combustible protection.
   4. System shall be listed and labeled by an NRTL.
   5. Tested per ISO 6944, Type A Duct and achieve a 2 hour rating for stability, integrity and insulation.
   6. Provided system is subject to the approval of the Local Authority Having Jurisdiction.
   7. Acceptable Manufacturers
      a. Unifrax ON Fyrewrap Elite 1.5
      b. Partak Insulation, Inc. Paroc Fireboard
      c. Thermal Ceramics FireMaster 3M
      d. Premier Refractories International, Pyroscat.

D. Rigid Closed Cell Insulation
   1. Acceptable Manufacturers
      a. Dow Trymer.
      b. Phenolic Foam.

E. Reinforced Foil Tape
   1. Acceptable Manufacturers
      a. Venture 1525CW.
      b. 3” FSK.
   2. Thickness 6.5 mils.
   3. Color: silver.

2.2 COATING AND ADHESIVE

A. Coating. Provide Childers CP-38 or Foster 30-80 vapor barrier coating. Coating must meet MIL Spec C-19565C, Type II and be QPL Listed. Permeance shall be 0.013 perms or less at 43 mils dry. Tested at 100ºF and 90% RH per ASTM E96.

B. Outdoors: Provide as insulation coating Childers Encacel X or Foster Monolar 60-90. Permeance shall be 0.03 perms or less at 30 mils dry. Tested at 100ºF and 90% RH per ASTM F 1249.

C. Adhesive. Provide Childers CP-82 or Foster 85-20 vapor barrier adhesive.

D. Reinforcing Mesh. Provide 10 x 10 white glass or polyester reinforcing mesh.

PART 3 - EXECUTION

3.1 FIRE SAFETY REQUIREMENTS

A. Do not extend duct coverings through walls or floors required to be fire-stopped or required to have a fire resistance rating. Interrupt duct coverings in the immediate vicinity of heat sources such as electric resistance or fuel-burning heater.

3.2 CONCEALED DUCT

A. Provide flexible glass fiber insulation with factory-applied, reinforced UL labeled Foil-Skrim-Kraft (FSK) facing.

B. Standing Seams. Insulate standing seams and stiffeners, which protrude through the insulation with 0.6 lb. per cubic foot density, 1-1/2” thick, faced, flexible blanket insulation. Insulation shall not prevent adjustment of damper operators.

C. Insulation shall be wrapped tightly on the ductwork with all circumferential joints butted and longitudinal joints overlapped a minimum of 2”. In addition, secure insulation to the bottom of rectangular ductwork by the use of either weld pins with washers or cup-head pins welded to the ductwork or perforated based insulation hangers glued to the duct on twelve inch centers to prevent sagging of insulation.

D. Ductwork in mechanical rooms is considered concealed spaces.

3.3 EXPOSED DUCT INSULATION

A. Ductwork in exposed locations is to be insulated with fiberglass rigid / semi-rigid board insulation.
   1. Apply fabric and mastic to provide a smooth surface for painting.

B. Standing Seams: Insulate standing seams and stiffeners which protrude through the insulation with 0.6 lb per cubic foot density, 1-1/2 inch thick, faced insulation. As a vapor seal, use reinforcing mesh with vapor barrier coating. Insulation shall not prevent adjustment of damper operators.

C. Insulation shall be wrapped tightly on the ductwork. Adhere insulation to ductwork with adhesive. In addition, secure insulation to the bottom of rectangular ductwork by the use of either weld pins with washers or cup-head pins welded to the ductwork or perforated based insulation hangers glued to the duct on 12 inch centers to prevent sagging of insulation.

D. Cover all seams, joints, pin penetrations and other breaks with coating reinforced with reinforcing mesh. Fabric shall not be visible after coating.

3.4 GENERAL INSTALLATION

A. Install materials in accordance with manufacturer's instructions.

B. Apply insulation on clean, dry surfaces only.

C. Continue insulation with vapor barrier through penetrations.

D. Neatly finish insulation at supports, protrusions and interruptions.

E. Install insulation on clean, dry surfaces, and only after building is weatherproofed sufficiently to preclude any rainwater on insulation.

F. Apply mastic over the fiberglass reinforcing mesh to a thickness where fabric is not visible after completion.

G. Install fiberglass blanket duct insulation on top of supply air grilles not fire rated.

END OF SECTION

SECTION 23 07 19

HVAC PIPING INSULATION

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Furnish and install piping insulation, jackets, accessories and covering of specified materials. The insulation shall be used for high and low temperature piping applications including refrigerant lines and condensate piping.

1.2 QUALITY ASSURANCE

A. The intent of insulation specifications is to obtain superior quality workmanship resulting in an installation that is absolutely satisfactory in both function and appearance. Provide insulation in accordance with the specifications for each type of service and apply as recommended by the manufacturer and as specified.

B. An approved contractor for this work under this Division shall be:
   1. A specialist in this field and have the personnel, experience, training, skill, and the organization to provide a practical working system.
   2. Able to furnish evidence of having contracted for and installed not less than 3 systems of comparable size and type that have served their owners satisfactorily for not less than 3 years.

C. All piping insulation used on the project inside the building must have a flame spread rating not exceeding 25 and a smoke developed rating not exceeding 50, as determined by test procedures ASTM E 84, NFPA 255 and UL 723. These ratings must be as tested on the composite of insulation, jacket or facing, and adhesive. Components such as adhesives, mastics and cements must meet the same individual ratings as the minimum requirements and bear the UL label.

D. Condensation on any insulated piping system is not acceptable.

E. Replace insulation damaged by either moisture or other means. Insulation that has been wet, whether dried or not, is considered damaged. Make repairs where condensation is caused by improper installation of insulation. Also repair any damage caused by the condensation.

F. Where existing insulated piping, or other surfaces are tapped, remove existing insulation back to undamaged sections for hot surfaces or to nearest insulation stop for cold surfaces, and replace with new insulation of the same type and thickness as existing insulation. Apply as specified for insulation of the same service.

1.3 SUBMITTALS

A. Submit product data on each insulation type, adhesive, and finish to be used in the work. Make the submittal as specified in General Requirements and obtain approval before beginning installation. Include product description, list of materials and thickness for each service and location and the manufacturer's installation instructions for each product.

B. Make a field application of each type of insulation to display the material, quality and application method. Obtain approval of the sample application before proceeding with installation of the work.

1.4 RELATED WORK

A. Finishes. Painting and color-coding.

B. Pipe Heat Tracing.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Glass fiber pipe insulation:
   1. Johns-Manville Micro-Lok AP-T.
   2. Owens-Corning ASJ/SSL.
   3. Knauf ASJ/SSL.

B. Cellular Glass Insulation (Foamglass):
   1. Pittsburg Corning.
   2. Cell-U-Foam.

C. Rigid Foam Insulation:
   1. Kingsapan Tarec.
   2. Dow Trymer.
   3. Tarec Ecophen – Phenolic Foam.

D. Aluminum Jacketing:
   1. ITW Lock-on (Childers).
   2. ITW Z-lock (Pabco).

E. Fiberglass reinforcing cloth mesh:
   1. Perma Glass Mesh.
   2. Alpha Glass Mesh.
   3. Childers Chil-Glas.
   4 Foster Mast a Fab.
   5. Vimasco.

F. Mastics, Sealants, Coatings and Adhesives
   1. Childers.
   2. Foster.
   3. Vimasco.
   4. Armacell 520 Adhesive.

G. Elastomeric Insulation
   1. Armacell.

H. Weather Resistant Coating
   1. WB Armaflex Finish.
   2 Foster 30-64.

I. Glass fiber blanket insulation
   1. Manville R-series Microlite FSKL.
   2. Owens-Corning eD75 or ED100 RKF.
   3. Knauf 0.75 PCF FSK.

2.2 RIGID FOAM PIPE INSULATION

A. Polyisocyanurate pipe insulation or phenolic foam pipe insulation, with all service reinforced vapor barrier jacket having integral laminated vapor barrier.
   1. Polyisocyanurate: Thermal conductivity 0.14 @ 75°F mean (ASTM C518).
   2. Phenolic Foam: Thermal conductivity 0.13 @ 75°F mean (ASTM C 518); minimum 2.5# density.
   3. Polyisocyanurate is not to be used inside of buildings without 25/50 rating.

2.3 FIBERGLASS PIPE INSULATION

A. Heavy density, dual temperature fiberglass insulation with factory applied, all service, reinforced vapor barrier jacket having integral laminated vapor barrier. Provide with a factory applied pressure sensitive tape closure system and matching butt strips. Supply in thickness as shown.
   1. Thermal conductivity 0.23 @ 75°F mean (ASTM 335).

2.4 ELASTOMERIC INSULATION

A. Insulation material shall be flexible, closed-cell elastomeric insulation in tubular or sheet form. Material shall have a flame spread rating of 25 or less and a smoke developed rating of 50 or less when tested in accordance with ASTM E84, latest revision. Sheet material with a thickness greater than ¾" shall have a flame spread rating of 25 or less and a smoke developed rating of 100 or less when tested in accordance with ASTM E84, latest revision. In addition, the product, when tested, shall not melt or drip flaming particles, and the flame shall not be progressive. In addition, all materials shall pass simulated end-use fire test.
   1. Thermal conductivity 0.27 at 75°F mean (ASTM C177 or C518).

2.5 CELLULAR GLASS INSULATION

A. ASTM C552:
   1. "k" value of 0.35 @ 75°F ("ksi" value of 0.047 @ 24°C);
   2. 8.0 lb/cu.ft. (128 kg/cu.m.) density.

2.6 INSULATION/SHIELD AT HANGERS

A. Field fabricated: Use 360° sections of rigid foamglass insulation that will support the bearing area at hangers and supports. Further support insulation at hangers and supports with a shield of galvanized metal covering at least half of the pipe circumference, and conforming to the schedule. Insulation shall extend at least 1" beyond metal shield on each end. When pipe is guided at top and bottom, metal shields shall cover the whole pipe circumference. Adhere metal shield to insulation so that metal will not slide with respect to insulation with ½" aluminum bands (2) per shield.
   1. Sections of foam glass insulation may be used of the same outside diameter of the adjoining pipe insulation.
   2. Minimum thickness of foam glass insulation shall not be less than 1" thick.

B. Pipe saddles: Formed galvanized sheets at each support point for insulated pipe, shaped to fit pipe, and covering bottom half of pipe. Length at saddle shall be not less than twice the insulation outside diameter or more than 22". Provide 18 gauge through 4" pipe and 16-gauge 5" pipe and above.

2.7 SEALANT, ADHESIVE AND FINISH

A. Lap Adhesive. Provide Childers CP-82 or Foster 85-20 adhesive.

B. Vapor Barrier Finish:
1. Indoors: Provide as insulation coating Childers CP-38 or Foster 30-80, white. Coating must meet MIL Spec C-19565C, Type II and be QPL Listed. Permeance shall be 0.013 perms or less at 43 mils dry. Tested at 100ºF and 90% RH per ASTM E96.
2. Outdoors: Provide as insulation coating Childers Encacel X or Foster 60-90. Permeance shall be 0.03 perms or less at 30 mils dry. Tested at 100ºF and 90% RH per ASTM F 1249 and must be Hypalon rubber based.
3. Underground: Provide Childers CP-22/24 or Foster 60-25/26 for fittings and areas. Pittwrap cannot be used.

C. Insulation Joint Sealant. Provide Childers CP-76 or Foster 95-50 vapor barrier sealant.

D. Metal Jacketing Sealant. Provide Childers CP-76 or Foster 95-44 metal jacketing sealant for all outdoor metal jacketing laps.

E. Lagging Adhesive. Provide Childers CP-50AMV1 or Foster 30-36.

F. Other products of equal quality will be acceptable only upon approval.

2.8 ALUMINUM JACKETING

A. Finish insulated piping outdoors with a smooth prefabricated Z-lock aluminum jacket 0.016” thick with factory applied 1 mil polyethylene/40 lb and Fab strap. Kraft moisture barrier.

B. Valves, Fittings and Flanges. For finishing valves, fittings, flanges and similar installations, provide formed aluminum covers, 0.024” thick.

C. Straps and Seals. Provide ½” x 0.020 stainless steel strapping and seals for jackets and covers according to manufacturer's recommendations.

2.9 GLASS FIBER BLANKET INSULATION

A. Minimum density of 1.0 PCF, 2” thick, installed R value to be 6.0 or better at 75°F mean, facing of 0.35 mil foil reinforced with glass yarn mesh and laminated to 40 lbs fire resistant kraft.

PART 3 - EXECUTION

3.1 INTERIOR PIPING

A. Cover all piping with glass fiber, heavy density, dual temperature pipe insulation with a vapor barrier jacket. Apply insulation to clean, dry pipes. Longitudinal seams shall be joined firmly together and sealed with self-sealing lap joints. Butt insulation joints firmly together and seal with a 3” wide ASJ butt strip seal. Longitudinal seams and butt strip laps shall be coated and sealed with CP-38 or Foster 30-80 vapor barrier coating for chilled water piping applications.

B. Install hanger with protective shield, on the outside of all insulation.

C. Where domestic water pipes (1/2” & ¾” pipe sizes) are installed on trapeze type hangers,

provide galvanized sheet metal protection shields at these locations. Place insulation jacket directly on hanger. Incompressible, load bearing insulation segments are not required.

D. Pipe Saddles: Formed galvanized sheets at each support point for insulated pipe, shaped to fit pipe, and covering bottom half of pipe. Length at saddle shall be not less than twice the insulation outside diameter. Provide 18-gauge through 4” pipe and 16-gauge for 5” pipe and above.

E. Seal ends of pipe for chilled water insulation with vapor barrier mastic at valves, flanges, fittings and every 21' on straight runs of piping. Mastic should extend on top of ASJ jacket, across the glass, down onto the pipe making a complete seal.

F. Apply a smooth flood coat of white lagging adhesive Foster 30-35 or Childers CP-35 over all exposed insulation within mechanical rooms.

G. Piping to be insulated as specified above:
1. Chilled water and heating water.
2. Make-up water.
3. Horizontal sanitary drain piping that receives condensate.
4. Condenser water.

3.2 REFRIGERANT AND CONDENSATE PIPING

A. Cover all pipe with elastomeric insulation by slitting tubular sections or sliding unslit sections over the open ends of piping or tubing. Seams and butt joints shall be adhered and sealed using Foster 85-75, Childers CP-82 or Armstrong 520 Adhesive.

B. All fittings shall be insulated with the same insulation thickness as the adjacent piping. All seams and mitered joints shall be adhered with Foster 85-75, Childers CP-82 or 520 Adhesive.

C. Pipe Saddles: Formed galvanized sheets at each support point for insulated pipe, shaped to fit pipe, and covering bottom half of pipe. Length at saddle shall be not less than twice the insulation outside diameter.

D. Outdoor exposed piping shall be painted with two coats of either WB or SB Armaflex finish or Foster 30-64 elastomer foam coating. All seams shall be located on the lower half of the pipe.

E. Outdoor exposed piping after being sealed as noted above apply aluminum jacketing to protect piping insulation exposed to weather, from damage from sunlight, moisture, equipment maintenance, wind, and shall provide shielding from solar radiation. Adhesive Tape shall not be permitted.

3.3 FLANGE, VALVE AND FITTING INSULATION

A. Cover valves and flanges with fabricated segments, fittings with two-piece factory molded fittings, and both of matching pipe insulation type and thickness equal to that of the adjoining pipe. Fittings and fabricated segments shall be securely held in place.
1. Apply a tack coat of insulating coating/mastic to the insulated fitting to produce a smooth surface.
2. After mastic is dry, apply a second coat of vapor barrier coating/mastic. Neatly embed with 10 x 10 fiberglass or polyester reinforcing mesh into the tack coat.
3. Overlap coating/mastic and fiberglass/polyester reinforcing mesh by 2” on adjoining sections of pipe insulation.

4. Apply a second coat of coating/mastic over the fiberglass/polyester reinforcing mesh to present a smooth surface.
5. Apply coating/mastic to a wet film thickness of 3/64".
6. Fabric shall not be visible after completion.
7. Vapor seal flanges, valves and fittings with Childers CP-38 or Foster 30-80. Coating must meet MIL Spec C-19565C, Type II and be QPL Listed. Permeance shall be 0.013 perms or less at 43 mils dry. Tested at 100ºF and 90% RH per ASTM E96.

B. PVC fitting covers are not acceptable.

3.4 MISCELLANEOUS

A. Insulate pumps.

B. Install materials after piping has been tested and approved.

C. Apply insulation on clean, dry surfaces only.

D. Apply weather protective finish on elastomeric insulation installed in non-conditioned spaces. Provide a minimum of three coats.

3.5 INSULATION THICKNESS

INSULATED UNIT	THICKNESS (Inches)
Refrigerant Piping	1-1/2
Condensate Drains	1

END OF SECTION

SECTION 23 20 00

HVAC PIPE AND PIPE FITTINGS - GENERAL

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Furnish and install pipe and pipe fittings for piping systems specified in Division 23 - Mechanical.

1.2 RELATED WORK

A. Division 23 Mechanical:
   1. Vibration Isolation.
   2. Insulation.
   3. Other Piping Sections.

PART 2 - PRODUCTS

2.1 PIPE AND FITTINGS

A. The particular type of pipe and fittings for each system is specified in the individual sections.

2.2 JOINTS

A. Make screwed joints using machine cut USASI taper pipe threads. Apply a suitable joint compound to the male threads only. Ream the pipe to full inside diameter after cutting. All-thread nipples are not permitted.

B. Dissimilar Metals. Make joints between copper and steel pipe and equipment using insulating unions or couplings such as Crane Company #1259; EPCO as manufactured by EPCO Sales, Inc.; or an approved equal.

C. Solder joints.
   1. Prior to making joints, cut pipe square and ream to full inside diameter. Clean exterior of pipe and socket. Apply a thin coat of suitable fluxing compound to both pipe and socket, and fit parts together immediately.
   2. Heat assembled joint only as required to cause the solder to flow. Run the joint full, slightly beaded on the outside, and wipe to remove excess solder.
   3. Use silver brazing alloy or Sil-Fos on refrigerant piping and on underground piping. Use lead free solder on all other copper piping.

D. Make welded joints as recommended by the standards of the American Welding Society. Ensure complete penetration of deposited metal with base metal. Provide filler metal suitable for use with base metal. Keep inside of fittings free from globules of weld metal. The use of mitered joints is not approved.

E. Flanged.
   1. Prior to installation of bolts, center and align flanged joints to prevent mechanical pre-stressing of flanges, pipe or equipment. Align bolt holes to straddle the vertical, horizontal or north-south centerline. Do not exceed 3/64" per foot inclination of the flange face from true alignment.
   2. Use flat-face companion flanges only with flat-faced fittings, valves or equipment. Otherwise, use raised-face flanges.

3. Install gaskets suitable for the intended service and factory cut to proper dimensions. Secure with manufacturers recommended gasket cement.
4. Use ANSI nuts and bolts, galvanized or black to match flange material. Use ANSI 316 stainless steel nuts and bolts underground. Tighten bolts progressively to prevent unbalanced stress. Draw bolts tight to ensure proper seating of gaskets.
5. Use carbon steel flanges conforming to ANSI B16.5 with pipe materials conforming to ASTM A 105 Grade II or ASTM A 108, Grade II, ASTM A 53, Grade B. Use slip-on type flanges on pipe only. Use welding neck type flanges on all fittings. Weld slip-on flanges inside and outside.
6. Keep flange covers on equipment while fabricating piping. Remove when ready to install in system.

F. Mechanical Joints: Provide a stuffing box type mechanical joint adapted to use gasket, cast iron gland and bolts. Coat bolts with bitumastic enamel. Use joint parts similar in design to one of the following:
1. Doublex Simplex Joint manufactured by the American Cast Iron Pipe Company, Birmingham, Alabama.
2. U.S. joints manufactured by the United States Pipe and Foundry Company, Burlington, New Jersey.
3. Boltite Joint manufactured by the McWane Cast Iron Pipe Company, Birmingham, Alabama.
4. Flexlamp manufactured by the National Cast Iron Pipe Company, Birmingham, Alabama.

2.3 UNIONS

A. Use 150 lb. standard (300 lb. WOG) malleable iron, ground joint unions with bronze seat. Provide flanged joints on piping 2-1/2" and larger.
1. Where pipe material of different types join, use a dielectric union. Union shall be threaded, solder or as required for its intended use.

2.4 BRANCH CONNECTIONS

A. Pipe 2" and Smaller: For threaded piping, use straight size reducing tee. When branch is smaller than header, a nipple and reducing coupling or swagged nipple may be used.

B. 2-1/2" through 36": For welding piping, when branch size is the same as header size, use welding tee. For threaded branch connections, use 3000 lb. full coupling or Thread-o-let welded to header.

2.5 GASKETS

A. High Temperature Piping: Provide 1/16" thick ring gaskets of aramid reinforced SBR such as Garlock #3200 or 3400 or equal by Advanced Products and Systems.

B. Other Piping: Provide ring rubber gaskets, Garlock #7992 or equal by Advanced Products and Systems. Use 1/8" thick cloth reinforced neoprene gaskets. For smaller than 6", use 1/16" thick gasket.

2.6 FLOORS AND CEILING PLATES

A. Provide chrome-plated floor and ceiling plates around pipes exposed to view when passing through walls, floors, partitions, or ceilings in finished areas; size plates to fit pipe or insulation and lock in place.

2.7 DOMESTIC MANUFACTURE

A. All piping material, pipe and pipe fittings shall be manufactured in the United States of America.

PART 3 - EXECUTION

3.1 PIPE FABRICATION AND INSTALLATION

A. Make piping layout and installation in the most advantageous manner possible with respect to headroom, valve access, opening and equipment clearance, and clearance for other work. Give particular attention to piping in the vicinity of equipment. Preserve the required minimum access clearances to various equipment parts, as recommended by the equipment manufactured, for maintenance.

B. Cut all pipes to measurement determined at the site. After cutting pipe, remove burrs by reaming. Bevel plain ends of ferrous pipe.

C. Install piping neatly, free from unnecessary traps and pockets. Work into place without springing or forcing. Use fittings to make changes in direction. Field bending and mitering is prohibited. Make connections to equipment using flanged joints, unions or couplings. Make reducing connections with reducing fittings only.

D. Install piping without tapping out of the bottom of pipe.

3.2 WELD

A. Weld and fabricate piping in accordance with ANSI Standard B31.1, latest edition, Code for Pressure Piping.

B. Align piping and equipment so that no part is offset more than 1/16". Set fittings and joints square and true, and preserve alignment during welding operation. Use of alignment rods inside pipe is prohibited.

C. Do not permit any weld to project within the pipe so as to restrict flows. Tack welds, if used, must be of the same material and made by the same procedure as the completed weld. Otherwise, remove tack welds during welding operation.

D. Do not split, bend, flatten or otherwise damage piping before, during or after installation.

E. Remove dirt, scale and other foreign matter from inside piping before tying into existing piping sections, fittings, valves or equipment.

F. Bevel ends of ferrous pipe.

3.3 OFFSETS AND FITTINGS

A. Due to the small scale of drawings, the indication of offsets and fittings is not possible. Investigate the structural and finish conditions affecting the work and take steps required to meet these conditions.

B. Install pipe close to walls, ceilings and columns so pipe will occupy minimum space. Provide proper spacing for insulation coverings, removal of pipe, special clearances, and offsets and fittings.

3.4 SECURING AND SUPPORTING

A. Support piping to maintain line and grade, with provision for expansion and contraction. Use approved clevis-type or trapeze-type hangers connected to structural members of the building. Single pipe runs to be supported by approved clevis type hangers. Multiple pipe runs to be supported by approved trapeze type hangers. Do not support piping from other piping or structural joist bridging. Review structural drawings for additional information.

B. Provide supports both sides and within 12” of each horizontal elbow for pipe 6" and larger.

C. Support vertical risers with steel strap pipe clamps of approved design and size, supported at each floor. Support piping assemblies in chases so they are rigid and self-supported before the chase is closed. Provide structural support for piping penetrating chase walls to fixtures. On chilled water pipe supports shall be outside the insulation.

D. Where insulation occurs, design hangers to protect insulation from damage. Pipe saddles and insulation shields, where required, are specified in the appropriate insulation section and are sized in accordance with the schedule on the drawings.

E. Install trapeze hangers, properly sized, to support the intended load without distortion. Use hangers with 1-1/2” minimum vertical adjustment.

F. Use electro-galvanized or zinc plated beam clamps if acceptable to the structural engineer, threaded rods, nuts, washers and hangers. All hanger rods shall be trimmed neatly so that no more than 1 inch of excess hanger rod protrudes beyond the hanger nut. Use only on beams as directed by the Structural Engineer.

G. At outdoor locations, all supports, brackets and structural members shall be hot-dipped galvanized.

H. Provide hangers within 3' of pipe length from all coil connections.

I. Support spacing: As recommended by the project structural engineer and support manufacturer, but not more than listed below. Not to exceed spacing requirements of smallest pipe.

Pipe Size	Copper & Steel Max. Support Spacing, Ft.	Cast Iron Max. Support Spacing, Ft.	Minimum Rod Diameter, Inches
1" & smaller	6		3/8
1-1/4" & 1-1/2"	8	5	3/8
2"	10	5	3/8
3"	10	5	1/2
4" & 5"	10	5	5/8
6" and above	10	5	3/4

3.5 PIPE SUPPORTS

A. Provide P1001 or P 5000 Unistrut metal framing members and appurtenances for pipe support. Hot-dip galvanized members and appurtenances when located outside. Sagging of pipes or supports is not acceptable.

B. Adjustable clevis hangers shall be used for single pipe supports; Anvil Fig. 260. When oversized clevis is used, a nipple shall be placed over the clevis bolt as a spacer to

assure that the lower U-strap will not move in on the bolt. Provide adjustable clevis with a nut / washer above and below the hanger on the support rod. Ring type clevis hangers are not acceptable.

C. Provide Anvil Figure 45 galvanized or primed and painted channel assembly for trapeze hangers.

3.6 PIPE SUPPORTS ON ROOF

A. Support condensate drain pipe on roof with Portable Pipe Hanger Model PP-10 with roller and fully adjustable height throughout pipe run. Base material shall be high density / high impact polypropylene with UV inhibitors and anti-oxidants. Provide with hot dip galvanized rod finish and framing. Nuts and washers shall be hot dip galvanized.

3.7 ANCHORS

A. Provide anchors as required. Use pipe anchors consisting of heavy steel collars with lugs and bolts for clamping to pipe and attaching anchor braces. Install anchor braces in the most effective manner to secure desired results. Do not install supports, anchors or similar devices where they will damage construction during installation or because of the weight or the expansion of the pipe. When possible, install sleeves in structural concrete prior to pouring of concrete.

3.8 FLOOR PENETRATIONS

A. At locations where pipe passes through floors, provide watertight concrete curb around penetration.

3.9 PIPE SLEEVES

A. Sleeves through masonry and concrete construction:
   1. Fabricate sleeves of Schedule 40 galvanized steel pipe.
   2. Size sleeve large enough to allow for movement due to expansion and to provide continuous insulation.

B. Sleeves through gypsum wall construction.
   1. Fabricate sleeves of 16 gauge galvanized sheet metal.

C. Sleeves through elevated slab construction.
   1. Fabricate sleeves of Schedule 40 galvanized steel pipe with welded center flange in floor.

D. Extend each sleeve through the floor or wall. Cut the sleeve flush with each wall surface. Sleeves through floors shall extend 2” above floor lines for waterproofing purposes. Slab on grade floors shall not be sleeved except where penetrating waterproofing membrane or insect control is required.

E. Caulk sleeves water and air tight. Seal annular space between pipes and sleeves with mastic compound to make the space water and air tight.

F. For sleeves below grades in outside walls, provide Thunderline Link-Seal or Advance Product and System Interlynx, with 316 stainless steel nuts and bolts, with cast iron pressure plate.

G. Provide chrome plated escutcheon plates on pipes passing through walls, floors or ceilings exposed to view. At exterior walls, stainless steel sheet metal is to be used.

H. For sleeves through fire and smoke rated walls, seal with a UL through-penetration firestop, rated to maintain the integrity of the time rated construction. Install in accordance with the manufacturer's installation instructions. Comply with UL and NFPA standards for the installation of firestops. Refer to Architectural drawings for all fire and smoke rated partitions, walls, floors, etc.

3.10 ISOLATION VALVES

A. Provide piping systems with line size shutoff valves located at the risers, at main branch connections to mains for equipment, to isolate central plant, and at other locations.

3.11 DRAIN VALVES

A. Install drain valves at low points of water piping systems so that these systems can be entirely drained. Install a line size drain valve for pipes smaller than 2" unless indicated otherwise. For pipes 2-1/2" and larger, provide 2" drain valves unless indicated otherwise. Drain valves shall be plugged when not in use and at completion.

3.12 CLEANING OF PIPING SYSTEMS

A. General cleaning of piping systems. Purge pipe of construction debris and contamination before placing the systems in service. Provide and install temporary connections as required to clean, purge and circulate. Flush the chilled and hot water systems utilizing the filter feeders.

B. Install temporary strainers at the inlet of pumps and other equipment as necessary where permanent strainers are not indicated. Keep strainers in service until the equipment has been tested, then remove either entire strainer or straining element only. Fit strainers with a line size blow down ball valve and pipe to nearest drain. Blow down strainers, remove and clean as frequently as necessary.

C. Phase One: Initial flushing of system. Remove loose dirt, mill scale, weld beads, rust and other deleterious substances without damage to system components. Open valves, drains, vents and strainers at all system levels during flushing procedures. Flush until “potable water clear” and particles larger than 5 microns are removed.

D. Connect dead-end supply and return headers, even if not shown on the drawings, and provide terminal drains in bottom of pipe end caps or blind flanges.

E. Dispose of water in approved manner.

F. Phase Two: Cleaning of Piping Systems. Remove, without chemical or mechanical damage to any system component, adherent dirt (organic soil), oil, grease, (hydrocarbons), welding and soldering flux, mill varnish, piping compounds, rust (iron oxide) and other deleterious substances not removed by initial flushing. Chemical shall be equal to Nalco 2578 prepping compound. Insert anti-foam compound as necessary. Circulate for 48 hours or as recommended by the manufacture. Dispose of water in approved manner. Flush system and replace with clean water. Verify compatibility of chemicals used with existing chemical treatment program on remodel projects.

G. Phase Three: Final flushing and rinsing: Flush and rinse until “potable water clear” and particles larger than 5 microns are removed. Operate valves to dislodge any debris in valve body. Dispose of water in approved manner.

H. Submit status reports upon completion of each phase of work on each system.

I. Special requirements, if any, are specified in the sections on each type of piping or in the section on Water Treatment Systems.

3.13 TESTING

A. Test piping after installation with water hydrostatic pressure of 1-1/2 times operating pressure (150 psig minimum) and carefully check for leaks. Repair leaks and retest system until proven watertight.

B. Do not insulate or conceal piping systems until tests are satisfactorily complete.

C. If any leaks or other defects are observed, suspend the test and correct the condition at once. Repeat testing until leaks are eliminated and the full test period is achieved.

D. The satisfactory completion of testing does not relieve the Contractor of responsibility for ultimate proper and satisfactory operation of piping systems and their accessories.

3.14 PIPE MARKERS

A. Identify interior exposed piping and piping in accessible chases or plenums with Opti-Code Brady Pressure Sensitive Adhesive Pipe Markers, consisting of pipe marker and direction of flow arrow tape. Clean pipe prior to installation. Background colors of markers, arrows and tape for each type of system shall be the same. Meet ANSI/OSHA standards and clearly identify each system. Provide minimum 2-1/4-inch letters through 4-inch pipe and 4-inch letters for 5-inch pipe and larger.

B. Identify exterior and mechanical room piping with Snap Around pipe markers through 4-inch pipe and Strap Around markers 5-inch pipe and larger. Pipe markers consisting of pipe marker and direction of flow arrow tape; background colors of markers, arrows and type for each type of system shall be the same. Meet ANSI / OSHA standards and clearly identify each system. Provide minimum 2-1/4-inch letters through 4-inch pipe and 4-inch letters for 5-inch pipe and larger.

C. Install identification in the following locations:
   1. both sides of penetrations through walls, floors and ceilings.
   2. Close to valves or flanges.
   3. Intervals on straight pipe runs not to exceed 50 feet
   4. Apply marker where view is obstructed.

D. Pipe markers shall meet or exceed the specifications of the ASME A13.1 “Scheme for Identification of Piping Systems”.

END OF SECTION

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SECTION 23 23 00

REFRIGERANT PIPING AND APPURTENANCES

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Furnish and install copper tubing, valves, strainers and sight glass for refrigerant piping.

1.2 RELATED WORK

A. Division 23 Mechanical.
   1. Pipe and Pipe Fittings.
   2. Piping Insulation.

PART 2 - PRODUCTS

2.1 PIPE AND FITTINGS

A. Furnish refrigerant piping of Type K hard-drawn copper tubing with sweat-type, wrought copper fittings. Cast fittings are not permitted.

2.2 SERVICE VALVES

A. Provide angle or globe service valves, with sweat connections. Use packed-type, wrench operated, valves with gasketed seal cap and back seat feature. Furnish valves designed for refrigerant service, in conformance with the ARI code.

B. Place service valves at the inlet and outlet of each compressor, on both sides of each strainer and solenoid valve, and as otherwise shown and specified.

2.3 SOLENOID VALVES

A. Furnish pilot-operated, floating-piston solenoid valves suitable for operation with refrigerant.

B. Use valves with a bronze body and sweat-type connections.

C. Provide stainless steel stem and plunger assembly and a stainless steel piston.

D. Furnish sealed and moisture proof solenoid coils.

E. Use electrical characteristics of 115 volt, 60 Hertz.

2.4 SIGHT GLASSES

A. Provide suitable moisture and liquid sight glass in the liquid line leaving the condenser or receiver.

2.5 FILTER DRYER

A. Furnish replaceable core liquid line filter dryer.

B. Provide filter dryer constructed to permit the removal of the core element without removing the filter dryer from the line.

PART 3 - EXECUTION

3.1 BRAZING

A. During the brazing process, dry nitrogen shall be purged through the tubing to prevent oxides from forming.

3.2 PRESSURE TEST

A. After refrigeration and piping system items are installed, charge the system with dry nitrogen and test to 450 psig.
   1. Test joints with a Halide torch or an electronic leak detector.
   2. Repair leaks and retest each system until proved tight.

3.3 EVACUATION AND DRYING

A. After refrigerant system has been pressure-tested, connect a suitable vacuum pump and evacuate piping system, including lines and equipment.
   1. Maintain a vacuum as high as practicable for long enough to evaporate the moisture in the system (at least 48 hours).
   2. Check the humidity within the system with a wet bulb indicator, and maintain the vacuum until the wet bulb temperature is reduced to -40°F. After the system has been evacuated and dried, break the vacuum by charging proper refrigerant into the system.

3.4 PIPE SIZE

A. Pipe shall be routed and sized per condensing unit manufacturer’s instructions.

END OF SECTION

SECTION 23 31 13

DUCTWORK

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Duct construction, support and accessories. Dimensions shown on the drawings are free area dimensions.

1.2 RELATED WORK

A. Division 23 Mechanical
   1. Air Devices.
   2. Insulation.
   3. Fan Coil Units.
   4. Fans.
   5. Testing, Balancing and Adjusting (TAB) of Environmental Systems.

B. Division 9 – Finishes, Painting and Color Coding.

1.3 QUALITY ASSURANCE

A. The intent of ductwork specifications is to obtain superior quality workmanship resulting in an installation that is absolutely satisfactory in both function and appearance. Provide ductwork in accordance with the specifications for each type of service.

B. An approved contractor for this work under this division shall be:
   1. A specialist in this field and have the personnel, experience, training, skill, and the organization to provide a practical working system.
   2. Able to furnish evidence of having contracted for and installed not less than 5 systems of comparable size and type that have served their owners satisfactorily for not less than 5 years.

1.4 GUARANTEE

A. Guarantee ductwork for 1 year from the date of substantial completion. The guarantee covers workmanship, noise, chatter, whistling, or vibration. Ductwork shall be free from pulsation under conditions of operation.

1.5 CONTRACTOR COORDINATION

A. Erect ducts in the general locations shown, but conform to structural and finish conditions of the building. Before fabricating any ductwork, check the physical conditions at the job site and make necessary changes in cross sections, offsets, and similar items, whether they are specifically indicated or not.

B. Coordinate location of ductwork with structural members and Architectural drawings and requirements.

1.6 SHOP DRAWINGS AND SAMPLES

A. Submit shop drawings of all ductwork layouts, including enlarged plans and elevations of all air handling equipment, and summit details of duct fittings, including particulars such as gauge sizes, welds, and configurations prior to starting work.

B. Submit product data and sealing materials to be used.

Submit sound attenuation data.

D. Submit shop drawings in plan, elevation and sections, and three-dimensional view showing equipment in mechanical equipment areas.

PART 2 - PRODUCTS

2.1 STANDARDS AND CODES

A. Except as otherwise indicated, sheet metal ductwork material and installation shall comply with the latest edition of SMACNA HVAC Duct Construction Standards. Air distribution devices (such as dampers) included in this specification shall comply with the latest applicable SMACNA Fire, Smoke and Radiation Damper Installation Guide for HVAC Systems and NFPA 90A.

2.2 DUCT MATERIAL AND CONSTRUCTION

A. Except for the special ducts specified below use lock forming quality prime galvanized steel sheets or coils up to 60" wide. Stencil each sheet with gauge and manufacturer's name. Stencil coils of sheet steel throughout on 10' centers with gauge and manufacturer's name. Provide certification of duct gauge and manufacturer for each size duct.

B. Rectangular low and medium pressure duct constructed of sheet metal in accordance with the latest edition of SMACNA HVAC Duct Construction Standards.

D. Low pressure round ducts shall be shop fabricated with snap lock longitudinal seams. Ducts shall be constructed for a minimum of 2" w.g. static pressure.

2.3 DUCT SEALING OF SEAMS AND JOINTS

A. Follow seal classification as indicated in Table 1-2 of SMACNA "HVAC AIR DUCT LEAKAGE TEST MANUAL". Use seal class A for 4" w.g. static. All longitudinal and transverse joints and seams shall be sealed by use of a fireproof, non-hardening, and non-migrating elastomeric sealant. With the exception of continuously welded joints and machine made spiral lock seams, joints and seams made air tight with duct sealer.
   1. Indoor applications – Foster 32-14.
   2. Outdoor applications – Foster 32-17.

2.4 FLEXIBLE DUCT LOW PRESSURE

A. Construction:
   1. Continuous galvanized spring steel wire helix, with reinforced metalized cover
      a. The fabric shall be mechanically fastened to the steel helix without the use of adhesives.
   2. UL 181 Class I air duct label.
   3. Reinforced vapor barrier jacket.
   4. Rated for use at system pressure (6" wc minimum).
   5. Flexible duct connections from lateral taps to variable volume boxes or terminal boxes shall be rated at twice the maximum pressure rating of the medium pressure system.

B. Fire hazard classification:
   1. Flame spread rating 25 maximum.
   2. Smoke developed rating 50 maximum.

C. Thermal characteristics:
   1. R-6 BTU/hr/sq. ft./°F (when located in a conditioned plenum).
   2. R-8 BTU/HR/Sq.Ft./°F (when located in an unconditioned plenum).
   3. 2" minimum wall thickness insulation with 1" overlap.

D. Acceptable manufacturers:
   1. Flexmaster.
   2. Hart & Cooley.
   3. Omniair.
   4. Peppertree Air Solutions.

2.5 FIRE DAMPERS

A. Fire dampers for required wall ratings that are 95% minimum free area. Provide Type B or Type C UL dampers for low, medium and high-pressure rectangular, square or round ducts. Dampers shall be activated by a fusible link designed to react at 165°F. Install per manufactures recommendations to provide a UL assembly. Provide sealed sleeve to meet desired leakage performance.

B. Acceptable Manufacturers:
   1. Ruskin.
   2. Prefco Products.
   3. Air Balance.
   4. Greenheck, Inc.
   5. Nailor Industries.
   6. Pottoroff.

2.6 WALL LOUVERS

A. Refer to schedule on drawings. Coordinate with Architectural Drawings.

B. All louver frames shall be a minimum of 0.08" extruded aluminum. All blades shall be a minimum of 0.081" extruded aluminum. Beginning point of water penetration at 0.01 oz/sq.ft. Shall be a minimum of 800 ft/min.

C. Provide all louvers with removable aluminum bird screen with 1/4" mesh.

D. Louvers shall be AMCA-550 tested and approved.

E. Acceptable manufacturers:
   1. American Warming and Ventilation.
   2. Arrow.
   3. Greenheck.
   4. NCA.
   5. Pottorff.
   6. Ruskin.

2.7 STORM SHELTER WALL LOUVERS

A. Refer to schedule on drawings. Coordinate with Architectural Drawings.

B. All louver frames shall be a minimum of 0.08" extruded aluminum. All blades shall be a

minimum of 0.081" extruded aluminum. Beginning point of water penetration at 0.01 oz/sq.ft. Shall be a minimum of 800 ft/min.

C. Provide all louvers with removable aluminum bird screen with 1/4" mesh.

D. Louver performance shall be certified in accordance with the AMCA 511 Certified Ratings Program for AMCA 500-L Air Performance and Water Penetration and shall be licensed to bear the AMCA seal.

E. Louvers shall be UL Classified (Wind-storm Rated) and shall be tested in accordance with the ICC 500 debris impact standard of a 15 lb. 2 x 4 traveling at 100 mph as per the requirements indicated within the FEMA 361 construction guidelines for a FEMA 361 or FEMA 320 compliant storm shelter or safe room.

F. Louvers shall be capable of withstanding positive or negative wind pressure loads up to 250 psf when installed in accordance with the manufacturer's published installation instructions.

G. Acceptable manufacturers:
   1. Ruskin (XP500).
   2. United Enertech (FEMA-5).
   3. Greenheck (AFL-501) .
   4. Pottorff (XAV-505).
   5. Airolite (AFG501).

2.8 FLUES FOR ATMOSPHERIC BOILERS AND WATER HEATERS

A. Type B, round or oval, double-wall vent pipe, equal to Metalbestos or Metal-Fab, including accessories such as vent caps by the same manufacturers. Use oval vent where necessary to fit in wall construction. All exterior components shall be 304 stainless steel for outdoor installations.

2.9 FLUES FOR POWER EXHAUST AND HIGH EFFICIENCY BOILERS AND WATER HEATERS

A. Double wall air insulated positive pressure chimney equal to Metalbestos, Van-Packer, Schebler or Metal-Fab. Chimney shall be rated for 550°F maximum flue gas temperature and with a UL tested pressure rating of 40 inches w.c. The interior pipe shall be constructed of AL 29-4C stainless steel and the exterior pipe shall be constructed of 304 stainless steel. Stack system shall be complete with a one inch air gap between inner liner and outer cover. Chimney shall be constructed and installed per UL-1738 and NFPA-211. All accessories shall be made by the same manufacturer and designed to be a part of a positive pressure chimney system.

2.10 FLUES FOR FAN POWERED FIRETUBE BOILERS AND WATER HEATERS

A. Double wall air insulated positive pressure chimney equal to Metalbestos, Van-Packer, Schebler or Metal-Fab. Chimney shall be rated for 1400°F continuous operation, 1800°F intermittent operation and for positive pressures up to 60 inches w.c. The interior pipe shall be constructed of 304 stainless steel and the exterior pipe shall be constructed of 304 stainless steel. Stack system shall be complete with a one-inch air gap between inner liner and outer cover. Chimney shall be constructed and installed per UL-103 and NFPA-211. All accessories shall be made by the same manufacturer and designed to be a part of a positive pressure chimney system.

2.11 FLUE CAPS

A. Stainless steel flue caps of a design so that wind action from any direction will create a vacuum in the flue. Caps as manufactured by Breidert or equal are acceptable. Refer to installation details on drawings.

2.12 DUCT LINING

A. Duct lining shall be 1" thick, 1-1/2 lb. density, flexible lining coated on the air stream side to reduce attrition. Liner shall be Schuler Lina-Coustic, Certain-Teed Ultralite, or equal meeting requirements of NFPA 90-A. Provide I.A.Q. rated liner.

2.13 CONTROL DAMPERS

A. Opposed blade dampers for 2-position and modulating control. Construct frames of 13-gauge galvanized sheet metal with provisions for duct mounting. Damper blades not exceeding 8" in width, of corrugated-type construction, fabricated from two sheets of 22-gauge galvanized sheet metal spot-welded together or a single 16-gauge sheet. Make bearings of nylon or oil-impregnated, sinthered bronze. Make shafts of 1/2" zinc-plated steel. Blades suitable for high velocity performance. Construct damper so that leakage does not exceed 1/2% based on 2000 fpm and 4" static pressure. Provide replaceable resilient seals along top, bottom and sides of frame and along blade edge. Submit leakage and flow characteristics data with shop drawings. Linkage shall be concealed out of the air stream within damper frame to reduce pressure drop and noise.

B. Acceptable Model is Ruskin Model CD60.

2.14 VOLUME DAMPERS

A. Manual balancing dampers that meet or exceed the following minimum construction standards:
   1. Frame 16-gauge.
   2. Blades 16-gauge.
   3. Bearings corrosion resistant.
   4. Concealed linkage.
   5. Opposed blade dampers.

B. Acceptable manufacturer:
   1. Ruskin Model MD-35 or approved equal, by.
   2. Arrow.
   3. American Warming and Ventilating.
   4. Nailor Industries.
   5. Pottoroff.

2.15 ACCESS DOORS

A. Round spin-in door of galvanized steel.
   1. Fire proof sealing gaskets and quick fastening locking devices.
   2. Insulated door.
   3. Conform to the requirements of the NFPA.
   4. Identification and use of each access door.
   5. UL label to match the construction in which it is installed.
   6. Cable attached to door and outer frame.
   7. Low leakage Access Door.

B. Acceptable Manufacturer
   1. Flex master, Inspector Series.
   2. Approved Equal.

2.16 SMOKE DAMPERS

A. Smoke dampers meeting the following requirements.
   1. Each smoke damper shall be classified by Underwriters Laboratories as a leakage Rated Damper for use in smoke control systems under the latest version of UL555S, and bear a UL label attesting to same. The damper manufacturer shall have tested, and qualified with UL, a complete range of damper sizes covering all dampers required by this specification. Testing and qualifying a single damper size is not acceptable. The leakage rating under UL555S shall be Leakage Class II.
   2. The damper frame shall be a minimum of 16 gauge, galvanized steel, formed into a structural hat channel shape with tabbed corners for reinforcement, as approved in testing by Underwriters Laboratories. Bearings shall be integral high surface area non-electrolytic materials construction to incorporate a friction free frame blade lap seal, or molybdenum disulfide impregnated stainless steel or bronze oilite sleeve type turning in the damper frame. The dampers shall be opposed blade type. The blades shall be constructed with a minimum of 16 gauge, galvanized steel. The blade edge seal material shall be able to withstand 450°F. The jamb seals shall be flexible stainless steel compression type.
   3. As part of the UL qualification, dampers shall have demonstrated a capacity to operate (open and close) under HVAC system operation conditions, with pressures of at least 4" water gauge in the closed position, and 2,000 fpm air velocity in the open position.
   4. Provide UL555S qualified electric actuator at 120 VAC.
   5. Provide air-foil type blades.

B. Provide integral sleeves.

C. Acceptable Manufacturers:
   1. Ruskin.
   2. Air Balance, Inc.
   3. Greenheck, Inc.
   4. Nailor Industries.
   5. Pottoroff.

2.17 DIFFUSER FITTINGS LOW PRESSURE TAPS

A. Fitting shall meet or exceed the following minimum construction standards:
   1. Conical with a base diameter two inches larger than the tap diameter.
   2. Construct fitting and damper of galvanized steel in accordance with ASTM A 527, G90 finish.
      a. Fitting with a 3/16-inch high stop bead approximately 2-1/2-inches from the discharge end of the fitting.
      b. Provide the fitting with a butterfly damper, damper rod, end bearings and heavy duty locking quadrant.
      c. Size the length of the straight section of the fitting to match the damper blade diameter. Center the damper blade in the straight section.
   3. Match the fitting body gauge to the SMACNA duct gauge, but not less than:
      a. Through 8 inches: 26 gauge; Damper blade 22 gauge.
      b. 10 inches and 12 inches: 24 gauge; Damper blade 22 gauge.
      c. 14 inches and 16 inches: 22 gauge; Damper blade 22 gauge.
      d. 18 inches and 20 inches: 20 gauge; Damper blade 20 gauge.
   4. Fasten damper blade to a 3/8 X 3/8 continuous square rod with minimum (2) galvanized U-bolts.
   5. Support the damper rod to the fitting with airtight nylon end bushings / bearings.
   6. Provide the damper with a self-locking regulator and handle.

7. Provide a 2” sheet metal stand-off to extend the regulator.
8. Flex duct grip area – 2 inches behind retaining bead.
9. Flex duct retaining bead – 1 inch from end.
10. Conical length of at least 3 inches.
11. Barrel length of at least 9 inches.

2.18 AUXILIARY DRAIN PANS

A. Galvanized steel, same gauge and same bracing or cross breaks as a duct with same dimensions. Sides of pan turned up to 1-1/2”, all joints soldered watertight. Pan is to be large enough to complete cover drip lines of unit.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Use construction methods and requirements as outlined in SMACNA HVAC Duct Construction Standards as well as SMACNA Balancing and Adjusting publications, unless indicated otherwise in the specifications. Refer to details on the drawings for additional information.

B. Reinforce ducts in accordance with recommended construction practice of SMACNA. Provide additional reinforcement of large plenums as required to prevent excessive flexing and or vibration.

C. Cross break or bead sheet metal for rigidity, except ducts that are 12" or less in the longest dimension.

D. Where ducts pass through walls in exposed areas, install suitable escutcheons made of sheet metal angles as closers.

E. At locations where ductwork passes through floors, provide watertight concrete curb around penetration.

F. Support ducts where passing through floors with galvanized steel structural angles of adequate bearing surface.

G. Metal or lined ductwork exposed to view through grilles, registers, and other openings shall be painted flat black. Do not install grilles, registers, or similar items until painting is complete.

H. Fire Dampers shall be installed per manufacturer’s recommendations to create a UL rated assembly.

I. Install end bearing at all locations where damper shaft penetrates duct wall.

J. Clean duct to remove accumulated dust. Ducts shall be closed on ends between phases of fabrication to assure that no foreign material enters the ducts.

3.2 DUCTWORK

A. Construct rectangular ducts and round ducts in accordance with the latest SMACNA HVAC Duct Construction Standards. Use the static pressure specified on the air handling unit schedule or fan schedules as a minimum for duct construction. All ductwork between the variable volume air handling units and the terminal units shall be constructed to the medium pressure ductwork specification.

B. Provide adjustable, galvanized splitter-dampers, pivoted at the downstream end with appropriate control device at each supply duct split.

C. For branch ducts wider than 18", and when shown on drawings provide extractors with an appropriate control device at each rectangular zone or branch supply duct connection. Provide controllers for extractors. Branch ducts shall have a 45° angle in the direction of flow. Do not provide extractor at branch ducts to sidewall registers where the registers are within 10 feet of the main duct.

D. Shop manufactured curved blade scoops may be used for branch duct takeoffs up to 18" wide. Taper scoop blade to the end, to prevent any sagging that may cut into, or damage duct liner if specified during operation.
   1. Construct shop manufactured scoops and splitter blades of galvanized sheet metal 2 full gauges heavier than equivalent sheet metal gauge of branch duct (up to 16 gauge).
   2. Check extractors, scoops and splitter blades thoroughly for freedom of operation. Oil bearing points before installing.

E. Use pushrod operator with locking nut and butt hinges assembly.

F. Provide opposed-blade volume dampers with an appropriate control device in each of the following locations:
   1. Return air ductwork.
   2. Outside air branch duct.
   3. Exhaust branch duct.
   4. Exhaust connections to hoods except kitchen grease hoods or equipment.
   5. In each zone at multi-zone unit discharge installed downstream of duct mounted re-heat coils.
   6. At each outside air and return air duct connection to plenum of constant volume units.
   7. At discharge side of constant volume boxes.
   8. Where otherwise indicated or required for balancing coordinate location of additional dampers required by TAB Contractor.
   9. Provide multi-blade dampers when blade width exceeds 12". Provide end bearing where damper shaft penetrates duct wall.

G. Elbows:
   1. Rectangular: Where square elbows are shown, or are required for good airflow, provide and install single-wall or airfoil turning vanes. Job-fabricated turning vanes, if used, shall be single-thickness vanes of galvanized steel sheets of the same gauge metal as the duct in which they are installed. Furnish vanes fabricated for the same angle as the duct offset. The use of radius elbows with a centerline radius of not less than 1-1/2 times the duct width may be provided in lieu of vaned elbows where space and air flow requirements permit.
   2. Round Oval Duct. Provide elbows with a centerline radius of 1-1/2 times the duct diameter or duct width. For round ducts, furnish smooth elbows or 5 piece, 90° elbows and 3 piece, 45° elbows.

H. For control devices concealed by ceilings, furring, or in other inaccessible locations, furnish extension rods and appropriate recessed-type Young regulators, mounted on the surface of the ceiling or the furring, unless specified, or shown otherwise. Provide with chrome plated cover plates. Use only one mitered gear set for each control device.

I. Install streamline deflectors at any point where dividing a sheet metal duct around piping or where other such obstruction is permitted. Where such obstructions occur in insulated

ducts, fill space inside streamliner and around obstructions with glass fiber insulation.

J. Insulated Flexible Duct:
1. Install in accordance with manufacturer's instructions, and the terms of its UL listing. Duct shall not exceed 6' in length. Make connections by use of sheet metal collars and stainless steel circular screw clamps. Clamps shall encircle the duct completely and be tightened with a worm gear operator to the point that will provide an airtight connection without unnecessary deformation of the duct. Provide one clamp on flexible duct and one clamp on external insulation. Vapor barrier jacket shall be tucked inside to conceal insulation material.
2. Construct bends over 45° with sheet metal elbows.

K. Duct Supports:
1. Horizontal ducts up to 40". Support horizontal ducts up to and including 40" in their greater dimension by means of #18 U.S. gauge galvanized iron strap hangers attached to the ducts by a minimum of two locations per side by means of screws, rivets or clamps, and fastened to inserts with toggle bolts, beam clamps or other approved means. Place supports on at least 8' centers. Use clamps to fasten hangers to reinforcing on sealed ducts.
2. Horizontal ducts larger than 40". Support horizontal ducts larger than 40" in their greatest dimension by means of hanger rods bolted to angle iron trapeze hangers. Place supports on at least 8' centers in accordance with SMACNA Standards.
3. Support vertical ducts where they pass through the floor lines with 1-1/2" x 1-1/2" x 1/4" angles for ducts up to 60". Above 60", the angles shall be increased in strength and sized on an individual basis considering space requirements.
4. Supports shall be suspended from structural or by independent support. Do not support from structural bridging. Upper attachments should be selected with a safety factor of 4 or 5 times actual load conditions and subject to Engineers approval. Double wrap straps over open web of joist.

L. Branch connections for medium pressure ductwork shall be made with a conical lateral. Field installed conical branch ducts shall be minimum 20-gauge galvanized sheet metal, “Everdur” welded and coated with “Galvabar”.

3.3 PLENUMS

A. Return air plenums shall be rectangular galvanized sheet metal ductwork.

B. Fabricate plenums upstream of fan of 16-gauge material.

C. Fabricate plenums upstream of filters minimum 18-gauge material.

3.4 FLEXIBLE CONNECTIONS

A. Where ducts connect to fans or air handling units that are not internally isolated, make flexible airtight connections using "Ventglas" fabric. The fabric shall be fire-resistant, waterproof and mildew resistant with a weight of approximately 30 ounces per square yard. Provide a minimum of 1/2" slack in the connections, and a minimum of 2-1/2" distance between the edges of the ducts. Also, provide a minimum of 1" slack for each inch of static pressure on the fan system. Fasten fabric to apparatus and to adjacent ductwork by means of galvanized flats or draw bands. Where connections are made in outdoor locations, seal fabric to metal with mastic.

3.5 ACCESS DOORS

A. Install ductwork access doors as noted below, arranged for convenient access. Stencil each door for specific use. Install access doors in each of the following locations:
   1. Fire Dampers.
   2. Smoke Dampers.
   3. Smoke/fire Dampers.
   4. Outside Air Dampers.
   5. Duct Mounted Coils (up-stream).
   6. Control Dampers.

B. Size access door 1" smaller than ductwork.
   1. Available Sizes: 8”, 10”, 12”, 18”, 24”.

C. Construct access door air tight, and conform to recommendations of NFPA and SMACNA.

D. Demonstrate suitability of access for the intended purpose. Install multiple access doors as required.

3.6 DUCT LINING

A. Install glass fiber acoustical lining where shown on drawings. Secure to duct surfaces with Foster 85-62 / 85-60 or Childers CP-125-1 / CP-127 adhesive and sheet metal fasteners on 12" centers. Coat exposed edges and leading edges of cross-joints with adhesive.

B. Provide metal nosing that is either channeled or "Z" profiled or are integrally-formed from the duct wall securely installed over transversely oriented liner edges facing the air stream at fan discharge and at any interval of lined duct preceded by unlined duct.

C. Refer to Insulation & Liner Detail on drawings for locations requiring liner to be installed.

D. Do not install liner in multi-zone unit ductwork.

3.7 SEALING OF SEAMS AND JOINTS

A. Seal supply, return, exhaust and outside air duct systems.

3.8 FLUES

A. Provide and install flues for all gas fired equipment.

B. Refer to plans for all related locations.

C. Contractor is responsible for coordinating stack sizing, stack drains, stack test ports, stack termination fittings and all other required fittings with the selected equipment manufacturers.

D. All fittings and accessories shall be manufactured by the flue manufacturer. The flue shall be installed per manufacturer's instruction.

E. Terminate flues at height above roof to prevent flue gas from entering the building.

3.9 SCREENS

A. Furnish and install screens on all duct, fan, etc., openings furnished by the Contractor that lead to, or are, outdoors; screens shall be No. 16 gauge, one-half inch (1/2”) mesh in removable galvanized steel frame. Provide safety screens meeting OSHA requirements for protection of maintenance personnel on all fan inlets and fan outlets to which no ductwork is connected.

3.10 CONNECTIONS TO LOUVERS

A. Make watertight connections to all louvers. Ductwork behind louver shall have watertight soldered joints for a minimum of three feet and be sloped to bottom of louver. Lap duct to be over bottom louver blade where possible.

B. Where plenums are installed on inside of louver, construct such that bottom of plenum will lap over bottom blade of louver to drain any water that may enter.

3.11 PLENUMS

A. Construct plenums with galvanized steel framing members and galvanized sheet steel, cross broken and rigidly braced with galvanized angles. Gauges and bracing shall conform to SMACNA recommendations for ductwork of like sizes. Openings for fans, access doors, etc., shall be framed with galvanized steel angles.

B. Provide access doors.

3.12 AUXILIARY DRAIN PANS

A. Where coils that have a condensate drain are located above ceiling.

3.13 TESTING OF LOW PRESSURE DUCTWORK

A. Test ductwork for leaks before concealing. Maximum allowable leakage is 5% of total airflow.

B. Provide equipment necessary for performing tests, including rotary blower large enough to provide required static pressure at allowed CFM quantity, certified orifice section with proper papers, traceable serial numbers and pressure vs CFM leakage rate scale, U-tube gauge board complete with cocks, tubing, and inclined manometer for leakage rates.

C. Mains: Test mains after risers and branches are tied in and all equipment set. Close runout connections and place fan in operation. Provide pressure in mains at 1-1/2 times design pressure. Visually inspect joints. Repair leaks detected by sound or touch. Release mains for completion after joints are tight.

D. Ductwork down stream of terminal boxes, return, exhaust, and outside air ducts are to be visually inspected.

END OF SECTION

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SECTION 23 34 16

FANS

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Furnish and install fans, including centrifugal, axial and propeller types, with supplemental equipment.

1.2 RELATED WORK

A. Division 23 Mechanical:
   1. Ductwork.
   2. Vibration Isolation.
   3. Air Balance.
   4. Electrical Provisions of Mechanical Work.

1.3 PERFORMANCE

A. Provide fan type, arrangement, rotation, capacity, size, motor horsepower, and motor voltage as shown. Fan capacities and characteristics are scheduled on the drawings. Provide fans capable of accommodating static pressure variations of +10% of scheduled design at the design air flow.

B. Rate fans according to appropriate Air Moving and Conditioning Association, Inc. (AMCA), approved test codes and procedures. Supply fans with sound ratings below the maximums permitted by AMCA Standards. All fans provided must be licensed to bear the Certified Ratings Seal.

C. Statically and dynamically balance all fans.

D. Motors shall be sized so that they do not operate within the motor service factor.

E. Fans shall be capable of 120% of the scheduled air capacities.

F. All static pressures shown on schedules are external to fans. Manufacturer shall add damper and accessory losses to scheduled value before selecting fan.

1.4 SUBMITTALS

A. Submit fan performance curves with system operating point plotted on curves.

B. Submit manufacturer’s printed installation instructions.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Cook.

B. Greenheck.

C. Penn Barry Ventilator.

D. Twin City Fans.

2.2 PROTECTIVE COATINGS

A. Manufacturer's Standard. Apply to fans, motors and accessories, the manufacturer's standard prime coat and finish, except on aluminum surfaces or where special coatings are required.

B. Galvanizing. After fabrication of the parts, hot-dip coat surfaces that require galvanizing. Where galvanizing is specified, a zinc coating may be used. After fabrication, apply the zinc coating and air-dry the coating to 95% pure zinc. Acceptable zinc coatings include Zincilate, Sealube, Amercoat, Diametcoat, or an approved equal.

2.3 SUPPLEMENTAL EQUIPMENT

A. Motor Covers. Provide weatherproof motor covers for installations out of doors. Apply the same finish as used on the fan.

B. Belt Drives:
1. Unless otherwise specified for belt-driven fans, equip the fan motors with variable pitch sheaves. Select the sheave size for the approximate midpoint of adjustment and to provide not less than 20% speed variation from full open to full closed. Size drives for 150% of rated horsepower. Key the fan sheave to the fan shaft.
2. Nonadjustable motor sheaves may be used for motor sizes over 15 horsepower, at the Contractor's option. However, if changing a nonadjustable sheave becomes necessary to produce the specified capacity, the change must be made at no additional cost.
3. Provide belt guards and apply the same finish as used on the fan.
4. Oil and heat resistant, nonstatic type belts.
5. Bearings shall be designed and individually tested specifically for use in air handling applications. Construction shall be heavy duty, regreasable, ball type, in a pillow block, cast iron housing, selected for a minimum L50 life in excess of 200,000 hours at maximum catalog operating speed.

C. Safety Disconnect Switch: Provide a factory-wired to motor, safety disconnect switch on each unit.

D. Relief Vents and Air Inlets: Provide vents and inlets with aluminum frames and 1/2" mesh, galvanized bird screens. Include dampers where shown.

E. Prefabricated Roof Curbs: Furnish prefabricated roof curbs as detailed. The minimum height is 14". Include a resilient pad on each roof curb so the equipment can be mounted on the top flange for proper seal. Coordinate roof slope and curb to ensure equipment is installed in level position. Provide double shell to protect insulation from damage.

F. Dampers. Where automatic backdraft damper is scheduled:
1. Multi-bladed.
2. Heavy duty.
3. Roll formed aluminum blades.
4. Nylon bearings.
5. Neoprene weather strip on blade edge.

G. All fans are to be provided with a durable, deep etched, .025" thick, factory installed aluminum identification plate with the following information. Plates are to be furnished with four mounting holes.
1. Fan mark as indicated on the Contract Drawings.

2. Serial number.
3. Model number.
4. Capacity (CFM) and static pressure.
5. Motor HP.
6. Motor Amps.
7. Manufacturer.
8. Motor phase.
9. Number of Belts/Make/Size.
10. Motor volts.

H. Utility Vent Set Fans, provide minimum ¾ inch threaded coupling drain connection at lowest point of housing.

2.4 VENTILATION AND EXHAUST FANS

A. Provide the ventilation and exhaust fans shown on the drawings.

B. Provide each motor with internal overload protection.

C. Provide each belt driven fan with approved, totally enclosed belt guard.

D. Provide approved safety screen where inlet or outlet is exposed.

E. Provide duct flanges where required for connections.

F. Furnish supply fans with 1” aluminum, washable filter section.

2.5 ROOFTOP VENTILATION AND EXHAUST SYSTEMS

A. Provide the rooftop ventilation and exhaust systems shown on the drawings.

B. Provide each motor with internal overload protection.

C. Components:
1. Aluminum, stainless steel or plastic coated bird guard.
2. Screws and fasteners of stainless steel or nonferrous material.
3. All aluminum construction unless indicated otherwise on fan schedule.

D. Welded construction, corrosion resistant fasteners, minimum 16 gauge marine allow aluminum.

E. Aluminum base shall be continuously welded curb cap corners.

2.6 GRAVITY ROOF-TOP INTAKE AND RELIEF VENTS

A. Provide the rooftop intake and relief vent systems shown on the drawings.

B. Provide with aluminum, stainless steel or plastic coated bird guard.
1. Screws and fasteners of stainless steel or nonferrous material.
2. All aluminum construction.

C. Welded construction, corrosion resistant fasteners, minimum 16-gauge marine alloy aluminum.

D. Aluminum base shall be continuously welded curb cap corners.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install fans according to the manufacturer's instructions and in the locations shown on the drawings. Ensure fan location is installed at minimum distance from roof edge to meet code requirements.

B. Do not operate fans or fan powered devices for any purpose until ductwork is clean, filters in place, bearings lubricated and the fan has been run under observation.

C. Roof mounted fans and gravity roof-top intake and relief vents shall be secured to the curb with stainless steel lag screws at a minimum of 6-inches on center. Follow manufacturer’s installation instructions if they are more stringent. Install roof mounted equipment in a level position. Units shall be seated on properly sized curb. Gap between base of the fan and top of the curb shall be sealed with neoprene 1” x ¼” gasket. Gasket shall be glued or attached with pressure sensitive adhesive.

D. Install curbs and equipment in level position.

E. Ceiling mounted in-line centrifugal blowers
   1. Shall be suspended from structure with 1/2-inch zinc plated all-thread rods secured to structure.
   2. Provide sub-structure where required.
   3. Mount bottom of fan no more than 18-inches above the finished ceiling height.

3.2 EXTRA MATERIALS

A. Provide two sets of belts for each fan, not including the set installed on the fans. Tag set to identify fan.

END OF SECTION

SECTION 23 37 13

AIR DEVICES

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Furnish and install air distribution devices, including grilles, diffusers, registers, dampers, and extractors.

1.2 RELATED WORK

A. Division 23 Mechanical.
   1. Ductwork.
   2. Air Balance.
   3. Electrical Requirements for Mechanical Work.

1.3 COOPERATION WITH OTHER TRADES

A. Coordinate this work with work under Division 26 Electrical, to ensure that intended functions of lighting and air systems are achieved.

1.4 SUBMITTALS

A. Submit product data for outlets, grilles, registers, control devices, and similar equipment for review prior to placement of purchase order.

B. Submittal shall include performance sheet for each air device type. Performance sheet shall include NC levels, throw, and total pressure loss at various air flows.

1.5 FINISHES

A. Paint exposed devices with factory standard prime coat, or factory finish coat, as specified.

PART 2 - PRODUCTS

2.1 DIFFUSERS, GRILLES AND REGISTERS - Refer to Drawing Schedule.

2.2 ACCEPTABLE MANUFACTURERS

A. Titus.

B. Krueger.

C. Nailor Industries.

D. Price.

E. Metal-Aire.

2.3 ACCESSORIES

A. Supply Grille Extractors. Provide supply grilles with an air control device capable of positively regulating the volume of air extracted from the supply duct.

Select extractors similar to Titus Model AG25, tight-closing in the minimum position. Include a key-operated or worm-gear adjusting mechanism to facilitate positioning from the grille opening. Where adjustment is not accessible at the grille opening, provide a square control rod equipped with a locking quadrant.

B. Mounting Frames. Provide each grille or register not equipped with a removable core with a companion, all-purpose mounting frame constructed like grille frame to facilitate installation and removal of the grille or register without marring adjacent mounting surfaces.
   1. Furnish frames with 1/2" thick sponge rubber gasket to prevent air leakage.
   2. Provide a frame that neatly fits the grille. Mounting frames will not be required for grilles or registers mounted directly on exposed ductwork.

PART 3 - EXECUTION

3.1 INSPECTION

A. Do not install ceilings adjacent to fixtures until installation of fixtures, air supply assemblies, return-air blank-off strips and flexible duct have been approved. Remove and reinstall any part of the installation found incorrect.

3.2 INSTALLATION

A. Louvered diffuser outlets mount tight against the ceiling. Fasten outlets to ductwork with sheet metal screws. For perforated diffusers, attach the frame assembly by a concealed hinge assembly to an outer frame compatible with the type of ceiling on which the diffuser is installed.

END OF SECTION

SECTION 23 63 00

AIR-COOLED CONDENSING UNITS

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Furnish and install air-cooled condensing units complete with casing, compressor, condenser coil, condenser fan and controls required for a split air conditioning system.

1.2 RELATED WORK

A. Refrigerant Piping.

B. Electrical Provisions of Mechanical Work.

1.3 PERFORMANCE

A. Provide performance as scheduled on drawings, and head pressure control to enable unit to operate in temperatures as low as 20 degrees F. ambient.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Carrier.

B. Trane.

C. Daikin.

D. York.

E. Lennox.

2.2 COMPRESSOR

A. Provide a hermetic or semi-hermetic compressor with crankcase heaters, inherently protected motors, spring mounts and capacity modulation. Provide each compressor with a 5-year warranty.

2.3 CONDENSER COILS

A. Provide copper tubes with mechanically bonded aluminum fins. Protect condenser coils with a heavy gauge, corrosion resistant wire guard.

2.4 FANS AND MOTORS

A. Provide propeller-type fans with direct drive or belt drive and vertical discharge. Protect fan with a heavy-gauge, corrosion resistant wire guard. Provide inherently protected, permanently lubricated, and weatherproof motors.

2.5 CASING

A. Furnish a unit designed for outdoor mounting. Fabricate the casing of heavy gauge steel, zinc coated and finished with enamel. Provide removable access panels.

2.6 CONTROLS

A. Provide safety and operating controls factory wired and mounted in a separate enclosure. Include thermostatic expansion valve, high and low pressure switches and compressor motor overload devices. Furnish a time delay device to prevent short cycling. Employ a control transformer, a pressure relief device and suction and discharge valves with service connections.

2.7 THERMOSTAT

A. Low voltage, 7-day programmable thermostat is a component of the unit manufacturer unless specified in another Section.
   1. Individual Heating/Cooling setpoints.
   2. Automatic Heat/Cool change-over.
   3. Sub-Base On-Off-Auto fan selection.
   4. Sub-Base Heat-Off-Cool-Auto system selection.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Mount condensing units on 4" foundation pads and pipe as shown on Drawings or as recommended by the equipment manufacturer. Install removable core refrigerant filter dryer and sight indicating glass.

3.2 CONTROL WIRING

A. Furnish and install control wiring as required. Install control wiring in conduit.

END OF SECTION

SECTION 23 82 17

DUCTED MINI SPLIT DX UNITS

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Furnish and install mini split system. Complete with a compact, ducted fan coil section with wired wall mounted thermostat and a slim silhouette horizontal discharge outdoor condensing unit. Unit shall be provided with inverter driven compressor, pre-charged with R410A refrigerant. air-cooled condensing units complete with casing, compressor, condenser coil, condenser fan and controls required for a split air conditioning system.

1.2 RELATED WORK

A. Refrigerant Piping.

B. Electrical Provisions of Mechanical Work.

1.3 PERFORMANCE

A. Provide performance as scheduled on drawings, and head pressure control to enable unit to operate in temperatures as low as 20 degrees F. ambient.

1.4 QUALITY ASSURANCE

A. The units shall be tested by a Nationally Recognized Testing Laboratory (NRTL) and bear the ETL label.

B. All wiring shall be in accordance with the National Electrical Code (N.E.C.).

C. The units shall be rated in accordance with Air-conditioning, Heating, and Refrigeration Institute's (AHRI) Standard 210 and bear the AHRI Certification label.

D. The units shall be manufactured in a facility registered to ISO 9001 Quality assurance Standards and ISO 14001 which are set of standards applying to sustainability and environmental protection set by the International Standard Organization (ISO).

E. A pressure charge of R410A refrigerant sufficient for up to twenty-five (25) feet of refrigerant tubing shall be provided in the outdoor condensing unit.

F. A dry air holding charge shall be provided in the indoor section.

1.5 WARRANTY

A. Unit shall have a manufacturer's parts and defects warranty for a period five (5) years from the date of the original installation. The compressor shall have a warranty of seven (7) years from date of installation. Warranties shall start at the date of substantial completion.

PART 2 - PRODUCTS

2.00 ACCEPTABLE MANUFACTURERS

A. Carrier.

B. Daikin.

C. Trane.

D. LG.

2.1 INDOOR UNIT GENERAL

A. The indoor shall be factory assembled, wired and run tested. Contained within the unit cabinet shall be all factory wiring, internal piping, electronic control circuit board and fan with fan motor.

B. The unit shall have a self-diagnostic function, 3-minute time delay mechanism, and auto restart after power interruption function, an emergency operation function and a test run switch.

C. Indoor unit and refrigerant pipes shall be charged with dry air before shipment from the factory. All refrigerant piping must be insulated.

2.2 CABINET

A. The casing shall be constructed from galvanized steel with flanged edges, removable panels for servicing, and insulation on back of panel.

B. Multi directional drain offering four two (2) directions for draining shall be standard.

C. The cabinet shall be located into the ceiling and ducted to the supply and return openings.

D. The cabinet shall be constructed with sound absorbing foamed polystyrene and polyethylene insulation.

2.3 FAN

A. The fan shall be direct-drive DC (ECM) type fan, statically and dynamically balanced impeller with three fan speeds available.

B. The unit shall be equipment with an automatically adjusting external static pressure logic selectable during commissioning.

C. The fan motor shall operate on 208/230 volts, 1 phase, 60 hertz with a motor output range of 0.12 to 0.47 HP respectively.

D. The airflow rate shall be available in three settings.

E. The fan motor shall be thermally protected.

F. The fan motor shall be equipped as standard with adjustable external static pressure (ESP) settings.

2.4 FILTER

A. The units shall be provided with a fabricated rear return angled filter housing (field installed). Filter box shall be configured to accept owner’s standard sizes of 16x20x2, 16x25x2, 20x20x2, 20x25x2 only.

B. Provide minimum MERV 11 filter during construction. Contractor to install clean MERV 13 filters just prior to owner acceptance.

2.5 COIL

A. Coils shall be of the direct expansion type constructed from copper tubes expanded into aluminum fins to form a mechanical bond.

B. The coil shall be of a waffle louver fin and high heat exchange, rifled bore tube design to ensure highly efficient performance.

C. The coil shall be a 3 row cross fin copper evaporator coil with 13 FPI design completely factory tested.

D. The refrigerant connections shall be flare connections and the condensate will be 1-1/4" outside diameter PVC.

E. A condensate pan shall be located under the coil.

F. A condensate pump with an 18-3/8" lift shall be located below the coil in the condensate pan with a built in safety alarm.

G. A thermistor will be located on the liquid and gas line.

2.6 ELECTRICAL

A. Power for the indoor unit shall be supplied from the outdoor unit.

B. Power supply shall be as indicated on the drawings.

C. The unit shall be equipped with a micro-processor control system directing indoor and outdoor unit coordinated operation.

2.7 CONTROL

A. This system shall have a wired wall mounted thermostat/controller to perform input functions necessary to operate the system. The controller shall consist of a Power On / Off switch, Mode Selector, Temperature Setting, Timer Control, Fan Speed Select and Auto Vane Selector.

B. Temperature changes shall be by 1°F increments with a range of 65°F to 87°F.

C. There shall be a 24 hour On / Off timer.

D. The microprocessor located in the indoor unit shall have the capability of sensing return air temperature and indoor coil temperature, receiving and processing commands from the space controller, providing emergency operation and controlling the outdoor unit.

E. The control voltage between the indoor unit and the outdoor unit shall be 115 volts, AC.

F. The system shall be capable of automatic restart when power is restored after power interruption.

G. The control system shall control the operation of the air sweep louvers, as well as provide on / off and system / mode function switching.

2.8 OUTDOOR UNIT GENERAL

A. The outdoor unit is designed specifically for use with the indoor units. The outdoor unit shall be completely factory assembled, internally piped and wired. Each unit shall be run tested at the factory.

B. When refrigerant lines are exposed on exterior of building provide “LINE-HIDE” line set cover system.
   1. Material, Weather resistant, UV stabilized, ASA/PVC/ABS/Poly/PE
   2. Assembly Screws, stainless steel.

2.9 UNIT CABINET

A. The casing shall be fabricated from zinc coated steel, bonderized with an electrostatically applied, thermally bonded, acrylic or polyester powder coating for corrosion protection.

B. Case and mounting feet shall be as follows:
   1. The base shall be of Aluminum-Zinc-Magnesium alloy coated steel, with welded mounting feet.

C. Cabinet mounting and construction shall be sufficient to withstand 155 MPH wind speed conditions for use in Hurricane condition areas. Mounting, base support, and other installation to meet Hurricane Code Conditions shall be by others.

2.10 FAN

A. The unit shall be furnished with a directive drive propeller type fan, statically and dynamically balanced for smooth and quiet operation.

B. The fan motor shall have inherent protection, be equipped with permanently lubricated bearings. The fan motor shall be mounted and isolated for quiet operation.

C. The fan shall be provided with a raised guard to prevent contact with moving parts.

D. The outdoor unit shall have horizontal discharge airflow.

2.11 COMPRESSOR

A. The compressor shall be a high performance, inverter driven rotary type.

B. Compressor shall be mounted using rubber isolating bushings to avoid the transmission of vibration.

C. Compressor shall be protected by an automatic over current relay and a thermal overload switch.

2.12 OPERATION

A. The outdoor unit shall have an accumulator.

B. The outdoor unit must have the ability to operate with a maximum height difference of 35 feet between indoor and outdoor units.

C. The unit shall have a maximum refrigerant tubing length of 65 feet between indoor and outdoor units without the need for line size changes, traps or additional oil. All refrigerant lines must be insulated.

D. The unit shall be pre-charged for a maximum of 25 feet of refrigerant tubing.

2.13 ELECTRICAL

A. Power supply shall be as indicated on the drawings.

B. The outdoor unit shall be controlled by the microprocessor located in the indoor unit. The control voltage between the indoor unit and the outdoor unit shall be 115 volts, AC.

2.14 WALL BRACKET

A. As indicated on the drawings, provide each unit 3 tons and below with a stainless steel mini-split condenser bracket.

B. Unit shall be constructed for a maximum weight of 300 lbs.

C. Unit shall be manufactured by Rectorseal model #WBB-300SS or Diveritech model #QSWB4000SS.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Mount condensing units on 4" foundation pads and pipe as shown on Drawings or as recommended by the equipment manufacturer. Install refrigerant filter dryer and sight indicating glass.

B. Install units on vibration isolation pads.

C. Ensure unit provided will meet the refrigerant and line lengths required by the installation as indicated on the drawings.

D. Provide convenience water and electrical within 50 feet of new condensing unit.

3.2 CONTROL WIRING

A. Furnish and install control wiring as required. Install control wiring in conduit.

3.3 DELIVERY, STORAGE AND HANDLING

A. Unit shall be stored and handled according to the manufacturer’s recommendations.

B. The wired controller shall be shipped inside the carton with the indoor unit and able to withstand 105°F storage temperatures and 95% relative humidity without adverse effect.

3.4 START-UP

A. Follow the manufacturer's start-up procedures.

B. Provide flexible elastomeric rubber closed cell insulation to prevent condensation from occurring op suction piping. After completion of successful start-up, installing contractor shall seal all openings in insulation and apply a protective aluminum sheetmetal jacket over insulation exposed on exterior of building.

END OF SECTION

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SECTION 23 82 23

GAS FIRED FURNACE WITH DX EVAPORATOR

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Floor mounted high efficiency gas fired furnace with DX evaporator configured for a vertical installation.

1.2 RELATED WORK

A. Division 23 Mechanical
   1. Air Balance.
   2. Controls.
   3. Electrical Provisions of Mechanical Work.
   4. Ductwork.
   5. Air filtration.

1.3 REFERENCES

A. ANSI/AHRI 410 - force circulation air cooling and air heating coils.

B. National Electrical Code.

1.4 SUBMITTALS

A. Submit manufacturer's dimensioned product data sheets.
   1. Show location of filter access doors.

B. Submit fan performance curve for each unit:
   1. Plot fan volume against static pressure, horsepower and efficiency.
   2. Show point of rating based on static requirements of the system.

C. Submit the fan performance plot at each motor speed position with consideration for the reduced internal static.

D. Submit a chart of specific sound power level at each octave band center frequency.

E. Submit manufacturer's certified heating and cooling coil capacity data.

F. Submit filter manufacturer's product data sheets and capacity information.

G. Submit manufacturer's data on housing insulation material.

1.5 CAPACITY

A. Refer to equipment schedule.

1.6 WARRANTY

A. Provide a full parts and labor warranty for a period of one year. Warranty shall start the date of the substantial completion certificate. Warranty shall be provided by manufacturer only.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Carrier.

B. Trane.

C. Lennox.

D. York.

E. Daikin.

2.2 COMPONENTS

A. Direct Expansion coil section.

B. Fan section with a direct drive blower.

C. Gas fired furnace section.

D. Filter section.

E. Insulated sheet metal cabinet with removable panels for access to the interior.

2.3 DIRECT EXPANSION EVAPORATOR SECTION

A. Coil module shall be designed for either a vertical or horizontal installation as indicated on drawings.

B. Reference Schedule and Specification Section 23 82 16.

C. Coil module shall be designed to avoid condensate blow off and moisture carry over into ductwork.

D. Coil shall be provided with a corrosion resistant IAQ style drain pan.

2.4 FAN SECTION AND GAS FIRED FURNACE

A. Locate the motor and drive assembly inside the cabinet.

B. Fan motor shall be a multi-speed direct drive ECM type with integrated vibration isolation.

C. Select the fan motor so that the brake horsepower required to deliver the design air quantity at the system static pressure will not exceed the motor nameplate amperage rating.

D. Select fan to operate at or near its maximum efficiency point when handling the required air quantity and static pressure.

E. Furnace shall be a pilot free, hot surface power heat ignition with single stage operation. Induction motor shall be a fixed speed motor.

F. Primary heat exchanger shall be an aluminized steel clamshell design and the secondary heat exchanger shall be a stainless steel fin and tube design.

2.5 UNIT CABINET

A. Construct the unit of galvanized steel sheets, and formed members.
   1. Provide structure to brace the assembly for the pressure of the system.

B. Cabinet shall be fully internally insulated and be equipped with a noise reduction insulating system.

C. Insulation, vapor barriers, facings and adhesives:
   1. Flame spread not higher than 25.
   2. Smoke developed rating not higher than 50.

D. Condensation on the exterior of the unit is not approved.

E. Provide a duct flange on four sides of the return air inlet and supply air outlet of the unit.
   1. Sized to permit connection of the flexible connection to the ductwork.
   2. Extend beyond the primary drain pan.
   3. Minimum dimension 2".

F. Provide insulated, removable panels for access to the interior.
   1. Plated captive screws and nuts.
   2. Neoprene gaskets.

2.6 FILTER SECTION

A. Locate behind access doors.
   1. Construct with substantial hinges.
   2. Neoprene gaskets.
   3. Permanent quick-release latching devices.

B. Arranged to accommodate the 1" thick filters as specified.
   1. Single section filter.

C. Provide full length tracks to support the filter.

PART 3 - EXECUTION

3.1 SPARE PARTS

A. Provide the following spare parts and material to the Owner for use after the warranty period.
   1. One spare fan motor for each size of fan motor on the project.
   2. One spare set of filters or filter media for each fan coil unit on the project.

3.2 ELECTRICAL REQUIREMENTS

A. Bring electrical connections to a common junction box.

3.3 STORAGE

A. Storage and shipping in accordance with manufacturer's recommendations.

3.4 INSTALLATION

A. Install unit so motor connections and filters are accessible.

END OF SECTION

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SECTION 23 82 39

ELECTRIC UNIT HEATERS

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Provide and install electric unit heaters complete with heating element, propeller mounting brackets and other options as specified.

1.2 RELATED WORK

A. Division 23 - Mechanical.
   1. Electrical Provisions of Mechanical Work.
   2. Ductwork.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Modine.

B. Reznor.

C. Chromalox.

D. Trane.

E. Markel.

2.2 COMPONENTS

A. Casing:
   1. Construct casing of sheetmetal with a structural frame.
   2. Enamel or lacquer finish to manufacturers standard.

B. Electric Heating Elements:
   1. Shall bear the UL label.
   2. Corrosion resistant materials.
   3. Heating coil of 80-20 nickel-chrome wire.

C. Components:
   1. Fused control circuits
   2. Contactors in accordance with the staging requirements.
   3. Control power transformer.
   4. Control voltage 120.

D. Louvers:
   1. Adjustable vertical and horizontal louvers for air discharge.

E. Mounting brackets:
   1. As indicated.

2.3 CONTROLS

A. Automatic controls:
   1. Factory mounted.
   2. Prewired to the junction box.
   3. Unit mounted thermostats 24-volt low voltage.

B. Safety Controls:
   1. A primary and secondary thermal cut-off to de-energize each circuit.
   2. Manual reset high limit.
   3. Automatic reset thermal protection.

2.4 FAN

A. Propeller blade fan:
   1. Construct the fan of aluminum or other corrosion-resistant material.
   2. Statically and dynamically balanced.
   3. Substantial fan guard.

2.5 MOTOR

A. Totally enclosed ball bearing motor:
   1. Permanently lubricated bearings.
   2. 120 volt, single phase, 60 cycle motor.
   3. Sized to operate the fan at the required capacity.

2.6 ELECTRICAL

A. Single point connection:
   1. Factory wiring.
   2. Only direct line supply and thermostat field connections.
   3. Terminal blocks for line voltage wiring.
   4. Wiring diagram permanently attached.
   5. Balance phases.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Furnish units with suitable connections for mounting as shown or as otherwise approved.

B. Provide start-up to ensure correct operation of unit.

C. Adjust discharge louvers to control direction of air flow.

END OF SECTION

SECTION 26 05 00

ELECTRICAL GENERAL PROVISIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Except as modified in this Section, General Conditions, and Supplementary Conditions, applicable provisions of Division 1 General Requirements, and other provisions and requirements of the Contract Documents apply to work of Division 26 Electrical.

B. Applicable provisions of this section apply to all sections of Division 26, Electrical.

1.2 CODE REQUIREMENTS AND FEES

A. Perform work in accordance with applicable statutes, ordinances, codes and regulations of governmental authorities having jurisdiction.

B. Electrical work shall comply with applicable inspection services:
1. Underwriters Laboratories.
2. National Fire Protection Association.
3. State Health Department.
4. Local Municipal Building Inspection Department adopted codes with amendments.
5. National Electrical Code with local amendments.
6. State Regulatory Agencies.
7. Where the project is located outside a municipal jurisdiction, and has no municipal inspection services, the National Electrical Code with amendments of the municipality with extraterritorial jurisdiction shall govern.
8. Where the project is located outside any municipal jurisdiction, including extraterritorial jurisdictions, the National Electrical Code with local adopted amendments of the largest municipality located in the same county or parish shall govern.
9. International Energy Conservation Code.
10. National Electrical Safety Code.

C. Resolve any code violations discovered in contract documents with the Engineer prior to award of the contract. After Contract award, any correction or additions necessary for compliance with applicable codes shall be made at no additional cost to the Owner.

D. This Contractor shall be responsible for being aware of and complying with asbestos NESHAP regulations, as well as all other applicable codes, laws and regulations.

E. Obtain all permits required.

1.3 CONTRACTOR'S QUALIFICATIONS

A. An approved contractor for the work under this division shall be:
1. A specialist in this field and have the personnel, experience, training, and skill, and the organization to provide a practical working system.
2. Able to furnish evidence of having contracted for and installed not less than 3 systems of comparable size and type that has served their Owners satisfactorily for not less than 3 years.

1.4 REFERENCE SPECIFICATIONS AND STANDARDS

A. Materials which are specified by reference to Federal Specifications; ASTM, ASME, ANSI, APWA, or AWWA Specifications; Federal Standards; or other standard specifications must comply with latest editions, revisions, amendments or supplements in effect on date proposals are received. Referenced specifications and standards are minimum requirements for all equipment, material and work. In instances where specified capacities, size or other features of equipment, devices or materials exceed these minimums, meet specified capacities.

B. Use electrical materials and equipment that is constructed and tested in accordance with the standards of NEMA, ANSI, ASTM, or another recognized commercial standard. If materials and equipment is labeled, listed, or recognized by any Nationally Recognized Testing Laboratory (NRTL) acceptable to the Occupational Safety and Health Administration (OSHA), then provide NRTL-labeled, listed, or recognized material and equipment. Acceptable NRTLs include but are not limited to:
   1. Underwriters Laboratories, Inc. (UL).
   2. Factory Mutual Research Corp. (FMRC) (also referred to as “Factory Mutual Global,” or “FM Global”).
   3. Intertek Testing Services NA, Inc. (ITSNA, formerly ETL)
   4. Canadian Standards Association (CSA).
   5. A complete listing of acceptable NRTLs is published on the OSHA website at http://www.osha.gov/dts/otpca/nrtl/.

C. Where material and equipment are not labeled, listed, or recognized by any NRTL, provide a manufacturer’s Certificate of Compliance indicating complete compliance of each item with applicable standards of NEMA, ANSI, ASTM, or other recognized commercial standard.

D. Do not install or use electrical material or equipment for any use other than that for which it was designed, labeled, listed, or identified unless formally approved for such use by the Owner’s AHJ. This *National Electrical Code*® requirement is re-stated for emphasis.

E. Codes and Standards applicable to this Division:
   1. ANSI – American National Standards Institute
      a. ANSI Z535.1, Safety Colors.
      b. ANSI Z535.2, Environmental and Facility Safety Signs.
      c. ANSI Z535.3, Criteria for Safety Symbols.
      d. ANSI Z535.4, Product Safety Signs and Labels.
   2. ASHRAE – American Society of Heating, Refrigeration, and Air Conditioning Engineers:
      a. ASHRAE Standard 90.1, *Energy Standards for Buildings Except for Low Rise Residential Buildings [ANSI, IESNA].*
   3. ASTM – American Society for Testing and Materials.
   4. CBM – Certified Ballast Manufacturers.
   5. ICC – International Code Council
      a. International Building Code® (IBC).
      b. International Existing Building Code® (IEBC).
   6. ICEA – Insulated Cable Engineers Association
      a. ICEA S-93-639, *Shielded Power Cables 5-46kV* (NEMA WC-74).
   7. IEEE® - Institute of Electronics and Electrical Engineers
      a. IEEE C2™, *National Electrical Safety Code* (NESC) [ANSI].
      b. IEEE Std 141™, *Recommended Practice for Electric Power Distribution for Industrial Plans* (“Red Book”) .
      c. IEEE Std 143™, *Recommended Practice for Grounding of Industrial and Commercial Power Systems* (“Green Book”).

d. IEEE Std 241™, *Recommended Practice for Electric Power Systems in Commercial Buildings* (“Gray Book”).
e. IEEE Std 242™, *Recommended Practice for Protection and Coordination of Industrial and Commercial Power Systems* (“Buff Book”).
f. IEEE Std 315™, *Graphic Symbols for Electrical and Electronics Diagrams.*
g. IEEE Std 399™, *Recommended Practice for Power Systems Analysis* (“Brown Book”).
h. IEEE Std 446™, *Recommended Practice for Emergency and Standby Power Systems for Industrial and Commercial Applications* (“Orange Book”).
i. IEE Std 493™, *Recommended Practice for the Design of Reliable Industrial and Commercial Power Systems* (“Gold Book”).
j. IEEE Std 519™, *Recommended Practices and Requirements for Harmonic Control in Electrical Power Systems.*
k. IEEE Std 739™, *Recommended Practice for Energy Management in Industrial and Commercial Facilities* (“Bronze Book”).
l. IEEE Std 902™, *Guide for Maintenance, Operation, and Safety of Industrial and Commercial Power Systems* (“Yellow Book”).
m. IEEE Std 1015™, *Recommended Practice Applying Low-Voltage Circuit Breakers Used in Industrial and Commercial Power Systems* (“Blue Book”).
n. IEEE Std 11oo™, *Recommended Practice for Powering and Grounding Electronic Equipment* (“Emerald Book”).
o. IEEE Std 1584™, *Guide for Performing Arc-Flash Hazard Calculations*

8. IESNA – Illuminating Engineering Society of North America
   a. IESNA *Lighting Handbook*, Ninth Edition.
   b. IESNA RP-1, *American National Standard Practice for Office Lighting.*
   c. IESNA RP-7, *American National Standard Practice for Lighting Industrial Facilities.*
9. NECA – National Electrical Contractors Association:
   a. NECA 1, *Good Workmanship in Electrical Construction* [ANSI].
   b. NECA 90, *Recommended Practice for Commissioning Building Electrical Systems* [ANSI].
   c. NECA 100, *Symbols for Electrical Construction Drawings* [ANSI].
   d. NECA 101, *Standard for Installing Steel Conduits (Rigid, IMC, EMT)* [ANSI].
   e. NECA 104, *Recommended Practice for Installing Aluminum Building Wire and Cable* [ANSI].
   f. NECA / NEMA 105, *Recommended Practice for Installing Metal Cable Tray Systems* [ANSI].
   g. NECA 111, *Standard for Installing Nonmetallic Raceways (RNC, ENT, LFNC)* [ANSI].
   h. NECA / NACNA 120, *Standard for Installing Armored Cable (Type AC) and Metal-Clad Cable (Type MC)* [ANSI].
   i. NECA 202, *Recommended Practice for Installing and Maintaining Industrial Heat Tracing Systems* [ANSI].
   j. NECA 230, *Standard for Selecting, Installing and Maintaining Electric Motors and Motor Controllers* [ANSI].
   k. NECA 331, *Standard for Building and Service Entrance Grounding and Bonding.*
   l. NECA 400, *Standard for Installing and Maintaining Switchboards* [ANSI].
   m. NECA 402, *Standard for Installing and Maintaining Motor Control Centers* [ANSI].
   n. NECA / EGSA 404, *Standard for Installing Generator Sets* [ANSI].

o. NECA 407, *Recommended Practice for Installing and Maintaining Panelboards* [ANSI].
p. NECA 408, *Recommended Practice for Installing and Maintaining Busways* [ANSI].
q. NECA 409, *Recommended Practice for Installing and Maintaining Dry-Type Transformers* [ANSI].
r. NECA 410, *Recommended Practice for Installing and Maintaining Liquid-Filled Transformers* [ANSI].
s. NECA 411, *Recommended Practice for Installing and Maintaining Uninterruptible Power Supplied (UPS)* (ANSI].
t. NECA 420, *Standard for Fuse Applications* [ANSI].
u. NECA 430, *Standard for Installing Medium-Voltage Metal-Clad Switchgear* [ANSI].
v. NECA / IESNA 500, *Recommended Practice for Installing Indoor Lighting Systems* [ANSI].
w. NECA / IESNA 501, *Recommended Practice for Installing Exterior Lighting Systems* [ANSI].
x. NECA / IESNA 502, *Recommended Practice for Installing Industrial Lighting Systems* [ANSI].
y. NECA / MACSCB 600, *Recommended Practice for Installing and Maintaining Medium-Voltage Cable* [ANSI].
z. NECA / NEMA 605, *Installing Underground Nonmetallic Utility Duct* [ANSI].

10. NEMA – National Electrical Manufacturers Association.
11. NETA – International Electrical Testing Association, Inc.:
    a. NETA ATS, *Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.*
    b. NETA MTS, *Maintenance Testing Specifications for Electrical Power Distribution Equipment and Systems.*
    c. NETA ETT, *Standard for Certification of Electrical Testing Technicians* [ANSI].
12. NFPA – National Fire Protection Association:
    a. NFPA 20®, *Standard for the Installation of Stationary Pumps for Fire Protection*®
    b. NFPA 70™, *National Electrical Code® (NEC®).*
    c. NFPA 70E, *Standard for Electrical Safety in the Workplace.*
    d. NFPA 101®, Life Safety Code®.
    e. NFPA 110, *Standard for Emergency and Standby Power Systems.*
    f. NFPA 111, *Standard on Stored Electrical Energy Emergency and Standby Power Systems.*
    g. NFPA 780, *Standard for the Installation of Lightning Protection Systems.*
    h. All other NFPA codes and standards except NFPA 5000.
13. OSHA – Occupational Safety and Health Administration.
14. IECC – International Energy Conservation Code.
15. ISO – International Organization for Standardization.
16. State and Local Energy Conservation Code.
17. Applicable County and Municipal Codes.

1.5 CONTRACT DRAWINGS

A. Contract drawings are diagrammatic only and do not give fully dimensioned locations of various elements of work. Determine exact locations from field measurements.

B. Every effort has been made by the Engineer to indicate wiring of all receptacles, light fixtures, switches, telephone outlets, HVAC equipment, other equipment, elevator equipment, and all other devices / appliances requiring electrical power. It is the intent of

the Engineer that all light fixtures be powered and controlled unless specifically noted on the plans; that all wiring devices (receptacles and direct connected equipment) be circuited to a power source of the correct voltage and that all HVAC, elevator equipment and other equipment be properly wired to the correct voltage power source; that all communications and security systems devices and equipment and all fire alarm system devices and equipment are installed, wired and systems are fully operational.

C. It is the responsibility of the Contractor to review the construction drawings (reflected ceiling plans) for light fixtures, casework elevation details for electrical devices which are not indicated on the electrical drawings; to review the mechanical and plumbing documents and all other drawings to determine the electrical rough-ins for all equipment requiring power connections, and to include in their proposals the correct and complete electrical rough-ins for all of these items which were inadvertently not indicated on the electrical drawings, OR the Contractor shall specifically enumerate each item requiring electrical rough-in which is not specifically shown on the electrical drawings, and indicate the electrical provisions of these items as specifically excluded from his proposal.

D. It is the responsibility of the Contractor to compare the scale of all electrical drawings with the scale of the architectural drawings and make adjustments to all electrical drawings which have the incorrect drawing scale so that his material takeoffs are not in error due to an incorrectly labeled drawing scale and his proposal is complete.

E. No proposal shall be accepted which specifically excludes any of the provisions of paragraphs B, C, or D above.

1.6 PROJECT RECORD DOCUMENTS

A. Maintain at the job site a separate set of white prints (black line) of the contract drawings for the sole purpose of recording the "as-built" changes and diagrams of those portions of work in which actual construction is significantly at variance with the contract drawings. Mark the drawings with a colored pencil. Prepare, as the work progresses and upon completion of work, reproducible drawings clearly indicating locations of various major and minor feeders, equipment, and other pertinent items, as installed. Record underground and under slab service and feeders installed, dimensioning exact location and elevation of such installations.

B. At conclusion of project, obtain without cost to the Owner, electronic PDF and AutoCAD 2014 and / or Revit CAD files of the original drawings and transfer as-built changes to these. Provide the following as-built documents including all contract drawings regardless of whether corrections were necessary and include in the transmittal: “2 sets of CDs and prints for Owner’s use, one set of CDs, prints, and mylars for Architect / Engineers Records”. Delivery of these as-built electronic, reproducibles and prints is a condition of final acceptance.
   1. 3 sets of electronic AutoCAD (2014 dwg) and / or Revit CAD drawing files, on CD-ROM media, of each contract as-built drawing.
   2. One reproducible Dayrex Mylar film positive of each contract as-built drawing.
   3. Three sets of blue-line prints of each contract as-built drawing.
   4. Three sets of pdf prints of each contract as-built drawing on CD.

C. As-Built Drawings should indicate the following information as a minimum:
   1. Indicate all addendum changes to documents.
   2. Remove Engineer’s Seal, name, address, and logo from drawings.
   3. Mark documents RECORD DRAWINGS.
   4. Clearly indicate: DOCUMENT PRODUCED BY:
   5. Indicate all changes to construction during construction. Indicate actual routing of all conduits, etc. that was deviated from construction drawings.

6. Indicate exact location of all underground electrical raceways, and elevations.
7. Correct schedules to reflect (actual) equipment furnished and manufacturer.
8. During the execution of work, maintain a complete set of Drawings and specifications upon which all locations of equipment, devices, and all deviations and changes from the construction documents in the work shall be recorded.
9. Exact location of all electrical equipment in building. Label panel schedules to indicate actual location.
10. Exact location of all electrical equipment in and outside of the building.
11. Exact location of all outdoor lighting poles and equipment.
12. Location, size and routing of all feeder conduits, equipment, etc. shall be accurately and neatly shown to dimension.
13. Exact location of all roof mounted equipment, wall, roof and floor penetrations.
14. Cloud all changes.
15. Update all panel schedules with all additional circuits added or deleted through construction. Identify each circuit to include all information specified for directory cards for circuit identification in panelboards.

1.7 SPACE REQUIREMENTS

A. Consider space limitations imposed by contiguous work in selection and location of equipment and material. Do not provide equipment or material that is not suitable in this respect.

1.8 RELATION WITH OTHER TRADES

A. Carefully study all matters and conditions concerning the project. Submit notification of conflict in ample time to prevent unwarranted changes in any work. Review other Divisions of these specifications to determine their requirements. Extend electrical services and final connections to all items requiring same.

B. Because of the complicated relationship of this work to the total project, conscientiously study the relation and cooperate as necessary to accomplish the full intent of the documents.

C. Provide sleeves and inserts in forms as required for the work. Stub up and protect open ends of pipe before any concrete is placed. Furnish sizes of required equipment pads. Furnish and locate bolts and fittings required to be cast in them.

D. Locate and size openings required for installation of work specified in this Division in sufficient time to prevent delay in the work.

E. Refer to other Divisions of the specifications for the scope of required connections to equipment furnished under other Division. Determine from the General Contractor / Construction Manager for the various trades, the Owner, and by direction from the Architect / Engineer, the exact location of all items. The construction trades involved shall furnish all roughing-in drawings and wiring diagrams required for proper installation of the electrical work.
   1. Make final electrical connections to all electrically operated equipment indicated on the drawings, except as noted.
   2. The responsibility for alignment of motor and driven equipment is specified in the related division.

F. Request all Shop Drawings required in ample time to permit proper installation of all electrical provisions.

G. Extend services as indicated to the various items of equipment furnished by others. Rough-in for the various items and make final connections ready for operation upon placing of the equipment.

1.9 CONCEALED AND EXPOSED WORK

A. When the word "concealed" is defined as hidden from sight as in chases, furred spaces or above ceilings. "Exposed" is defined as open to view, in plain sight.

1.10 GUARANTEE

A. Guarantee work for 1 year from the date of substantial completion of the project. During that period make good any faults or imperfections that may arise due to defects or omissions in material, equipment or workmanship. Replacement of failed parts or equipment shall be provided.

1.11 MATERIAL AND EQUIPMENT

A. Furnish new and unused materials and equipment meeting the requirements of the paragraph specifying acceptable manufacturers. Where two or more units of the same type or class of equipment are required, provide units of a single manufacturer.

1.12 NOISE AND VIBRATION

A. Select equipment to operate with minimum noise and vibration. If noise or vibration is produced or transmitted to or through the building structure by equipment, piping, ducts or other parts of work, and judged objectionable by the Owner, Architect, or Engineer, rectify such conditions at no additional cost to the Owner. If the item of equipment is judged to produce objectionable noise or vibration, demonstrate at no additional cost that equipment performs within designated limits on a vibration chart.

1.13 ACCEPTABLE MANUFACTURERS

A. Manufacturers names and catalog number specified under sections of Division 26 are used to establish standards of design, performance, quality and serviceability and not to limit competition. Equipment of similar design, materials, energy efficiency characteristics (where applicable) and lighting performance characteristics (where applicable) equal to that specified, manufactured by a named manufacturer shall be acceptable on approval. Written notification of intent to use manufacturers other than those specified is required ten days prior to bid. Submittals shall be reviewed only after bidding and may be rejected if any aspect of the equivalent product is deemed lesser than that of the specified product by the specifier. The contractor shall be responsible for ensuring alternates are equivalent to those specified.. Submit a marked-up set of the relevant specification section indicating all variances, a comparison to the specified product, and of construction and performance criteria, complete design and performance data for the specified product and the proposed substitution for comparison to the Engineer. The Architect issues approvals of acceptable manufacturers as addenda to the Construction Proposal Documents.

1.14 UTILITIES, LOCATIONS AND ELEVATIONS

A. Locations and elevations of the various utilities included within the scope of this work:
   1. Obtained from utility maps and other substantially reliable sources.
   2. Are offered separate from the Contract Documents as a general guide only without guarantees to accuracy.

B. Examine the site and verify the location and elevation of all utilities and of their relation to the work. Existing utilities indicated on the site plans are for reference only and shall be field verified by the Contractor with the respective public or private utility.

1.15 OPERATING TESTS

A. After all electrical systems have been completed and put into operation, subject each system to an operating test under design conditions to ensure proper sequencing and operation throughout the range of operation. Tests shall be made in the presence of the Architect / Engineer and Owner. Provide minimum 24-hour advance notice of scheduling of all tests. Make adjustments as required to ensure proper functioning of all systems. Special tests on individual systems are specified under individual sections. Submit 3 copies of all certifications and test reports adequately in advance of completion of the work to allow for remedial action as required to correct deficiencies discovered in equipment and systems.

1.16 WARRANTIES

A. All normal and extended warranties shall include parts, labor, miscellaneous materials, travel time, incidental expenses, normal freight / shipping, refrigerant, oils, lubricants, belts, filters and any expenses related to service calls required to diagnose and correct warranty problems.

B. Manufacturer’s warranty shall be from one year from date of substantial completion. Contractor shall be responsible for extending the warranties regardless of date of installation or commissioning.

C. Submit 3 copies of all warranties and guarantees for systems, equipment, devices and materials. These shall be included in the Operating and Maintenance Manuals.

1.17 BUILDING CONSTRUCTION

A. It shall be the responsibility of the sub-contractor to consult the Contract Drawings, details and specifications and thoroughly familiarize himself as to the construction and all job-related requirements. All construction trades shall cooperate with the General Contractor / Construction Manager Job site superintendent and lay out work so that all raceways and other items are placed in the walls, furred spaces, chases, etc., so that there shall be no delay in the job.

1.18 TEMPORARY FACILITIES

A. General: Refer to Division 1 for general requirements on temporary facilities.

B. Temporary Wiring: Temporary power and lighting for construction purposes shall be provided under this Division. Installation of temporary power shall be in accordance with NEC Article 527.

C. Temporary facilities, wire, lights and devices are the property of this Contractor and shall be removed by this Contractor at the completion of the Contract.

PART 2 - PRODUCTS – NOT USED

PART 3 - EXECUTION

3.1 IDENTIFICATION OF EQUIPMENT

A. Identification of Equipment:

1. All major equipment shall have a manufacturer's label identifying the manufacturer's address, equipment model and serial numbers, equipment size, and other pertinent data. Take care not to obliterate this nameplate. The legend on all nameplates or tags shall correspond to the identification shown on the Operating Instructions. All panels, cabinets, or equipment requiring 120 volt or higher power shall be labeled as required which includes circuit designation and circuit panelboard location, regardless of which discipline installs the equipment.
2. Three layer laminated plastic engraved identifying nameplate shall be permanently secured to each switchboard, distribution panel, motor control center, transformer, panelboard, safety disconnect switch, enclosed circuit breaker, transfer switches, remote generator transfer deices not installed inside light fixtures, wireway, busduct plug, terminal cabinet, surge protective device, capacitor, individual motor controller, contactor, fire alarm panels (main and remote booster), and communications (voice, data, video) cabinet or rack, security panels, time clocks, BMCS cabinets, sound reinforcement cabinets and racks, miscellaneous control cabinets, equipment integral disconnect switches, toggle or motor switches, disconnects for equipment, exterior junction boxes, exterior pull boxes, exterior wireways and gutters, and rooftop equipment (i.e.: supply and exhaust fans, rooftop HVAC equipment) with stainless steel screws.
   a. Utility Power: White letters on black background.
      Generator Power (White letters on red background.
      UPS Power: White letters on blue background.
      Load Bank Circuits: White letters on green background.
      Solar or Wind Power Generation: White on orange background.
   b. Identifying nameplates shall have 1/2-inch high, engraved letters for equipment designation and ¼-inch letters indicating source circuit designation, (i.e.: “PANEL HA –fed from MDP-6 located in Mech. Rm. 100”). The words “fed from” and “located” shall be included in the labeling.
      Example: Panel HA
      Fed From MSB
      Located Main Elec. RM 100
      Example: Disconnect for Panel LK
      Location: Kitchen
      Fed From Transformer TLK
      Located Main Elec. RM 100
   c. Each switchboard, distribution panel, transfer switch, generator transfer device (GTD) for emergency lighting, and motor control center feeder or branch circuit device shall have a nameplate showing the load and location of load served in ¼-inch high, engraved letters. Circuit breaker name and kirk key designation if applicable.
   d. Each section of multiple section panelboards shall also indicate panelboard section number (i.e.: Panel “HA-Section 2 – fed from MDP-6 located in Mech. Rm. 100”).
   e. Motor Controllers, starters, and contactors: Provide neatly typed label inside each motor controller and contactor enclosure door identifying motor or load served, nameplate horsepower, full load amperes, code letter, service factor, and voltage / phase rating.
   f. Individual motor controller and contactor nameplates shall include load served, location of load served, panel and circuit numbers serving load, location of panel serving load, panel and circuit number serving control

circuit, location of panel serving control circuit (if different from panel serving load), description and location (if applicable) of control controlling contactor (i.e. Controlled: Switch in RM 100, and Controlled: BMCS). Contactor nameplate is to include whether it is a lighting or receptacle contactor and name of contactor. i.e., C-1.

Lighting Contactor Example	Receptacle Contactor Example
Lighting Contactor C1 West Parking Lot Pole Lights Fed From Panel HA-2,4,6 Located Main Elec. Rm. 100 Control Circuit-Panel LA 42 Located Main Elec. Rm. 100 Controlled-BMCS	Receptacle Contactor C2 Table Recpts Lab Rm 100 Fed From Panel LA-2,4,6,8 Located Mech. Rm. 110 Control Circuit-Panel LA-42 Controlled-Emer Shut Off Mushroom Switch Rm 101
GTD Example	
Exterior lighting wall packs / north soffit / west metal canopy Fed from Panels EHA-2 located in Elec. RM 105 and HA-1 via Lighting Contactor controlled by BMCS located in Elec. RM 200.	

g. Exterior J-boxes, pull boxes, and gutters shall have panel identification, circuit numbers, and location of panel listed on name plate. Low voltage shall be identified per contents, examples: DATA, BMCS, F/A.

h. Name plates on equipment served from switchboards, distribution panels, I-Line panels, and motor control centers are not to include circuit numbers shown on drawings as the circuit numbers are for construction drawing purposes only.

i. Panel names for 277/480v shall start with the letter “H” and 120/208v, 120/240v shall start with the letter “L”. No panel shall be named to include a number other than multi sectional panels, example HA-section 2. New panels installed in renovation or site additions shall have names approved or designated by Owner’s electrical representative. Panel names shall not include the letter “I”. Transformer names shall start with the letter “T” followed by the panel name it serves, i.e., TLA.

j. Main service ATS label shall include equipment name, emergency source and location, normal power source and location, panel served and location. Wall mounted ATS serving lighting loads shall include type of lighting and location, emergency panel and circuit ID and location of panel, normal panel and circuit ID and location of panel.

Main Service ATS Example ATS-1	Wall Mounted Lighting ATS Example ATS
Emer Power-Emer Generator Located Chiller Yard Normal Power-MSB Located-Mech Rm 100 Serves Panel EHA Located-Mech Rm 100	Exterior Wall Packs/Soffit Lights North/West Metal Canopy Lights Fed from EHA-2 Located Mech Rm 200 Fed From HB-4 Located Mech Rm 150

k. Name plates shall include rated bus amperage, voltage, number of phases, number of wires and type of essential electrical system as applicable.

l. Switchgear, switchboards, panelboards, motor control centers, or service equipment available fault current labeling: Provide a 2x3 inch permanently affixed (notice) label with white lettering on contrasting blue background permanently affixed to the equipment prior to energizing the equipment. The label shall include the date of installation and the date of

calculation and comply with ANSI Z535.4 current standards design and durability. The date of calculation shall be the date indicated by the Engineer of Record's seal on the Construction Documents. Example:

AVAILABLE FAULT CURRENT: ##, ### AMPS
DATE OF INSTALLATION: MM/DD/YY
DATE OF CALCULATION: MM/DD/YY

3. Cardholders and directory cards shall be furnished for circuit identification in panelboards. Cardholder shall be located on inside of panel door and shall be in a metal frame with clear plastic front. Circuit lists shall be typewritten. Circuit descriptions shall include explicit description and identification of items controlled by each individual breaker, including final graphics room number or name designation and name of each item served. If no building appointed room number or name is given, list locations per the following examples – A. Storage in Rm 100 – B. Office in Rm 100 – C. Storage west of Rm. 100. List corridors as "corridors". Identify circuits controlled by contactors using a separate notation for each contactor used. List notation at bottom of schedule stating the circuits are controlled by a contactor, list exact location of contactor, and how switched. Do not use architectural room number designation shown on plans. Obtain final graphics room number identification from Architect's final room number graphics plan. All locations served by breakers shall be listed on schedule. Panel schedule shall be large enough to contain all information required. Also refer to Section 26 24 16.
4. Permanent, waterproof, black markers shall be used to identify each lighting and power grid junction box, gutter and wireway. Clearly indicate the panel and branch circuit numbers available at that junction box, gutter or wireway. Where low voltage relay panels are used for lighting control, identify the low voltage relay panel and number in addition to the branch circuit panel and number.
5. Pull Boxes, Transformers, Disconnect Switches, etc.: Field work each with a name plate showing identity, voltage and phase and identifying equipment connected to it. The transformer rating shall be shown on the panels or enclosures. For an enclosure containing a motor starter, the nameplate shall include the Owner's motor number, motor voltage, number of motor phases, motor load being serviced, motor horsepower, and motor full load current. Nameplates shall also indicate where panel is fed from.

B. Prohibited Markings: Markings intended to identify the manufacturer, vendor, or other source from whom the material has been obtained are prohibited for installation in public, tenant, or common areas within the project. Also prohibited are materials or devices that bear evidence that markings or insignias have been removed. Certification, testing (example, Underwriters Laboratories), and approval labels are exceptions to this requirement.

C. Warning Signs: Provide warning signs where there is hazardous exposure associated with access to or operation of electrical facilities. Provide text of sufficient size to convey adequate information at each location, mount permanently in an appropriate and effective location. Comply with industry standards for color and design.

D. Wire and Cable Markers: Provide vinyl cloth markers with split sleeve or tubing type, except in manholes provide stainless steel with plastic ties.

E. Wire and Cable Labeling: Provide wire markers on each conductor in all boxes, pull boxes, gutters, wireways, contactors, and motor controllers and load connection. Identify with panelboard / switchboard branch circuit or feeder number for power and lighting

circuits, and with control wire number as indicated on equipment manufacturer's shop drawings for control wiring.

F. Underground Warning Tape: Thomas and Betts or approved equal. Six-inch wide plastic tape, colored red for 50 volts or above electrical, or orange for communications and control with suitable warning legend describing buried electrical lines; telephone lines and data lines per APWA recommendations. All underground electrical conduits shall be so identified. Tape shall be buried at a depth of 6-inches below grade and directly above conduits or ductbanks. Provide magnetic marking tape below all underground electrical conduits.

G. Lighting Controls and Equipment: Provide self-adhesive machine typed tape labels with ¼" high white letters on ½" tall black background for digital lighting modules as "DLM". Modules or relays located above ceiling: adhere label to bottom of ceiling T-grid below relay location. Modules or relays located in mechanical or electrical rooms or other areas other than above ceiling: Adhere label to the cover of the module or relay and identify the area they control as "MAIN GYM", "BAND HALL", or "CORRIDOR 100", etc. Remote lighting control switches or push-button stations located remotely from the area they control: Adhere label to device face plate, not obstructing screw fasteners, and intuitively identify function such as "GYM LTG LOW-HIGH" or "CAFE LTG DIM", etc.

3.2 CUTTING AND PATCHING

A. General: Comply with the requirements of Division 1 for the cutting and patching of other work to accommodate the installation of electrical work. Except as authorized by the Architect / Engineer, cutting and patching of electrical work to accommodate the installation of other work is not permitted.

3.3 INSTRUCTION OF OWNER'S PERSONNEL

A. Prior to substantial completion, conduct an on-site training program to instruct Owner's operating personnel in the operation and maintenance of the electrical systems.
   1. Provide the training during regular working day.
   2. The instructors shall be experienced in their phase of operation and maintenance of the electrical systems and with the project.
   3. Refer to other specification sections for additional training and commissioning requirements.

B. Time to be allocated for instructions.
   1. Minimum of 20 hours dedicated instructor time.
   2. 4 hours on each of 5 days.
   3. Additional instruction time for specific systems as specified in other Sections.

C. Before on-site training, submit the program syllabus; proposed time and dates; for review and approval, minimum 48 hours prior to proposed training time and date.
   1. One copy to the Owner.
   2. One copy to the Architect / Engineer.

D. The Owner shall provide a list of personnel to receive instructions and shall coordinate their attendance at the agreed upon times.

E. Use operation and maintenance manuals as the basis of instruction. Review manual with personnel in detail. Explain all aspects of operation and maintenance.

F. Demonstrate start-up, operation, control, adjustment, troubleshooting, servicing, maintenance, and shut down of each item of equipment.

G. Demonstrate equipment functions (both individually and as part of the total integrated system).

H. Prepare and insert additional data in the operating and maintenance manuals when the need for additional data becomes apparent during instructions.

I. Submit a report within one week after completion of training. List time and date of each demonstration, hours devoted to the demonstration, and a list of people present, with their respective signatures.

J. At the conclusion of the on-site training program, have the person designated by the Owner sign a certificate to certify that he / she has a proper understanding of the system, that the demonstrations and instructions have been satisfactorily completed, and the scope and content of the operating and maintenance manuals used for the training program are satisfactory.

K. Provide a copy of the report and the certificate in an appropriately tabbed section of each Operating and Maintenance Manual.

3.4 OPENINGS

A. Framed, cast or masonry openings for boxes, equipment or conduits are specified under other divisions. Drawings and layout work for exact size and location of all openings are included under this division.

3.5 HOUSEKEEPING PADS

A. Provide concrete equipment housekeeping pads under all floor and outdoor mounted electrical equipment.

B. Concrete and reinforcing steel shall be as specified in Division 3, or as indicated or noted.

C. Concrete pads:
1. 6-inches thick minimum indoors; 8-inches thick minimum outdoors or match existing if indicated on the drawings to extend existing pads, or in other sections of the specifications.
2. Chamfer strips at edges and corner of forms.
3. Smooth steel trowel finish.
4. Extend 3-inches minimum indoors beyond perimeter of equipment unless otherwise shown.
5. 6-inch x 6-inch #8 wire reinforcement mesh.

3.6 OBSTRUCTIONS

A. The drawings indicate certain information pertaining to surface and subsurface obstructions, which has been taken from available drawings. Such information is not guaranteed, however, as to accuracy of location or complete information.
1. Before any cutting or trenching operations are begun, verify with Owner's representative, utility companies, municipalities, and other interested parties that all available information has been provided.
2. Should obstruction be encountered, whether shown or not, alter routing of new work, reroute existing lines, remove obstruction where permitted, or otherwise perform whatever work is necessary to satisfy the purpose of the new work and leave existing services and structures in a satisfactory and serviceable condition.

B. Assume total responsibility for and repair any damage to existing utilities or construction, whether or not such existing facilities are shown.

3.7 VANDAL RESISTANT DEVICES

A. Where vandal resistant screws or bolts are employed on the project, deliver to the Owner 2 suitable tools for use with each type of fastener used, and 25 percent spare fasteners.

B. Proof of delivery of these items to the Owner shall be included in the Operating and Maintenance Manuals.

3.8 PROTECTION

A. Protect work, equipment, fixtures, and materials. At work completion, work must be clean and in original manufacturer's condition.

B. Do not deliver equipment to this project site until progress of construction has reached the stage where equipment is actually needed or until building is closed in enough to protect the equipment from weather. Equipment allowed to stand in the weather shall be rejected, and the contractor is obligated to furnish new equipment of a like kind at no additional cost to the Owner.

3.9 COORDINATION OF BRANCH CIRCUIT OVERCURRENT AND PROTECTION DEVICES

A. Review with equipment specified which requires electrical connections. Review equipment shop drawings and manufacturer's nameplate data and coordinate exact branch circuit overcurrent protective device and conductors with equipment provided.
   1. Provide equipment manufacturer's recommended overcurrent protective device indicated on nameplate at no additional cost to the Owner.
   2. If branch circuit conductors and / or conduit sizing is less than the minimum required by equipment manufacturer, notify the Architect / Engineer immediately, prior to rough-in.
   3. If equipment manufacturer is a substitution to the specified equipment manufacturer, provide the greater of the conductors specified or those required for the installed equipment manufacturer’s minimum circuit conductors, at no additional cost to the Owner.
   4. If conductors indicated on plans are in excess of that permitted by equipment manufacturer, notify Architect / Engineer immediately, prior to rough-in.
   5. If conductors indicated on plans are in excess of that permitted by the equipment manufacturer, provide the maximum conductors permitted by the equipment manufacturer based on NEC ampacity tables, either in a single set, or as a set of parallel conductors as permitted by the NEC. Conductor size and quantity entering the equipment enclosures shall not exceed the equipment manufacturer’s maximum recommendations.

3.10 FAULT CURRENT AND ARC FLASH STUDY FOR OVERCURRENT DEVICE COORDINATION

A. Contractor shall provide a coordination study, fault current analysis, and Arc-Flash study report for new electrical distribution equipment downstream to the last new overcurrent device in each feeder or branch circuit, conducted and prepared by the switchgear manufacturer. The coordination study and fault current analysis shall include the manufacturer’s recommendations for all adjustable overcurrent devices specified or provided. Study does not require inclusion of existing switchgear, except it shall include existing or new overcurrent devices in existing switchgear serving new switchgear. Contractor shall submit the report results prior to submitting switchgear submittals to allow changes or modifications to equipment selection.

B. Contractor shall adjust all overcurrent device settings based on manufacturer's recommendations, or as directed by Owner / Architect at no additional cost to Owner. Settings for GFI shall be set at maximum as permitted by the NEC.

C. Arc-Flash & Shock-Hazard Warning Labels: Provide arc-flash and shock hazard-warning labels that comply with ANSI Z535.4 on switchgear, switchboards, transformers, motor control centers, panelboards, motor controllers, safety switches, industrial control panels and other equipment that is likely to require examination, adjustment, servicing, or maintenance while energized. Locate the marking to be clearly visible to qualified persons before examination, adjustment, servicing, or maintenance of the equipment. On renovation projects, install arc-flash warning labels on existing equipment where lock-out / tag-out will be required for the renovation work. Provide the information listed below on each label. Specify that arc-flash warning label information be produced by the electrical equipment manufacturer or supplier as a part of the final power system studies to be submitted by the Contractor in accordance with the electrical acceptance testing.
   1. Note: In addition to the final arc-flash analysis, the final power system studies include load flow and fault-current calculations, and an overcurrent protective device (OCPD) coordination study based on the actual equipment to be installed for the project.

D. Information to be determined and applied to electrical equipment:
   1. Arc-Flash Protection Boundary.
   2. Arc-Flash incident energy calculated in accordance with IEEE Std 15841 ™.
   3. Working distance calculated in accordance with IEEE Std 1584a ™.
   4. NFPA 70E Hazard / Risk Category Number or the appropriate personal protective equipment (PPE) for operations with doors closed and covers on.
      a. Typical operations include operating circuit breakers, fused switches, and meter selector switches.
   5. System phase-to-phase voltage.
   6. Condition(s) when a shock hazard exists (e.g., "With cover off").
   7. Limited Approach Boundary as determined from NFPA 70E, Table 130.2(C).
   8. Restricted Approach Boundary as determined from NFPA 70E, Table 130.2(C).
   9. Prohibited Approach Boundary as determined from NFPA 70E, Table 130.2(C).
   10. Unique equipment designation or code (described under "Component Identification".
   11. Class for insulating gloves based on system voltage (e.g., Class 00 up to 500V).
   12. Voltage rating for insulated or insulating tools based on system voltage (e.g., 1000V).
   13. Date that the hazard analysis was performed.
   14. "Served from" circuit directory information including the serving equipment designation, location (e.g., room number), circuit number, and circuit voltage / number of phases / number of wires.
   15. If applicable, the "serves" circuit directory information including the served equipment designation, location (e.g., room number), circuit number, and circuit voltage / number of phases / number of wires.
   16. An abbreviated warning label may be used where it has been determined that no dangerous arc-flash hazard exists in accordance with IEEE 1584a ™, paragraph 9.2.3.
   17. Use a "DANGER" label where the calculated arc-flash incident energy exceeds 40 cal/cm.

E. Submittals: Submit four copies of coordination study and certified fault current study results to the Architect for review.

3.11 EQUIPMENT BACKBOARDS

A. Backboards: ¾ inch, fire retardant, exterior grade plywood, painted gray, both sides.
   1. Provide minimum of two 4-ft. by 8-ft. sheets of plywood for each new telephone equipment terminal location.
   2. Provide minimum of two 4-ft. by 4-ft. sheets of plywood for each new data / voice / video / communications equipment location / cable TV head end equipment, or security equipment location.

3.12 TESTING

A. The contractors for the various sub-systems shall submit proposed testing procedures for their systems, subject to review and approval and Owner acceptance. The contract will not be declared to be substantially complete until the functional operation of the subsystems have been demonstrated and verified and reports have been provided, reviewed and accepted.

B. The project will not be declared substantially complete until the following has taken place.
   1. The “As-Built” drawings have been submitted, reviewed and accepted by the Architect / Owner / Owner’s Construction Representative.
   2. The building emergency lighting system and other systems including but not limited to those listed below have been tested, completed factory start-up and programming and adjusting as required for a complete and fully operational system acceptable to the Architect and Owner.
      a. Occupancy Sensor and Lighting Controls.
      b. Surge protective device equipment.
      c. Overcurrent devices.
      d. Motor Controllers
      e. Emergency Lighting..
      f. Building Fire Alarm System.
      g. Clock System.
      h. Television Distribution System.
      i. Building Data / Voice Cabling System.
      j. Surveillance and Security System.
      k. Intercom / Telephone.
      l. Sound Reinforcement Systems.
      m. Building Lightning protection System.

3.13 LOAD BALANCING

A. Balance the loads on each low-voltage feeder so that the voltage on each phase is within +/- 1.0% of the average voltage of the three phases. Refer to the DOE Office of Industrial Technologies, “Motor Tip Sheet #7” dated September 2005 available for download to PDF format at no charge at: http://www1.eere.energy.gov/industry/bestpractices/pdfs/eliminate_voltage_un_balanced_motor-systemts7.pdf .

END OF SECTION

SECTION 26 05 09

ELECTRIC UTILITY COORDINATION AND SERVICE ENTRANCE

PART 1 - GENERAL

1.1 WORK INCLUDED

A. General: Electrical service shall be provided by local utility company.

B. Power Company Data: Obtain from utility company information and installation standards for electrical service installation.

C. Responsibilities: Determine what equipment and labor is provided by utility company and what equipment and labor is required of this Contractor.

PART 2 - PRODUCTS

2.1 GENERAL

A. Service Data: Ensure that utility company service data is accurate and verified.

2.2 PRIMARY SERVICE

A. General: Division 26 shall provide primary service conduit, concrete transformer pads, concrete duct bank, utility service and metering equipment enclosures, manholes, and pull boxes as required and as specified.

B. Utility company shall provide primary cables, splices, utility metering instruments, terminations, and primary underground and overhead service conductors.

2.3 TRANSFORMERS AND SWITCHGEAR

A. General: Division 26 shall make provisions for service as required by utility company, including, but not limited to permanent or removable/lockable vehicular barriers, grounding rods, grounding conductors, and sleeves.

B. The utility company shall provide service transformers, primary switchgear, primary protective relaying, and connections to the customer service.

2.4 SECONDARY SERVICE CONDUCTORS

A. General: Division 26 shall provide secondary service entrance conductors, conduit and concrete duct bank.

2.5 SECONDARY SERVICE CABLE TAP BOXES

A. General: Division 26 shall provide secondary service cable tap boxes only if required or specified and as approved by the utility company. Where required or specified, enclosure shall be constructed of aluminum or stainless steel NEMA 3RX construction.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Standards: The installation of the service entrance provisions shall comply with the

published standards and requirements of the utility company, the utility company's specific construction requirements for this project, and with requirements of this Division.

B. Correction: Any failure to meet the standards and requirements shall be corrected to the satisfaction of the utility company and Owner without any additional cost to the Owner.

C. Contractor shall provide all construction materials and labor that the utility company determines to be the responsibility of the customer, at no additional cost to the Owner.

D. The materials and labor required by the for a complete installation shall be provided by the contractor and includes, but is not limited to permanent or removable / lockable vehicular barriers, grounding rods, grounding conductors, sleeves, concrete pads, concrete reinforced ductbanks, conduits, metering racks and metering enclosures.

E. Utility distribution poles and service entrance ductbank locations shall be staked and surveyed prior to pole installation by the Contractor to verify their proper placement is within the Owner's property and respective utility easements. Contractor shall verify by survey that the pole and service entrance ductbank location and easements do not interfere with existing easements, right-of-ways, or other restricted properties. Conflicts with existing easements and restrictions shall be brought to the attention of the Architect prior to construction.

F. Contractor shall initiate contact with the power provider (retail seller), utility (transmission and distribution), and Owner within 14 days of Notice to Proceed to ensure permanent power will be available to the site. Any delays resulting from lack of this coordination shall be the responsibility of the Contractor.

END OF SECTION

SECTION 26 05 12

ELECTRICAL SHOP DRAWINGS, COORDINATION DRAWINGS & PRODUCT DATA

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Prepare submittals as required by Division 01 and as outlined below.

B. Provide individual submittals based on the project specification section number and description and only items specified or required in that specific project specification section.

C. Submit product data shop drawings only for the following items indicated below when included as part of the project specifications, and for items specifically requested elsewhere in the Contract Drawings and Specifications. Architect / Engineer reserves the right to refuse shop drawings not requested for review, typically for basic materials and commodity off-the-shelf materials, and/or to imply that materials shall be provided as specified without exception.

D. The term submittal, as used herein, refers to all:
1. Shop Drawings.
2. Coordination Drawings.
3. Product data.

E. Submittals shall be prepared and produced for:
1. Distribution as specified.
2. Inclusion in the Operating and Maintenance Manual, in the related O&M manual section.

1.2 ARCHITECT / ENGINEER REVIEW OF SUBMITTALS

A. The Architect / Engineer will:
1. Review requested submittals with reasonable promptness. Specific equipment submittal within a materials specification section that may be required to be expedited shall be submitted separately without other submittal items not requiring the same prompt attention.
2. Affix stamp and initials or signature and indicate requirements for resubmittal or exceptions to submittal as submitted.
3. Return submittals to Contractor for distribution or for resubmission.

B. Review of submittals will not extend to design data reflected in submittals that is peculiarly within the special expertise of the Contractor or any party dealing directly with the Contractor.

C. Architect / Engineer's review is only for conformance with the design concept of the project and for compliance with the information given in the contract.
1. The review shall not extend to means, methods, sequences, techniques or procedures of construction or to safety precautions or programs incident thereto.
2. The review shall not extend to review of quantities, dimensions, weights or gauges, fabrication processes, or coordination with the work of other trades.

D. The review of a separate item as such will not indicate approval of the assembly in which the item functions.

1.3 SUBSTITUTIONS

A. Do not make requests for product or material substitution employing the procedures of this Section. The procedure for making a formal request for substitution is specified in Division 01.

PART 2 - PRODUCTS

A. Each individual submittal shall be an individual specific electronic data file with the file name resembling the product specification section number and title. Refer to Division 01 for additional data file format and media requirements.

PART 3 - EXECUTION

3.1 SPECIFICATION COMPLIANCE REVIEW

A. Do not submit an outline form of compliance, submit a complete copy with the product data.

B. Mark up a complete copy of the complete specification section for the product to indicate a) acknowledgement of the specification requirement (Comply), or b) acknowledgement that the particular specification requirement does not apply to this specific project (Not Applicable) or, c) acknowledgement that the specification requirement cannot be made or that a variance is being submitted for review to the Architect / Engineer / Owner (Does Not Comply, Explanation:).

C. Variances for roduct ot materials typically include updated model numbers or updated versions of the specified product from the same manufacture or an equal or better product from the approved manufactures list. Substutions from manufacture's not on the approved manufacture's will not be reviewed unless prior approval using one of the procedures for substitutions or changes in the contract documents are followed as requried in Division 01.

3.2 COMPOSITE COORDINATION DRAWINGS

A. Produce a set of composite coordination drawings for above ceiling, below ceiling, and below floor of electrical, mechanical, and technology equipment rooms and equipment yards for review and comment within four (4) weeks of receipt of Owner's official Notice to Proceed. Show coordination of items including but not limited to structural and architectural elements, all mechanical and plumbing piping, ductwork, equipment, electrical conduit, low voltage communications and safety/security systems cabling, cable trays, lighting, electrical switchgear, generators and UPSs, and any public or private building utility services.
   1. Prepare the composite plans at one-quarter inch (1/4") equals one-foot scale. Include larger scale sections with vertical elevations of elements as required to confirm coordinate of all elements.
   2. For each room containing major electrical switchgear and each outside equipment area with major electrical switchgear and other equipment also include NEC working space, NEC equipment space, and NEC access to NEC working space, and housekeeping pad location and dimensions.
   3. Prepare coordination drawings to coordinate installations for efficient use of available space allowing for future additional equipment wherever possible, for proper sequence of installation, and to resolve conflicts. Coordinate with work specified in other sections and other divisions of the specifications.
   4. Identify field dimensions. Show relation to adjacent or critical features of work or products.

B. Submit composite coordination shop drawings in plan, elevation and sections, showing receptacles, outlets, electrical and telecommunication devices in casework, cabinetwork and built-in furniture.
   1. Verify location of wiring devices and outlets, communication devices and outlets, safety and security devices, and other work specified in this Division.
   2. Coordinate with drawing details, site conditions, composite coordination drawings, and millwork other equipment shop drawings prior to installation.
   3. Submit coordination and shop drawings prior to rough-in and fabrication.

3.3 EQUIPMENT SHOP DRAWINGS AND PRODUCT DATA

A. Submittals shall not be combined or bound together with any other material submittal. Do not submit entire product catalogs, submit only specific data sheets indicating required product information and available product options or accessories.

B. Submittal Specification Information:
   1. Every submittal document shall bear the following information as used in the project manual:
      a. The related specification section number.
      b. The exact specification section title.
      c. Additional identifiers as required in Division 01.
   2. Submittals delivered to the Architect / Engineer without the specified information will not be processed. The Contractor shall bear the risk of all delays, as if no submittal had been submitted or delivered.

C. All product options specified shall be clearly indicated on the product data submittal. All options listed on the standard product printed data not clearly identified as either part of or not part of the product data submitted shall become part of the Contract and shall be assumed to be provided with the product submitted.

D. Mark each copy of standard manufacture’s printed data to identify pertinent products, referenced to specification section and article number.

E. Show reference standards, performance characteristics and capacities; wiring diagrams and controls; component parts; finishes; dimensions and required clearances.

F. Modify manufacturer's standard schematic drawings and diagrams to supplement standard information and to provide information specifically applicable to the work. Delete or strike through information not applicable.

G. Submit drawings in a clear and thorough manner. Identify details by reference to sheet and detail, schedule, or room numbers shown on Contract Drawings.

H. Show all dimensions of each item of equipment in its to be installed assembled condition with all components assembled. Include a series of drawings of individual components as necessary for reference.

I. Identify field dimensions; show relation to adjacent or critical features or work or products.

J. Submit individually bound shop drawings and product data for the following when specified or provided.

K. The Fault Current and Overcurrent Device Coordination Analysis shall be submitted prior to other electrical switchgear dependent on the results of the study for specific product selection by the vendor or contractor for compliance with the study.
   1. The emergency life safety power system equipment shall be fully coordinated as

required by the NEC.

2. The AIC and WCR ratings of all products meet or exceed the available fault current at that equipment's location.
3. Electrical systems other than life safety power systems shall be coordinated as much as practicable while reducing arc flash energy as much as practical.

L. Required submittals when products are indicated or specified:

1. Fault Current and Overcurrent Device Coordination Analysis. Submit this analysis at a minimum of three (3) weeks prior to any overcurrent device submittal to allow review for modifications to overcurrent device product selection submittal based on the manufacture's analysis and recommendations. Manufacture's recommendations for code compliance equipment fault tolerance are a project requirement and shall be provided at no additional cost to the Owner. Manufacture's recommendations for arc flash reduction that result in no additional cost to the Owner shall be provided. Manufacture's recommendations for arch flash reduction which would result in additional cost to the Owner are considered recommendations only and will be reviewed by the Engineer during the submittal review and may or may not result in changes to the specified or submitted equipment.
2. Enclosed Switches, non-fused, fused, or circuit breaker.
3. Panelboards.
4. Load centers.
5. Wiring devices.
6. Lighting fixtures.
7. Lighting Controls.
8. Surge Protection Devices.
9. Transformers.
10. Electrical Contactors.
11. Enclosed Motor Controllers.
12. Site Lighting Photometrics, Poles, and Fixtures.
13. Switchboards, including renewal components for existing switchboards.
14. Elevator Power Module fused switches.
15. Fuses.
16. Recessed floor boxes and fittings.
17. Metering equipment for building management energy monitoring, usage, IECC compliance.
18. Modular metering equipment for multi-tenant utility electrical services.
19. Emergency/Standby generators.
20. Automatic transfer switches.
21. Manual transfer switches with or without integral generator docking stations.
22. Remote generator docking stations.
23. Emergency lighting inverters.
24. Theatrical Lighting Systems.
25. Architectural Dimming Systems.
26. Electrical cable trays.
22. Sports Lighting Equipment, Photometrics, Fixtures, and Poles.
27. Surface Raceways.
28. Electrical controls and time switches.
29. Motor control centers, including renewal components for existing motor control centers.
30. Busway.
31. Uninterrupted Power Supply systems.
32. Power quality improvement filters or capacitors.
33. Lightning protection system.
34. Fire Rated Cables and Connectors.
35. Low Voltage Switchgear.

36. Medium Voltage Cable and Connectors.
37. Medium Voltage Switchgear.

3.4 MANUFACTURERS INSTRUCTIONS

A. Submit Manufacturer's instructions for storage, preparation, assembly, installation, start-up, adjusting, calibrating, balancing and finishing.

3.5 CONTRACTOR RESPONSIBILITIES

A. Review, make corrections or annotations for clarification of manufacturer supplied data, stamp and sign submittals prior to transmittal.

B. Determine and verify:
1. Field measurements.
2. Field construction criteria.
3. Manufacturer's catalog numbers.
4. Conformance with the Contract Documents.

C. Coordinate submittals with requirements of the work and of the Contract Documents.

D. Notify the Architect / Engineer in writing at time of submission of any deviations in the submittals from requirements of the Contract Documents.

E. Do not fabricate products, or begin work for which submittals are required, until such submittals have been produced and bear contractor's stamp of acceptance or approval. Do not fabricate products or begin work until return of reviewed submittals with Architect / Engineer's acceptance.

F. Contractor's responsibility for errors, omissions, or un-approved substitutions in submittals is not relieved whether Architect / Engineer reviews submittals or not.

G. Contractor's responsibility for deviations in submittals from requirements of Contract Documents is not relieved whether Architect / Engineer reviews submittals or not, unless Architect / Engineer gives written acceptance of the specific deviations identified by the Contractor on reviewed documents.

H. Submittals shall show sufficient data to indicate complete compliance with Contract Documents:
1. Proper sizes and capacities.
2. That the item will fit in the available space in a manner that will allow proper service; manufacture’s and code required clearances.
3. Construction methods, materials and finishes.

I. Schedule submissions at least 15 days before date reviewed submittals will be needed by the Contractor for processing or for making corrections for re-submittal.

J. General and Electrical Contractor’s Stamp of Approval
1. The general contractor and the electrical contractor shall stamp and sign each document certifying to the review of products, field measurements and field construction criteria, and coordination of the information within the submittal with requirements of the work and of Contract Documents.
2. Contractor's stamp of approval on any submittal shall constitute a representation to Owner and Architect / Engineer that Contractor has either determined and verified all quantities, dimensions, field construction criteria, materials, catalog numbers, and similar data or assumes full responsibility for doing so, and that

Contractor has reviewed or coordinated each submittal with the requirements of the work and the Contract Documents.

3. Do not deliver any submittals to the Architect / Engineer that do not bear the Contractor's stamp of approval and signature.
4. Submittals delivered to the Architect / Engineer without Contractor's stamp of approval and signature will not be processed. The Contractor shall bear the risk of all delays, as if no submittal had been delivered.

3.6 SUBMISSION REQUIREMENTS

A. Make submittals promptly in accordance with approved schedule, and in such sequence as to cause no delay in the Project or in the work of any other Contractor. Product and equipment related to site work or other trades which require extensive rough-in, foundations, or structural support shall be submitted as soon as possible after given notice to proceed with construction.

B. Number of submittals required:
1. Coordination Drawings: Submit one electronic data file (pdf) and three opaque reproductions or coordination drawings.
2. Product Data: Submit electronic data PDF files. Refer to Division 01 for specific requirements. PDF files that are 20MB or larger may indicate that a submittal includes information not specifically relevant to the specific product being provided, information not required for the review of the specific product such as a complete product catalog or catalog section. Contractor shall include only the product data required to review the specific products characteristics for compliance with the contract documents.

C. Accompany submittals with transmittal letter containing:
1. Date.
2. Project title and number.
3. Contractor's name, address and contact information.
4. The number of each Shop Drawing, Project Datum and Sample submitted.
5. Other pertinent data as required in Division 01.

D. Submittals shall include:
1. The date of submission.
2. The project title and number.
3. Contract Identification.
4. The names of:
   a. Contractor.
   b. Subcontractor.
   c. Supplier.
   d. Manufacturer.
5. Identification of the product.
6. Field dimensions, clearly identified as such.
7. Relation to adjacent or critical features of the work or materials.
8. Applicable standards.
9. Identification of deviations from contract documents.
10. Suitable blank space for General Contractor and Architect / Engineer stamps.
11. Contractor's signed and dated Stamp of Approval.

E. Coordinate submittals into logical groupings to facilitate interrelation of the several items.
1. Finishes which involve Architect / Engineer selection of colors, textures or patterns.
2. Associated items requiring correlation for efficient function or for installation.

3.7 RESUBMISSION REQUIREMENTS

A. Make resubmittals under procedures specified for initial submittals. Re-submittals shall be a complete submittal as if it were the initial submittal unless otherwise instructed in the review comments on the original submittal.
   1. Indicate that the document or sample is a resubmittal.
   2. Identify changes made since previous submittals.

B. Indicate any additional changes which have been made by the contractor other than those requested by the Architect / Engineer.

END OF SECTION

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SECTION 26 05 16

EXCAVATING, BACKFILLING AND COMPACTING FOR ELECTRICAL

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 apply to this section.

B. Refer to Instructions for substitution of materials and products.

C. Addenda issued during the bidding period that affect this section of the specifications.

1.2 WORK INCLUDED

A. Coordinating all excavating and backfilling for the electrical underground, and all related appurtenances. Provide concrete duct banks as specified in other related Division 26 specification sections.

B. The extent of raceways, excavation, and backfill shall be in conformance with the locations, raceways, elevations and grades shown on the drawings.

1.3 REFERENCES

A. American Society for Testing and Materials (ASTM) Use current edition.
   1. ASTM D698, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft^3).
   2. ASTM D1556, Standard Test method for Density and Unit Weight of Soil in Place by the Sand-Cone Method.
   3. ASTM D4253, Standard Test Methods for Maximum Index Density and Unit Weight of Soils Using a Vibratory Table.
   4. ASTM D4254, Standard Test Method for Minimum Index Density and Unit Weight of Soils and Calculation of Relative Density.

B. Local Authority Having Jurisdiction Standards.

C. Local Governing Agencies or Utilities.

1.4 WARRANTY

A. Provide written warranty against defects in the material and workmanship for the work of this Section for a period of one year from the Date of Substantial Completion of the Project. Refer to Division 1 for Warranty form.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Concrete: Refer to other Division 26 specification section where concrete encasement is required or specified.

B. Cement-Stabilized Sand: Clean, local sand mixed with not less than 1-1/2 sacks of Portland cement per ton; mix in a mill-type mixer.

C. Sand: Clean, local sand.

D. Earth Backfill: Clean local material consistent with the surrounding earth material and free of large clods, roots, organic materials, rocks or other debris.

PART 3 – EXECUTION

3.1 EXCAVATION

A. General:
1. All utility trenches shall be constructed in conformance with OSHA trench safety standards.
2. Refer to project Geotechnical Report for additional requirements for excavating and backfilling of utility trenches.
3. Sheeting and shoring shall be accomplished to the extent necessary to maintain the sides of the trench in a vertical position throughout the construction period for trenches five feet in depth or deeper. Where approved, trench sides may be laid back in lieu of shoring to meet OSHA safety standards.
4. Utilities shall not be constructed or laid in a trench in the presence of water. All water shall be sufficiently removed from the trench prior to the raceway placing operation to ensure a dry, firm bed on which to place the raceway.

B. Appurtenances:
1. Any overdepth excavation below appurtenances shall be refilled with cement-stabilized sand.

C. Electrical Trenches:
1. Electrical underground raceways must be the minimum depth required by the local governing authority and Power Company.
2. Trench width for the electrical raceway shall be a minimum of the outside raceway encasement plus 12 inches.
3. Trenches shall be excavated to a depth of at least 6 inches below the conduit raceway. The conduit raceway bedding or concrete encasement shall then be placed in accordance with the specifications, local governing authority, and Power Company standard details.

3.2 BEDDING AND BACKFILL

A. Electrical Trenches:
1. Place backfill, consisting of sand or cement stabilized sand, to a depth of one foot above top of raceway or concrete duct bank and compact to 90% maximum density.
2. Backfill the remainder of the trench in 6 inch lifts with select excavated material and compact as required to achieve density of soil of surrounding area.

B. Utility Locators:
1. Provide metallic locators for utility company raceways as required by respective utility.
2. Refer to other specification sections for additional requirements for underground raceway locators and markers.

END OF SECTION

SECTION 26 05 19

CONDUCTORS AND CONNECTORS – 600 VOLT

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Provide electrical conductors, wire and connector work as shown, and specified.

B. Types: The types of conductors and connectors required for the project include the following:
   1. 600V building conductors.
   2. 600V building conductor connectors.

C. Application: The applications for conductors and connectors required on the project are as follows:
   1. Power distribution circuitry.
   2. Lighting branch circuitry.
   3. Appliance, receptacle, and equipment branch circuitry.
   4. Motor branch circuitry.
   5. Control wiring.
   6. Line voltage.

D. Refer to other specific specification sections for voice, video, data, alarm and instrumentation cables.

1.2 QUALITY ASSURANCE

A. UL Label: Conductors and connectors shall be UL labeled.

1.3 REFERENCES

A. Refer to other specific specification sections regarding specialized wiring and connections.

PART 2 – PRODUCTS – Provide products manufactured in the USA.

2.1 CONDUCTORS AND CONNECTORS

A. General: Except as indicated, provide conductors and connectors of manufacturer's standard materials, as indicated by published product information, designed and constructed as instructed by the manufacturer, and as required for the installation.

B. Cable Lubricant: Fire resistant, nonflammable, water-based type for standard building conductors. Provide cable lubricants for fire rated cables as recommended by the cable manufacturer.

C. Conductors: Provide factory-fabricated conductors of the size, rating, material, and type as indicated for each use. Conductors shall be soft or annealed copper wires meeting, before stranding, the requirements of ASTM B 3, Standard Specification for Soft or Annealed Copper Wire for Electrical Purposes, latest edition.
   1. Conductors for control wiring sized #14 AWG through #10 AWG shall be stranded.
   2. Conductors for power and lighting shall be stranded. Stranding shall be Class B meeting the requirements of ASTM B 8, Standard Specification for Concentric-

Lay-Stranded Copper Conductors, Hard, Medium Hard, or Soft.

D. Insulation for standard building conductors: Insulation shall meet or exceed the requirements of UL 83, Standard for Thermoplastic Insulated Wires.
   1. All wiring inside lighting fixtures shall be temperature rated per NEC.
   2. Insulation for copper conductors shall be UL Type THHN/THWN, 90 degrees C.

2.2 COLOR CODES FOR CONDUCTORS FOR BRANCH CIRCUITS AND FEEDERS

A. Color coding for conductors as required by NEC 210.5. Color coding for phase and voltage shall be as required by local codes and local standards. Where such standards do not exist, color coding shall be as follows:

Color Code Table	**USE CONTINUOUS COLOR CODED INSULATION THROUGHOUT**					
System/ Phase	**A**	**B**	**C**	**N**	**G**	**IG**
120/208 3 Ph	Black	Red	Blue	White	Green	Green/Yellow Stripe
120/240 3 Ph	Black	Orange	Blue	White	Green	Green/Yellow Stripe
120/240 1 Ph	Black	N/A	Blue			
277/480	Brown	Purple	Yellow	Gray	Green	Green/Yellow Stripe

Notes to Color Code Table:
1. 120/208, 120/240, and 277/480 Volt Systems shall be routed in separate raceways.
2. Switched legs of phase conductors for lighting and appliance branch circuits shall be of the same color as described above throughout the entire circuit.
3. Conductors shall be the same color from breaker to device or outlet.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Install electrical conductors and connectors as shown, in accordance with the manufacturer's written instructions, the requirements of NEC, the NECA Standard of Installation, and industry practices.

B. Coordination: Coordinate conductor installation work with electrical raceway and equipment installation work, as necessary for interface.

C. Conductors:
   1. Provide a grounded (neutral) conductor for each branch circuit. Do not share grounded (neutral) conductors.
   2. No more than six phase conductors shall be installed in a single raceway. Any combination of phase conductors and grounded (neutral) conductors in any raceway shall not exceed nine.
   3. When any combination of four or more phase and grounded (neutral) conductors are installed in a raceway, the minimum size for all conductors including equipment ground conductor shall be #10 AWG, and they shall be de-rated accordingly.
   4. When more than four (4) conductors are size #10 AWG, they shall be installed in

a one-inch conduit.

5. Pull conductors together when more than one is being installed in a raceway. Whenever possible, pull conductors into their respective conduits by hand. Use pulling lubricant when necessary.
6. Before any conductor is pulled into any conduit, thoroughly swab the conduit to remove foreign material and to permit the wire to be pulled into a clean, dry conduit.
7. Run feeders their entire length in continuous section without joints or splices.
8. No wire smaller than #12 AWG shall be permitted for any lighting or power circuit. No wire smaller than #14 AWG shall be used for any control circuit, unless shown otherwise.
9. Provide the same size wire form the panelboard to last outlet on circuit. For 20 amp branch circuits operating at 150V or less, provide #10 AWG wire when the first outlet is over 75-feet from the panelboard. For branch circuits operating at 150 to 600 volts, provide #10 AWG wire when the first outlet is over 150-feet from the panelboard.
10. Branch circuit voltage drop shall not exceed 3% of rated voltage.
    a. Total voltage drop from the point of service to the last outlet or utilization equipment of the same voltage shall not exceed five-percent of rated voltage.
    b. Total voltage drop from the point of service to transformers with adjustable taps, buck-boost transformers, uninterruptable power supplies (UPS), or voltage regulators shall not exceed five-percent of rated voltage.
    c. Total voltage drop from a separately derived system, transformer with adjustable taps, buck-boost transformer, uninterruptable power supply (UPS), or voltage regulator to the last outlet or utilization equipment of the same voltage shall not exceed five-percent of rated voltage.
    d. Total voltage drop from the point of service to distribution equipment of the same voltage shall not exceed two-percent of rated voltage.
    e. Branch circuit voltage drop from distribution equipment to the last outlet or utilization equipment shall not exceed three-percent of rated voltage.
    f. Provide the same size branch circuit conductors to last outlet on circuit unless specifically noted or indicated otherwise on the drawings. For 20 amp branch circuits operating at 150-Volts or less, provide #10 AWG wire when the first outlet is over 75-feet from the panelboard. For branch circuits operating above 150-Volts to 600-Volts, provide #10 AWG wire when the first outlet is over 150-feet from the panelboard.
11. No tap or splice shall be made in any conductor except in outlet boxes, pull boxes, junction boxes, splice boxes, or other accessible locations. Make taps and splices using an approved compression connector. Insulate taps and splices equal to the adjoining conductor. Make splices or taps only on conductors that are a component part of a single circuit, protected by approved methods. Taps or splices in feed through branch circuits for connection to light switches or receptacles shall be made by pigtail connection to the device.
12. Support conductors in vertical raceways, as required by the NEC.
13. Do not permit conductors entering or leaving a junction or pull box to deflect to create pressure on the conductor insulation.
14. Make joints in branch circuits only where circuits divide. These shall consist of one through circuit to which the branch from the circuit shall be spliced.
15. Make connections in conductors up to a maximum of one #6 AWG wire with two #8 AWG wires using twist-on pressure connectors of required size.
16. Make connections in conductors or combinations of conductors larger than specified using cable fittings of type and size required for specific duty.
17. After a splice is made, insulate entire assembly with UL-approved insulating tape to a value equivalent to the adjacent insulation.

18. Make splices and connections in control circuit conductors using UL-approved solderless crimp connectors.
19. All conduits shall be installed with an insulated grounding conductor per NEC 250.122. Where green conductor insulation is not available, the ground conductor shall be identified with green phasing tape at all accessible locations.
20. Neatly train and lace wiring inside boxes, equipment and panelboards. Provide tie-straps around conductors with their shared neutral conductor where there are more than two neutral conductors in a conduit.
21. Clean conductor surfaces before installing lugs and connectors.
22. Make splices, taps and terminations to carry full ampacity of conductors with no perceptible temperature rise.
23. Provide stranded conductors connected with pressure type connectors / compression fittings and terminal lugs UL listed for the type of conductor used (AL-CU) and correctly sized to the diameter of the bare conductors.
24. Run mains and feeders their entire length in continuous pieces without splices or joints.
25. Color code conductors.
26. Do not install a pull string in conduits containing conductors.
27. Conductors shall be the same color from load side of overcurrent protection device to outlet or utilization equipment.
28. Spare conductors shall not be installed in any conduit, gutter, raceway, panel or enclosure unless noted otherwise.

D. Identification: Label each phase conductor in each junction box with corresponding circuit number, using self-adhesive wire markers.

E. Splices and Joints:
1. In accordance with UL 486A, C, D, E, and NEC.
2. Aboveground Circuits (No. 10 AWG and smaller):
   a. Connectors: Solderless, screw-on, reusable pressure cable type, rated 600 V, 220˚ F, with integral insulation, approved for copper and aluminum conductors.
   b. The integral insulator shall have a skirt to completely cover the stripped wires.
   c. The number, size, and combination of conductors, as listed on the manufacturers' packaging, shall be strictly followed.
3. Motor connections:
   a. All AHU motors connections shall be split bolt connectors.
   b. All non-AHU motors 10 HP and larger shall be split bolt connectors.
   c. All non-AHU motors less than 10 HP shall be split bolt connectors or as recommended by the manufacturer.

F. Aboveground Circuits (No. 8 AWG and larger):
1. Connectors shall be indent, hex screw, or bolt clamp type of high conductivity and corrosion resistant material, listed for use with copper and aluminum conductors.
2. Provide field-installed compression connectors for cable sizes 250 kcmil and larger with not less than two clamping elements or compression indents per wire.
3. Insulate splices and joints with materials approved for the particular use, location, voltage, and temperature. Splice and joint insulation level shall be not less than the insulation level of the conductors being joined.
4. Plastic electrical insulating tape: Per ASTM D2304, flame-retardant, cold and weather resistant.

G. Underground Branch Circuits and Feeders:
   1. Submersible connectors in accordance with UL 486D, rated 600 V, 190˚F, with integral insulation.

3.2 TESTING

A. Pre-Energization Check: Before energizing, check cable and conductors for circuit continuity and short circuits. Correct malfunctions.

B. Service Entrance and Feeder Insulation Resistance Test: Each main service entrance conductor and each feeder conductor shall have its insulation resistance tested after the installation is complete except for connection at its source and point of termination. Testing shall be performed by qualified technicians who have been trained in testing procedures and in the use of all test equipment.
   1. Make tests using a Biddle Megger or equivalent test instrument at a voltage of not less than 1000 VDC; measure resistance from conductor to conductor, conductor to neutral (if present) and from conductor to ground. Insulation resistance shall not be less than the following:

Wire Size (AWG)	Insulation Resistance (Ohms)
#8	250 K
#6 through #2	100 K
#1 through #4/0	50 K
Larger than #4/0	25 K

   2. Conductors that do not meet or exceed the insulation resistance values listed above shall be removed, replaced, and retested.

C. Submittals: Contractor shall furnish instruments and personnel required for tests. Submit 4 copies of certified test results to Architect for review. Test reports shall include conductor tested, date and time of test, relative humidity, temperature, and weather conditions.

D. Voltage and Current Values: The voltage and current in each conductor shall be measured and recorded after connections have been made and the conductor is under load.

SAMPLE DC HIGH VOLTAGE CABLE TEST REPORT
(Specification Paragraph 3.2, C)

Date_____

Contract and Work Location: ___
Contract (Project) No.: _
Circuit Identification: ___
(Dwg., Title, Number and Ckt. Number)

Test Equipment: _____
(Make, Model, Serial No., Etc.)
Applied Test Voltage _____
Normal Oper. Voltage _____
Cable Installation: New _____ Used _____
(Date) (No. Years)
Cable Size _____AWG
Cable Length _____Ft.
Cable Material _____Cu _____Al
Temperature _____ Humidity _____

TEST DATA - RESISTANCE IN KILO OHMS

CONDUCTOR PER PHASE	A-N	B-N	C-N	A-G	B-G	C-G	A-B	B-C	A-C

END OF SECTION

SECTION 26 05 26

ELECTRICAL GROUNDING

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Grounding shall conform to the requirements of:
   1. National Electrical Code.
   2. Governing local codes.
   3. All Local Utility Companies

B. Ground effectively and permanently.
   1. Neutral conductor at the main service disconnect and other separately derived systems.
   2. All conduit systems.
   3. All electrical equipment and related current carrying supports or structures.
   4. All metal piping systems.
   5. All building structural metal frames.
   6. All telephone/voice/video/CATV/data utilities.

1.2 REFERENCE STANDARDS

A. ANSI/IEEE Standard 142 - "Recommended Practice for Grounding of Industrial and Commercial Power Systems."

B. ANSI/UL 467 - "Safety Standard for Grounding and Bonding Equipment."

C. Article 250 of the NEC (NFPA 70) for grounding.

D. NECA – Standard of Installation.

E. NETA ATS – Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.

F. EIA / TIA 607.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Copperweld.

B. nVent ERICO.

C. Burndy.

D. O. Z Gedney.

E. Eaton.

2.2 GROUNDING ELECTRODES

A. Driven Rod Electrode
   1. 3/4" x 10'-0" copper clad grounding electrode.

2. UL listed.
3. Approved thermal fusion connector methods (exothermic).

B. Metal frame of building or enclosure.

C. Foundation concrete encased rebar.

2.3 DATA / VOICE COMMUNICATIONS CLOSET GROUND BAR

A. MDF closets/head end rooms: Erico Cadweld #B544A028 ground bar with 7/16-inch holes.

B. IDF closets, Erico Cadweld #B542A004 ground bar with 7/16-inch holes.

C. Heavy-duty, two bolt type, copper alloy or bronze for grounding and bonding applications, in configurations required for particular installation.

2.4 EXOTHERMIC CONNECTIONS

A. Exothermic type for underground and structural steel; Cadweld.

B. Exothermic materials, accessories, and tools for preparing and making permanent field connections between grounding system components.

2.5 WIRE

A. Stranded, copper cable.

B. Foundation Electrodes: 4/0 AWG.

C. Grounding Electrode Conductor: Size to meet NFPA 70 requirements.

PART 3 - EXECUTION

3.1 GROUNDING AND BONDING

A. In the service equipment, provide a separate (dedicated) ground bus.
1. Bond the ground bus with copper bus bar or cable, of equal or greater current carrying capacity of the service grounding conductor, to the neutral bar.
2. Resistance of neutral to ground shall not exceed 10 Ohms.
3. Connect the electric service grounding electrode conductors to the incoming metal water pipe system (when available, using a suitable ground clamp) and to a supplemental electrode such as a ground rod or ground ring.
4. Provide grounding and bonding at the power company’s metering equipment.
5. Provide access and cover for access to the ground grid and removable connections for testing the system.

B. Connect the grounding electrode conductor between the ground bus and the grounding electrode system.
1. In rigid PVC conduit.
2. Provide thermo fusion connection for each rod ground electrode.
a. All rod electrodes shall be located outside the building in non-paved areas where available. Access cover top shall be flush with finish grade or floor.
b. Install rod electrodes as required. Install additional rod electrodes as required to achieve specified resistance to ground.

c. The minimum distance between driven ground rod electrodes shall be 10'.

3. The total ground resistance shall not exceed 10 Ohms for service entrance grounds and 25 Ohms for equipment grounds.
   a. Where this condition cannot be obtained with one electrode, install a longer electrode, deep-driven sectional electrodes, or additional grounding electrodes until the required ground resistance is obtained.

C. Provide an insulated equipment grounding conductor inside all conduits, raceways, surface raceways, gutters and wireways. The ground wire shall be bonded to each box to suitable lug, bus, or bushing. All bonding jumpers shall be routed inside conduit or raceway.

D. Provide an insulated isolated equipment grounding conductor in addition to the insulated equipment grounding conductor for all isolated grounding feeders, branch circuits, outlets and isolated grounding receptacles.

E. Provide all conduit terminating in switchgear, transformers, switchboards, panelboards and voice/data outlets with grounding bushings, where required, and ground wire extended to ground bus in equipment. Install grounding bushings where reducing washers are used and concentric and eccentric knock-outs are used.

F. Main bus and building grounding electrode conductor installation shall be witnessed by the Architect / Engineer.

G. Provide bonding to meet Regulatory Requirements.

H. Interface with lightning protection system when lightning protection system is specified.

I. Locate and install anchors, fasteners, and supports in accordance with NECA “Standard of Installation”.

J. Do not fasten supports to pipes, ducts, mechanical equipment, or conduit.

K. Do not use spring steel clips and clamps.

L. Do not use powder-actuated anchors.

M. Do not drill or cut structural members.

N. Do not use compression or mechanical connectors underground.

O. Do not use sheetmetal or self-drilling screws for bonding connections. Provide listed or approved connectors.

P. Provide grounding access well for each driven ground electrode, not located in manholes or pull boxes.
   1. Access well top shall be flush with finish paved surfaces.
   2. Ground access wells located in non-paved areas shall be set two-inches above surrounding finished grade. Provide 12-inch wide by 8-inch deep reinforced concrete crown around neck or opening and sloped down away from pull box opening.
   3. Provide thermal fusion (exothermic) connectors approved for direct burial.

3.2 METAL FRAME OF BUILDING OR STRUCTURE

A. Effectively ground the building steel or structure per NEC 250-52 (2).

3.3 UFER GROUND

A. Provide a UFER ground at bottom of building slab per NEC 250.52 (3), bond to building steel.

3.4 MISCELLANEOUS REQUIREMENTS

A. Continuity of the equipment grounding system shall be maintained throughout the project. Equipment grounding jumpers shall be installed across conduit expansion fittings, liquid-tight flexible metal and flexible metal conduit, and other non-electrically continuous raceway fittings.

B. Equipment grounding conductors and grounding electrode conductor shall be stranded copper conductors and run in a suitable raceway. Grounding conductors and grounding electrode conductor shall be continuous, without joints or splices over their entire length, except as allowed by NFPA 70/NEC.

C. For separately derived alternating current system grounds, bond the case and neutral of each transformer secondary winding directly to the nearest available effectively grounded structural metal member as required in NEC 250.

D. Exterior Electrical Equipment Racks:
   1. Provide driven ground electrode.

E. Technology/Data/Voice Communications, CATV, CCTV, and MATV Equipment Grounding: Provide grounding electrode conductor from the communications service equipment to the building grounding system as required. Grounding shall conform to ANSI/TIA/EIA 607(A) – Commercial Building Grounding and Bonding Requirements for Telecommunications, National Electrical Code®, ANSI/NECA/BICSI-568 and manufacturer's grounding requirements as minimum. Bonding shall be of low impedance to assure electrical continuity between bonded elements.
   1. MDF Closets Telecommunications Main Ground Bar (TMGB): Provide Erico #EGBA14424MM ground bar, wall mounted to the telecommunications plywood backboard. Provide one #3 AWG insulated ground conductor from ground bar to building steel. Provide #2/0 AWG insulated ground conductor to the building electrical service ground at the nearest electrical switchboard or panelboard.
   2. IDF Closets Telecommunications Ground Bar (TGB): Provide Erico #EGBA14410FF ground bar mounted to the telecommunications plywood backboard. Provide one #6 AWG insulated ground conductor from ground bar to building steel and to ground bus of nearest electrical panelboard or switchboard.
   3. Provide #2/0 AWG insulated ground conductor between each TMGB and all TGBs.
   4. Provide #2/0 AWG insulated ground conductor from TMGB to electrical service ground bus at main electrical service switch.
   5. Bond each equipment rack, cabinets, frames, together and with #6 AWG insulated ground conductor to the local TMGB / TGB. Bond and ground equipment racks, housings, messenger cables, raceways, and rack-mounted conduit.
   6. Route TMGB – TGB ground conductor using the shortest, straightest, route practical with long radius curves.
   7. All conduits terminating to cable trays, wireways, and racks shall be mechanically fastened. When connected to a cable tray or rack, it must be connected with

ground bushings, wire bonded to the tray or rack, and grounded to the main building grounding system or IDF room grounding bar using #6 AWG copper.

F. Ground lighting fixture bodies to the conduit grounding system.

G. Bond receptacle ground to the box and conduit ground system, except where and insulated/isolated grounding receptacle or outlet is specified.

H. Ground connections to building steel, grounding electrodes and all underground connections shall be by thermal fusion (exothermic).

I. Provide OZ Type “BJ” bonding jumper at all expansion joints, points of electrical discontinuity or connections in conduit where firm mechanical bond is not possible, such as flexible connections, insulating couplings, etc.

J. Ground each lighting and power panelboard by connecting the grounding conductors to the grounding stud.

K. Ground each secondary dry-type transformer to the ground bus of the primary side panelboard. Provide a bonding jumper between the ground stud and the neutral. Ground transformer ground stud to ground ring if a ground ring is installed or the nearest structural steel member.

L. Bond every item of equipment served by the electrical system to the building equipment ground system. This includes, but is not limited to, switchboards, panelboards, disconnect switches, receptacles, cable trays, controls, fans, air handing units, pumps and flexible duct connections.

M. Ground each light pole, power distribution poles, and metal conduit stub-ups at each light pole base.

N. Ground all metal conduit including metal conduit used for bends and penetrations through concrete.

O. Bond hot water and cold water piping together at each domestic water heater.

3.5 MANHOLE AND/OR PULL BOX GROUNDING

A. Provide a driven ground rod and ground bond ring in each power and telephone manhole or pull box. Bond cable racks and medium voltage cable shields at splices and terminations, ductbank conduit ground bushings and all other metal components in manholes or pull box to the ground ring.

3.6 COORDINATION

A. General: Coordinate installation of grounding connections for equipment with equipment installation work.

3.7 TESTING

A. Ground Resistance Test: Perform a ground resistance test for comparison to future inspection and testing data by the Owner. Test shall be performed using a Biddle Megger Earth Tester or equivalent test instrument. The test shall not be performed within 48 hours after the last rainfall.
   1. Inspect and test in accordance with NETA ATS except Section 4
   2. Grounding and Bonding: Perform inspections and tests listed in NETA ATS,

Section 7.13.

B. True Root Mean Square (RMS) AC measurements: The True RMS AC Measure test should be performed for all bonding conductors. The recommended maximum AC current value on any bonding conductor should be less than 1 ampere (A). The recommended maximum DC current value should be less than 500 milliamperes (mA). If abnormally high AC current levels are present on any bonding conductor, a dangerous faulty wiring condition likely exists within the room.

C. Two-Point Bonding Measurements: The Two-point Bonding test should be performed for all bonding conductors. This test should be performed using an earth grounding resistance tester configured for a continuity test. The test is performed by connecting the meter leads between the nearest available grounding electrode (e.g., structural steel) and the TMGB or TGB. The recommended maximum value for the bonding resistance between these two points is 0.1 Ohms (100 milliohms).

D. Submittals: Furnish instruments and personnel required for tests. Personnel shall be trained in all aspects of testing grounding systems and shall be formally trained on using all test equipment required. Submit 2 copies of certified test results for Owner's record and submit 4 copies of certified test results to Architect / Engineer for review. Test reports shall include date and time of tests, relative humidity, temperature, and weather conditions.

END OF SECTION

SECTION 26 05 33

CONDUIT SYSTEMS

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Furnish and install a complete system of electrical conduits and fittings.

1.2 REFERENCE STANDARDS

A. National Electrical Code.

B. Local codes and ordinances.

C. UL.

D. ETL.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS – Provide products manufactured in the USA.

A. Raceways:
1. Allied, International Metal Hose, Ipex, Heritage Plastics, Wheatland, Can-Tex, Carlon, Certain-Teed, Anamet, Inc., Electri-Flex Co., Western Tube and Conduit, Sentinel Conduit.
2. PVC Coated RGC: Robroy Perma Cote, Robroy Plasti-Bond, or Calbond – no exceptions.
3. Stainless Steel: Robroy, Calbrite, Gibson.
4. Aluminum: Penn Aluminum, American Conduit, Wheatland, Eaton B-Line, Patriot Aluminum Products.
5. Reinforced Thermosetting Resin Conduit (RTRC): FRE Composites, Champion Fiberglass, United Fiberglass.

B. Fittings:
1. Appleton, Crouse Hinds, Topaz, Steel City, O.Z. Gedney, Carlon, Heritage Plastics, Raco, Ipex, International Metal Hose, Lew Electric Fittings Co.
2. PVC Coated ferrous fittings: Robroy Perma Cote, Robroy Plasti-Bond, or Calbond – no exceptions
3. Stainless Steel: Robroy, Calbrite, Gibson, Crouse Hinds
4. Aluminum: Penn Aluminum, American Conduit, Wheatland, Eaton B-Line, Patriot Aluminum Products
5. Reinforced Thermosetting Resin Conduit (RTRC): FRE Composites, Champion Fiberglass

C. Condulets and Conduit Bodies:
1. Appleton, Form 85.
2. PVC Coated: Robroy Perma-cote or Plasti-Bond, – no exceptions.
3. Stainless Steel: Robroy, Calbrite, Gibson, Crouse Hinds.
4. Reinforced Thermosetting Resin Conduit (RTRC): FRE Composites, Champion Fiberglass.

D. Steel MC Cable for light fixture whips:
1. AFC.

2. Southwire.
3. General Cable.
4. Kaf-Tech.

2.2 GENERAL

A. The minimum conduit size shall be ¾-inch unless indicated otherwise in Divisions 26, 27 or 28.
1. Branch Circuits: Minimum conduit size shall be ¾-inch.
2. Feeder Circuits: Minimum conduit size shall be ¾-inches.
3. Technology, telecommunications, and low voltage systems: The minimum conduit size shall be ¾-inches unless noted or indicated otherwise.
4. The minimum conduit size between buildings for technology, voice, data, fire alarm, video, security, surveillance, BMCS, and other telecommunications shall be 2-inch unless indicated otherwise.

B. The minimum conduit size for flexible metallic conduit for tap connections to individual light fixtures shall be ½ inch, or steel metal clad (MC) cable with insulated ground conductor maximum 6 feet.

C. Electrical nonmetallic tubing, flexible polyethylene or PVC tubing shall not be used on this project.

D. BX and AC cable shall not be used on this project.

E. PVC elbows shall not be used on this project.

F. Intermediate metal conduit (IMC) shall not be used on this project.

2.3 RIGID METAL CONDUIT

A. UL labeled, Schedule 40:
1. Mild steel pipe, zinc coated inside and out.
2. Aluminum Alloy 6063, T-1 temper.
3. Threaded ends.
4. Insulated bushings.

B. Fittings shall meet the same requirements as rigid metal conduits.
1. UL labeled.
2. Threaded fittings.

2.4 ELECTRICAL METALLIC TUBING (EMT)

A. UL labeled, standard weight:
1. Cold rolled steel tubing, zinc coated inside and out.
2. Aluminum Alloy 6005, 6063. Temper T-1.

B. Fittings shall meet the same requirements as EMT conduits.
1. UL labeled.
2. Insulated throat connectors.
3. Steel fittings with setscrews with lock nuts on threaded ends, no snap locks.
4. Cast metal fittings are not approved.
5. Uni-couple type connectors are not approved.
6. Split ring, anti-short bushings are not approved.

2.5 RTRC CONDUIT FITTINGS AND CONDUIT BODIES

A. UL listed.

B. Standard wall thickness sizes ¼-inch through 4-inch.

C. Underground medium wall thickness sizes 5 and 6-inch.

D. Conduit interface joints above grade, gasket joint below grade.

E. Extra heavy wall for above ground and/or UL Class 1 Division 2 and Class 1 Zone 2 applications.

2.6 PVC COATED RIGID STEEL WITH URETHANE INTERIOR COATING

A. The PVC coated galvanized rigid conduit and fittings must be ETL Listed and Verified. The PVC coating must have been investigated and verified by ETL as providing the primary corrosion protection for the rigid metal conduit. Ferrous fittings for general service locations must be ETL Listed with PVC as the primary corrosion protection. Hazardous location fittings, prior to plastic coating must be UL listed for the hazard conditions to which they are to be used. All conduit and fittings must be new, unused material. Applicable UL standards may include UL 6 Standard for Safety, Rigid Metal Conduit, and UL514B Standard for Safety, Fittings for Conduit and Outlet Boxes.

B. The PVC coated galvanized rigid conduit and fittings must be ETL Verified to the Intertek ETL SEMKO High Temperature H_2O PVC Coating Adhesion Test Procedure for 200 hours. The PVC coated galvanized rigid conduit must bear the ETL Verified PVC-001 label to signify compliance to the adhesion performance standard.

C. The conduit shall be hot dip galvanized inside and out with hot galvanized threads.

D. A PVC sleeve extending one pipe diameter or two inches, whichever is less, shall be formed at every female fitting opening except unions. The inside sleeve diameter shall be matched to the outside diameter of the conduit.

E. The PVC coating on the outside of conduit couplings shall have a series of longitudinal ribs 40 mils in thickness to protect the coating from tool damage during installation.

F. Form 8 Condulets, ½-inch through 2-inch diameters, shall have a tongue-in-groove gasket to effectively seal against the elements. The design shall be equipped with a positive placement feature to ease and assure proper installation. Certified results confirming seal performance at 15 psig (positive) and 25 inches of mercury (vacuum) for 72 hours shall be available.

G. Form 8 Condulets shall be supplied with plastic encapsulated stainless-steel cover screws.

H. A urethane coating shall be uniformly and consistently applied to the interior of all conduit and fittings. This internal coating shall be a nominal 2 mil thickness. Conduit or fittings having areas with thin or no coating shall be unacceptable.

I. The PVC exterior and urethane interior coatings applied to the conduit shall afford sufficient flexibility to permit field bending without cracking or flaking at temperatures above 30°F (-1°C).

J. All male threads on conduit, elbows and nipples shall be protected by application of a

urethane coating.

K. All female threads on fittings or conduit couplings shall be protected by application of a urethane coating.

L. Independent certified test results shall be available to confirm coating adhesion under the following conditions
   1. Conduit and condulet exposure to 150°F (65°C) and 95% relative humidity with a minimum mean time to failure of 30 days. (ASTM D1151)
   2. The interior coating bond shall be confirmed using the Standard Method of Adhesion by Tape Test (ASTM D3359).
   3. No trace of the internal coating shall be visible on a white cloth following six wipes over the coating which has been wetted with acetone (ASTM D1308).
   4. The exterior coating bond shall be confirmed using the methods described in Section 3.8, NEMA RN1. After these tests the physical properties of the exterior coating shall exceed the minimum requirements specified in Table 3.1, NEMA RN1.

M. Right angle beam clamps and U bolts shall be specially formed and sized to snugly fit the outside diameter of the coated conduit. All U bolts shall be provided with plastic encapsulated nuts that cover the exposed portions of the threads.

N. All fittings, clamps, straps, struts, and hardware used with PVC coated conduit shall be PVC coated or 316 stainless steel.

2.7 STEEL FLEXIBLE CONDUIT

A. Steel flexible metallic conduit:
   1. Zinc coated inside and out.
   2. 18-inches minimum length, 24-inches maximum length.

B. Steel flexible metallic conduit for tap connections to light fixtures where steel MC Cable fixture whips are not used:
   1. 18 inches minimum length; 6 feet maximum length.

C. Liquid tight flexible steel conduit
   1. Type L.A. - Grounded - UL Approved.
   2. 18-inches minimum length, 24-inches maximum length.

2.8 PVC CONDUIT

A. UL labeled Schedule 40 and Schedule 80.

B. PVC fittings and solvent welded joints.

C. Acceptable PVC condulet manufacturer: Ipex, Cantex .

2.9 CONDULETS AND CONDUIT BODIES

A. UL Labeled.

B. Form 85.

C. PVC Coated: Form 8.

D. LBC Condulets shall be used for size 2 inch and above.

E. LL and LR Condulets shall not be used for 2 inch and above.

2.10 ROOF MOUNTED CONDUIT AND BOX SUPPORTS

A. Conduit supports and pads suitable for direct sunlight, conduit size, weight, quantity and roof system with unistrut supports and accessories. Conduit supports shall allow for conduit expansion and contraction.

B. Refer to roofing specifications for additional information. The limitations and restrictions contained in any roofing specification shall prevail and supercede these specifications for roof mounted supports for conduits and boxes.

C. Approved Manufacturer:
   1. Portable Pipe Hangers.
   2. Eaton B-Line.
   3. Miro Industries, Inc.

2.11 ALUMINUM CONDUIT

A. UL Labeled.

B. Aluminum fittings shall meet the same requirements of aluminum conduits, compatible steel fittings.
   1. UL Labeled for use with aluminum conduit.

2.12 STAINLESS STEEL CONDUIT

A. UL Labeled.

B. Rigid Stainless Steel:
   1. Type 304 Stainless Steel.
   2. Threaded ends.
   3. Insulated Bushings.

C. EMT:
   1. Type 304 Stainless Steel.
   2. Compression Fittings.
   3. Insulated Bushings.

D. Fittings, elbows, nipples, strut, device box, clamps straps, etc.
   1. Type 304 Stainless Steel.

2.13 ELECTRICAL NON-METALLIC TUBING (ENT)

A. UL labeled Schedule 40.

B. PVC fittings and solvent welded joints.

C. Acceptable manufacture: Carlon.

2.14 EXTERIOR IN-GRADE PULL BOXES

A. Enclosures, boxes and covers are required to conform to all test provisions of the most current American Association of State Highway and Transportation Officials (AASHTO) standards for H-20 loading applications.
   1. AASHTO H-20 certified precast concrete, cast iron or other AASHTO recognized materials, rated for deliberate traffic.

2. Conduit entry knock-outs as required.
3. Bolt down galvanized steel/cast iron covers.
4. Thin wall knocks outs as required .
4. Integral bottom.
5. Box height as required for specified conduit depth and required top elevation.
6. Concrete design strength of minimum 5,500 PSI at 28-days.
7. Place enclosures on a minimum of 6 inches of coarse gravel with a border of 6-inches beyond the enclosures exterior dimension.
8. Size and volume as required for application.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install electrical conduits and fittings for all wiring of any type unless specifically specified or instructed to do otherwise. Install conduits and fittings in accordance with local codes and applicable sections of the NECA “Standard of Installation”, concealed where possible.
1. Fasten conduit supports to building structure and surfaces; do not support to roof deck.
2. Arrange supports to prevent misalignment during wiring installation.
3. Do not support conduit with wire or perforated pipe straps. Remove wire used for temporary supports.
4. Do not attach conduit to ceiling support wires.
5. Arrange conduit to maintain head room and present neat appearance.
6. Maintain 4-inch clearance between conduit and rooftop surfaces.
7. Cut conduit square using saw or pipe cutter; de-burr cut ends.
8. Bring conduit to shoulder of fittings; fasten securely.
9. Conduit penetrations to all individual motor controllers, VFDs, and motor control cabinets shall only be made at the bottom of the enclosure. For other equipment, provide listed water sealing conduit hubs to fasten conduit to sides or tops of electrical equipment enclosures, device box, gutter, wireway, disconnect, etc.
10. Use suitable caps to protect installed conduit against entrance of dirt and moisture.
11. Ground and bond conduit as required.
12. Identify conduit as required.
13. Route all conduits above building slab perpendicular or parallel to building lines.
14. Do not use no-thread couplings and connectors for galvanized steel, PVC coated galvanized steel, or aluminum rigid conduit.

B. Group related conduits; support using conduit rack. Construct rack using steel channel; provide space on each for 25 percent additional conduits.

C. In areas where raceway systems are exposed and acoustical or thermal insulating material is to be installed on walls, partitions, and ceilings, raceways shall be blocked out proper distance to allow insulating material to pass without cutting or fitting. Also provide Kindorf galvanized steel channels to serve as standoffs for panels, cabinets and gutters.

D. Securely fasten conduits, supports and boxes, to ceiling (not roof deck), walls, with Rawl Plugs or approved equal anchors. Use lead cinch anchors or pressed anchors. Use only cadmium plated or galvanized bolts, screws. Plastic anchors and lead anchors shall not be used for overhead applications.

E. Provide separate raceway systems for each of the following when specified, indicated or required:
1. 120/208 volt circuits.

2. 277/480 volt circuits.
3. Emergency
    a. Life safety branch.
    b. Critical branch.
    c. Equipment branch.
4. Voice/Data.
5. Sound reinforcement.
6. Theatrical and Architectural Dimming Controls.
7. MATV/CATV.
8. Security CCTV.
9. Security System.
10. Communications / PA Systems / Sound System Line Input and Speakers.
11. Fire Alarm.
12. Lighting Control Systems.
13. Building Management Control Systems.

F. Unless shown otherwise, do not install conduit in or below concrete building slabs.

G. Unless shown otherwise, do not install conduit horizontally in concrete slabs.

H. Roof penetrations shall be made in adequate time to allow the roofing installer to make proper flashing. Conduit for equipment mounted on roof curbs shall be routed through the roof curb. Conduit, gutters, pull boxes, junction boxes, etc. shall not be routed on roof unless specified otherwise. Where specifically indicated to be routed or mounted on the roof, supports shall be as specified, as recommended by roofing manufacturer and roof support manufacturer and as required by NEC. Place supports every five feet along conduit run and within 3 feet of all bends, condulets, and junction boxes. Provide roofing pad under stands at directed by Architect and as recommended by roofing manufacturer and roof support manufacturer. Provide additional unistrut supports and accessories as required.

I. PVC coated conduit shall have all nicks and cuts to the protective coating repaired using manufacturer's approved touch-up material as recommended by manufacturer. Provide a minimum of two-wraps of 3M-50 type tape over touch-up.

J. Installation of the PVC Coated Conduit System shall be performed in accordance with the Manufacturer's Installation Manual. To assure correct installation, the installer shall be certified by Manufacturer to install coated conduit. Submit copies of training certification with submittal. Contractor shall coordinate installation with manufacturer's representative for field training and observation of installed PVC coated rigid galvanized conduit and fittings. Manufacturer's representative shall certify the installation is in accordance with manufacturer's installation instructions. Submit copies of installation certification prior to cover-up of underground installation.

K. All conduit terminations at locations including but not limited to, switchgear, pull boxes, outlet boxes, stub-up, and stub-outs:
1. Provide insulated throat connectors for EMT conduits.
2. Provide insulated bushing on all rigid conduit terminations.
3. Provide locknuts inside and outside of all boxes and enclosures.
4. Provide threaded type plastic bushing at all boxes and enclosures

L. In suspended ceilings, support conduit runs from the structure, not the ceiling system construction.
1. Do not support from structural bridging.
2. Do not support from metal roof deck.

M. Completely install each conduit run prior to pulling conductors. All boxes are to be accessible after completion of construction.

N. All conduits must be kept dry and free of water or debris with approved pipe plugs or caps. Cap or plug conduit ends prior to concrete pours.

O. Ream ends of conduits after cutting and application of cutting die to remove rough edges.

P. Install all above concrete slab conduits perpendicular or parallel to building lines in the most direct, neat and workmanlike manner.
   1. Cable Tension:
      a. 0.008 lb./cmil for up to 3 conductors, not to exceed 10,000 pounds.
      b. 0.0064 lb./cmil for more than 3 conductors, not to exceed 10,000 pounds
      c. 1000 lbs. per basket grip.
   2. Sidewall pressure: 500 lbs./ft.
   3. Conduit runs within the following limits of bends and conduit length between pull points shall not exceed the above installation pulling tension and sidewall pressure limits.
      a. Three (3) equivalent 90-degree bends: not more than fifty feet (50') between pull points.
      b. Two (2) equivalent 90-degree bends: not more than one hundred feet (100') between pull points.
      c. One (1) equivalent 90-degree bend: not more than one hundred fifty feet (150') between pull points.
      d. Straight pull: not more than two hundred feet (200') between pull points.
   4. Indicate sizes of conduits, wireway sections, and cable tray sections on the as-built drawings.
   5. Hold horizontal and vertical conduits as close as possible to walls, ceilings and other elements of the building construction. Conduits shall be kept a minimum of 6 inches clear of roof deck / insulation, and 2 inches clear of above floor deck / insulation.
   6. Install conduits to conserve building space and not obstruct equipment service space or interfere with use of space. Conduit shall not be routed on floors, paved areas or grade.
   7. Where a piece of equipment is wired from a switch or box on adjacent wall, the wiring shall go up the wall from the box, across at or near the ceiling, and back down to the equipment. Wiring shall not block the walkway between wall and equipment.
   8. Horizontal runs of conduit on exposed walls shall be kept to a minimum.
   9. Conduit for mechanical / plumbing equipment installed outdoors shall be routed with the associated mechanical / plumbing pipe support rack system where practical, coordinate with Divisions 22 and 23.
   10. Conduits installed in public areas, not concealed by architectural ceilings, shall be supported by galvanized steel channel racks to bottom of roof deck or floor deck. Conduits shall be grouped for neat workman-like appearance.

Q. Install expansion and deflection fittings and bonding jumpers on straight runs which exceed 200-feet, on center, and at 200-feet maximum, on center, on straight runs which exceed 400-feet, and where conduits cross building expansion joints.

R. Provide grounding bushings at concentric/eccentric knockouts or where reducing washers are used.

S. Run conduit to avoid proximity to heat producing equipment, piping surfaces with temperatures exceeding 104 degrees F., and flues, keeping a minimum of 13-inches clear.

T. Install conduit as a complete system, without conductors, continuous from outlet to outlet and from fitting to fitting. Make up threaded joints of conduit carefully in a manner to ensure a tight joint. Fasten the entire conduit system into position. A run of conduit between outlet and outlet, between fitting and fitting, or between outlet and fitting shall not contain more than the equivalent of four quarter bends, including those bends located immediately at the outlet or fitting.

U. Conceal conduit systems in finished areas. Conduit may be exposed in mechanical and electrical rooms, and where otherwise shown or indicated only. Run the conduit parallel and perpendicular to the structural features of the building and support with malleable iron conduit clamps at intervals as required by NEC or on conduit racks, neatly racked and bent in a smooth radius at corners.

V. Conduit bends shall be factory elbows or shall be bent using equipment specifically designed to bend conduit of the type used to maintain the conduit's UL listing. Conduit hanger spacing shall be 10 feet or less and as required by the NEC for all conduit. Beam clamp attachments to steel joist chords is prohibited. Beam clamps may only be used at beams, no exceptions. Connections to joists shall be made with galvanized channel extended between joist chords or with galvanized channel bearing on the vertical legs of joist chord angles.

W. Support conduit on galvanized channel, using compatible galvanized fittings (bolts, beam clamps, and similar items), and galvanized threaded rod pendants at each end of channel and secure raceway to channel and channel to structure. Where rod pendants are not used, channel supports are to be secured to structure at each end. Conduit supports are to be secured to structure using washers, lock washers, nuts and bolts or rod pendants; use of toggle bolt "wings" are not acceptable. Support single conduit runs using a properly sized galvanized conduit hanger with galvanized closure bolt and nut and threaded rod. Raceway support system materials shall be galvanized and manufactured by Kindorf, Unistrut, Superstrut, Caddy, or Spring Steel Fasteners, Inc. Provide chrome or nickel-plated escutcheon plates on conduit passing through walls and ceilings in finished areas. Do not support conduit from other conduit, structural bridging or fire rated ceiling system. Do not support more than one conduit from a single all-thread rod support. Provide electrical insulating sleeve or wrapping for aluminum conduit supported by zinc coated supports or fasteners. Channel supports shall have cut ends filed smooth. When installed outside of the building, or in areas subject to moisture, the cut ends shall be painted with ZRC galvanized paint or equivalent.

X. Terminate all motor connection conduits in mechanical room spaces with a floor pedestal and with "Tee" conduit at motor outlet height for flexible conduit.

Y. Where conduit is not embedded in concrete or masonry, conduit shall be firmly secured by approved clamps, half-straps or hangers. Tie wire and short pieces of conduit used as supports and or hangers are not approved.

Z. Where "LB" condulets are used, 2-inches and larger shall be type "LBD".

AA. No more than 12 conduits containing branch circuits may be installed in junction boxes, pull boxes or gutters.

BB. Flexible metal conduit and liquid tight flexible metal conduit shall only be used for final connections from junction box to equipment, light fixtures, power poles, etc. They are not to be used in lieu of conduit runs. They shall not be used for wall or roof penetrations unless they are installed in a PVC coated RGC conduit sleeve at least one size larger than the OD of the flexible conduit.

CC. Where 3-1/2-inch conduit is specified and the required or specified material is Schedule 80 PVC, provide 4-inch conduit.

DD. “Daisy Chaining” light fixtures installed for lay-in ceiling areas is not allowed. Each light fixture shall have its own fixture whip from junction box. The only exception being light fixtures installed end to end using chase nipples between them, or light fixtures recessed in non-accessible ceilings.

EE. In above ceiling applications, do not install raceways, junction boxes, gutters, disconnects, etc. within 36 inches directly in front of HVAC control boxes or other equipment requiring access from a point starting from the top of control box / equipment down to ceiling.

FF. Do not install conduit, junction boxes, etc. within 18 inches of outside edges of roof access openings.

GG. Install minimum size 2-inch nipple, at least one, between multi-sectional panels for branch circuit independent of feeder conductors.

3.2 CONDUITS

A. Conduit above grade indoors:
   1. Concealed Conduits: EMT with set screw fittings.
   2. Exposed conduits:
      a. Below nine feet AFF where not directly attached and against building walls, ceiling, or structure: Rigid metal conduit or x-wall RTRC.
      b. Where subject to physical damage: Rigid metal conduit or x-wall RTRC.
      c. Wet locations: PVC coated galvanized rigid steel or aluminum conduit
      d. Damp Locations: Aluminum rigid conduit or x-wall RTRC.
      e. Exposed conduits in mechanical rooms or electrical rooms shall be rigid galvanized steel or x-wall RTRC when installed below 18-inches above finished floor.

B. Conduit installed above grade outdoors:
   1. Galvanized rigid steel or x-wall RTRC for conduits up utility poles and where subject to physical damage or where located less than four feet above finished floor.
   2. Aluminum or x-wall RTRC where not subject to physical damage and where located four feet above finished floor.

C. Conduit where indicated underground:
   1. PVC Coated Galvanized rigid steel or RTRC conduit elbows and Schedule 80 PVC, RTRC, or PVC coated galvanized steel straight run conduits. PVC conduits for underground branch circuits shall be Schedule 80 or Schedule 40 PVC.
      a. PVC conduit and fittings shall be used only for straight horizontal runs and for vertical risers at site lighting pole bases. Bending straight sections of PVC conduit to less than 25-foot radius or the use of PVC factory bends is not allowed.
      b. Change in direction of conduit runs, either vertical or horizontal, shall be with RTRC or PVC coated galvanized steel elbows or long sweep bends of straight PVC conduit sections. Long sweep bends of straight PVC 20-foot sections shall have a minimum radius of curvature of 25 feet and a maximum arc of 22.5degrees. Multiple long sweep bends of straight PVC sections shall be separated by a minimum of 20-feet of straight, linear, PVC sections.

c. Provide RTRC or PVC coated rigid galvanized steel conduit elbows and fittings with urethane interior coating at all changes in direction with radius of less than 25-feet and at all vertical runs to 18 inches above finished floor elevation. For interior slab penetrations, provide continuous RTRC or PVC coated rigid galvanized steel conduit and fittings with urethane interior coating from change in direction to 18 inches above finished floor elevation, except where stubbed-up under and inside equipment or switchgear where conduit shall be terminated at minimum two inches above concrete housekeeping pad.

d. Elbows for underground electrical service entrance, feeders, transformer primary / secondary, telecommunication, and low voltage conduits shall be RTRC or PVC coated rigid galvanized steel with long radius as follows:
   1) Up to 1-inch conduit, minimum 12-inch radius.
   2) 1.5-inch conduit, minimum 18-inch radius.
   3) 2-inch conduit, minimum 24-inch radius.
   4) 2.5-inch conduit, minimum 30-inch radius.
   5) 3-inch conduit, minimum 36-inch radius.
   6) 3.5 to 6-inch conduit, minimum 48-inch radius.

e. Conduit for all floor boxes shall be routed below building slab from floor box to nearest column, wall, or as indicated.

f. Conduits shall not be routed horizontally in building slab, grade beams or pavement.

2. Encase all underground conduits in concrete.
   a. Concrete shall be tinted red throughout with a ratio of 10 pounds of dye per yard of concrete unless prohibited by utility for utility conduits. Concrete encasement for utility installed conductors shall be as specified by the utility and comply with their standards and specifications. Where utility does not require but allows concrete encasement of conduits, provide concrete encasement as specified herein.
   b. Provide minimum 3-inch concrete encasement around conduits.
   c. Provide conduit spacers for parallel branch/feeder conduits.
   d. When prior written approval from Owner and Architect to omit concrete encasement of conduits below building slab is given, conduits either specified or approved in writing to be routed under building slab without concrete encasement for electrical branch circuits or voice / data / video / communications horizontal drops or outlets shall be installed 18 inches below finished floor and on select fill. All other conduits, including but not limited to electrical feeders, voice / data / video / communications vertical, riser, tie, trunk, or service cable conduits shall be installed 48-inches below finished floor and on select fill.
   e. Use suitable manufactured separators and chairs installed 4 feet on centers. Securely anchor conduit at each chair to prevent movement during backfill placement.
3. Install building voice / data / video / communications main service conduits and electrical service transformer primary and secondary conduits with top of concrete encasement minimum 48-inches below finished grade or pavement. Voice / data / video / communications conduits and electrical service primary conduits for utility owned electrical service transformers shall also comply with the respective utility company requirements and standards. All other underground conduits outside of building other than voice / data / video / communications main service conduits and electrical service transformer primary and secondary conduits shall have top of concrete encasement at 36 inches minimum below finished grade or pavement.
4. Provide two “caution” plastic tapes at 6-inches and 18-inches below finished slab, grade, or pavement; identify as specified in Section 26 05 00.

5. Conduits located outside building, provide magnetic locator tape at top of first compacted layer of backfill or concrete.
6. During construction, partially completed underground conduits shall be protected from the entrance of debris such as mud, sand, and dirt by means of conduit plugs. As each section of the underground conduit is completed, a testing mandrel with diameter ¼-inch smaller than the conduit, shall be drawn through each conduit. A brush with stiff bristles shall be drawn through until conduit is clear of particles of earth, sand, or gravel. Conduit plugs shall then be installed.
7. Utility underground conduit for Utility Company cable shall be installed per Utility Company standards, and their specifications for this project.
8. Concrete shall be Portland Cement conforming to ASTM-C-150, Type 1, Type III or Type V if specified. Cement content shall be sufficient to product minimum strength of 2,500 PSI.
9. Contractor shall stake out routing and location of underground conduits using actual field measurements. He shall obtain approval of the Owner and Architect before beginning trenching, horizontal drilling, and excavation.
10. Verify location and routing of all new and existing underground utilities with the Owner and Architect on the job site. Stake out these existing utilities so that they will not be damaged. Stake out new utilities to provide coordination with other trades and with new and existing utilities, easements, property lines, restricted land use areas, and right-of-ways. Verify existing public utilities with Call811.

D. Conduit shown in concrete walls, floor or roof slab:
   1. PVC Coated Galvanized Rigid steel.

E. Conduits that penetrate concrete slab, or within 100 feet of cooling towers, or at designated corrosive locations.
   1. RTRC.
   2. PVC coated galvanized rigid steel.

F. Connections to equipment mounted on roof, rotating equipment, transformers, and kitchen or food processing equipment, or where flexible conduit is required outdoors.
   1. Liquid tight flexible metal conduit (1/2 inch may be used for roof top supply / exhaust fans only).
   2. Liquid tight flexible metal conduit for 24-inch maximum length.
   3. Conduit for roof-mounted equipment shall be routed inside the roof curb assembly roof opening. Provide permanent lock-off device at panelboard circuit breakers serving roof equipment and accessories to enable tag-out procedures for all power routed through roof curb and to the roof mounted equipment and accessories.

G. Light fixture whips:
   1. Accessible ceilings and open structure: ½-inch flexible steel conduit or steel MC cable, length not to exceed 6-feet.
   2. Non-accessible ceilings: ½-inch flexible steel conduit. Length as required to make a tap at an accessible j-box. Recessed light fixtures in non-accessible ceilings may be daisy chained using the light fixture's integral, UL listed j-box or internal wire way that is accessible through fixture from below the ceiling.
   3. Dedicated insulated ground wire.
   4. Light fixture whips shall not rest on ceiling grid or tile.
   5. Light fixture whips shall not be supported from the ceiling suspension system. Support from the structure with #13 AWG galvanized iron wire pendants and Caddy clips. Do not support conduit from structural bridging. Flexible conduit and steel MC cable shall be kept a minimum of 2 inches clear of roof deck.

H. Conduits at Natatorium or therapeutic pool areas:
   1. Underground conduit shall be as specified in this section.
   2. Exterior conduits and boxes within 100 feet of exhaust openings shall be x-wall RTRC or PVC coated galvanized rigid steel or stainless steel.
   3. Exposed conduits in chemical storage rooms, pool mechanical equipment (pump rooms, and pool equipment storage rooms shall be Schedule 80 PVC. Boxes shall be PVC, or 304 Stainless Steel.
   4. Exposed conduits and boxes in indoor pool areas and all other indoor public areas shall be Type 304 Stainless Steel.

I. Conduits located inside greenhouses and natatorium pump and water treatment rooms:
   1. X-wall RTRC.
   2. Schedule 80 PVC.
   3. PVC coated galvanized rigid steel conduit and fittings.

J. Conduits in classified hazardous (Classified) locations:
   1. Conduit fittings and seals UL listed for the classification.

K. Conduits embedded in parking structure traffic wearing surface and concrete support structures:
   1. Schedule 40 PVC, RTRC, PVC coated rigid galvanized conduit.
   2. Schedule 40 ENT may only be used for flat runs embedded in traffic wearing surface concrete topping.
   2. Solvent welded fittings only for PVC conduit and ENT.
   3. Verify with Structural Engineer prior to construction for any additional limitations for raceway installation restrictions installed in parking structure including but not limited to maximum outside diameter of raceways permitted to be used in the wearing surface, and field cutting or drilling through parking structure structural members or support structures.
   4. All raceways shall be securely fastened to prevent floating during concrete installation. ENT raceways shall be completely embedded in concrete material to maintain fire and smoke integratory as required by the NEC.
   5. When using ENT or PVC conduits, provide transition to x-wall RTRC or PVC coated rigid galvanized conduit elbows and vertical risers to ensure that only flat horizontal runs of PVC conduit or ENT are used along the top of the parking structure structural support deck and that they are completely concealed and embedded by the wearing surface concrete material topping.

3.3 CONDUIT PENETRATIONS, SLEEVES AND ESCUTCHEONS

A. Furnish sleeves for placing in construction for all conduit passing through concrete or masonry walls, partitions, beams, all floors other than grade level, and roofs. A conduit sleeve shall be one size larger than the size of conduit, which it serves except where larger sizes are required for manufactured water, fire, or smoke stop fittings.
   1. Sleeves set in concrete floor construction shall be minimum Schedule 40 galvanized steel.
   2. Sleeves shall extend 3-inches above the finished floor.

B. Sleeves in concrete or masonry walls shall be RTRC or Schedule 40 galvanized steel. Sleeves shall be set flush with finished wall.

C. Install manufactured UL listed water, fire, and smoke stop fittings, or caulk around conduit or cables in sleeves with sufficient UL listed fire safe insulation or foam to maintain wall or floor slab fire or smoke rating. Refer to Architecture drawings for locations of rated walls.

D. Provide Linkseal Mechanical Seals around conduit penetrations through walls below

grade. Provide a pull box to install a water stop inside wall penetration. Internally seal low voltage cabling conduit penetrations with waterproof caulking.

E. Sleeves penetrating walls below grade shall be Schedule 40 black steel pipe with ¼-inch thick steel plate secured to the pipe with continuous fillet weld. The plate shall be located in the middle of the wall and shall be 2-inches wider all around than the sleeve that it encircles. The sleeve should extend a minimum of 24-inches on either side of the penetration. The entire assembly shall be hot-dipped galvanized after fabrication. Do not sleeve or penetrate grade beams.

F. Conduit passing through the housing on connected equipment shall pass through a cleanly cut hole protected with a threaded steel bushing. Route conduit through roof openings, for piping and ductwork or through suitable roof jack, with pitch pocket. Coordinate location with roofing installation as required.

G. Conduit passing through fire rated wall shall be sealed with Fire Stop. Route conduit to preserve fire resistance rating of partitions and other elements, using materials and methods under the provisions of Division 7.

3.4 POWER DISTRIBUTION UNDERGROUND FEEDER CONDUIT AND UNDERGROUND SERVICE ENTRANCE CONDUIT

A. Power underground feeder and service entrance shall be of individual conduit encased in concrete. Unless shown otherwise, the type of conduit used shall not be mixed in any one underground conduit and shall be the size indicated on the drawings. The concrete encasement surrounding the underground conduit shall be rectangular in cross-section, having a minimum concrete thickness of 3-inches, except that conduit for 120V and above shall be separated from control and signal conduits by a minimum concrete thickness of 3-inches. Encasement concrete shall be tinted in red.

B. During construction, partially completed underground conduits shall be protected from the entrance of debris such as mud, sand, and dirt by means of conduit plugs. As each section of the underground conduit is completed, a testing mandrel shall be drawn through until each conduit is clear of particles of earth, sand, or gravel. Conduit plugs shall then be installed.

C. Furnish the exact dimensions and location of power underground conduit to be encased in time to prevent delay in the concrete work.

D. Conduit for service entrance underground conduits shall be as indicated on the drawings.

E. Primary power underground conduit shall be installed in accordance with utility company standards and the utility company specifications for this project.

3.5 TELECOMMUNICATIONS, LOW VOLTAGE AND EMPTY CONDUIT SYSTEM RACEWAYS

A. Conduit shall be installed in accordance with the specified requirements for conduit and with the additional requirements that no length of run shall exceed 100-feet for 1 inch or smaller trade sizes and shall not contain more than two 90-degree bends or the equivalent. Pull or junction boxes shall be installed to comply with these requirements. Provide plastic bushings at all conduit terminations. Provide a grounding bushing on each data and voice conduit.

B. Conduits shall be installed from outlet box to above an accessible ceiling. All cables routed through open spaces (no-ceiling below roof deck or above floor deck) shall be routed in conduit. Telecommunications systems, CATV, CCTV, fire alarm and BMCS

cables can be installed above accessible ceilings without conduit. Cables installed above accessible ceiling shall be plenum rated. Conduit rough in of these cables shall include a 90-degree turn-out to an accessible location with insulated bushings on the end of the conduit.

1. Provide conduit from each telecommunications outlet box to accessible ceiling plenum.
2. Provide conduit from each security / surveillance device outlet box to accessible ceiling plenum.
3. Provide two conduits for each multi-media outlet box and each outlet box indicated to contain more than four data, audio, or video drops to accessible ceiling plenum.
4. Provide the following minimum conduits for telecommunications and multi-media wall, floor, and ceiling mounted outlet boxes. Use the largest diameter conduit indicated below unless instructed otherwise in writing from the Architect:
   a. Non-masonry outlet box: Two 1-inch conduits.
   b. Masonry outlet box: Two 1-inch conduits, or three 3/4-inch conduits.
   c. Where indicated differently on plans or where conflicts arise, notify the Architect / Engineer prior to installation.

C. All conduit in which cable is to be installed by others shall have pull string installed. The nylon pull string shall have not less than 200 lb. tensile strength. Not less than 12-inches of slack shall be left at each end. Provide blank cover plate before substantial completion if box is for a future installation after substantial completion of the project. Conduit shall extend to a minimum six inches above nearest accessible ceiling and be turned horizontally with plastic bushing at terminations.

D. Conduits for Building Entrance Facilities:
1. Underground Outside Plant: Install a pull box every 300-feet or after 180 degree turns.
2. Inside Plant: Install a pull box every 150-feet or after 180 degree turns. All turns shall be large sweeps, not sharp 90s, with the radius of the sweep at least 10X the diameter of the conduit. Hence, a 4-inch conduit requires a 40-inch minimum radial sweep. If field conditions absolutely mandate a sharp 90-degree bend to be installed, then a pull box shall be installed at that location regardless of distance.
3. Building entrance facilities shall not terminate in an IDF or any other space except the MDF.
4. Coordinate the termination location of the building entrance facilities in the MDF with the room layout and equipment configuration.
5. Provide 4-inch conduit unless indicated otherwise. Provide (3) fabric innerducts in each 4-inch conduit.

3.6 EXTERIOR IN-GRADE PULL BOXES

A. Provide pull boxes where specified and as required.

B. Pull boxes located in pavement shall be set with proper extensions so that top of cover is flush with pavement.

C. Pull boxes located in non-paved areas shall be set two-inches above surrounding finished grade. Provide 12-inch wide by 8-inch deep reinforced concrete crown around neck or opening and sloped down away from pull box opening.

3.7 ALUMINUM ALLOY CONDUCTORS

A. Where aluminum alloy conductors are specified, approved and substituted for copper

conductors, provide the required conduit size based on conduit fill using NEC or recognized cable manufacturer's conduit fill tables for aluminum alloy compact conductors.

3.8 IDENTIFICATION

A. Conduit Systems: Provide adequate marking of conduit larger than one inch exposed or concealed in interior accessible spaces to distinguish each run as either a power (120/208V or 277/480V) or signal / telecommunication conduit (Fire Alarm, BAS, BMCS, Security, CCTV, Access Control, Intrusion Detection, Telecom, etc.). Except as otherwise indicated, use orange banding with black lettering. Provide self-adhesive or snap-on type plastic markers. Locate markers at ends of conduit runs, near switches and other control devices, near items of equipment served by the conductors, at points where conduit passes through walls or floors or enters non-accessible construction, and at spacing of not more than 50-feet along each run of exposed conduit. Switch-leg conduit and short branches for power connections need not be marked, except where conduit is larger than 1-inch.

END OF SECTION

SECTION 26 05 35

ELECTRICAL CONNECTIONS FOR EQUIPMENT

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Electrical connections as required and scheduled, and as specified.

1.2 RELATED WORK

A. Refer to other Divisions for specific individual equipment electrical requirements.

1.3 QUALITY ASSURANCE

A. UL Label: Products shall be UL listed to the extent possible.

PART 2 - PRODUCTS

2.1 MATERIALS AND COMPONENTS

A. General: For each electrical connection indicated, provide a complete assembly including, but not limited to, pressure connectors, terminals (lugs), electrical insulating tape, heat-shrinkable insulating tubing, cable ties, solderless wire nuts, and other items and accessories needed to complete splices and terminations.

B. Raceways: Refer to related sections.

C. Conductors and Connectors: Refer to related section. Conductors at equipment terminations shall be copper.

D. Terminals: Provide electrical terminals as indicated by the terminal manufacturer for the application.

PART 3 - EXECUTION

3.1 INSTALLATION OF ELECTRICAL CONNECTIONS

A. General: Install electrical connections as shown, in accordance with applicable portions of the NECA Standard of Installation, and industry practices.

B. Conductors: Connect electrical power supply conductors to equipment conductors in accordance with equipment manufacturer's written instructions and wiring diagrams. Where possible, match conductors of the electrical connection for interface between the electrical supply and the installed equipment.

C. Splice Insulation: Cover splices with electrical insulation equivalent to, or of a higher rating than, insulation on the conductors being spliced.

D. Appearance: Prepare conductors by cutting and stripping covering, jacket, and insulation to ensure a uniform and neat appearance where cables and wires are terminated.

E. Routing: Trim cables and wires to be as short as practical. Arrange routing to facilitate inspection, testing, and maintenance.

F. Motor Connections: Where possible, terminate conduit in conduit boxes at motors. Where motors are not provided with conduit boxes, terminate the conduit in a suitable condulet, and make motor connections. Conduit passing through the housing on connected equipment shall pass through a cleanly cut hole protected with an approved grommet. For all AHU or fan motors and all other motors 10 HP and larger, at the motor connection do not use wire nuts. Provide copper alloy split bolt connectors or compression lugs and bolts. Insulate connection with Scotch Super 88 vinyl electrical tape over rubber tape, or Tyco Gelcap Motor Connection Kit.

G. Conduit connections to equipment including, but not limited to, Variable Frequency Drives, Manual and Automatic Transfer Switches, Surge Suppression Devices, motor controllers, electrical disconnects, food service / processing equipment, electronics, control panels and Owner furnished equipment:

1. Make conduit penetrations only at the bottom flat surface of the equipment and only where permitted by the equipment manufacturer to avoid un-intentional water entry. Coordinate installation of electrical connections for equipment with equipment installation work. Where equipment manufacture does not permit a bottom conduit entry, verify with Owner/Engineer and locate the conduit entry at the side surface as close as possible to the bottom of the enclosure.
2. Where conduit originates from an elevation above the conduit entry, provide a “T” condulet below the enclosure’s bottom elevation. Provide conduit from the condulet up to the enclosure bottom horizontal surface for electrical connection.

H. Identification: Refer to Electrical General Provisions for identification of electrical power supply conductor terminations with markers approved as to type, color, letter and marker size by the Architect. Fasten markers at each termination point, as close as possible to each connecting point.

I. Equipment and Furnishings: Refer to other Divisions. Coordinate power and control provisions shown for equipment and furnishings with the provisions required for the furnished equipment and furnishings. Where the power and control requirements are less than or equal to those specified, modifications to power and control provisions shall be made at no cost as a part of coordination. Where power and control requirements are in excess of those shown, notify the Architect in writing of the requirements.

END OF SECTION

SECTION 26 05 37

ELECTRICAL BOXES AND FITTINGS

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Provide electrical box and fitting work as required, scheduled, indicated, and specified.

1.2 QUALITY ASSURANCE

A. UL Label: Electrical boxes and fittings shall be UL listed.

PART 2 - PRODUCTS

2.1 FABRICATED MATERIALS

A. Interior Outlet Boxes: Provide galvanized steel interior outlet wiring boxes, of the type, shape, and size, including depth of box, to suit respective locations and installation. Construct with stamped knockouts in back and sides. Provide gang boxes where devices are shown grouped. Single box design; sectional boxes are not acceptable, except for wall mounted electronic displays.
   1. Type of Various Locations:
      a. Wall mounted interactive media boards, video displays, televisions, electronic signage and similar installations; recessed wall mounted box for power and/or multi-media (low voltage) outlets: Arlington Industries #TVBS 613, 4-gang steel box with white trim plate.
      b. Technology, data, voice, video and multi-media outlet boxes at locations other than wall mounted interactive media boards, video displays, televisions, electronic signage and similar installations: minimum 4-inch square (2-gang), 3-inch deep interior outlet boxes. Raco #260H large capacity box with ½ through 2-inch knockouts.
      c. Security, access control, and video surveillance outlet boxes: single gang, 3-inch deep outlet boxes mounted long axis vertically.
      d. All other applications: minimum 4-inch square (2-gang) 2-1/8-inch deep boxes.
      e. Masonry Walls: Galvanized switch boxes made especially for masonry installations; depths of boxes must be coordinated for each installation.
      f. Surface: Type FS or FD box with surface cover.
      g. Corrosive locations or natatorium areas: 316 stainless steel construction suitable for the installation.
      h. Hazardous (Classified) Locations: Explosion proof boxes, seals and fittings.
      i. Special: Where above types are not suitable, boxes as required, taking into account space available, appearance, and Code requirements
   2. Interior Outlet Box Accessories: Outlet box accessories required as for installation, including covers or wall device plates, mounting brackets, wallboard hangers, extension rings, plaster rings for boxes in plaster construction, fixture studs, cable clamps and metal straps for supporting outlet boxes. Accessories shall be compatible with outlet boxes used and meet requirements of individual wiring.

B. Damp Location Outlet and Damp or Wet Location Switch Boxes: Deep type, hot dipped galvanized cast-metal weatherproof outlet wiring boxes, of type, shape, and size required. Include depth of box, threaded conduit ends, and stainless steel cover plate

with spring-hinged waterproof caps suitable for application. Include faceplate gasket and corrosion-resistant, tamper / vandal proof fasteners.

C. Wet Location Outlet Boxes: Hot dipped galvanized cast-iron weatherproof outlet wiring boxes, of type, shape, and size required. Include depth of box, threaded conduit ends.

D. Junction and Pull Boxes: Galvanized sheet steel junction and pull boxes, with screw-on covers, of type, shape, and size, to suit respective location and installation.
   1. Type for Various Locations:
      a. Minimum Size: 4-inch square, 2-1/8-inches deep.
      b. 150 Cubic Inches in Volume or Larger: Code gauge steel with sides formed and welded, screw covers unless shown or required to have hinged doors. All boxes mounted above ceiling shall have screw covers. Boxes in all other areas with covers larger than 12-inches shall have hinged with screw covers. Knockouts factory stamped or formed in field with a cutting tool to provide a clean symmetrically cut hole.
      c. Exterior or Wet Areas: 304 stainless steel NEMA 4X construction with gaskets and corrosion-resistant fasteners.

E. Conduit Bodies: Provide galvanized cast-metal conduit bodies, of type, shape, and size, to suit location and installation. Construct with threaded conduit ends, removable cover, and corrosion-resistant screws.

F. Bushings, Knockout Closures, and Locknuts: Provide corrosion-resistant punched-steel box knockout closures, conduit locknuts, and insulated conduit bushings of type and size to suit use and installation.

G. Outlet boxes in fire rated walls: Provide 2-hour rated gasket within box and below cover, equal to Rectorseal Metacaulk box guard and cover guard.

PART 3 - EXECUTION

3.1 INSTALLATION OF BOXES AND FITTINGS

A. Install electrical boxes and fittings as shown and as required, in compliance with NEC requirements, in accordance with the manufacturer's written instructions, in accordance with industry practices.

B. Provide recessed device boxes for wall mounted interactive media boards, video displays, televisions, electronic signage and similar installations.

C. Provide minimum 4-inch square (2-gang), 3-inch deep interior outlet boxes for technology, data, voice, video, and multi-media outlet boxes at locations other than wall mounted interactive boards, video or visual displays. Provide single gang only, 3-inch deep outlet boxes mounted long axis vertically for security, access control, and video surveillance, coordinate with security equipment installation. Provide minimum 4-inch square (2-gang) 2-1/8-inch deep boxes for all other applications. Where indicated differently on plans or where conflicts arise, notify the Architect / Engineer prior to installation. Box extenders or plaster rings shall not be used to increase size. Provide increased box size as required.

D. Junction and pull boxes, condulets, gutters, located above grid ceilings shall be mounted within 18-inches of ceiling grid. Junction and pull boxes above grid ceilings shall be mounted in the same room served. Junction boxes and pull boxes required for areas with inaccessible ceilings shall be located above the nearest accessible ceiling area. All junction box or pull box openings shall be side or bottom accessible. Removal of light

fixtures, mechanical equipment or other devices shall not be required to access boxes. Outlet boxes above ceiling for low voltage terminations shall face towards the floor.

E. Use outlet and switch boxes for junctions on concealed conduit systems except in utility areas where exposed junction or pull boxes can be used.

F. Determine from the drawings and by measurement the location of each outlet. Locate electrical boxes to accommodate millwork, fixtures, marker boards, and other room equipment at no additional cost to the Owner. The outlet locations shall be modified from those shown to accommodate changes in door swing or to clear interferences that arise from construction as well as modifying them to center in rooms. The modifications shall be made with no cost as part of coordination. Check the conditions throughout the job and notify the Architect of discrepancies. Verify modifications before proceeding with installation. Set wall boxes in advance of wall construction, blocked in place and secured. Set all wall boxes flush with the finish and install extension rings as required extending boxes to the finished surfaces of special furring or wall finishes. Provide wall box support legs attached to stud to prevent movement of box in wall.

G. Unless noted or directed otherwise at installation, place outlet boxes as indicated on architectural elevations and as required by local codes.

H. Outlets above counters, mount long axis horizontally. Refer to architectural elevations and coordinate to clear backsplash and millwork.

I. Provide pull boxes, junction boxes, wiring troughs, and cabinets where necessary for installation of electrical systems. Surface mounted boxes below 9 feet and accessible to the public shall not have stamped knockouts.

J. Provide weatherproof boxes for interior and exterior locations exposed to weather or moisture.

K. Provide knockout closures to cap unused knockout holes in boxes.

L. Locate boxes and conduit bodies to ensure access to electrical wiring. Provide minimum 12-inch clearance in front of box or conduit body access.

M. Secure boxes to the substrate where they are mounted, or embed boxes in concrete or masonry.

N. Boxes for any conduit system shall not be secured to the ceiling system, HVAC ductwork or piping system.

O. Provide junction and pull boxes for feeders and branch circuits where shown and where required by NEC, regardless of whether or not boxes are shown.

P. Coordinate locations of boxes in fire rated partitions and slabs to not affect the fire rating of the partition or slab. Notify the Architect in writing where modification or construction is required to maintain the partition or slab fire rating.

Q. Exterior boxes installed within 50-feet of cooling towers or water treatment areas shall be of 304 stainless steel, weatherproof NEMA 4X construction.

R. Identification: Paint the exterior and cover plates of building interior junction boxes and pull boxes located above accessible ceilings or non-finished areas to correspond to the following colors:

1. Orange: - 480/277 VAC systems.

2. Light Blue: - 240 VAC three phase delta systems.
3. Red – All Emergency circuits, regardless of voltage, and fire alarm system.
4. Light Green - 120/208 VAC 3 phase and 120/240 VAC single-phase systems.
5. Yellow – Building Management and Control System – BMCS.
6. White - Security and Surveillance equipment circuits.

S. All box covers shall be labeled with Panel ID and circuit numbers of all circuits available in box using permanent black marker. Boxes containing main feeders are to list where fed from and load (example “MSB to Panel HA”). Information listed is to be legible, markovers are not acceptable. Multi-sectional panel numbers are not to be listed on covers (example “LA2” referring to Panel LA sec. 2 is to be listed as “LA”). Label covers for special applications explaining contents (example “Emerg. Gen. Annunciator controls”, “IDF ground”). Do not attach box covers that have both sides painted or labeled differently. In public areas where boxes are painted same color as room per architect, label inside covers. Boxes that are not used shall be labeled as not used and include panel ID. Example “Not Used Panel LA”. Unused raceways not in sight of panel shall be terminated in a box and labeled not used and include panel identification.

T. Align adjacent wall mounted outlet boxes for switches, thermostats, and similar devices.

U. Use flush mounting outlet box in finished areas unless specifically indicated as being used with exposed conduit.

V. Locate flush-mounting box in masonry wall to require cutting of masonry unit corner only. Coordinate masonry cutting to achieve neat opening.

W. Do not install flush mounting box back-to-back in walls; provide minimum 6 inches with stud separation. Provide minimum 24 inches with separation in acoustic rated walls.

X. Secure flush mounting box to interior wall and partition studs. Accurately position to allow for surface finish thickness. Provide UL listed materials to support boxes in walls to prevent movement. Ensure box cannot be pushed inside wall.

Y. Use stamped steel bridges to fasten flush mounting outlet box between studs.

Z. Install flush mounting box without damaging vapor barriers, wall insulation or reducing its effectiveness.

AA. Use adjustable steel channel fasteners for hung ceiling outlet box.

BB. Do not fasten boxes to ceiling support wires.

CC. Support systems are to hang vertically straight down. All-thread supports, when used, are not to be installed at an angle or bent.

DD. Use gang box where more than one device is mounted together. Do not use sectional box.

EE. Use gang box with plaster ring for single device outlets.

FF. Support outlets flush with suspended ceilings to the building structure.

GG. Mount boxes to the building structure with supporting facilities independent of the conduits or raceways.

HH. Where multiple feeders are in one pull box, conductors shall be wrapped with 3M No. 7700 Arc and fireproof tape.

II. Provide plaster rings of suitable depth on all outlet boxes. Face of plaster ring shall be within 1/8 inch from finished surface.

JJ. Equip boxes supporting fixtures designed to accept fixture studs with 3/8-inch stud (galvanized malleable iron) inserted through back of box and secured by locknut. Boxes not equipped with outlets shall have level metal covers with rust-resisting screws.

KK. Do not mount junction boxes above inaccessible ceilings or in inaccessible spaces. Do not mount junction boxes above ceilings accessible only by removing light fixture, mechanical equipment or other devices. At inaccessible spaces use junction box furnished with light fixture or light fixture wiring compartment UL listed for through wiring.

LL. No more than 12 conduits containing branch circuits may be installed in any junction or pull box.

MM. All junction boxes shall be protected from building finish painters' over spray and from fire proofing overspray. Remove protective coverings when painting and fire proofing are complete.

NN. Bond equipment grounding conductor to all junction and pull boxes.

OO. Do not mount boxes or conduit bodies on walls directly above electrical panels or switchgear located next to walls.

PP. Do not mount boxes or conduit bodies within 18 inches of outside edges of roof access openings.

QQ. Box extenders or plaster rings shall not be used to increase the Code mandated cable capacity of a box. Provide proper size box.

3.2 ADJUSTING

A. Adjust flush-mounting outlets to make front flush with finished wall material.

B. Install knockout closures in unused box openings.

END OF SECTION

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SECTION 26 05 38

ELECTRICAL FLOOR BOXES AND FITTINGS

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Provide electrical floor box and fitting work as required, scheduled, indicated, and specified.

B. All floor boxes and all poke-throughs for line voltage wiring devices or telecommunication outlets shall be the concealed service type.

1.2 QUALITY ASSURANCE

A. UL Label: Electrical boxes, covers, and fittings shall be UL listed.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS – Provide products that are Buy American Act Compliance

A. Wiremold.

B. Hubbell.

2.2 CONCEALED SERVICE - FLOOR BOXES

A. Wiremold Evolution RFBA 4/6/10 Series.

B. Floor box shall be electro-galvanized sheet steel with fusion-bonded epoxy suitable for direct contact with concrete on grade.

C. Cover assembly shall die-cast aluminum, finish as selected by Architect.

D. Shall deliver electric power and telecommunications from non-proprietary building standard wiring devices and non-proprietary building standard telecommunications ports installed below the surface of the floor.

E. Shall deliver telecommunications without interference from the electric power delivery.

F. Hinged cover shall accept carpet or tile to match floor covering and be 180 degrees reversible.

G. Shall accept conduit sizes up to 2-inches.

H. When hinged cover is closed and no services in place, device shall have no obstructions above surface of floor.

2.3 CONCEALED SERVICE, FIRE RATED, POKE-THROUGH DEVICE

A. Wiremold Evolution Series - 6AT (3-gang) / 8AT (5-gang) /10AT (8-gang).

B. Shall be UL classified two-hour fire rating. Where floor fire rating is three-hour, provide only the 6AT series with a 3-hour fire rating.

C. Shall be UL listed for use with power and low voltage in a single service fitting and shall protect against ingress of water or foreign materials.

D. Shall deliver electric power and telecommunications from non-proprietary building standard wiring devices and non-proprietary building standard telecommunications ports installed below the surface of the floor.

D. Center data channel for six-inch 6AT poke throughs shall accept a minimum of (22) Category 6a cables, center data channel shall accept a minimum of (5) Category 6a cables.

E. Shall be installed in a single core drilled hole.

F. Shall permit use with “H” cut opening in carpet so carpet can be restored if position is vacated.

G. Shall have interchangeable service fitting accessories including hinged guard and low voltage communication inserts.

H. Service fitting cover shall be aluminum, finish as selected by Architect.

2.4 RECESSED FURNITURE FEED POKE-THROUGH DEVICES

A. Wiremold Evolution 6ATCFF Series.

B. Shall be UL classified for use in up to two-hour fire rated floors.

C. Shall be UL listed for use with power and low voltage in a single service fitting and shall protect against ingress of water or foreign materials.

D. Shall be installed in a single core drilled hole.

E. Die-cast aluminum covers, finish as selected by Architect.

2.5 SERVICE FITTING HEADS

A. Shall be brushed aluminum or stainless steel.

B. Shall deliver electrical power from receptacles as designated on the plans.

C. Shall deliver telephone/data through precut bushed opening.

D. Provide non-proprietary building standard line voltage wiring devices.

E. Shall be furnished standard with conduit nipple for direct screw threading into cover assembly.

PART 3 - EXECUTION

3.1 GENERAL

A. Locate position for floor boxes and runs of conduit as shown on the plans, or as required. Coordinate with the Structural Engineer and Architect for dimensional locations of floor boxes prior to cutting or pouring slab.

B. Select appropriate size of floor boxes, poke-through, or multiple services floor boxes for quantity of wiring devices or cables indicated and as recommended by manufacturer.

3.2 INSTALLATION

A. Position floor boxes and install conduits at locations approved by the Architect.

B. After concrete pour, pull wires and install devices according to manufacturer's recommendations.

C. Activate in accordance with the National Electrical Code.

D. Coordinate with floor covering contractor to complete installation.

E. Core drill openings for poke-through service fitting and installation in accordance with manufacturer's instructions and where approved by the Structural Engineer and Architect.
   1. Minimum spacing of 2-feet on center and not more than one unit per each 65-square feet of floor area in each span as required by Fire Resistance Directory.

END OF SECTION

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SECTION 26 05 40

ELECTRICAL GUTTERS AND WIREWAYS

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Provide electrical gutter work as shown, as specified and as required.

B. Application: The types of electrical gutters required for the project include the following:
1. Electrical wiring gutters.
2. Voice / Data / Video / Communication and signal distribution wireway.

1.2 QUALITY ASSURANCE

A. UL Label: Gutters and wireways shall be UL labeled.

PART 2 - PRODUCTS

2.1 ELECTRICAL GUTTERS AND WIREWAYS

A. General: Provide hinged electrical gutters and wireways in the types and sizes indicated or required, minimum 16 gauge thickness, with rounded edges and smooth surfaces; constructed in compliance with applicable standards; with features required.

B. Size: Provide size indicated. Where size is not indicated, construct in accordance with the NEC and other standards. Gutters shall be of manufacturer’s standard lengths, without field cutting or field extensions.

C. Accessories: Provide gutter and wireway accessories where indicated, constructed of same metal and finish as gutters or wireways.

D. Supports: Provide gutter and wireway supports indicated, conforming to NEC, and as recommended by the manufacturer, and as specified in Section 26 05 33 Conduit Systems.

E. Materials and Finishes: NEMA 1 gutters and wireways shall have gray powder coat finish over galvanized steel. Gutters and wireways installed outside shall be NEMA 3RX minimum. Gutters or wireways installed within 100-feet of cooling towers, at kitchen or food preparation areas, and natatorium, spa or therapy pool areas shall be of 304 stainless steel NEMA 4X construction.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Provide gutters and wireways only where specified or required. Use of gutters and wireways shall be kept to a minimum.

B. Finishing: Remove burrs and sharp edges of gutters and wireways wherever they could be injurious to conductor insulation or jacket.

C. Installation: Install gutters and wireways where shown or required, in accordance with the manufacturer's written instructions, NEC, NECA "Standard of Installation," and with recognized industry practices to ensure that the gutters and wireways comply with the

specified requirements. Comply with requirements of NEMA and the NEC pertaining to installation of electrical gutters.

D. Grounding: Electrically ground gutters and wireways to ensure continuous electrical conductivity. Provide equipment grounding conductor.

E. Conductors:
   1. Complete gutter and wireway installation before starting the installation of conductors.
   2. Provide sufficient space to permit access for installing, splicing, and maintaining the conductors.

F. A maximum of 12 conduits containing branch circuits shall be allowed to be installed in any gutter or wireway.

END OF SECTION

SECTION 26 05 50

FIRESTOPS

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Provide firestop as required, and as specified. Refer to Architectural drawings for all fire and smoke rated partitions, walls, floors, etc.

B. Types: Firestop required for the project includes smokestop.

1.2 QUALITY ASSURANCE

A. UL Label: Firestops shall be UL labeled.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Nelson.

B. 3M (Minnesota Mining Manufacturing).

C. Hilti.

D. Specified Technologies, Inc.

E. Metacaulk.

2.2 MATERIAL AND COMPONENTS

A. General: Except as otherwise indicated, provide firestop manufacturer's standard materials and components as indicated by published product information, designed and constructed as recommended by the manufacturer, and as required for installation.

2.3 FIRESTOP

A. Conduits: Provide a soft, permanently flexible sealant for 1-1/2 to 2 hour rated fireproofing for steel conduits (up to 4" diameter).

B. Low Voltage Cables, Fiber Optic Cable and Innerduct: Provide Specified Technologies, Inc. EZ-Path single, double, or triple pathways as required.

PART 3 - EXECUTION

3.1 INSTALLATION OF FIRESTOPS

A. General: Install firestops in accordance with the manufacturer's installation instructions and industry practices to ensure that the firestops comply with requirements. Comply with UL and NFPA standards for the installation of firestops.

END OF SECTION

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SECTION 26 09 44

LIGHTING CONTROLS

PART 1 – GENERAL

1.1 SECTION INCLUDES

A. Lighting control system and components:
   1. Touch panel controls.
   2. Low and line voltage wall stations.
   3. Power interfaces.
   4. Sensors.

1.2 SUMMARY

A. The lighting control system specified in this section shall provide manual lighting control, sensor-based (both occupancy and daylight control when indicated, specified, or required by AHJ.

B. The system shall be capable of turning lighting and plug loads on/off as well as dimming lights (if lighting load is capable and indicated to be dimmed). Dimmers shall be capable of smooth dimming lights to off.

C. All system devices within a group or controlled area shall be networked together, enabling wired or wireless digital communication between devices within that group.

D. The system architecture shall be stand-alone groups (areas) of devices.

E. The system shall not require any centrally hardwired switching equipment.

F. The system shall be capable of wireless, wired, or hybrid wireless/wired communication architectures. All powered devices shall be wired for power. Battery operation shall not be used unless specifically indicated on the drawings, typically due to existing conditions which prohibit wired power sources.

G. The term “occupancy sensor” shall be interchangeable with the term “vacancy sensor” as the control hardware shall be the same device and be capable of either function.

1.3 SUBMITTALS

A. Specification line-by-line compliance review consisting of a marked-up copy of these specifications with contractor comments. Refer to Submittals specification section for additional instructions.

B. Product Datasheets (general device descriptions, dimensions, electrical specifications, wiring details, nomenclature).

C. Riser Diagrams – typical per room type (detailed drawings showing device interconnectivity of devices).

D. Other Diagrams – as needed for special operation or interaction with other system(s)

E. Example Contractor Startup/Commissioning Worksheet – must be completed prior to factory start-up and commissioning.

F. Hardware Operation Manuals.

G. Other operational descriptions as needed.

1.4 PROJECT CLOSEOUT DOCUMENTATION

A. Provide a factory published manual
   1. Warranty.
   2. Technical support contact.
   3. Electronic manual on manufacturer's website for free download.

B. Completed Startup/Commissioning Worksheet with Owner's acceptance and date clearly noted.

1.5 QUALITY ASSURANCE

A. All components and the manufacturing facility where product was manufactured must be RoHS compliant.

B. In high humidity or cold environments, the sensors shall be conformably coated and rated for condensing humidity and -40 degrees Fahrenheit (and Celsius) operation.

C. All applicable products must be UL or ETL Listed or other acceptable national testing organization.

1.6 PROJECT CONDITIONS

A. Only install equipment after the following site conditions are maintained:
   1. Ambient Temperature 14 to 105 degrees F (-10 to 40 degrees C).
   2. Relative Humidity less than 90% non-condensing.

B. Standard electrical enclosures shall be permanently installed.

C. Equipment shall be protected from dust, debris and moisture.

1.7 WARRANTY

A. Five (5) year manufacturer's warranty parts replacement beginning upon completion of Factory Start-up and Commissioning date as noted on the Owner accepted Startup / Commissioning Worksheet.

1.8 MAINTENANCE & SUSTAINABILITY

A. Provide new parts, upgrades, and/or replacements available for a minimum of 5 years available to the end user.
B. Provide free telephone technical support.

C. Spare Parts: Provide minimum of 1 unit up to 5% of each hardware device product used, whichever is greater.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers:
   1. Acuity Brands Lighting, Inc.

2. Legrand North America, LLC.
3. Cooper Lighting Solutions.
4. Douglas Lighting Controls.
5. Lutron – Athena.
6. Leviton.
7. Crestron.
8. Hubbell.
9. ILC – Intelligent Lighting Controls.

2.2 SYSTEM REQUIREMENTS

A. System shall have an architecture that is based upon three main concepts; 1) intelligent lighting control devices 2) standalone lighting control zones. Intelligent lighting control devices shall consist of one or more basic lighting control components; occupancy sensors, photocell sensors, relays, UL 924 emergency lighting relays, dimming outputs, manual switch stations, manual dimming stations. Combining one or more of these components into a single device enclosure is be permissible so as to minimize overall device count of system.

B. Lighting control zones shall consist of one or more intelligent lighting control components and fully functional in stand-alone operation.

C. Low voltage devices within a lighting control zone shall be capable of being connected with low voltage cabling in any order.

D. Lighting control zone shall be capable of automatically configuring itself for default operation without any start-up labor required.

E. Power for devices within a lighting control zone shall come from either resident devices already present for that zone. Standalone power supplies are not acceptable.

F. All switching and dimming for a specific lighting zone shall take place within the devices located in the zone itself (i.e. not in remotely located devices such as panels) to facilitate system robustness and minimize wiring requirements.

G. Individual lighting zones requiring or indicated with intelligent room controllers shall be capable of being segmented into several local channels of occupancy, photocell, and switch functionality for more advanced configurations and sequences of operation.

H. Operating modes shall be utilized only in manners consistent with local energy codes. Where daylight controls are indicated or required the photocell functions noted below shall be incorporated.
   1. Auto-On / Auto-Off (via occupancy sensors)
      a. Zones with occupancy sensors automatically turn lights on when occupant is detected.
      b. Zones with occupancy and/or photocell sensors turn lights off when vacancy or sufficient daylight is detected.
      c. Pressing a switch will turn lights off. The lights will remain off regardless of occupancy until switch is pressed again, restoring the sensor to Automatic On functionality.
   2. Manual-On / Auto-Off (also called Semi-Automatic or Vacancy)
      a. Pushing a switch will turn lights on.
      b. Zones with occupancy and/or photocell sensors turn lights off when vacancy or sufficient daylight is detected.
   3. Auto On / Predictive Off

a. Zones with occupancy sensors automatically turn lights on when occupant is detected.
b. Zones with occupancy and/or photocell sensors turn lights off when vacancy or sufficient daylight is detected.
c. Pressing the switch will turn the lights off and a short “exit timer” begins. After the timer expires, sensor scans the room to detect whether occupant is still present. If no occupancy is detected, zone returns to auto-on. If occupancy is detected, lights must be turned on via the switch.

4. Auto ON at 50% or less / Auto Off (Occupancy with dimming)
   a. Operating mode designed specifically IECC compliance using occupancy mode for specific areas.
   b. Zones with occupancy sensors automatically turn lights on to maximum 50-percent (adjustable and programmable to 50-perecent max) when occupant is detected.
   c. Pushing a switch will raise or lower light levels.
   d. Zones with occupancy and/or photocell sensors turn lights off when vacancy or dim accordingly when daylight is detected to maintain desired light level.
   e. Pushing a switch will turn lights off.
5. Manual-On to Auto-On/Auto-Off
   a. Pushing a switch will turn lights on.
   b. After initial lights on, zones with occupancy and/or photocell sensors turn lights on/off according to occupancy/vacancy and/or daylight conditions.

2.3 INDIVIDUAL DEVICE SPECIFICATIONS

A. Occupancy sensors:
1. Occupancy sensors shall sense the presence of human activity within the desired space and fully control the on/off function of the lights.
2. Only passive infrared (PIR) technology, which detects occupant motion, shall be used to initially turn lights on from an off state, thus preventing false on conditions.
3. Dual technology sensors shall be used. Only where ultrasonic or microphonic technology might create a false occupied state, not allowing the lights to automatically turn off shall PIR only be used. Acceptable dual technology includes PIR/Microphonics technology (also known as Passive Dual Technology or PDT) which both looks for occupant motion and listens for sounds indicating occupants or PIR/Ultrasonic technology.
4. Sensors shall include a minimum of one integrated dry contact switching relay, capable of switching 1 amp at 24 VAC/VDC (resistive only) for BAS/BMCS control.
5. Sensors shall be available in multiple lens options which are customized for specific applications.
6. Embedded luminaire sensors shall be capable of both PIR and Dual Technology occupancy detection. Embedded sensors shall have an optional photocell.
7. Ceiling, fixture, recessed, & corner mounted sensors shall be available.
8. Sensors shall have optional features for photocell/daylight override, dimming control, and low temperature/high humidity operation.

B. Daylight (photocell and/or dimming) sensors:
1. Photocell shall provide for an on/off set-point, and a deadband to prevent the artificial light from cycling. Delay shall be incorporated into the photocell to prevent rapid response to passing clouds.
2. Photocell and dimming sensor’s set-point and deadband shall be automatically calibrated through the sensor’s microprocessor by initiating an “Automatic Set-point Programming” procedure. Min and max dim settings as well as set-point may be manually entered.

3. Deadband setting shall be verified and modified by the sensor automatically every time the lights cycle to accommodate physical changes in the space (i.e., furniture layouts, luminaire depreciation, or luminaire outages).
4. Combination units that have all features of on/off photocell and dimming sensors may be used.
5. Luminaire mounted dimming photocells shall be embedded into luminaire such that only the lens shows on luminaire face.

C. Power (Relay) Packs:
1. Power Packs shall incorporate one Class 1 relay, a 0-10 VDC dimming output, and contribute low voltage power to the rest of the system.
2. Power Packs shall accept 120 or 277 VAC, rated for a minimum 16 Amps for any type of lighting load or motor load rated to 1 HP, provide 0-10 VDC dimming control, be plenum rated, and provide Class 2 power to the system.
3. Every Power Pack parameter shall be available and configurable locally.
4. Power Pack shall securely mount to junction location through a threaded ½ inch chase nipple or be capable of being secured within a luminaire ballast channel. Plastic clips into junction box shall not be accepted. All Class 1 wiring shall pass through chase nipple into adjacent junction box without any exposure of wire leads. Note: UL Listing under Energy Management or Industrial Control Equipment automatically meets this requirement, whereas Appliance Control Listing does not meet this safety requirement.
5. When required by local code, Power Pack shall install inside standard electrical enclosure and provide UL recognized support to junction box. All Class 1 wiring is to pass through chase nipple into adjacent junction box without any exposure of wire leads.
6. Secondary Packs shall be available that provide up to 5 Amps of switching and can line voltage dim 120 VAC incandescent/halogen lighting loads.
7. Secondary Packs shall be available that provide up to 5 Amps of switching and can dim line voltage 120/277 VAC magnetic low voltage transformers.
8. Secondary Packs shall be available that provide up to 4 Amps of switching and can dim 120 VAC electronic low voltage transformers.
9. Power/Secondary Packs shall be available that are UL924 listed for switching of Emergency Power circuits and control of 0-10 VDC dimming circuit.
10. Secondary Packs shall be available that control louver/damper motors for skylights.
11. Secondary Packs shall be available that provide a pulse on/pulse off signal for purposes of controlling shade systems via relay inputs.
12. Power (Secondary) Packs shall be available that provide up to 20 Amps switching of general purposed receptacle (plug-load) control.

D. Relay & Dimming Room Controller (Panel)
1. Panel shall incorporate up to 3 normally closed latching relays capable of switching 120/277 VAC or up to 2 Dual Phase relays capable of switching 208/240/480 VAC loads.
2. Relays shall be rated to switch up to a 30A ballast load at 277 VAC.
3. Panel shall provide one 0-10VDC dimming output paired with each relay.
4. Panel shall power itself from an integrated 120/277 VAC supply.
5. Panel shall supply current limited low voltage power to other devices in the same lighting zone.
6. Panel shall provide auxiliary low voltage device power connected wired directly to a dedicated terminal connection.

E. Auxiliary Input / Output (I/O) Devices for enhanced room controls:
1. Devices shall be plenum rated and be inline wired, screw mountable, or have an extended chase nipple for mounting to a ½" knockout.

2. Specific I/O devices shall have a dimming control output that can control 0-10 VDC LED drivers by sinking up to 20 mA of current.
3. Specific I/O devices shall have an input that reads a 0-10 VDC signal from an external device.
4. Specific I/O devices shall have a switch input that can interface with either a maintained or momentary switch and run a switch event (toggle the lighting load) or run a local/remote control profile.
5. Specific I/O devices shall sense state of low voltage outdoor photocells.
6. Specific I/O devices shall enable RS-232 communication between lighting control system and Touch Screen based A/V control systems.
7. Specific I/O devices shall sense momentary and maintained contact closures, and either toggle a connected load after a momentary contact or ramp the load high/low during a maintained contact (stopping when the contact releases).

F. Low Voltage Wall Switches & Dimmers:
1. Devices shall provide toggle on/off switch control.
2. Devices color shall match building standard line voltage wiring device color.
3. Devices with mechanical push-buttons shall provide tactile with LED user feedback.
4. Devices with mechanical push-buttons shall be made available with custom button labeling.

G. Graphic Wall Station:
1. Minimum 3.5-inch full color touch screen for selecting up to 16 programmable lighting control preset scenes or acting as up to 16 on/off/dim control switches.
2. Color shall match building standard for line voltage switching.
3. Device shall enable configuration of all switches, dimmers, and lighting preset scenes via password protected setup screens.
4. Device shall enable user supplied .jpg screen saver image to be uploaded.
5. Surface mount to single-gang recessed switch box.
6. Micro-USB style connector for local computer connectivity.

H. Scene Controllers:
1. Two, three, four, or eight buttons for selecting programmable lighting control profiles or acting as on/off switches.
2. Color shall match building standard for line voltage switching.
3. Devices shall provide LED user feedback.
4. Device shall be capable of reprogramming other devices in its zone so as to implement user selected lighting scene.
5. Device shall have LEDs indicating current selection.

2.4 START-UP & SUPPORT FEATURES

A. To facilitate start-up, all devices daisy-chained together shall automatically be grouped together into a functional lighting control zone.

B. All lighting control zones shall be able to function according to default settings once adequate power is applied and before any field programming is performed.

PART 3 - EXECUTION

3.1 GENERAL

A. Provide the quantity of sensors required for complete and proper coverage to completely cover the controlled areas. Contractor shall verify room coverage and ceiling heights with manufacturer and provide the quantity and type of occupancy sensors as required. Rooms

shall have one hundred (100) percent coverage of small motion detection to completely cover the controlled areas to accommodate all occupancy habits of single or multiple occupants at any location within the room(s). The locations and quantities of sensors shown on the drawings are diagrammatic and indicate only rooms that are to be provided with sensors. Proper judgment must be exercised in executing the work so as to ensure the best possible installation in the available space and to overcome local difficulties due to space limitations or interference of structural components, architectural components, or Owner installed equipment which may cause obstructions to sensor coverage.

B. Provide ceiling mounted sensors. Wall mounted sensors shall only be used where ceiling mounted sensors are proven by the manufacturer to be impractical, or if specifically indicated on the drawings.

C. For ceilings up to 12-feet AFF, control equipment shall be mounted above an accessible ceiling. Control equipment shall be wall mounted on 24x24-inch fire resistive 0.75-inch thick plywood back board mounted to the wall above the ceiling. Do not paint fire resistive plywood or obliterate the fire resistive labeling. Locate the control equipment directly above the space/area main entry wall switch station, observing good installation practice and shall be consistent throughout the project. Where the ceiling is over 12-feet, the control equipment shall be located in an adjoining ancillary room/area where the ceiling is 12-feet AFF or lower, typically adjacent to the ancillary room/area above ceiling control equipment location, verify exact location with Owner.

D. Control units used for the security or fire systems shall be powered from the emergency power source as indicated on the drawings. Other control units shall be powered from the lighting circuit, which they control.

E. Refer to other specification sections for line voltage wiring device requirements, including momentary on/off toggle switches used with low voltage sensors.

3.2 INSTALLATION

A. Use lighting control wiring with jacket color that matches Owner’s cable color standards.

B. Install the work of this Section in accordance with manufacturer’s printed instructions unless otherwise indicated.

C. The installing electrical contractor shall complete, prior to request of factory start up and site commissioning, complete installation of all devices, their respective loads landed and confirmed operations, switches installed, and confirmed operational.

D. The installing contractor shall, prior to request of factory start up and site commissioning, request an on-site meeting by including the manufacture’s local authorized representative, the Owner and the general contractor, to assist in identification of any open-ended issues, thereby eliminating potential for delays and system commission interruptions.

E. Upon confirmation of progress by local factory representative, the installing electrical contractor shall complete the manufacture’s start up request form(s), including any field changes from the contract documents.

F. The installing electrical contractor shall provide a preliminary as-built drawing prior to commissioning to the manufacturer’s representative. Drawing shall include all wire routing, room by room device ID’s and locations of all lighting control devices.

G. Install sensors in accordance with manufacturer's written instructions, requirements of NEC, and in accordance with industry practices. Do not install devices until wall construction and wiring is completed.

H. Install sensors and switches only in electrical boxes that are clean, free from excess building materials, debris, and similar matter.

I. Install sensors plumb and aligned in the plane of the wall, or ceiling in where they are installed.

J. Install wall occupancy sensor switches in boxes on the strike side of doors as hung. Where more than one switch is in the same location, install switches in a multi gang box with a single cover plate.

K. Provide a cover plate for every switch. Refer to Architectural drawing, elevations, etc. for exact location of wall switches where indicated on the Architectural plans. Coordinate location of all wall switches with other specialty items and millwork and avoid conflicts. Coordinate with all trades to avoid conflicts during construction. Mounting heights of all switches shall comply with current Accessibility Standards and local codes.

L. Unless indicated otherwise, circuit relays/switchpacks ahead of local control switches. Source –> relay/switchpack –> local toggle switch(s).

M. Coordinate with BMCS/BAS Contractor for interface of BMCS/BAS System and wiring connections.

N. Low voltage cabling installed above ceiling shall be supported every 5 feet at a minimum height of 3 feet above grid/ceiling but no closer than six inches below deck. Support system shall be ceiling wire attached to structure and clipped to ceiling support grid using Caddy drop wire securing clip #EC311. Cabling shall hang plumb to devices.

3.3 SENSOR TESTING AND ADJUSTMENT

A. At the time of installation, the contractor shall test and adjust each sensor for proper detection of motion appropriate to room usage. The contractor shall follow the testing and adjustment procedures as written in the manufacturer’s installation instructions for each sensor model. Relocate sensors as needed for proper coverage.

B. Prior to testing and adjusting, verify with Owner/Architect the initial settings for each type of area based on its intended function and use.

C. Verify with Owner all adjustable functions of each type of occupancy sensor prior to installation. Set all adjustable functions of each type of occupancy sensor as directed by Owner. Initial settings unless directed by Owner / Architect (some settings may not apply to all sensors):
   1. Time delay = 10-miniutes
   2. Zero Time Delay = OFF
   3. Auto-On = OFF
   4. Manual-On = ON
   5. Self-Adjust = OFF
   6. Disable Self-Adjust = OFF
   7. Energy Saver (Dual Level) = ON
   8. Manual Override = OFF

D. Bi-level occupancy wall switches shall be initially set with the energy saver feature enabled.

E. Before energizing, check for continuity of circuits, short circuits, and grounding connections. After energizing, check devices to demonstrate proper operation.

F. Operate each wall switch with circuit energized and verify proper operation.

3.3 FACTORY COMMISSIONING

A. Upon completion of the installation, the system shall be commissioned by the manufacturer's factory authorized representative who will verify a complete fully functional system.

B. The factory commissioning shall include the following services. Programming of all button stations, configuration and of all occupancy sensors and photocells.

C. Provide written or computer-generated documentation on the commissioning of the system including room by room description including:
1. Sensor parameters, time delays, sensitivities, and daylighting set points.
2. Sequence of operation, (e.g. manual ON, Auto OFF. etc.).
3. Load Parameters.

D. The electrical contractor shall provide in writing to the manufacturer, General Contractor, Architect, and the Owner with 21 Owner’s business days’ written notice of the requested system startup and adjustment date.

E. The electrical contractor shall provide at least (1) journeyman electrician familiar with the installation of the system dedicated to assisting the factory start-up technician for the entire duration of the commissioning process.

F. Upon completion of the system commissioning the factory-authorized technician shall provide the proper training to the Owner's personnel on the adjustment and maintenance of the system.

G. Re-commissioning – After 90 days from full certificate of occupancy, re-calibrate all sensor time delays and sensitivities to meet the Owner’s Project Requirements. Provide a detailed report to the Architect / Owner of re-commissioning activity.

END OF SECTION

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SECTION 26 24 16

PANELBOARDS AND ENCLOSURES

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Panelboards and enclosures, including cabinet, as shown, scheduled, indicated, and specified.

1.2 QUALITY ASSURANCE

A. UL Standards: Panelboards and enclosures shall confirm to all applicable UL standards and shall be UL labeled.

1.3 SUBMITTALS

A. Indicate:
1. Detailed dimensions.
2. Enclosure material, finish, and NEMA classification type.
3. Location of main circuit breaker.
4. Mounting and trim.
5. Acceptable incoming conductors' size.
6. Electrical characteristics including voltage, ampacity, overcurrent device frame size and trip ratings, bus material and rating, withstand ratings, lugs, and time current curves of all overcurrent devices and components.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Schneider Electric - Square D.

B. ABB-General Electric Co.

C. Siemens.

D. Eaton.

2.2 MATERIALS AND COMPONENTS

A. General: Panelboards shall be dead-front type equipped with fusible switches or circuit breakers as shown and as required.

B. The overcurrent protective device short circuit, coordination and arch flash studies performed by the overcurrent protective device manufacturer shall be used by the respective switchgear vendor(s) to select appropriate equipment, switchgear, and overcurrent protective device characteristics such as but not limited to: equipment bracing, AIC rating, circuit breaker frame size and trip settings, and fuse type/class. The appropriate equipment suitable and required by the studies for code compliance shall be included with the submittal data for review and provided at no additional cost to the Owner. The appropriate equipment recommended by the studies for enhanced selective coordination or enhanced arc flash energy reduction beyond code compliance shall be included with the submittal data for review and consideration purposes by the engineer.

C. Busing Assembly: Panelboard phase, neutral, and equipment ground busing shall be copper. Bus structure and mains shall have ratings as shown and scheduled. Furnish a bare uninsulated ground bus inside each panelboard enclosure. Two section panelboards shall be connected with copper cable, with an ampacity conforming to the upstream overcurrent device. Neutral bus termination quantity for branch circuit panelboards shall match or exceed the maximum number of single pole circuit breakers the panelboard will accept.

D. Main circuit breakers and feeder / branch circuit breakers:
   1. Less than 125 Amps: Thermal magnetic with factory fixed trip.
   2. 125-600 Amps: Thermal magnetic with adjustable instantaneous trip of 5X – 10X with short time tracking.
   3. 601 Amps and larger: Solid state true RMS sensing with adjustable: current set by rating plug or adjustable dial, I^2t settings, ground fault (where required), instantaneous trip, and short time trip; 80-percent continuous current rating.
   4. Provide permanent lock-off device for all fire alarm system branch circuit breakers, for all smoke control fans and equipment, and where indicated or required for circuit breaker to be used as a remote safety disconnect switch.
   5. General requirements:
      a. Make prepared space provisions for additional breakers or fused switches so that no additional bus or connectors will be required to add circuit breakers or fused switches in the available device mounting space.
      b. Two and three pole breakers shall have internal common trips.
      c. All circuit breakers used as the main or branch mounted back-fed main shall be bolt-on. All circuit breakers used in 600 Amp and smaller panelboards shall be bolt-on breakers. Circuit breakers for distribution panelboards rated 601 amps and larger shall have plug-on or bolt-on circuit breakers.
      d. Branch circuit panelboard shall have interrupting capacity as shown or as required, but in no case less 10k AIC for 120/208/240-Volt systems, and 18k AIC for 277/480-Volt systems.
      e. 15 and 20 Amp circuit breakers for lighting circuits shall be UL listed switch duty (SWD).
      f. Personnel ground fault interrupter (GFI) circuit breakers, where shown, shall be maximum 5 mA ground fault trip and shall include a TEST button.
      g. Equipment ground fault interrupter (EGFI/EGPD) circuit breakers, where shown or required shall be 30mA ground fault trip and shall include TEST button.
      h. Circuit breakers with 1,200 Amp and larger frame shall have Energy Reducing Maintenance Switching with local status indicator (ERMS).

E. Fusible Switches for distribution panelboards: Fusible switches shall be quick-make, quick-break type. Each switch shall be enclosed in a separate steel enclosure. The enclosure shall employ a hinged cover for access to the fuses. Interlock cover with the operating handle to prevent opening the cover when the switch is in the ON position. This interlock shall be constructed so that it can be overridden for testing fuses without interrupting service. The switches shall have padlocking provisions in the OFF position. Switches shall include positive pressure rejection type fuse clips for use with UL Class J fuses and be UL labeled for 200,000 AIC.

F. Spaces: Where space for future breakers or switches is shown, panelboard enclosure shall include removable blank panels or knockouts to allow installation of future breakers or switches, prepared spaces, and panelboard busing shall be complete, including required connectors.

G. Integrated Equipment Rating: Do not apply series ratings. Each panelboard, as a complete unit, shall have a short-circuit rating equal or greater than the available short circuit current. Rating shall have been established by tests on similar panelboards with the circuit breakers or fusible switches installed.

H. GFCI circuit breakers not available in the required panel AIC rating shall be series rated with the upstream over current protection device to provide the panelboard with required AIC rating. Coordinate series rating requirements with manufacturer. Mark the panel per NEC 110. The marking shall be visible and state the following: "CAUTION-ENGINEERED SERIES COMBINATION SYSTEM RATED XXX AMPERS. IDENTIFIED REPLACEMENT COMPONENTS REQUIRED".

I. Panelboard Enclosures:
   1. Provide sheet steel enclosures, minimum 16-gauge nominal thickness, with multiple knockouts, unless shown otherwise. Provide all NEMA 1 panelboard fronts with spring-loaded door pulls, and flush lock and key, panelboard enclosures keyed alike to match the Owner's standard key system; coordinate with Owner.
   2. All NEMA 1 enclosure panelboards shall be hinged "door-in-door" type with interior hinged door with hand operated latch or latches, as required providing access only to circuit breaker or fusible switch operating handles, not to exposed energized parts. Outer hinged door shall be securely mounted to the panelboard box with factory bolts, screws, clips, or other fasteners, requiring a tool for entry. Hand operated latches are not acceptable. Push inner and outer doors shall open left to right. Manufacturer hardware (OEM), screws, and bolts shall be used to secure dead fronts and covers. Do not used third party hardware. Do not use power tools to secure panel hardware. Provide gray powder coat finish over a rust inhibitor.
   3. Equip with interior circuit directory frame, card, and clear plastic covering for panelboards.
   4. Panelboards located in kitchen preparation or natatorium areas shall have Type 316 stainless steel front, door, and trim with a NEMA 1 rating for the entire enclosure.
   5. Panelboards at exterior locations shall be NEMA 4X Type 316 stainless steel.
   6. Panelboards at hose down areas, cooling towers, in greenhouses, and other corrosive locations shall be NEMA 4X 316 stainless steel.
   7. Enclosure shall be for recessed or surface mounting as shown or as required.
   8. Enclosures shall be fabricated by the same manufacturer as panelboards to be enclosed. Multi-section panelboards shall have same physical dimensions.

PART 3 - EXECUTION

3.1 INSTALLATION OF PANELBOARDS AND ENCLOSURES

A. General: Install panelboards and enclosures, as shown, including electrical connections, in accordance with the manufacturer's written instructions, the requirements of NEC, NECA Standard of Installation, and industry practices. Circuit breakers shall be factory installed except for required field modifications due to actual site conditions.

B. Coordination: Coordinate installation of panelboards and enclosures with conductor and raceways installation work.

C. Anchoring: Anchor enclosures to walls and structural surfaces ensuring that they are permanently and mechanically secured.

D. Directory Card: Provide a typed circuit directory card(s) upon completion of work. Directory card shall be of super heavy-weight index card stock, 110 lb, white. Directory shall include type of load (i.e.: receptacles, lighting, exhaust fan, etc.) and location (i.e.: Room 102, Office, etc.) Room number shall be identified as the actual graphics room number assigned to the space and not the room number identified on the Plans. Circuits with shunt trip shall be identified with the control circuit operating the shunt trip (i.e.: Kitchen Hood No. 2). Shunt trip breakers with common trip circuit shall be grouped in the panelboard (i.e.: circuits 1, 3, 5 and 7).

E. Fuses: Install fuses, of the ratings and class shown.

F. Circuit Arrangement: Branch circuits shall be arranged to provide the best possible phase balance, unless shown otherwise.

G. Panelboards not intended to be used as service entrance (SE) rated or for establishing a separately derived neutral system shall have the factory installed neutral to ground bonding screws and straps removed and disposed of.

H. Recessed or flush mounted panelboards: Terminate spare conduits in junction box 18-inches above accessible ceiling close to panelboard location. Label junction box cover as “not used” and include panel identification.
   1. Provide (3) 1-inch and (3) ¾-inch spare conduits above accessible ceiling to j-box from each panelboard section.
   2. Where recessed panelboard is located above another building floor, also provide (3) 1-inch and (3) ¾-inch conduits to j-box in ceiling space on floor below.

I. Conductors shall be bent neatly opposite the fuse switch or circuit breaker to which they are to be attached. Vertically installed conductors shall be neatly tie-wrapped. Conductors shall be connected in a neat and professional manner. Conductors brought in from the top or bottom of the cabinet shall be bent neatly opposite the fuse or circuit breaker to which they are to be attached. Each conductor shall be run along the full height of the panel and returned to the circuit breaker or fuse location to allow relocation of the conductor to any position along the bus. Panelboard shall be cleaned of all construction debris prior to substantial completion review. Neutral and grounding conductors shall be installed similar to the phase conductors.

J. Circuit breakers and conductors installed for SPD devices shall be located on the same side as the SPD to allow the shortest and straightest run of conductors in respect to the location of the SPD device. Route all conductors to the SPD device with straight as possible run, using longest sweep bends and the shortest conductor length possible. Twist all SPD conductors and secure with tie straps wherever possible.

K. Install copper ground bus for copper ground conductors. Ground conductors size #1 and larger are to be landed to panelboard enclosure with mechanical lugs and not to ground bus.

L. Install panels so that breaker number 1 is the top left breaker.

M. In panels that contain multi-layered neutral bus, install neutrals beginning with the back neutral bus row and work forward. Do not make up neutrals on front neutral bus row unless all other rows are full.

N. Label breaker mounting space with stick-on number labels.

O. Mount the fully aligned panelboard such that the maximum height of the top circuit breaker above the finished floor shall not exceed 78-inches. Mount panelboards as high

as practical and such that the bottom of the cabinets will not be less than 6 inches above the finished floor.

3.2 TESTING

A. Before energizing, energization, check for continuity of circuits and short circuits.

B. Provide thermal infrared scan of panelboards under full load as directed and witnessed by Owner. Correct any deficiencies causing abnormal heating and repeat the scan. Provide digital video documentation with deficiencies corrected for comparison to future test. Make corrections as needed as soon as possible as directed by the Owner. Repeat the scan at the 11-month prior to closeout, and make corrections prior to close-out.

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SECTION 26 27 73

LINE VOLTAGE WIRING DEVICES

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Provide wiring device work as shown, scheduled, indicated, and specified. Low voltage and/or digital control switches required for lighting controls and lighting control systems shall be as specified and required for the low voltage and / or digital control lighting system. Refer to drawings or other specification sections for low voltage / digital lighting control systems. Cover plates for lighting control systems shall be as specified in this section unless specifically required otherwise by the low voltage / digital control device bulkhead or form factor.

1.2 QUALITY ASSURANCE

A. UL Label: Wiring devices shall be UL labeled.

B. NEMA Standard WD1 and WD6.

C. Fed. Spec. WC596, W-S-896.

1.3 SUBMITTALS

A. Mark up a complete copy of the specification section for the product to indicate a) acknowledgement of the specification requirement (Comply), or b) acknowledgement that the particular specification requirement does not apply to this specific project (Not Applicable) or, c) acknowledgement that the specification requirement cannot be made or that a variance is being submitted for review to the Architect/Engineer/Owner (Does Not Comply, Explanation:) Do not submit an outline form of compliance, submit a complete copy of the specification section with the product data.

B. Submit a sample of each style and color of 120-Volt duplex receptacle and each 120/277-Volt switch with related cover plate. Attach plate to wiring device and label back side of plate with job description with permanent black marker.

C. Submit manufacturer's product data sheet for each style of device and plate on the project.

D. Submit drawings of plans, elevation and sections of receptacles and outlets in casework, cabinetwork and built-in place furniture. Coordinate dimensions with millwork shop drawings and related architectural drawing series.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Toggle switches, straight blade and twist lock devices, interior cover plates:
   1. Leviton.
   2. Hubbell.
   3. Pass and Seymour.
   4. Eaton.

B. Dimming
   1. Leviton.
   2. Lutron.

2.2 WIRING DEVICE COLOR

A. Device color shall be gray except 20A, 125V receptacles and toggle wall switches which are directly supplied from an emergency source shall be red, and heavy duty 30 Amp and larger simplex devices which shall be black in color where the building standard color is not available. Provide equivalent hospital grade devices where red is not available in grade specified. Verify with Owner / Architect prior to submitting for approval. Color change kits as required for dimming switches. Low voltage lighting control devices specified elsewhere shall match the line voltage wiring device color specified in this section.

2.3 RECEPTACLES

A. Industrial grade tamper resistant smooth face duplex receptacles, 2 pole, 3 wire grounding, with ground connection and poles internally connected to mounting yoke, with metal mounting straps, locking plug-tail or back and side wired with screw type terminals, NEMA indicated, (X=color designation).
   1. 20A, 125V duplex NEMA #5-20R: Leviton #5362-SGX.
   2. 20A, 125V isolated ground duplex NEMA #5-20R: Leviton #5362-IGX.
   3. 20A, 125V ground fault circuit interruption (GFCI) NEMA #5-20R weather and tamper resistant: Leviton #G5362-WTX.
   4. 20A, 125V weather resistant (WR), tamper resistant: Leviton #TWR20-GY.
   5. 20A, 125V plug load control, split circuit marked for “controlled”, tamper resistant: Leviton #TDR20-S1G.
   6. 15A, with 20A feed-through, NEMA #5-15R, 125V duplex, arc fault (AFCI), tamper resistant: Leviton #AFTR1-HGX.

B. Heavy-Duty Simplex: Single heavy-duty type receptacles, with green hexagonal equipment ground screw, with metal mounting straps, back or side wiring, black molded phenolic compound.
   1. 15-60A, 125-250V, straight blade, NEMA configuration as indicated or as required by Owner.
   2. 15-50A, 125-480V, twist lock, NEMA configuration as indicated or as required by Owner.

C. Hospital grade receptacles, 2 pole, 3 wire grounding, with ground connection and poles internally connected to mounting yoke, with metal mount straps, locking plug-tail or back and side wired with screw type terminals, molded phenolic compound, NEMA configuration indicated.
   1. 20A, 125V grounded duplex NEMA #5-20R: Leviton #8300-X.
   2. 20A, 125V isolated ground duplex NEMA #5-20R: Leviton #8300-LIG (orange).
   3. 20A, 125V ground fault circuit interruption (GFCI) with indicator light: Leviton NEMA 5-20R-8898-HGX.
   4. 20A/125V Tamper Resistant Duplex NEMA 5-20R: Leviton 8300-SGX.

D. USB 2-port charger / tamper-resistant with 125-Volt receptacles:
   1. USB type A/C, 1 type A and 1 type C port, 5.1A 5.0VDC charging. 20A, 125V, NEMA 5-20R: Leviton #T5833-HGX.
   2. USB A, 2 type A ports, 5.1A 5.0VDC charging. 20A, 125V, NEMA 5-20R: Leviton #T5832-HGX.

E. USB 4-port charger:
   1. USB type A+C, 2 type A ports and 2 type C ports. 5.0A 5.0VDC charging. Hubbell #USB4ACX.
   2. USB type A, 4 type A ports. 5.0A 5.0VDC charging. Hubbell #USB4X.

2.4 WALL SWITCHES

A. Toggle: Industrial grade flush toggle switches, with mounting yoke insulated from mechanism, equipped with plaster ears, switch handle, back and side-wired screw terminals.
   1. Single-pole, 120/277V, 20A switch: Leviton #1221-2X.
   2. Double pole 120/277V, 20A switch: Leviton #1222-2X.
   3. Three-way, 120/277V, 20A switch: Leviton #1223-2X.
   4. Four-way, 120/277V, 20A switch: Leviton #1224-2G.
   5. Pilot light single-pole, 120/277V, 20A switch: Leviton #1221-PL.
   6. Momentary, 120/277V, 20A, single-pole double throw, center off: Hubbell only, #HBL 1557G.

B. Toggle key operated switch (verify manufacture and key type with Owner prior to construction).
   1. Single-pole, 120/277V, 20A key operated switch: Hubbell HBL #1221GY.
   2. Two-pole, 120/277, 20A key operated, Hubbell HBL #1222GY.
   3. Three-way, 120/277V, 20A key operated switch: Hubbell HBL #1223GY.
   4. Four-way, 120/277V, 20A key operated switch: Hubbell HBL #1224GY.
   5. Momentary, single pole double throw, center off, 20A key switch: Hubbell #HBL 1557LG.
   6. Key: Hubbell #HBL 1209. Key switches shall be keyed alike to match the Owner’s standard key system. Coordinate with Owner.

C. Rotary key operated switch (verify manufacturer and keying with Owner prior to construction).
   1. Single-pole, 120/277V, 20A key operated switch: Leviton #1221-KL.
   2. Two-pole, 120/277, 20A key operated, Leviton #1222-2KL.
   3. Three-way, 120/277V, 20A key operated switch: Leviton #1223-3KL.
   4. Four-way, 120/277V, 20A key operated switch: Leviton #1224-4KL.
   5. Key switches shall be all keyed alike to match the Owner’s standard key system. Leviton #WS-35 or as otherwise directed by Owner.

2.5 WALL DIMMERS

A. Wall Box Dimmers: Self-contained, wall box mounted, linear slide square law dimmers with ON/OFF switch. Dimmers shall operate continuously at rated load in an ambient temperature up to 40°C and an input of 100 to 277V. Heat sink fins may be removed only as approved by Owner / Engineer for narrow ganging after applying de-rating.
   1. Single-pole, 120/277V, 1000/2308 Watt incandescent / magnetic low voltage: Leviton #AWSMT-MBW.
   2. Single-pole, 120/277V, 1500/3463 Watt incandescent / magnetic low voltage, 2-gang heat sink: Leviton #AWSMT-MCW.
   3. Single-pole, 120/277V, 1920/4432-Watt LED / fluorescent 0-10V dc, 75 mA current sink: Leviton #AWSMT-7DW.
   4. Three, four- or five-way remote switch: Leviton #AWSRT-00W.
   5. Color change kit as required.

2.6 GFCI – GROUND FAULT CIRCUIT INTERRUPTER, BLANK FACE

A. 20A, 125V, GFCI, switch rated, blank face feed through, Hubbell #GFBF20GYL, gray finish, stainless steel cover plate black laser engraved with device protected, (example: DRINKING FOUNTAIN GFCI).

2.7 INTERIOR WALL COVER PLATES AND FASTENERS

A. Type 302 non-magnetic stainless-steel with satin finish (also required for wall box device cover plates for low voltage and digital lighting controls specified elsewhere).

B. Cover plate laser plate engraving for device identification (other than low voltage lighting controls).
   1. Provide laser cover plate engraving with black filling for all wiring devices indicating panelboard name, circuit, and voltage.
   2. Wiring devices connected to emergency/stand-by generator or inverter shall include the word “EMERGENCY”.
   3. Text orientation shall be upright, readable from left to right when cover plate is installed.
   4. Remotely located lighting switches shall also indicate the room or area and zone controlled by each switch. Coordinate specific wording with Owner/Architect.
   5. Blank face GFCI cover plates shall also intuitively indicate the load or equipment served, device, or area protected downstream (“EDF” for drinking fountains, “RM RECEPTS”, “HOOD RECEPTS”, “VENDING”, “REFRIG”, etc.) For other loads, Owner/Architect shall determine name plate wording.

2.8 EXTERIOR COVER PLATES

A. Thomas & Betts CK Series, cast aluminum standard depth, locking mount, while-in-use, wet location, universal configuration.
   1. Vertical mount receptacle: #CKSUV.
   2. Horizontal mount receptacle: #CKMU.
   3. Two-gang: #2CKU.
   4. 30-60 Amp Devices: #CKLSUV.

2.9 CORD REELS AND DROP CORDS

A. Cord Reels:
   1. Lighted cord reels: Industrial grade, LED hand Lamp only, 125V, 45-foot 16/3 SJEO cord, white finish, LED hand lamp. Hubbell #HBLI45163LED with #HBL340PB pivot base.
   2. 20 Amp (2) duplex receptacle cord reels: Industrial grade, 125V, (2) 20A duplex receptacles, GFCI protection, 45-foot 12/3 SJO cord, white finish, yellow outlet box. Hubbell #HBLI45123GF220 with #HBLI340PB pivot base.
   3. 30 Amp receptacle cord reels: Industrial grade, 125/250V, 30A, 45-foot 10/4 SJO cord, white finish, yellow outlet box. Hubbell #HBLI45104 with #HBLI340PB pivot base. 30 Amp NEMA receptacle termination as required by Owner.
   4. 50 Amp receptacle cord reels: Industrial grade, NEMA 4 wet location, 600V, 55A, 50-foot 6/4 SOOW cord, yellow finish, self-retracting, with NEMA 50-Amp maximum receptacle termination as required by Owner. KH-Industries RTMH4L-WW-K6K.
   5. Recessed enclosure for 20 and 30-Amp cord reels recessed above T-grid drop ceilings: Hubbell #HBLIPRBOX recessed cord reel enclosure, white finish, plenum rated.

B. Drop cord receptacles:
   1. 20A, 125V, 25-feet 600 VAC, 3-conductor 12 AWG SOOW cable, twist lock plug, two 125V, 20A duplex WR GFCI outlets, safety yellow rubber outlet box, mesh strain relief cord grips. KH Industries #PP4DD-520-B12F-520.
   2. 20A, 125/250V, 25-feet 600 VAC, 4-conductor 12AWG SOOW cable, twist lock plug, four 125/250V NEMA L1420P outlets, safety yellow rubber outlet box, mesh strain relief cord grips. KH Industries #PP7DD-520-B12F-L1420.
   3. 30-60 Amp, voltage, NEMA plug/receptacle as required by Owner, SOOW cable, number of conductors and length as required, mesh strain relief cord grips.

2.10 FIRST RESPONDER EMERGENCY REMOTE POWER OFF (FREPO) STATION

A. Knox Company Remote Power Rapid Access 4500 Series Shutdown Station
   1. Recessed mount for public spaces and new construction, surface mount for when mounted to equipment or existing construction.
   2. Single lock keyed for local Fire Department/AHJ, verify configuration and keying with Knox Company.
   3. Red Finish.
   4. Tamper alert for integration with building security system.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Cover plates for receptacles and toggle switches shall be of the same manufacturer throughout unless otherwise noted.
   1. Key switches and keys shall be as specified and also as approved by Owner.
   2. Submit samples for each specified toggle switch and duplex receptacle color to Architect.

B. Install wiring devices where shown and as required, in accordance with manufacturer's written instructions, requirements of NEC, and in accordance with industry practices. Do not install devices until wall construction and wiring is completed.

C. Install receptacles and switches only in electrical boxes that are clean, free from building materials, debris, and similar matter.

D. Install wiring devices plumb and aligned in the plane of the wall, floor, ceiling or equipment rack.

E. Install switches in boxes on the strike side of doors as hung. Install so the up position will close the circuit or will be the highest level of illumination. Where more than one switch is in the same location, install switches in a multi-gang box with a single cover plate.

F. Provide a cover plate for every wiring device and blank cover plates for unused rough-in-only boxes that matches the building standard. Fasten all plates outdoors with type 302 Allen Head "tamper-proof" screws.

G. Mounting heights of all wiring devices shall comply with local accessibility standards and local codes, except where wiring devices are indicated for special purpose and access is only required by maintenance or service personnel.

H. Refer to Architectural drawing and elevations, etc. for exact location of wiring devices. Coordinate location of all wiring devices with other trades, specialty items, and millwork and resolve all conflicts prior to rough-in. Field coordinate exact mounting location with all trades to avoid and resolve conflicts during construction.

I. Locate receptacles for electric drinking fountains/coolers and bottle fill stations below equipment so that the receptacle is accessible and concealed as much as practical from public view by the equipment open cowling so that the receptacle remain readily accessible. For dual level basin equipment, locate receptacle under the upper basin.

J. Provide convenience outlet receptacle within 25-feet of all new electrically operated mechanical equipment.

K. Where exterior receptacles are intended for continuous use, mount in horizontal position with while in use cover plate. (Exterior electric drinking fountains, ice makers, ice storage bins, landscape lighting low voltage transformers, seasonal decorative lighting, etc.)

L. Install wall box dimmers to achieve full rating specified after de-rating for ganging as recommended by manufacturer.

M. Do not share neutral conductor on load side of dimming switches.

N. Install receptacles with grounding pole down, except in any of the following conditions where the grounding pole shall be installed in the up position: healthcare occupancies, if required by local AHJ, if required by Owner's construction standards or if directed by Owner or Architect. If installed horizontally, install with neutral pole on top.

O. Connect wiring device grounding terminal to branch circuit equipment grounding conductor.

P. Provide pigtail to each receptacle and each switch. Neutral and phase conductors shall be installed using side or rear entry lugs only. Do not wrap conductors around screw terminals. Tighten all screws and lugs as recommended by manufacturer.

Q. All receptacles and switches shall have a minimum of two wraps of Scotch 33 or equivalent tape around terminal screws.

R. Provide toggle switch within sight of all trap primers, circulation pumps, 120-Volt motors and motorized equipment to serve as the equipment disconnect switch.

S. Mount cord reels and cord reel recessed enclosures to structure with galvanized steel struts and as recommended by manufacturer. Field verify exact location of cord reels with Owner/Architect. Mounting location shall avoid conflicts with piping, light fixtures and ductwork, etc. when cord reel is extended and retracted. Set ball stop as directed by Owner / Architect. Provide hand lamp only type cord reels in commercial / educational automotive garages with classified (hazardous) locations. Provide local toggle switch at standard switch height for hand lamp only cord reels.

T. Mount drop cord suspension hook or j-box to structure to support the cord's weight and additional normal use pulling tension and as recommended by manufacturer. Use cable grips, either with cord grip hanging hook at open ceilings or with chrome plated escutcheon cover plate mounted to recessed j-box at finished ceilings. Field verify exact location, drop height, and NEMA outlet configuration of drop cords with Owner/Architect. Provide weatherproof receptacle cap or covers if located in wet location. Mounting location shall avoid conflicts with piping, light fixtures and ductwork, etc.

3.2 GROUND FAULT PROTECTION FOR PERSONNEL

A. When GFCI personnel protection receptacles are not commercially available or cannot be installed at a readily accessible location or indicated otherwise on the drawings, GFCI personnel protection shall be provided by a remote blank face GFCI wiring device or by

an up-stream GFCI receptacle that also provides downstream GFCI protection and located in a readily accessible location. When branch circuit breaker device with integral GFCI protection is required or specified, it shall be within the manufacture's recommended distance limitations of the connected receptacle(s) or load(s) for proper GFCI personnel protection at the farthest outlet.

B. GFCI personal protection locations include but are not limited to the following:
   1. For other than dwelling units: All single phase 125-250-Volt (150-Volts to ground or less) receptacles 50-Amperes or less, and all three phase 125-250-Volt (150-Volts to ground or less) receptacles 100-Ampres or less in the locations indicated below.
   2. Dwelling units: All single phase 125-250-Volt receptacles installed in the following locations indicated below.
   3. Provide personnel GFCI protection as indicated above in the following locations and all additional locations as required by the NEC.
      a. Outdoors (with exceptions for not readily accessible receptacles with dedicated branch circuits for snow melting, deicing, pipeline/vessel heat receptacles. Provide these loads with 30mA EGFI circuit breaker protection).
      b. Bathrooms/toilets/restrooms.
      c. Janitors/custodial closets and mop sinks.
      d. Laundry areas.
      e. Parking structures, service garages, garages and accessory buildings
      f. Basements, crawl spaces (including 120-Volt lighting).
      g. Within 6-feet of all water sources including sinks, mop-sinks, lavatories, bathtubs, shower stalls, faucets, eye wash stations, emergency shower stations.
      h. Indoor damp and wet locations.
      i. Locker rooms.
      j. Indoor swimming pools and natatoriums areas and adjacent corridor/hall convenience receptacle outlets located within 25-feet of all access doors.
      k. Non-dwelling unit therapeutic tubs/pools/whirlpool areas and adjacent corridor/hall convenience receptacle outlets located within 25-feet of all access doors.
      l. Receptacles serving dwelling unit kitchen counter tops.
      m. Vending machines.
      n. Elevators, dumb waiters, escalators, moving sidewalks: receptacles in pits, hoist ways, well ways or those mounted on the cars of elevators and dumb waiters.
      o. Electric vehicle charging equipment.
      p. All receptacles serving kitchen or food preparation counter tops.
      q. Automotive vacuum machines.
      r. Drinking water fountains/coolers and bottle fill stations.
      s. Corded high-pressure spray washing machines.
      t. Tire inflation machines.
      u. Dish washers.
      v. Receptacles at end of cord reels or drop cords.
      w. Boat houses, boat hoist, and all pier/dock receptacles and lighting (excludes shore power that requires GFPE).
      x. Central plant, mechanical rooms and electrical rooms.
      y. Wood, metal, or other material fabrication or vocational training shops.
      z. Receptacles that serve educational science and science prep room counter tops.

C. Where a GFCI protected receptacle outlet is required or indicated behind vending machine, refrigerators or other equipment, provide remote GFCI blank face in same room

as protected receptacle and at a readily accessible location with standard receptacle outlet behind equipment. Refrigerators shall be GFCI protected only where located within 6-feet of power cord distance from the edge of a sink to the surface of the refrigerator.

D. Unless indicated otherwise, locate blank face GFCI device near light switches at same height as light switches or ganged with the light switch. Provide GFCI protection for all receptacle outlets located below 42-inches in all infant through 2-year old day care and similar areas designated for occupancy by infant through 2-year old day care occupants so the GFCI device can easily be intentionally tripped or tested and reset.

E. Provide branch circuit breaker 30mA (EDP) or 100mA (EPE) equipment protection for utilization equipment as required by the NEC and where indicated on the drawings.

3.3 FIRST RESPONDER REMOTE EMERGENCY POWER OFF (FREPO) STATION

A. Provide Knox Company first responder remote emergency power off (FREPO) stations as indicated and/or where required by local AHJ. Mounting locations shall be as directed by the local AHJ and exact locations coordinated with the Architect. FREPOs shall be circuited only to shunt trip or shut-down control circuiting. FREPOs shall be recessed mounted in public locations and in all new construction when attached to building construction. Provide surface mount FREPOs when mounted to equipment or existing construction.

B. Integrate the FREPOs to shut-down the building non-emergency and non-legally required power sources which include the main electrical utility service disconnect circuit breaker(s), other than non-life safety or non-legally required distribution scale UPS equipment, and non-life safety or non-legally required local power generation equipment.

C. Provide FREPOs for fire pump, life safety, and legally required electrical generation equipment only when required by the AHJ. When required by the AHJ, fire pump, life safety, and legally required power generation and/or stored energy power supply equipment shall each have separate dedicated FREPOs that shut down only their associated power generation/stored energy equipment. FREPOs for emergency, and legally required systems shall have minimal 25-foot physical separation from the building main utility service FREPOs and clearly labeled with the equipment that they will shut down. FREPOs for fire pumps shall have minimal 25-foot physical separation from the any other FREPOs and from the building main utility service disconnect and clearly labeled with the equipment that it will shut down.

D. Integrate the FREPOs tamper switch with the building security or building management control system (BMCS) as directed by Owner.

3.4 TESTING

A. Before energizing, check for continuity of circuits, short circuits, and grounding connections.

B. After energizing, check wiring devices to demonstrate proper operation and receptacles for correct polarization, voltage and phase orientation if intended 3-phase equipment is phase orientation dependent for proper motor rotation or operation.

C. Test each individual GFCI receptacle and all downstream receptacles protected by an upstream GFCI device with simulated ground fault tester, make corrections as necessary.

D. Operate each wall switch with circuit energized and verify proper operation.

END OF SECTION

SECTION 26 32 13

NATURAL GAS STANDBY GENERATOR SETS and TRANSFER SWITCH

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Conditions of the Contract and applicable requirements of Division 1 and Section 26 05 00 govern this Section.

1.2 WORK INCLUDED

A. Furnish and install standby engine-driven generator system, complete with wiring and controls as shown on the drawings and as specified herein.

B. The standby emergency system shall consist of an engine-driven generator set designed and sized for project site ambient conditions and project site altitude, complete for outdoor installation where specified or required outdoors, automatic transfer switches and associated fuel system.

1.3 QUALITY ASSURANCE

A. Acceptable Manufacturers:
   1. Engine-Driven Generator Sets:
      a. Cummins.
      b. Taylor Power.
      c. Generac Industrial.
      d. Caterpillar.
      e. Kohler.
   2. Automatic Transfer Switch.
      a. Cummins.
      b. Russelectric.
      c. ASCO.
      d. Zenith.
      e. Eaton.
      f. Standby electric generating system manufacturer (as an integral part of a complete system).

B. NEC and NFPA Compliance: Comply with applicable portions of the NEC (NFPA 70) including, but not limited to, emergency and standby power generation systems (NFPA 99 & 110), and with NFPA 37 Installation and Use of Stationary Combustion Engines and Gas Turbines.

C. IEEE Compliance: Comply with applicable Institute of Electrical and Electronics Engineers, Inc. (IEEE) standards pertaining to generator construction.

D. EPA Compliance: Comply with all EPA Standards for permanently installed natural gas emergency generators.

E. Testing: The generator set shall receive the manufacturer's standard factory load testing.

F. Supplier: All equipment provided shall be supplied by an authorized distributor of the manufacturer who has been continuously engaged in the distribution of industrial grade Power System products for a minimum of 15 years. The supplier shall provide initial start-up services, conduct field acceptance testing, and warranty service. The supplier is to be

authorized to perform warranty service on all products provided. Within 50 miles of the job site, the supplier shall maintain; a minimum of 6 factory-trained and qualified field technicians; a proper supply of spare parts for the supplied equipment; a shop with overhaul capabilities; and be able to provide 24 hour, 7 day per week, 365 day per year field service capability.

1.4 SUBMITTALS

A. Submit manufacturer's certified computer-generated performance and capacity data in accordance with specification requirements. Indicate and include all ambient and altitude de-ratings and calculations.

B. Submittal drawings and information on the transfer switches including installation drawings, wiring diagrams, dimensions, weights, etc. shall be provided. Full descriptive information on accessory items shall be furnished.

C. Submit manufacturers' "Installation, Start-Up and Service" instructions, recommended conductors, overcurrent protection, and electrical interlocks.

D. Submit recommended clearance dimensions.

E. Submit sequence of operation in narrative form.

F. Instruction Data and Drawings: Commercial type operating instructions shall be provided consisting of operating and maintenance manuals, parts books, dimensional drawings and wiring diagrams.

1.5 WARRANTY

A. Provide five-year parts and labor warranty from date of substantial completion for generator set(s) and transfer switch(es).

PART 2 - PRODUCTS

2.1 ENGINE-GENERATOR SETS

A. The engine-generator set shall be furnished as a complete working system. The model provided shall be a standard model that is quality assurance tested and prototype tested, not one of a kind without supporting literature.

B. Engine shall be liquid cooled, reciprocating engine, 12V DC electric start, natural gas & liquid propane fueled with automatic switching, electronic isochronous governed with manual speed adjustment plus/minus 5%, with belt-driven battery charging alternator.

C. The set shall provide the following performance:
   1. Rated power for the duration of any utility power outage, in ambient conditions to 500-feet altitude and an outside air ambient temperature of 10 degrees F to 110 degrees F. Liquid coolant system ratings for natural gas sets through 140KW shall be rated at 122 degrees F ambient.
   2. Start and accept rated load within 10 seconds of utility power outage.
   3. Voltage regulation of plus/minus 2% no load to full load with random voltage variation, at any constant load, less than plus/minus 1%.
   4. Isochronous frequency regulation, less than plus/minus 0.5% at any steady state load from no load to full load.

D. Engine Coupling: Engine shall be directly connected to the generator through a suitable flexible coupling.

E. Generator:
1. The generator shall be a standard make, 4-pole, revolving field, single bearing, synchronous, brushless type with the following characteristics:
a. Capacity as shown on the drawings and shall operate at 1800 rpm.
b. Dripproof, self-ventilating, permanently aligned and complete with rotating brushless exciter and shall be of ball bearing construction and connected to the engine with flexible disc coupling.
c. Conform to the latest applicable IEEE and NEMA standards.
d. Provided with generator overload protection or generator manufacturer's overload protective circuitry.
e. Output main circuit breaker(s) with adjustable LIS trip for cable protection shall be provided when shown on drawings. Circuit breaker manufacturer shall be the same as switchgear manufacturers specified and submitted to be used on this project.
f. Voltage Regulator: Include a full wave rectified automatic digital voltage regulation system matched and prototype tested by the engine manufacturer with the governing system provided. It shall be immune from mis-operation due to load-induced voltage waveform distortion and provide a pulse width modulated output to the alternator exciter. The voltage regulation system shall be equipped with three-phase RMS sensing and shall control buildup of AC generator voltage to provide a linear rise and limit overshoot. The system shall include a torque-matching characteristic, which shall reduce output voltage in proportion to frequency below an adjustable frequency threshold. Torque matching characteristic shall be adjustable for roll-off frequency and rate, and be capable of being curve-matched to the engine torque curve with adjustments in the field.
g. Alternator: The generator shall be capable of withstanding a three phase load of 300% rated current for 10 seconds, and sustaining 150% of continuous load current for 2 minutes with field set for normal rated load excitation.
2. Provide the generator with the following:
a. Minimum 130°C rise stand-by rating.
b. NEMA Class F or H insulation as defined by NEMA MG1.65.
c. Temperature rise by resistance and embedded detector measurements at rated load within NEMA MG1-22.40 definition.
d. Pre-lubricated, maintenance free ball bearing, lubricated for life.
e. Direct drive centrifugal blower cooling.
f. RFI filters on the exciter to eliminate radio frequency interference on electronic equipment.
g. Thermostatically controlled block strip heater mounted for condensation control.

F. Sub-Base: The engine power plant shall be mounted on an I beam, box type sub-base of fabricated steel construction. The assembly shall be installed on a vibration-absorbing base on a concrete pad as shown on the drawings.

G. Automatic Starting Sequence of Events:
1. Upon drop in normal source voltage to 65 to 70% of rated voltage, or upon failure of the normal source of electrical supply, the engine shall be automatically cranked and brought up to the full operating speed.
2. The cranking motor circuit shall be instantly broken when the engine starts.
3. Within 10 seconds the generator shall be brought up to operating speed; the generator voltage shall operate the automatic transfer switch, disconnecting the load from the normal source of supply and connecting the emergency power to the

load.

4. Upon restoration of the normal source voltage to 92 to 95% of rated voltage or restoration of normal source of supply, the sequence shall be reversed, restoring the transfer switch to the automatic normal operating position, disconnecting the load from the emergency generator and reconnecting the load to the normal source of supply. The emergency generator set will continue to operate for a period of from 1 to 5 minutes after the restoration of the normal source of supply. Should the engine fail to start upon the first crank, there shall be two additional cranking attempts made with a 15 second rest between cranks, after which the cranking cycle shall cease and an alarm shall sound to indicate malfunctioning of the system.
5. The controls shall automatically stop the engine in the event the cooling water temperature becomes too high, if the coolant level becomes too low, if the oil pressure drops below a pre-determined pressure, or if the engine overspeeds. Upon the failure of the engine for any of the above reasons, an indicating lamp will operate indicating the condition under which the engine was shut down. Also, the alarm signal shall be energized.

H. Engine Control Panel & Accessories:

1. Provide a comprehensive monitoring and control system integral to the Generator Set control to guard the electrical integrity of the alternator and power system. Provide single and 3-phase fault current regulation, so that downstream protective devices have the maximum current available to quickly clear fault conditions, without subjecting the alternator to potentially catastrophic failure conditions. Include provisions to either prevent over voltage due to single phase faults, or to shut down the generator set if line to neutral voltage on any phase exceeds 115% for more than 0.5 seconds. Acceptable methods are a fully rated (100%) 600 volt Circuit Breaker, mounted in the generator enclosure, Schneider Electric - Square D Programmable Micrologic of size as indicated on drawings with handheld programmer or inherent protection provided by microprocessor-based GenSet AmpSentry protection. Submittals shall demonstrate that the protective device provides proper protection for the alternator by a comparison of the trip characteristic of the breaker with the thermal damage characteristic of the alternator. Field circuit breakers shall not be acceptable for generator overcurrent protection. The control system shall actively control the fuel rate and excitation as appropriate to the state of the generator set. Fuel rate shall be regulated as a function of starting, accelerating to start disconnect speed, accelerating to rated speed. The governing system shall include a programmable warm up at idle and cool-down at idle function. While operating in idle state, the control system shall disable the alternator excitation system. An electronic governor system shall provide automatic isochronous frequency regulation. The governing system dynamic capabilities shall be controlled as a function of engine coolant temperature to provide fast, stable operation at varying engine operating temperature conditions. The Control Panel shall include, but is not be limited to, the following instruments and protective devices:
    a. AC Ammeter.
    b. Phase Selector Switch.
    c. Current Transformers.
    d. AC Voltmeter.
    e. Automatic Solid State Voltage Regulator with immunity to severe induced waveshape distortion from nonlinear leads.
    f. Rheostat for Adjusting voltage ± 5% of Rated Voltage.
    g. Engine Malfunction Warning Lights/Audible Alarm:
        1) Anticipating High Engine Temperature.
        2) Anticipatory Low Oil Pressure.
        3) Low Fuel.

4) Control Switch not in Automatic Position.
5) Low Water Temperature.
6) Low Oil Pressure.
7) High Water Temperature.
8) Engine Overcrank.
9) Engine Overspeed.

h. Frequency Meter.
i. Non-resettable Elapsed Time Meter with a 9,999.9 Hour Maximum Indication.
j. Coolant Temperature Gauge.
k. Oil Pressure Gauge.
l. Provisions for Remote Emergency Shutdown.
m. Combination alarm shutdown system with manual reset and indicating lights for high engine temperature, low oil pressure, engine overspeed, and engine failed to start. Include an additional set of contacts for remote alarms.
n. Manual run/off/automatic selector switch for control of engine with flashing red light, and shall allow manual starting of plant without assuming load.

2. Provide low coolant level shutdown, which shall activate high engine temperature lamp and shutdown.
3. Solid-state cranking cycle device preset at 15 second cranking cycle and 15 second rest cycle followed by a 15 second cranking cycle. If engine fails to start after 3 crank cycles and 2 rest cycles, an overcranking alarm shall sound and cranking cycle shall stop. Provide adjustments in accordance with manufacturers recommendations, but cumulative crank-rest timing shall not be less than 75 seconds.
4. In the event of engine failure, the panel shall close alarm circuit, indicate the fault on the appropriate lamp and shut down the engine. The panel shall include a manual reset switch so that the panel can be reset immediately after a fault condition. Reset devices that require a waiting period are not acceptable.

I. Options and accessories shall include the following:
1. Housing: The complete engine generator set shall be enclosed in a free-standing weather protective, aluminum (0.063-inch) panel construction housing with lockable, removable hinged door panels, hinged instrument panel door and panel light. Housing shall be wind rated to a minimum150 mph.
a. All parts shall be adequately protected against oxidation and corrosion and finish painted with durable machinery enamel, minimum of 3 mils applied in a maximum of 1-1/2 mils per application.
b. Include within the enclosure a switched 12 or 24-Volt LED luminaire on each side of the engine and a GFCI receptacle.
c. The enclosure must maintain the engine and generator at 40°F or be equipped with space heaters to maintain starting batteries between 50°F and 90°F.
2. 12V or 24-volt battery starting with maintenance free lead acid batteries with dual rate solid state automatic battery charger, with equalize timer, low and high battery voltage indicators and alarm terminals, charger malfunction indicator and alarm. Batteries shall be capable of providing two 45 second continuous cranking cycles. Provide battery racks, and charger shall be protected from any other charging source.
3. Muffler, critical silencing, with condensation drain; stainless steel flexible exhaust connector. Silencer shall mount horizontally on structural support inside of housing with 90° elbow termination with rain cap.
4. Premium exhaust rain cap, cast aluminum, stainless steel hardware, brass bushing hinge.

5. Gas line accessories as required for the set to include but not limited to gas line strainer, 12" braided metallic flexible fuel line, battery power operated gas line shut-off solenoid valve, pressure reducing regulator fuel pressure gauge.
   a. Contractor shall provide natural gas fuel piping for the emergency generator set. Contractor shall install natural gas line fittings obtained from electrical contractor (as supplied with the engine generator). Plumbing line work for natural gas for the engine generator shall be with as few elbows and bends as possible (as near a straight line run from the gas supply tee-off as possible).
6. Coolant heater, 120VAC, 1 phase, 1000-2500 watts.
7. Unit mounted emergency shut-off mushroom type pushbutton switch.

J. Testing: The unit shall be given a complete shop test before shipment. It shall be installed on the job under supervision of the manufacturer's representative and shall receive start-up / commissioning service from that representative.
1. The unit shall be started cold and run for a one-hour test with building load connected. Provide additional load bank as required to achieve 100 percent loading.
2. Retransfer the load after test.
3. After this test, the set shall cool for five minutes, then must start and carry full building load for four hours.
4. Demonstrate the cranking cycle and all engine safety devices. The Owner’s authorized representative shall be instructed in the operation and maintenance of the unit.

K. Instruction Data and Drawings: Commercial type operating instructions shall be provided consisting of operating and maintenance manuals, parts books, dimensional drawings and wiring diagrams. Three copies of dimensional drawings and wiring diagrams shall be provided as specified.
1. Operating Instructions: Provide and install in a suitable enclosure operating instructions for the engine generator set.
2. Contractor shall fill the radiator with a combination of water and ethylene-glycol to protect the radiator to -20°F after completion of the test.

2.2 AUTOMATIC TRANSFER SWITCHES

A. Rating and Construction:
1. Refer to the project drawings for specifications on the sizes and types of transfer switch equipment, withstand and closing ratings, voltage and ampere ratings, enclosures and accessories. All transfer switches shall have switched neutrals and shall be electrically operated and mechanically held.
2. Automatic transfer switches shall be included in a factory assembly with bypass-isolation switch equipment for the emergency life safety branch, two-source type for bypassing to normal or emergency. Bypass isolation not required for equipment branch.
3. All transfer switches and accessories shall be UL listed and labeled, tested per UL Standard 1008, and CSA Approved, and comply with NEMA ICS 2-447. When protected by molded case breaker withstand and closing ratings shall not be less than the following RMS symmetrical amps at 600 VAC:

Switch Size in Amps	WCR @ 480 Volts
Up to 260	30,000
300 to 1000	65,000
1200	85,000
1600 and larger	100,000

4. Provide one of the following standard products:
   a. Onan OTPC Series as required.

b. Standby Generator System Manufacturer, provided as a complete system.
c. ASCO 300 Series.
d. Russelectric RMT/RMTD Series.
e. Zenith ZTSD Series.

5. Electrical operation shall be accomplished by a momentarily energized single solenoid operating mechanism which receives power from the source to which the load is being transferred. Fuse or thermal protection of the main operator is prohibited. The operating transfer time shall be 1/6 of a second or less. Mechanical locking in each position shall be accomplished without the aid of permanent magnets, latching solenoid, or motor operators.
6. Operation shall be inherently double-throw whereby all contacts move simultaneously and with no programmed delay in a neutral position. Electrical spacing shall be equal to or exceed those listed in table 15.1 of UL 1008. Only those main contact structures specifically manufactured for transfer switch service shall be acceptable. An overload or short circuit shall not cause the switch to go to a neutral position.
7. Inspection of all contacts (movable and stationary) shall be possible from the front of the switch without disassembly of operating linkages and without disconnection of power conductors. A manual operating handle shall be provided for maintenance purposes. The maintenance handle shall permit the operator to stop the contacts at any point throughout the entire travel to properly inspect and service the contacts when required.
8. All switches for systems with switched neutrals shall have fully rated neutral transfer contacts that momentarily interconnect the neutrals of the sources and load for 100 milliseconds maximum, during the transfer/retransfer operation. The neutrals shall remain so interconnected until the line contacts close on the alternate source. Line and neutral contacts shall be driven by a single main operator.

B. Controls and Accessories:
1. Controls shall provide for the automatic starting sequence of the generator set.
2. Automatic controls shall signal the engine-generator set to start upon signal from normal source sensors. Solid state time delay start, adjustable from 0 to 5 seconds (factory set at 2 seconds) shall avoid nuisance start-ups. Battery voltage starting contacts shall be gold, dry type contacts factory wired to a field wiring terminal block.
3. The switch shall transfer when the emergency source reaches the set point voltage and frequency. Provide a solid-state time delay on transfer, adjustable from 0 to 120 seconds.
4. The switch shall retransfer the load to the normal source after a time delay retransfer, adjustable from 0 to 30 minutes. Retransfer time delay shall be immediately bypassed if the emergency power source fails.
5. Control shall be solid state and designed for a high level of immunity to power line surges and transients, demonstrated by test to IEEE Standard 587-1980. The control shall have optically isolated logic inputs, high isolation transformers for AC inputs, and relays on all outputs. Control shall be quick disconnect for ease of service.
6. Automatic transfer switches shall have inherent phase balance protection logic to detect a ‘single phasing’ Solid state undervoltage sensors shall simultaneously monitor all phases of both sources. Pick-up and dropout settings shall be adjustable. Voltage sensors shall allow for adjustment to sense partial loss of voltage on any phase. Voltage sensors shall have field calibration of actual supply voltage to nominal system voltage. The transfer switch controller shall be equipped with a fault output terminal interconnected to a 24Vdc shunt trip, integral to the transfer switch and with built-in time delay, that functions to

disconnect the utility source from the load should the standby emergency source fail to start.

7. For transfer switches serving non-disconnected motor loads, equip with a field adjustable time delay during switching in both directions, during which time the load is isolated from both power sources, to allow load residual voltage to decay before closure to the opposite source. The delay feature shall have an adjustable range covering 0 to 7.5 seconds. Transfer switches serving life safety equipment shall have this time delay set at 0 at startup/commissioning.
8. Controls shall signal the engine-generator set to stop after a time delay, adjustable from 0 to 10 minutes, beginning on return to the normal source.
9. Power for transfer operation shall be from the source to which the load is being transferred.
10. The control shall include latching diagnostic indicators to pinpoint the last successful step in the sequence of control functions, and to indicate the present status of the control functions in real time.
11. The control shall include provisions for remote transfer inhibit and area protection.
12. Provide front panel devices mounted on cabinet front consisting of:
    a. A key operated selector switch to provide the following positions and functions:
        1) Test - Simulates normal power loss to control for testing of generator set. Refer to Part 3 for programming requirements.
        2) Normal - Normal operating position.
        3) Retransfer - Momentary position to override retransfer time delay and cause immediate return to normal source, if available.
13. Exerciser Clock: Provide solid state exerciser clock to set the day, time, and duration of generator set exercise/test period. Provide a with/without load selector switch for the exercise period. Refer to Part 3 for programming requirements.
14. Provide Phase Sequence Monitor/Balance Module to protect against inadvertent phase rotation hookup and monitor for voltage phase imbalance between phases.
15. Each transfer switch shall be provided with a control panel to allow the operator to view the status and control operation of the transfer switch. The control panel shall be a sealed membrane panel rated NEMA 3R/IP53 or better (regardless of enclosure rating) that is permanently labeled for switch and control functions. The control panel shall communicate with the engine generator, including display of all engine and alternator data, and other transfer switch data in the power system. The control panel shall allow starting and stopping of the generator set via the transfer switch control panel in both test and emergency modes.

2.3 REMOTE ANNUNCIATION PANEL

A. Locate next to ATS. Provide flush mounted with stainless steel plate containing the following:
    1. Trouble sonnet horn with silence switch.
    2. Illuminated annunciators with nameplates in accordance with the following table:

Lamp Legend	Generator Set Condition Indicated	Light	Audible Alarm
High Battery Voltage	Battery charger too high	Red	No
Low Battery Voltage	Battery voltage too low	Red	No
Normal Battery Voltage	Battery voltage ok	Green	No
Generator Running	Generator has output voltage	Green	No
Normal Utility Power	Utility power supplying the load	Green	No

Lamp Legend	Generator Set Condition Indicated	Light	Audible Alarm
EPS Supplying Load	Genset supplying the load	Green	No
Pre-Low Oil Pressure	Oil pressure approaching low limit	Yellow	Yes
Low Oil Pressure	Engine has shut down due to low oil pressure	Red	Yes
Pre-High Coolant Temp.	Temperature of coolant approaching high limit	Yellow	Yes
High Coolant Temp.	Genset has shut down due to high coolant temp.	Red	Yes
Low Engine Temp.	Engine heater has malfunctioned	Red	Yes
Overspeed	Engine has shut down due to overspeed	Red	Yes
Overcrank	Engine failed to start	Red	Yes
Not In Auto	Engine control switch not in AUTO position	Flashing Red	Yes
Battery Charger Malfunction	Charger is signaling a failure	Red	Yes
Low Fuel	Fuel level below preset minimum	Red	Yes
Fault	Customer preselected condition	Red	Yes

B. Name plates shall be laminated black with white letters engraved. Letter size shall be a minimum of 3/8” high.

C. Illuminated annunciators shall be 1 inch minimum.

2.4 ELECTRICAL AND MECHANICAL PERFORMANCE

A. The switch must comply with UL 1008 and NEMA Standard Publication ICS 2-447. In addition, the switch must meet or exceed the following requirements and if so requested, be verified by certified laboratory test report.
   1. Temperature Rise: Measurements shall be made after the overload and the endurance tests.
   2. Withstand: UL listed to withstand the magnitude of fault current available at the switch terminals when coordinated with respective protective devices at an X/R ratio of 6.6 or less. The main contacts of the transfer switch shall not trip open or weld when subjected to fault currents.
   3. Dielectric: Test, following the withstand current rating test, at 1960 volts AC rms minimum.
   4. Transient Withstandability: Control panel voltage surge withstand capability test per IEEE Standard 472-1974 and voltage impulse withstand test per NEMA Standard publication ICS-1-109.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Install standby engine driven generator set where shown, in accordance with the equipment manufacturer's written instructions and recognized industry practices, to ensure that the set complies with the specified requirements and serve the intended purposes. Provide and install in a Plexiglas enclosure complete operating instructions for each type of transfer switch.

B. Standard: Comply with NEMA standards, requirements of the NEC, and applicable portions of NECA Standard of Installation pertaining to installation of standby engine-driven generator sets and accessories.

C. Vibration Isolation:
   1. Outside Mounted: Ribbed Neoprene Vibration Isolation.
   2. Roof Mounted: Install units on properly sized spring-type vibration mounts and ribbed Neoprene vibrations isolators.
   3. Generator installed inside building: Install units on properly sized spring-type vibration mounts and ribbed Neoprene vibration isolators.

D. Concrete Pad: Install generator set on a reinforced concrete pad. The generator pad shall extend 6" beyond the generator set base, unless shown otherwise. Furnish the exact position of any block outs, mounting bolts, and the dimensions and location of the generator pad in a timely manner so as to prevent delay of the concrete work. Refer to Section 26 05 00 for housekeeping pads and Division 3 for Concrete Work.

E. Options and Accessories: Provide circuits, conductors, and raceways as required for generator options and accessories as required and specified. Provide separate dedicated circuits from the emergency branch circuit panel board to the generator for (1) engine/ coolant heaters, (2) GFCI convenience receptacle(s), (3) battery charger (LED work lights on battery), etc. Provide additional circuits as required, for a fully operational system.

F. Provide remote alarm annunciator. Coordinate final location of annunciator with Owner / Architect prior to installation. It shall be installed near ATS.

G. Provide dry contacts and outputs to monitor transfer switch and generator alarm conditions and notify Owner's Police or security personnel, and building management controls system and personnel, both when transfer to emergency occurs and when transfer to normal occurs.

H. Adjust main output circuit breaker(s) adjustable trip setting based on manufacturer's fault current and coordination analysis or as directed by Engineer.

3.2 GROUNDING

A. Install the generator as a separately derived system. Ground the generator neutral to the generator frame. Ground the generator frame to the building grounding system and provide a driven ground electrode at the generator location.

3.3 CONTROLS

A. Provide generator start-up control wiring and raceway from each automatic transfer switch to the respective standby generator set as required.

3.4 TESTING

A. Notify Owner's Commissioning Authority (CxA) prior to performing any tests so the CxA may witness tests at his/her discretion. Refer to Section 26 01 00 Commissioning of Electrical Systems. Testing shall be witnessed by owner and Engineer.

B. Provide testing in accordance with NFPA 110. Upon completion of installation of engine-driven generator set and after building circuitry has been energized with normal power source. Provide manufacturer's start-up service to test emergency power system to demonstrate standby capability and compliance with specified requirements, including automatic start-up, controls and full load acceptance. Test shall include operation of standby power system with voltage check while the system is loaded to ensure proper operation of the emergency generator, transfer switches, and other system components. Operation of the system shall simulate standby power conditions, that is, loss of main

electrical power to the building. Test period shall be trouble-free operation with at least four automatic transfer switch operations (each switch) within the period of operation.

1. The unit shall be started and run for 30-minute break-in period at no-load unless recommended otherwise by manufacturer.
2. The unit shall be started cold and run for a four-hour test with building load connected and load bank to achieve 90 percent of rated generator capacity. Monitor and record available natural gas pressure and verify supply is adequate and stable during the entire test.
3. Retransfer the load after test.
4. After this test, the set shall cool for five minutes, then must start and carry 90% rated capacity load for four hours.
5. Provide additional Owner witnessed testing for all ancillary equipment on generator. Demonstrate all specified functions and alarms.
6. Demonstrate the cranking cycle and all engine safety devices. The Owner's authorized representative shall be instructed in the operation and maintenance of the unit. Provide minimum 4-hours training at each campus for 4-persons; one hour on four separate days.

C. Contractor shall furnish all instruments, load banks, and personnel required for test. Submit 4 copies of certified test results to Architect/Engineer for review. Test reports shall include date and time of test, relative humidity, temperature and weather conditions.

3.5 MISCELLANEOUS

A. Provide circuits and receptacles to serve loads as directed by Owner / Architect, including, but not limited to:.

1. Telecommunications equipment.
2. Public Address Communication & Master Clock System.
3. Fire Detection Alarm and Signaling Systems including remote transponder panels and alarm power supply panels.
4. Security Systems including remote power supplies (except for battery powered access control door hardware).
5. Video Surveillance CCTV System including remote camera power supplies.
6. All receptacles and outlets in MDF/IDF rooms.
7. Technology MDF/IDF room dedicated HVAC equipment.
8. Walk-in coolers/freezers and selected reach-in refrigeration equipment.
9. Clinic refrigerator and selected clinic receptacles.
10. Building Access control System including remote power supplies, except do not power door electric strike or hinge hardware on emergency power.
11. Owner’s Radio Base Station and handset charging equipment / Radio Repeaters / Distributive Antennae Systems (DAS).
12. Elevators, ADA chair/personnel lifts.
13. Point of Sale Stations.
14. Kitchen Manager’s Workstation.
15. Building Management and Control System (BMCS).
16. Special education receptacles, minimum one in each room.
17. First responder Bi-Directional Distributive Antennae System (DAS) Systems.

B. Mount annunciator alarm as directed by Owner / Architect. Coordinate final location of ATS with Owner / Architect prior to installation. Install next to ATS.

3.6 PROGRAMMING

A. Program automatic transfer switches for delayed transfer to emergency and sequential operation to transfer loads by priority based on manufacturer recommendation or as indicated below:

1. Life Safety Loads – less than 10 seconds.

2. Critical Loads – more than 15 seconds, less than 30 seconds.
3. Equipment Loads – more than 40 seconds, less than 60 seconds.
4. Non-Legally required loads – more than 75 seconds, less than 120 seconds.

B. Program automatic transfer switch voltage and frequency pick-up and drop out for load shedding based on load priority for voltage and frequency based on manufacturer recommendations or as indicated below:
1. Life Safety pick-up 10%; drop out 20%.
2. Critical Loads pick-up 10%; drop out 15%.
3. Equipment Loads pick-up 8%; drop out 15%.
4. Non-Legally required loads pick-up 5%; drop out 10%.

C. Exerciser clock: Program automatic transfer switch exerciser clock for generator to run every Tuesday, 8:00 AM, for 15-miniute run time, without load. Verify with Owner.

D. Test switch: Program automatic transfer test switch for generator to run with load, for minimum 30-miniutes to comply with NFPA 110 requirements for monthly testing. Maximum test time shall not exceed 35-miniutes unless directed otherwise by Owner.

E. Program engine cooldown time as recommended by the manufacturer.

3.7 TRAINING

A. Provide 4 hours training, one hour each for four persons, four separate days.

END OF SECTION

SECTION 26 43 00

SURGE PROTECTION DEVICES

PART 1 - GENERAL

1.1 DESCRIPTION

A. The Surge Protection Device (SPD) covered under this section includes service entrance type surge protection devices suitable for use as Type 1 or Type 2 Devices per UL1449 5th Edition, applied to the line or load side of the utility feed inside the facility. SPDs shall be connected in parallel with the facility's wiring system. The unit shall be manufactured in the USA by a qualified manufacturer of suppression filter system equipment, which has been engaged in the commercial design and manufacture of such products for a minimum of five years.

B. Contractor shall provide all labor, materials, equipment, and incidentals as shown, specified and required to finish and install surge protection devices.

1.2 QUALITY ASSURANCE

A. Reference Standard: Comply with the latest edition of the applicable provisions and recommendations of the following, except as otherwise stated in this document:
   1. UL 1449 Fifth Edition.
   2. ANSI/IEEE C62.41, Recommended Practice for Surge Voltages in Low-Voltage AC Power Circuits.
   3. ANSI/IEEE C62.45, Guide for Surge Testing for equipment connected to Low-Voltage AC Power Circuits.
   4. IEEE 1100 Emerald Book.
   5. National Fire Protection Association (NFPA 70 (NEC), 75, and 78).
   6. UL 1283 – Electromagnetic Interference Filters.

B. When requested for verification, provide copies of the following:
   1. Copies of actual let through voltage data in the form of oscilloscope results for both ANSI/IEEE C62.41 Category C3 (combination wave) and B3 (Ring wave) tested in accordance with ANSI/IEEE C6245.
   2. Copies of test reports from a recognized independent testing laboratory, capable of producing 200kA surge current waveforms, verifying the suppressor components can survive published surge current rating on both a per mode and per phase basis using the ANSI/IEEE C62.41 impulse waveform C3 (8 x 20 microsecond, 20kV/10kA). Test data on an individual module is not acceptable.

1.3 SUBMITTALS

A. Submit shop drawings complete with all technical information for specific unit dimensions, let through voltage data, detailed installation instructions, maintenance manual, and wiring configuration.

B. Provide detailed marked-up copy of this specification with line-by-line compliance or exception statements to all provisions of this specification.

C. Copies of Manufacturer’s catalog data, technical information and specifications on equipment.

D. Copies of documentation stating that the Surge Protection Device is listed from a Nationally Recognized Testing Laboratory (NRTL) (UL, ETL, etc.) and are tested and

multi-listed to UL 1449 5th Edition and UL 1283.

F. Copy of warranty statement clearly establishing the terms and conditions to the building/facility owner/operator.

1.4 WARRANTY

A. The manufacturer shall provide a minimum 20-year warranty for high and very high exposure SPDs. Very high exposure unit warranties shall include exposure to temporary extended over-voltage conditions. Provide a minimum 15-year warranty for all medium exposure SPDs, and a minimum 10-year warranty for all other SPDs for parts from date of substantial completion against failure. Contractor shall assist the Owner with manufacturer warranty registration.

PART 2 – PRODUCTS

2.1 APPROVED MANUFACTURER

A. Low exposure, minimum 10-year parts warranty, minimum 50k Amps per mode, 100k Amps per phase, Type 1 and Type 2.
   1. Recessed mount panelboard extension with brushed stainless-steel front:
      a. ACT Communications:471- ###V-050-SS-F-PB flush series.
      b. ABB Current Technology PX3-050-VVV- #X-SF-X-F- # series.
      c. SSI Surge Suppression, Inc. CSMx12-FMPxSS series.
      d. SST Southern Tier Technologies T45-VVVV-50-AWAJ2-C-RKSS(Stainless Steel front).
   2. Branch panelboard surface mounted:
      a. ACT Communications 455 series.
      b. ABB Current Technology CG3 60 series.
      c. SSI Surge Suppression, Inc. CSMx12 series.
      d. SST Southern Tier Technologies T45-VVVV-50AWAJ2-C.

B. Medium exposure, minimum 15-year parts warranty, minimum 120k Amps per mode, 240k Amps per phase, Type 2.
   1. ACT Communications 471 series.
   2. ABB Current Technology CGP3 125 series.
   3. SSI Surge Suppression, Inc. CSMx24 series.
   4. SST Southern Tier Technologies T45-VVVV-120A series.

C. High exposure, minimum 20-year parts warranty, minimum 200k Amps per mode, 400k Amps per phase, Type 2 SPD.
   1. ACT Communications 471 x200 series.
   2. ABB Current Technology TG3 200 series.
   3. SSI Surge Suppression, Inc. CHLxM series.
   4. SST Southern Tier Technologies T45-VVVV-200A series.

D. Very high exposure at service entrance 1,201 Amps and above: Minimum 20-year parts warranty; minimum 200k Amps per mode; 400k Amps per phase, Type 1 and 2 SPD:
   1. ACT Communications 471 x200 SEL series.
   2. ABB Current Technology SEL3 200 series.

   The service entrance protector shall incorporate a combination of TPMOV and Selenium technology allowing for transient surge and temporary over voltage protection. The unit shall be able to prevent common temporary over voltages and high impedance faults from damaging the MOVs, increasing their longevity and ability to protect the critical load. Limited and Intermediate current TOVs can be caused by a loss of the neutral conductor

in a split phase or three phase power system. The available fault current will be determined by the impedance of the loads connected to the phases opposite the SPD and are typically in the range of 30A to 1000A. Minimum 20-year parts warranty, extended over-voltage protection, minimum 200k Amps per mode, 400k Amps per phase, Type 2 SPD. The Selenium elements must limit voltage to the MOV as a percent of nominal as outlined below:

Overvoltage seen by MOVs as % of Nominal				
	available current			
time	30A	100A	500A	1000A
1 cycle	120%	130%	150%	160%
10 cycles	130%	150%	160%	160%
30 cycles	140%	150%	160%	160%

*To verify damage to the MOVs has been mitigated, the percent overvoltage seen at the MOV must be less than 200% for split-phase applications or 173% for three-phase applications (100% is nominal).

2.2 MANUFACTURED UNITS / ELECTRICAL REQUIREMENTS

A. Declared Maximum Continuous Operating Voltage (MCOV) shall be greater than 115 percent of the nominal system operating voltage and in compliance with test and evaluation procedures outlined in the nominal discharge surge current test of UL1449, section 37.7.3. MCOV values claimed based on the component's value or on the 30-minute 115% overvoltage test in UL1449 will not be accepted.

B. Unit shall have not more than 10% deterioration or degradation of the UL1449, Voltage Protection Rating (VPR) due to repeated surges.

C. Protection Modes SVR (6kV, 500A) and UL1449 VPR (6kV, 3kA) for grounded WYE/delta and High Leg Delta circuits with voltages of (480Y/277), (208Y/120), (600Y/347). 3-Phase, 4 wire circuits, (120/240) split phase shall be as follows and comply with test procedures outlined in UL1449: Values Depicted are based on a system Without Disconnect / With Disconnect

System Voltage	Mode	MCOV	C3 Wave	UL 1449 VPR Rating
120/240	L-N	150	650/775	700/800
120/208	L-G	150	650/825	700/900
	N-G	0	500/500	900/1000
	L-L	300	950/1250	900/1200
277/480	L-N	320	1125/1225	900/1200
	L-G	320	1075/1225	1200/1200
	N-G	0	900/900	1200/1500
	L-L	550	1950/2200	1800/1800

D. Electrical Noise Filter- each unit shall include a high-performance EMI/RFI noise rejection filter. Noise attenuation for electric noise shall be as follows using the MIL-STD-220A insertion loss test method.
1. 14 dB from 10 kHz to 1 MHz.

E. Each Unit shall provide the following features:
1. Phase Indicator lights, Form C dry contacts, counter and audible alarm.
2. Field testable while installed.
3. High performance interconnecting cable.
4. The UL 1449 Voltage Protection Rating (VPR) shall be permanently affixed to the SPD unit.

5. The UL 1449 Nominal Discharge Surge Current Rating shall be 20kA.
6. The SCCR rating of the SPD shall be 200kAIC without requiring an upstream protection device for safe operation.
7. The unit shall be listed as a Type 2 SPD per UL1449.
8. Power wiring: SPD shall be equipped with mechanical lugs that can accept up to #2 AWG wire on High Exposure units and up to #6 on Medium and Low Exposure units.

2.3 POWER CABLES FOR CONNECTION

A. Power wiring: Conductors between all high and very-high SPDs and switchgear shall be high performance interconnect system “Low Z Cable” cables with Ultra Low impedance characteristics at 10kHz and above.

B. High Performance Low Impedance cable shall be #6 AWG minimum for Very High, High, and Medium Exposure SPDs and #10 AWG minimum for Low Exposure SPDs.

PART 3 – EXECUTION

3.1 GENERAL INSTALLATION

A. The unit shall be installed as close as practical to the facility's wiring system in accordance with applicable national/local electrical codes and the manufacturer's recommended installation instructions. Connection shall be with high performance, low impedance cables in conduit and shall not be any longer than necessary, avoiding unnecessary bends. Minimum wire size and overcurrent protection device for disconnect shall be provided and as recommended by the manufacturer.

B. Units specified for lighting and appliance panel boards as panelboard extensions (EGPE) shall be mounted directly above or below the first section of the panel board it is protecting. Any other mounting location will not be acceptable and shall be corrected, without exception, at no additional cost to the Owner.

C. Units specified for panelboards, switchboards, or motor control centers shall be mounted directly above or adjacent to the panelboard, switchboard or motor control center using unistrut supports secured to structure as required. Conduit length between power distribution panelboard or switchboard shall be less than two inches. Mounting above equipment is not acceptable.

D. Overcurrent device and conductors for devices shall be the maximum recommended by the manufacturer. Manufacturer’s recommendations shall prevail over the information given in the plans and specifications.

E. Provide recessed mounted panelboard extension type enclosures for devices protecting recessed panelboards. Enclosure front shall match panelboard front material and finish. Provide brushed stainless-steel front at kitchens and food processing areas.

3.2 UNIT SELECTION BASED ON EXPOSURE LEVEL

A. (SPDVH) Provide very-high exposure SPDs with Selenium and TPMOV technology for the following new electrical equipment or where indicated:
1. Service entrance rated 1,201 Amps and above.

B. (SPDH) Provide high exposure SPDs for the following new electrical equipment or where indicated:
1. Service entrance rated 801 – 1,200 Amps.

2. Switchboards located outside.

C. (SPDM): Provide medium exposure SPDs at the following new electrical equipment or where indicated:
1. Service entrance rated 401 - 800 Amps.
2. Panelboards above 600 Amps.
3. Motor control centers.
4. Non-service entrance switchboards.

D. (SPDL): Provide low exposure SPDs at the following new electrical equipment or where indicated:
1. Service entrance rated 400 Amps and below.
2. Panelboards 600 Amps and below.

3.3 TESTING

A. Factory Trained Representative shall provide start-up to include initial verification of proper installation, shortest cable connection, and initiate factory warranty. The technician will be required to do the following as a minimum:
1. Verify the installation follows applicable national / local electrical codes related to SPDs and the manufacturer's Installation, Operation and Maintenance Instructions and recommendations.
2. Verify overcurrent device rating.
2. Verify all wiring connections and installation conforms to manufacturer’s recommendations.
3. Record information for each product installed and include in O&M Manual

B. A copy of the Factory diagnostic test report and written approval of the installation shall be included with the Electrical Operating and Maintenance Manual. The Contractor shall make all adjustments, changes, corrections, etc. as required by the Factory Trained Representative so that the installation follows the manufacturer’s installation and operation instructions without additional charge to the Owner.

END OF SECTION

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SECTION 26 51 13

LIGHTING FIXTURES

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Work Included: Lighting fixture work is as shown, scheduled and specified.

B. Applications: The applications of lighting fixtures required for the project include the following:
   1. General lighting.
   2. Emergency lighting.
   3. Outdoor area lighting.

1.2 QUALITY ASSURANCE

A. Provide interior building LED fixtures that comply with the Design Lights Consortium (DLC) standards and are DLC or DLC Premium listed as a Qualifying Product at time of proposal submittal date.

B. UL Standards: Lighting fixtures shall conform to applicable UL standards, and be UL or ETL labeled.

C. Light fixtures shall conform to the requirements of NFPA 101, and 70 (NEC).

1.3 SUBMITTALS

A. Submit product data for light fixtures, and emergency lighting equipment, including generator transfer devices.

B. Specification Compliance Review: Mark up a complete copy of the specification section for the product to indicate a) acknowledgement of the specification requirement (Comply), or b) acknowledgement that the particular specification requirement does not apply to this specific project (Not Applicable) or, c) acknowledgement that the specification requirement cannot be made or that a variance is being submitted for review to the Architect / Engineer / Owner (Does Not Comply, Explanation:) Do not submit an outline form of compliance, submit a complete copy with the product data.

C. Submittal data shall include luminaire efficiency parameters.

D. Submittal data for exterior luminaries shall include IESNA BUG ratings, backlight, uplight, and glare ratings of each unique luminaire for the orientation and tile specified. Indicate total absolute lumens per luminaire and absolute lumens emitted above horizontal based by each luminaire for the orientation and tile specified.

1.4 WARRANTY

A. Provide 5-year warranty on all light fixtures, including internal or remote LED drivers, all other electrical internal electrical or electronic components except for emergency battery packs or emergency load control device relays. Refer to other specific component warranty requirements below.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Manufacturers: Provide products produced by manufacturers shown or scheduled for each type of lighting fixture. Refer to drawings for additional approved manufacturers.

1. Where alternate fixtures to those specified are provided, notification of alternates are required prior to bid in accordance with Section 26 05 12. Full photometric drawings and a spreadsheet indicating the differences between the specified fixtures and alternate fixtures shall be provided as part of the pre-bid notification. The spreadsheet shall indicate all aspects of the alternate fixture that differ from the specified fixture, including, but not limited to the following:
    1. Physical Dimensions.
    2. Mounting Type.
    3. Fixture Ratings/Listings.
    4. Housing Materials/Construction.
    5. Lumen Output.
    6. Fixture Voltage.
    7. Fixture Wattage.
    8. Fixture Efficacy.
    9. CCT.
    10. CRI.
    11. Beam Angles/Distribution.
    12. Manufacturer Warranty.
    13. Emergency Power.
    14. Controls Requirements.
3. Emergency Battery Packs with self-testing drivers/inverters: Shall be the same manufacturer as the low voltage lighting controls provided on this project. Where there are no low voltage lighting controls specified or provided, the manufacturer shall be Bodine.
    Bodine.
    Chloride.
    Lithonia.
    Dual Lite.
    IOTA.
4. Emergency Generator/Inverter Load Control Bypass Relay (ELC); UL924 listed and 0-10Vdc compatible: Shall be the same manufacturer as the low voltage lighting controls provided on this project. Where there are no low voltage lighting controls specified or provided, the manufacturer shall be Bodine.
5. Emergency Generator / Inverter Branch Circuit Transfer Switch, UL 1008 listed and 0-10Vdc compatible:
    Bodine GTD20A.

2.2 MATERIALS AND COMPONENTS

A. General: Provide lighting fixtures of the size, type, and rating indicated, with all accessories for a complete aesthetic installation.

B. Fixture Types:

1. General:
    a. LED Lay-in edge lit or back flat panel / troffer fixtures: Opaque, edge or back lighted, 4000 Kelvin color temperature. 0-10 Vdc dimmable, L70: 60,000 minimum hours.
    b. Safety chains and wire guards at fixtures in mechanical and electrical rooms, and high abuse areas. Provide safety chains only for gymnasium fixtures which shall be inherently vandal proof, no wire guards.

c. Fixtures located outdoors, in interior unconditioned spaces, and in wet locations shall be of aluminum construction.
d. Fixtures with door frames shall be of aluminum construction, white finish where located in kitchens, food prep areas, toilets, restrooms, locker rooms, dressing rooms, showers, and unconditioned spaces.
e. DLC, DLC Premium or Energy Star qualified unless specified otherwise.
f. Outdoor fixtures shall include a discrete / replaceable surge suppression device in addition to the surge suppression incorporated in the LED driver.
g. Operating temperature rating shall be between -40 degrees F and 120 degrees F.
i. Color Rendering Index (CRI): ≥ 80 Indoor; ≥ 65 Outdoor.
j. The manufacturer shall have performed JEDEC (Joint Electron Devices Engineering Council) reliability tests on the LEDs as follows: High Temperature Operating Life (HTOL), Room Temperature Operating Life (RTOL), Low Temperature Operating Life (LTOL), Powered Temperature Cycle (PTMCL), Non-Operating Thermal Shock (TMSK), Mechanical Shock Variable Vibration Frequency, and Solder Heat Resistance (SHR).

2. Downlight Fixtures: Provide recessed downlight fixtures with trim rings compatible with the ceiling material where fixture is to be installed.
3. LED Exit Signs: Provide red lettering. Exit lighting fixtures shall meet the requirements of Federal, State, and Local Codes. Edge-lit exit signs shall have a silver background so that “EXIT” cannot be read backwards from the opposite side.
   a. Gymnasiums, locker rooms, athletic/PE wing and associated corridors, black box theaters, auditorium stages, cafetoriums and kitchens: Vandal resistant, wet location cast aluminum with polycarbonate protective cover exit signs, Lithonia Extreme Series.
4. Emergency Lighting Units: Lead Calcium batteries with self-diagnostics. Provide full light output at 90 minutes of battery operation. LED lamps.
5. Gymnasium light fixtures, glass or acrylic refractors or lenses, round profile, single point swivel pendant or hook mounting, designed to be vandal proof without the need for wire guards, no wire guards.

C. LED drivers:
1. NEMA 410 compliant for in-rush current.
2. Starting Temperature: -40˚ F [-40˚ C].
3. Input Voltage: 120 to 480 (±10%) V.
4. Power Supplies: Class I or II output.
5. Surge Protection: The system must survive 250 repetitive strikes of “C Low” (C Low: 6kV/1.2 x 50 µs, 10kA/8 x 20 µs) waveforms at 1-minute intervals with less than 10% degradation in clamping voltage. “C Low” waveforms are as defined in IEEE/ASNI C62.41.2-2002, Scenario 1 Location Category C.
6. Power Factor (PF): ≥ 0.90.
7. Total Harmonic Distortion (THD): ≤ 20%.
8. Comply with FCC Title 47 CFR Part 18 Non-consumer RFI/EMI Standards.
9. Drivers shall be reduction of hazardous substances (ROHS)-compliant.

D. Voltage: Equipment for use on 120V systems shall be suitable and guaranteed for voltage range of 100V to 130V. Equipment on 277V systems shall be suitable and guaranteed for voltage range of 225V to 290V. Universal voltage equipment shall be suitable and guaranteed for a voltage range of 100V to 290V.

E. Light fixture housing for exterior use: Provide aluminum or stainless housing. Where stainless steel hardware is used, both male and female fasteners shall be stainless steel.

F. Emergency LED battery self-testing drivers and inverters; 5-year warranty. Basis of Design:
   1. Bodine BSL-ST Series for OEM installation.
   2. Bodine BSL310-SI Series for field installation.
   3. Bodine ELI-S Series for line voltage sine wave inverter field installation.

G. Emergency Battery Packs – Exit Signs: Nickel Cadmium battery with self- diagnostics; Minimum 3-year non-prorated replacement warranty.

H. Emergency Generator / Inverter Load Control Device (ELC):
   1. 16 Amp minimum ballast / driver load.
   2. Compatible with 0-10 Volt dimmer switches.
   3. UL 924.
   4. Minimum 3-year warranty.
   5. Integral or remove test switch.

I. Emergency Generator / Inverter branch circuit transfer switch:
   1. UL 1008.
   2. 20 Amp ballast/driver load.
   3. 0-10Vdc dimming compatible.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Install lighting fixtures of the types indicated, where shown, and at indicated heights in accordance with the fixture manufacturer's written instructions and industry practices to ensure that the fixtures meet the specifications. Fixtures shall fit the type of ceiling system scheduled.

B. Standards: Comply with NEMA standards, applicable requirements of NEC pertaining to installation of interior lighting fixtures, and with NECA Standard of Installation.

C. Attachment: Fasten fixtures to the indicated structural support members of the building. Provide four separate wire supports for recessed ceiling mounted lighting fixtures, one at each corner of fixture. Check to ensure that solid pendant fixtures are plumb. Provide T-bar locking clips on all four sides for lay-in fixtures.

D. Coordination: Field coordinate and locate lighting fixtures in open ceiling areas including mechanical and electrical rooms so that light is not obstructed by piping, ductwork, etc. Locate light fixtures in front of electrical and mechanical equipment to provide adequate illumination for testing and maintenance. Relocate installed light fixtures as directed by Owner / Architect at no additional cost.

E. Final adjustment of all aimable exterior light fixtures shall be in coordination with, and to the satisfaction of, the Owner’s designated representative. Pre-aim all fixtures prior to scheduled final aiming and adjustment with Architect / Owner. Verify that all rotatable optics are in their proper orientation prior to final aiming.

F. Provide vandal resistant exit signs without wire guards in all physical education and athletic sports areas, including egress corridors adjacent to these areas, black box theaters, auditorium stages, vocational shops, cafetoriums and kitchens.

G. Provide exit sign directional arrows as required. Provide a minimum of two and a maximum of 10% spare exit signs to be installed as directed by Architect.

H. Install in accordance with manufacturers instructions.

I. Install suspended luminaires using pendants supported from swivel hangers. Provide pendant length required to suspend luminary at indicated height.

J. Locate recessed ceiling luminaires as indicated on the Architectural reflected ceiling plan.

K. Install surface mounted luminaires plumb and adjust to align with building lines and with each other. Secure to prohibit movement.

L. Exposed Grid Ceilings: Support surface mounted luminaires on grid ceiling directly from building structure. Provide auxiliary members spanning ceiling Ts to support surface mounted luminaires. Fasten surface mounted luminaires to ceiling T using bolts, screws, rivets, or suitable clips.

M. Install recessed luminaires to permit removal from below.

N. Install recessed luminaires using accessories and fire stopping materials to meet regulatory requirements for fire rating.

O. Install wall-mounted luminaires at height as directed by Architect.

P. Install accessories furnished with each luminary.

Q. Connect luminaires to branch circuit outlets using flexible conduit as specified.

R. Make wiring connections to branch circuit using building wire with insulation suitable for temperature conditions within luminaires.

S. Bond products and metal accessories to branch circuit equipment grounding conductor.

T. Provide emergency transfer devices for light fixtures powered by generator or inverter emergency lighting circuits which are used for normal lighting and to be switched with the switched normal lighting circuit in the same room, corridor or area.

U. Provide un-switched, constant-hot circuit to all battery powered emergency lighting equipment and emergency load control devices (ELC). Where normal light fixture circuit is switched or contactor controlled, non-switched battery charging or ELC circuit shall originate from same branch circuit breaker as switched lighting circuit.

V. Provide emergency powered light fixture in front of all electrical switchgear, including but not limited to panelboards, switchboards, motor control centers, low voltage control panels, transfer switches, motor controllers and disconnect switches.

W. Provide emergency battery operated light fixtures at all transfer switch locations and at all central battery emergency lighting inverters.

X. Provide automatic controls for exterior light fixtures. Exterior building mounted light fixtures shall be circuited through lighting contactors. Lighting contactors shall be controlled by the Building Management System. Provide separate lighting contactors for:
   1. Parking Lot Lighting.
   2. Building Mounted Lighting.
   3. Exterior Signage.

Y. Lighting contactors shall not be installed above ceiling and shall be readily accessible, located in same room as panelboard serving load.

Z. Wall mounted light fixtures shall be attached to the studs in the walls. Attachment to gypsum board only is not acceptable. Where wall mounted fixtures attach to junction box only, firmly secure junction box to adjoining studs in wall.

AA. Lighting Fixture Supports:
1. Shall provide support for all of the fixtures. Supports may be anchored to channels of the ceiling construction to the structural slab or to structural members within a partition, or above a suspended ceiling.
2. Shall maintain the fixture positions after cleaning and relamping.
3. Shall support the lighting fixtures without causing the ceiling or partition to deflect.

BB. Hardware for surface mounting fixtures to suspended ceilings:
1. In addition to being secured to any required outlet box, fixtures shall be bolted to a grid ceiling system at four points spaced near the corners of each fixture. The bolts shall be not less than 1/4 inch secured to channel members attached to and spanning the tops of the ceiling structural grid members. Non-turning studs may be attached to the ceiling structural grid members or spanning channels by special clips designed for the purpose, provided they lock into place and require simple tools for removal.
2. In addition to being secured to any required outlet box, fixtures shall be bolted to ceiling structural members at four points spaced near the corners of each fixture. Pre-positioned 1/4-inch studs or threaded plaster inserts secured to ceiling structural members shall be used to bolt the fixtures to the ceiling. In lieu of the above, 1/4-inch toggle bolts may be used on new or existing ceiling provided the plaster and lath can safely support the fixtures without sagging or cracking.

CC. Lighting Fixture Supports for aluminum canopies:
1. Light fixtures mounted under aluminum canopies shall be UL wet location from above listed without a protective ceiling or cover. Light fixture shall not have conduit penetrations or mounting hole penetrations field made in the top of the fixture. Conduit penetration shall be at the end of the fixture only.

3.2 TESTING

A. General: Upon installation of lighting fixtures, and after building circuits are energized, apply electrical energy to demonstrate proper operations of lighting fixtures, emergency lighting, and controls. When possible, correct malfunctioning units at the site, then retest to demonstrate proper operation; otherwise, remove and replace with new units, and proceed with retesting.

B. Pre-Inspection Tasks: Immediately before final inspection, clean fixtures inside and out, including plastics and glassware, adjust trim to fit adjacent surfaces, replace broken or damaged parts, and lamp and test fixtures for electrical and mechanical operations. Any fixtures, or parts of fixtures that show signs of rust or corrosion at the time of completion, shall be removed, and replaced with protected metal parts.

C. Final aiming and adjustment: Aim and adjust lighting fixtures for their intended purpose as specified or as required. Adjustments may include but not be limited to directional aiming, adjusting selectable lumen output, selectable correlative color temperature (CCT), selectable beam pattern, replacing/installing fixture manufacture’s optional optical lens used for adjusting beam patterns or for softening beam edges, replacing/installing manufacture’s optional theatrical/specialty color lens colors. Re-aim and re-adjust as required to the satisfaction of the Architect / Owner, including nighttime adjustment of exterior lighting in the presence of the Architect / Owner.

END OF SECTION

LIGHT FIXTURE SCHEDULE

TYPE	SYMBOL	DESCRIPTION	MANUFACTURER	REFERENCE CATALOG #
A1		2X4 LED FLAT PANEL. 46W, 6400 LUMENS, 4000K CT. 0–10V DIMMING.	LITHONIA	CPX 2X4 ALO8 80CRI SWW7 SWL MVOLT
A1E		2X4 LED FLAT PANEL. 46W, 6400 LUMENS, 4000K CT. 0–10V DIMMING. PROVIDE WITH UL924 DEVICE.	LITHONIA	CPX 2X4 ALO8 80CRI SWW7 SWL MVOLT
A2		2X4 LED FLAT PANEL. 35W, 5000 LUMENS, 4000K CT. 0–10V DIMMING.	LITHONIA	CPX 2X4 ALO8 80CRI SWW7 SWL MVOLT
A2E		2X4 LED FLAT PANEL. 35W, 5000 LUMENS, 4000K CT. 0–10V DIMMING. PROVIDE WITH UL924 DEVICE.	LITHONIA	CPX 2X4 ALO8 80CRI SWW7 SWL MVOLT
B1		2X2 LED FLAT PANEL. 33W, 4600 LUMENS, 4000K CT. 0–10V DIMMING.	LITHONIA	CPX 2X2 ALO7 80CRI SWW7 SWL MVOLT
B1E		2X2 LED FLAT PANEL. 33W, 4600 LUMENS, 4000K CT. 0–10V DIMMING. PROVIDE WITH UL924 DEVICE.	LITHONIA	CPX 2X2 ALO7 80CRI SWW7 SWL MVOLT
C1		6" LED DOWNLIGHT. 13W, 1400 LUMENS, 4000K CT. 0–10V DIMMING.	LITHONIA	LBR6 NCH ALO2 SWW1 AR LSS WD MVOLT UGZ
C1E		6" LED DOWNLIGHT. 13W, 1400 LUMENS, 4000K CT. 0–10V DIMMING.	LITHONIA	LBR6 NCH ALO2 SWW1 AR LSS WD MVOLT UGZ
C2		6" LED DOWNLIGHT. 19W, 2100 LUMENS, 4000K CT. 0–10V DIMMING.	LITHONIA	LBR6 NCH ALO2 SWW1 AR LSS WD MVOLT UGZ
C2E		6" LED DOWNLIGHT. 19W, 2100 LUMENS, 4000K CT. 0–10V DIMMING. PROVIDE WITH UL924 DEVICE.	LITHONIA	LBR6 NCH ALO2 SWW1 AR LSS WD MVOLT UGZ
CW		6" LED DOWNLIGHT. 19W, 2100 LUMENS, 4000K CT. 0–10V DIMMING. WET LISTED.	LITHONIA	LBR6 NCH ALO2 SWW1 AR LSS WD MVOLT UGZ WL
CWE		6" LED DOWNLIGHT. 19W, 2100 LUMENS, 4000K CT. 0–10V DIMMING. WET LISTED. PROVIDE WITH UL924 DEVICE.	LITHONIA	LBR6 NCH ALO2 SWW1 AR LSS WD MVOLT UGZ WL
EX1		LED EXIT SIGN, BRUSHED ALUMINUM FACE WITH RED LETTERS, UNIVERSAL FACE AND MOUNTING, PROVIDE WITH UL924 DEVICE.	LITHONIA	EDG 1 R EL N SD
F		SURFACE MOUNT CANOPY LED 34W, 4800 LUMENS, 4000K CT. 0–10V DIMMING.	LITHONIA	CNY LED ALO SWW2 UVOLT PE PIR DD8 M2
G		FLAG POLE LIGHT 100W, 14,000 LUMENS, 4000K CT. IP66 RATED	LITHONIA	ESXF3 ALO SWW2 YS DDB
P1		SINGLE HEAD PARKING LOT LIGHT FIXTURE, 7–PIN RECEPTACLE CONTROL 133W, 16,417 LUMENS, 4000K CCT.	LITHONIA	RSX1 LED P4 40K R2 MVOLT SPA PER7 DDBXD / DLL127F 1.5 JU / SSS 25' 4C DM19AS DDBXD
P2		SINGLE HEAD PARKING LOT LIGHT FIXTURE, 7–PIN RECEPTACLE CONTROL 133W, 16,574 LUMENS, 4000K CCT.	LITHONIA	RSX1 LED P4 40K R4 MVOLT SPA PER7 DDBXD DLL127F 1.5 JU / SSS 25' 4C DM19AS DDBXD
P3		DOUBLE HEAD PARKING LOT LIGHT FIXTURE, 7–PIN RECEPTACLE CONTROL 266W, 32,991 LUMENS, 4000K CCT.	LITHONIA	(1) RSX1 LED P4 40K R2 MVOLT SPA PER7 DDBXD / (1) RSX1 LED P4 40K R4 MVOLT SPA PER7 DDBXD / (2) DLL127F 1.5 JU / SSS 25' 4C DM28AS DDBXD
RE		6' EXTERIOR LED FIXTURE. 30W, 3100 LUMENS, 4000K CT. 0–10V DIMMING. IP66 RATED. PROVIDE WITH UL924 DEVICE.	A–LIGHT	LIN 3 SP M6' LS 40 U HE M.5" B D ES
S1		4' LED STRIP FIXTURE. 35W, 5000 LUMENS, 4000K CT. MULTIPLE MOUNTING TYPES.	LITHONIA	CSS L48 ALO3 MVOLT SWW3 80CRI
S1E		4' LED STRIP FIXTURE. 35W, 5000 LUMENS, 4000K CT. MULTIPLE MOUNTING TYPES. PROVIDE WITH UL924 DEVICE.	LITHONIA	CSS L48 ALO3 MVOLT SWW3 80CRI
S2		2' LED STRIP FIXTURE 1800 LUMENS, 4000K CT MULTIPLE MOUNTING TYPES	LITHONIA	CSS L24 ALO15 MVOLT SWW3 80CRI
T		4" ROUND WALL SCONCE LED 31W, 1500 LUMENS UP AND DOWN, 4000K CT. 0–10V DIMMING.	GOTHAM	ICO4UDWC 40/15 AR LSS 20D SHLD SDDB U15LM U20D USHLD USDDB MVOLT GZ10 JBX
V1		2' LED VANITY FIXTURE 7W, 800 LUMENS, 4000K CT 0–10V DIMMING	MARK LIGHTING	S2WD LLP 2FT MSL2 80CRI 40K 400LMF SCT MIN10 FLL MVOLT WHTT ZT
W1E		2400 LUMENS, 4000K CT, LED WALL PACK PROVIDE WITH UL924 DEVICE.	LITHONIA	WPX1 LED P2 40K MVOLT DBLXD

GENERAL NOTES:
EQUIVALENT ALTERNATE LIGHT FIXTURES MAY BE PROVIDED FOR BIDDING PURPOSES. THE ENGINEER DOES NOT TAKE RESPONSIBILITY FOR ENSURING ALTERNATE LIGHT FIXTURES USED FOR BIDDING ARE EQUAL; THE CONTRACTOR SHALL BE RESPONSIBLE FOR ENSURING ALTERNATE FIXTURES ARE EQUIVALENT TO THOSE SPECIFIED PRIOR TO BID. THE WINNING BID PACKAGE SHALL BE SUBMITTED TO THE ENGINEER FOR REVIEW IN ACCORDANCE WITH THE SPECIFICATIONS.

ELECTRICAL ABBREVIATIONS

AC	ABOVE COUNTERTOP	MC	MECHANICAL CONTRACTOR
AFF	ABOVE FINISH FLOOR	MCA	MINIMUM CIRCUIT AMPS
AFG	ABOVE FINISH GRADE	MCB	MAIN CIRCUIT BREAKER
ANNC	ANNUNICIATOR	MDP	MAIN DISTRIBUTION PANEL
CC	CONTROLS CONTRACTOR	MLO	MAIN LUG ONLY
DF	DRINKING FOUNTAIN	MTD	MOUNTED
EC	ELECTRICAL CONTRACTOR	NIC	NOT IN CONTRACT
EF	EXHAUST FAN	OCC	OCCUPANCY
ERMS	ENERGY REDUCTION MAINTENANCE SWITCH	PC	PLUMBING CONTRACTOR
		PNL	PANEL
EX	EXISTING	SPST	SINGLE POLE SINGLE THROW
EXR	EXISTING RELOCATED	TTB	TELEPHONE TERMINAL BOARD
GC	GENERAL CONTRACTOR	TYP	TYPICAL
GFI	GROUND FAULT INTERRUPT	WG	WIRE GUARD
HP	HORSEPOWER	WP	WEATHER PROOF
IBC	INTERNATIONAL BUILDING CODE	20A	20 AMP
IG	ISOLATED GROUND	ø	PHASE
LSIG	LONG TIME, SHORT TIME, INSTANTANEOUS, AND GROUND	3W	3 WIRE
		1P20A	SINGLE POLE 20 AMP
LV	LOW VOLTAGE		
LVRP	LV RELAY PANEL		

SWITCH LEGEND	
SYMBOL	DESCRIPTION
$	20A, 120/277V SPST SWITCH
$a	20A, 120/277V LETTER INDICATES GROUP
$3	20A, 120/277V 3–WAY
$4	20A, 120/277V 4–WAY
$D	DIMMER SWITCH
$K	KEY OPERATED SWITCH
$OC	OCCUPANCY SENSOR SWITCH

GENERAL NOTE:
SEE SPECIFICATIONS FOR MANUFACTURERS

RECEPTACLE SCHEDULE	
SYMBOL	DESCRIPTION
	DUPLEX RECEPTACLE
	20A, 120V, 2P, 3W GROUNDING DUPLEX RECEPTACLE RECEPTACLE MTD. 6" ABOVE COUNTER OR HGT SHOWN
	DUPLEX RECEPTACLE, CEILING MOUNTED
	GFCI RECEPTACLE
	GFCI RECEPTACLE, MTD. 6" ABOVE COUNTER OR HGT SHOWN
	20A, 120V, 2P, 3W GROUNDING DUPLEX GFCI RECEPTACLE – WEATHER PROOF (IN USE COVER)
J	JUNCTION BOX, AS NOTED
	QUADPLEX RECEPTACLE

GENERAL NOTE:
SEE SPECIFICATIONS FOR MANUFACTURERS

GENERAL ELECTRICAL NOTES

1. CONTRACTOR TO VERIFY EXISTING ELECTRICAL CONDITIONS AND NOTIFY ARCHITECT/ENGINEER OF ANY ELECTRICAL OR CODE ISSUES PRIOR TO BID. CONTRACTOR IS RESPONSIBLE FOR PROVIDING A COMPLETE AND OPERATIONAL CODE COMPLIANT SYSTEM.
2. ALL WORK SHALL BE IN CONFORMANCE WITH NATIONAL, STATE, AND LOCAL CODES AND/OR ORDINANCES.
3. ELECTRICAL CONTRACTOR SHALL COORDINATE WORK WITH ALL OTHER CONTRACTORS & LOCAL UTILITY. E.C. SHALL CONTACT LOCAL UTILITY FOR EXACT SERVICE REQUIREMENTS TO INCLUDE BUT NOT LIMITED TO TRANSFORMER, METERING AND CABLING. LOCAL UTILITY REQUIREMENTS SUPERSEDE DRAWINGS AND SPECIFICATIONS.
4. SEE ARCHITECTURAL, MECHANICAL, & PLUMBING DRAWINGS FOR ADDITIONAL REQUIREMENTS.
5. ELECTRICAL DRAWINGS ARE DIAGRAMMATIC ONLY. THEY ARE INTENDED TO GIVE APPROXIMATE LOCATIONS AND OVERALL DESIGN INTENT. THE ELECTRICAL CONTRACTOR SHALL BE RESPONSIBLE FOR PRODUCTS, MATERIALS, AND ELECTRICAL METHODS WHICH HAVE NOT BEEN SHOWN OR INDICATED BUT ARE REQUIRED FOR A COMPLETE SYSTEM TO THE STANDARDS OF THE INDUSTRY.
6. INSTALL LIGHTING FIXTURES IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS. PROVIDE SUPPORTING DEVICES FOR ADEQUATE SUPPORT OF FIXTURES FROM STRUCTURE.
7. UPON COMPLETION OF THE ELECTRICAL WORK, THE INSTALLATION SHALL BE TESTED FOR CONTINUITY, GROUNDS, AND SHORT CIRCUITS. THE ELECTRICAL CONTRACTOR SHALL DEMONSTRATE PROPER PERFORMANCE OF ALL SYSTEMS. ALL DEFECTIVE WORK OR MATERIALS SHALL BE REPLACED OR REPAIRED AS NECESSARY AND RETESTED.
8. ELECTRICAL RACEWAYS THAT PENETRATE FIRE RATED ASSEMBLIES SHALL BE SLEEVED AND SEALED AS PER THE LOCAL BUILDING CODE.
9. THE ELECTRICAL CONTRACTOR SHALL PROVIDE A TEMPORARY ELECTRICAL SYSTEM FOR THE PROJECT. AT LEAST ONE 120 VOLT SINGLE PHASE RECEPTACLE SHALL BE PROVIDED FOR EACH 500 SQUARE FEET OF FLOOR SPACE. SUFFICIENT TEMPORARY LIGHTING SHALL BE PROVIDED TO ALLOW ALL CONTRACTORS TO COMPLETE THEIR WORK. TEMPORARY ELECTRICAL CIRCUITS SHALL BE EQUIPPED WITH COMBINATION GROUND FAULT INTERRUPTER AND CIRCUIT BREAKER PER NEC. TEMPORARY ELECTRICAL SYSTEM SHALL BE INCLUDED IN THIS BID. USAGE CHARGES SHALL BE PAID FOR BY THE GENERAL CONTRACTOR.

ELECTRICAL LEGEND

	PANEL BOARD
	DISTRIBUTION PANEL BOARD
T	TRANSFORMER
	UTILITY METER
CB	SEPARATE CIRCUIT BREAKER
	DISCONNECT
	FUSED DISCONNECT SWITCH
	EMERGENCY FUSED DISCONNECT SWITCH
	MOTOR STARTER/CONTRACTOR
	COMBINATION MOTOR STARTER
	PUSH BUTTON STATION AS NOTED
P	PULL BOX, SIZE AS REQUIRED BY CODE
	ELECTRICAL CONNECTION
	MOTOR CONNECTION
	HOME RUN TO PANEL BOARD

ELECTRICAL SHEET INDEX

E000	ELECTRICAL TITLE SHEET
ED101	ELECTRICAL DEMOLITION PLAN – EXISTING AUDITORIUM
ED102	ELECTRICAL DEMOLITION PLAN – EXISTING CAFETERIA
E100	ELECTRICAL SITE PLAN
E101	ELECTRICAL LIGHTING PLAN – AREA A
E102	ELECTRICAL LIGHTING PLAN – AREA B
E201	ELECTRICAL POWER PLAN – AREA A
E202	ELECTRICAL POWER PLAN – AREA B
E203	ELECTRICAL POWER PLAN – EXISTING AUDITORIUM
E204	ELECTRICAL ROOF PLAN – AREA A
E205	ELECTRICAL ROOF PLAN – AREA B
E401	ELECTRICAL ONE–LINE DIAGRAM – PART ONE
E402	ELECTRICAL ONE–LINE DIAGRAM – PART TWO
E501	ELECTRICAL DETAILS SHEET
E502	ELECTRICAL DETAILS SHEET
E601	ELECTRICAL SCHEDULES
E602	ELECTRICAL SCHEDULES
E603	ELECTRICAL SCHEDULES

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CIVIL

KFC ENGINEERING
STRUCTURAL

SALAS O'BRIEN
MECHANICAL / ELECTRICAL

DWG
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APRIL 2025
date

revisions

MOORE PUBLIC SCHOOLS
BOARD OF EDUCATION
MOORE, OKLAHOMA

MOORE Public Schools
LEARNING FOR LIFE

CLASSROOM ADDITION
CENTRAL JUNIOR
HIGH SCHOOL

sheet no:

E000

Salas O'Brien
2900 S. Telephone Road, Suite 120
Moore, OK 73160
Salas O'Brien Registration: CA# 7058
Expiration Date : 6/30/2025
Salas O'Brien Project Number: 2550-00564-00

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1 ELECTRICAL DEMOLITON PLAN - EXISTING AUDITORIUM

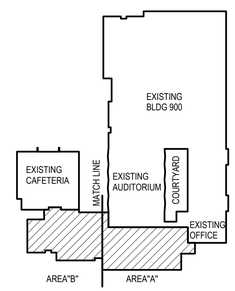
SCALE: 1/8" = 1'-0"

DEMOLITION GENERAL NOTES

1. THESE DEMOLITION PLANS HAVE BEEN PREPARED TO ASSIST THE CONTRACTOR IN DETERMINING THE SCOPE OF DEMOLITION WORK TO BE INCLUDED IN THIS PROJECT. THE CONTRACTOR SHOULD REVIEW ALL DRAWINGS AND SPECIFICATIONS, INCLUDING DEMOLITION SHOWN FOR OTHER TRADES, AND BECOME FAMILIAR WITH THE EXISTING CONDITIONS, IN ORDER TO DETERMINE THE SCOPE OF DEMOLITION WORK.
2. EXISTING PANELS SHALL BE REMOVED AND REPLACED WITH NEW PANELS AS INDICATED ON SHEET E-201. REFER TO SHEET E-401 FOR ADDITIONAL INFORMATION.
3. EXISTING LIGHT FIXTURES, SWITCHES, AND LIGHTING DEVICES SHALL BE REMOVED AND REPLACED WITH NEW FIXTURES AS INDICATED ON E-000 AND E-101.
4. EXISTING RECEPTACLES AND OTHER DEVICES SHALL BE REMOVED AND REPLACED WITH NEW DEVICES AS INDICATED ON SHEET E-201, E-202, AND E-203.
5. EXISTING CONDUIT AND WIRING MAYBE REUSED IF IN SERVICEABLE CONDITION, OTHERWISE PROVIDE NEW CONDUIT AND WIRE AS REQUIRED. NEW DEVICES AND FIXTURES SHALL BE CIRCUITED TO NEW PANELS AS INDICATED. EC SHALL FIELD VERIFY EXISTING CONDITIONS AND REPORT ANY ANOMALIES TO THE ARCHITECT AND ENGINEER PRIOR TO PROCEEDING.
6. DEMOLITION PLAN INFORMATION SHOWN AT TIME OF DESIGN. EC SHALL FIELD VERIFY EXISTING CONDITIONS AND MAKE ANY NECESSARY CHANGES TO COMPLETE THE WORK.
7. REMOVE ALL UNUSED WIRING AND CONDUIT AS PART OF THE DEMOLITION PROCESS.
8. EC SHALL UPDATE CIRCUIT DIRECTORIES IN EXISTING PANELS AS REQUIRED FOR NEW EQUIPMENT. NEW CIRCUIT DIRECTORIES ARE TO BE TYPED AND PRINTED.

KEYED NOTES

1. EXISTING 'FRANK ADAM' PANEL TO BE DEMOLISHED AND REPLACED. RETAIN BREAKERS AND RETURN TO OWNER PER OWNER'S REQUEST. EXISTING CIRCUITS TO BE RECONNECTED TO NEW PANEL. REFER TO E201 FOR ADDITIONAL INFORMATION.
2. EXISTING 'ZINSCO' PANEL TO BE DEMOLISHED AND REPLACED. RETAIN BREAKERS AND RETURN TO OWNER PER OWNER'S REQUEST. EXISTING CIRCUITS TO BE RECONNECTED TO NEW PANEL. REFER TO E201 FOR ADDITIONAL INFORMATION.
3. EXISTING LOAD CENTER TO BE DEMOLISHED. EXISTING CIRCUITS TO BE RECONNECTED TO NEW PANEL. REFER TO E201 FOR ADDITIONAL INFORMATION.
4. EXISTING ELECTRICAL PANEL TO REMAIN.
5. EXISTING WATER COOLER TO BE DEMOLISHED. DEMO WIRING BACK TO EXISTING PANEL AND LABEL BREAKER AS SPARE.
6. EXISTING LIGHT FIXTURES IN THIS AREA TO BE DEMOLISHED AND REPLACED.
7. THIS PANEL BELIEVED TO BE FED DIRECTLY FROM UTILITY AS A SEPARATE SERVICE. UTILITY TRANSFORMER LOCATED WEST OF MAIN ELECTRICAL ROOM IS BELIEVED TO BE THE SERVICE POINT. COORDINATE WITH UTILITY COMPANY TO VERIFY EXACT FEED AND RELOCATION. REPORT ANY ANOMALIES TO THE ENGINEER PRIOR TO PROCEEDING. REPLACEMENT PANEL SHALL BE FED DIRECTLY FROM 'SWBD', REFER TO E401 FOR MORE INFORMATION.



KEYPLAN

NO SCALE

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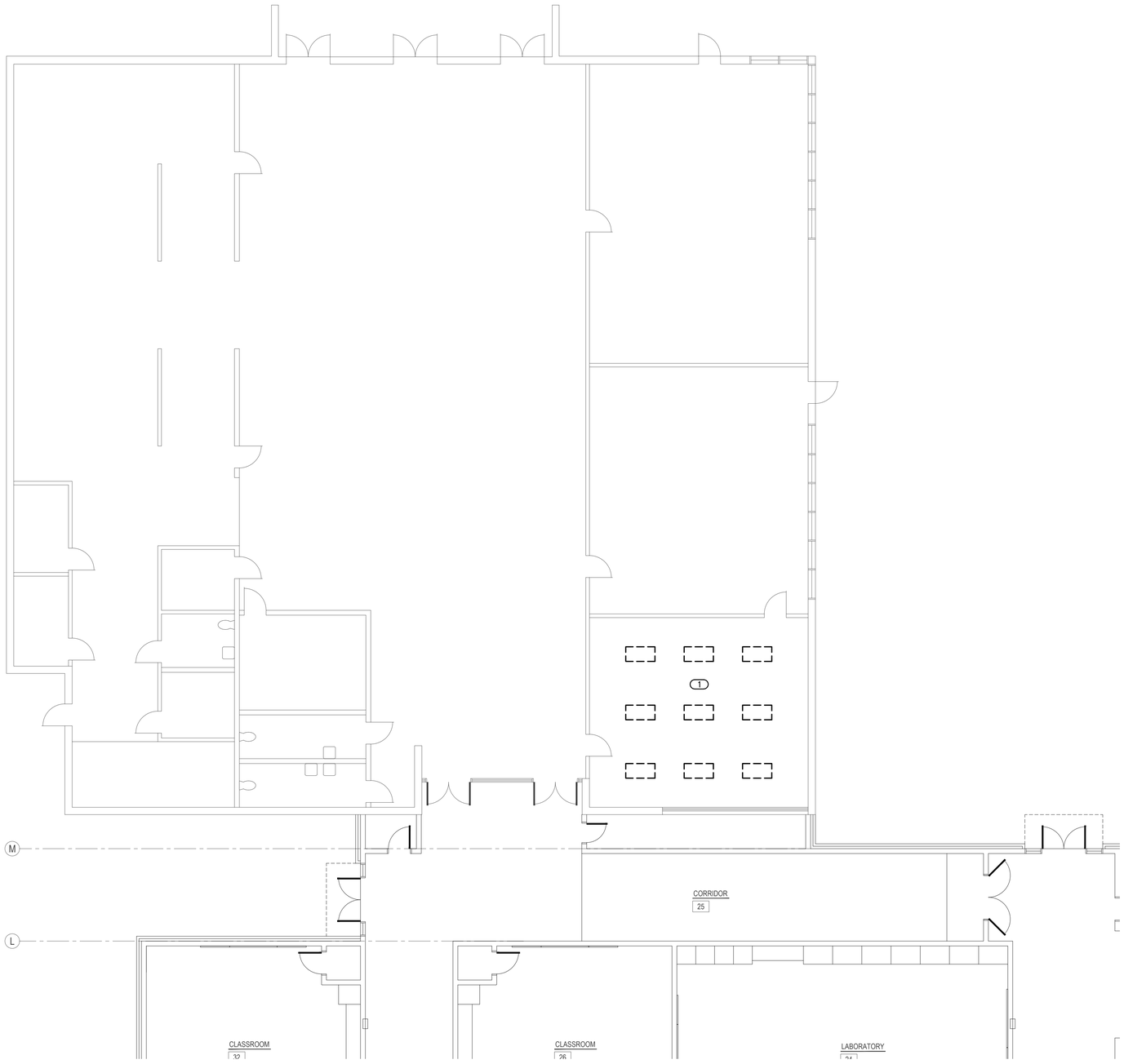


1 ELECTRICAL DEMOLITON PLAN - EXISTING CAFETERIA

SCALE: 1/8" = 1'-0"

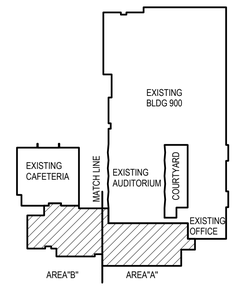
NORTH

DEMOLITION GENERAL NOTES

1. THESE DEMOLITION PLANS HAVE BEEN PREPARED TO ASSIST THE CONTRACTOR IN DETERMINING THE SCOPE OF DEMOLITION WORK TO BE INCLUDED IN THIS PROJECT. THE CONTRACTOR SHOULD REVIEW ALL DRAWINGS AND SPECIFICATIONS, INCLUDING DEMOLITION SHOWN FOR OTHER TRADES, AND BECOME FAMILIAR WITH THE EXISTING CONDITIONS, IN ORDER TO DETERMINE THE SCOPE OF DEMOLITION WORK.
2. EXISTING PANELS SHALL BE REMOVED AND REPLACED WITH NEW PANELS AS INDICATED ON SHEET E-201. REFER TO SHEET E-401 FOR ADDITIONAL INFORMATION.
3. EXISTING LIGHT FIXTURES, SWITCHES, AND LIGHTING DEVICES SHALL BE REMOVED AND REPLACED WITH NEW FIXTURES AS INDICATED ON E-000 AND E-101.
4. EXISTING RECEPTACLES AND OTHER DEVICES SHALL BE REMOVED AND REPLACED WITH NEW DEVICES AS INDICATED ON SHEET E-201, E-202, AND E-203.
5. EXISTING CONDUIT AND WIRING MAYBE REUSED IF IN SERVICEABLE CONDITION, OTHERWISE PROVIDE NEW CONDUIT AND WIRE AS REQUIRED. NEW DEVICES AND FIXTURES SHALL BE CIRCUITED TO NEW PANELS AS INDICATED. EC SHALL FIELD VERIFY EXISTING CONDITIONS AND REPORT ANY ANOMALIES TO THE ARCHITECT AND ENGINEER PRIOR TO PROCEEDING.
6. DEMOLITION PLAN INFORMATION SHOWN AT TIME OF DESIGN. EC SHALL FIELD VERIFY EXISTING CONDITIONS AND MAKE ANY NECESSARY CHANGES TO COMPLETE THE WORK.
7. REMOVE ALL UNUSED WIRING AND CONDUIT AS PART OF THE DEMOLITION PROCESS.
8. EC SHALL UPDATE CIRCUIT DIRECTORIES IN EXISTING PANELS AS REQUIRED FOR NEW EQUIPMENT. NEW CIRCUIT DIRECTORIES ARE TO BE TYPED AND PRINTED.

KEYED NOTES

(1) EXISTING LIGHT FIXTURES IN THIS AREA TO BE DEMOLISHED AND REPLACED.



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NO SCALE

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CLASSROOM ADDITION
CENTRAL JUNIOR
HIGH SCHOOL

sheet no:

ED102

Salas O'Brien
2900 S. Telephone Road, Suite 120
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Salas O'Brien Registration: CA# 7058
Expiration Date : 6/30/2025
Salas O'Brien Project Number: 2550-00564-00

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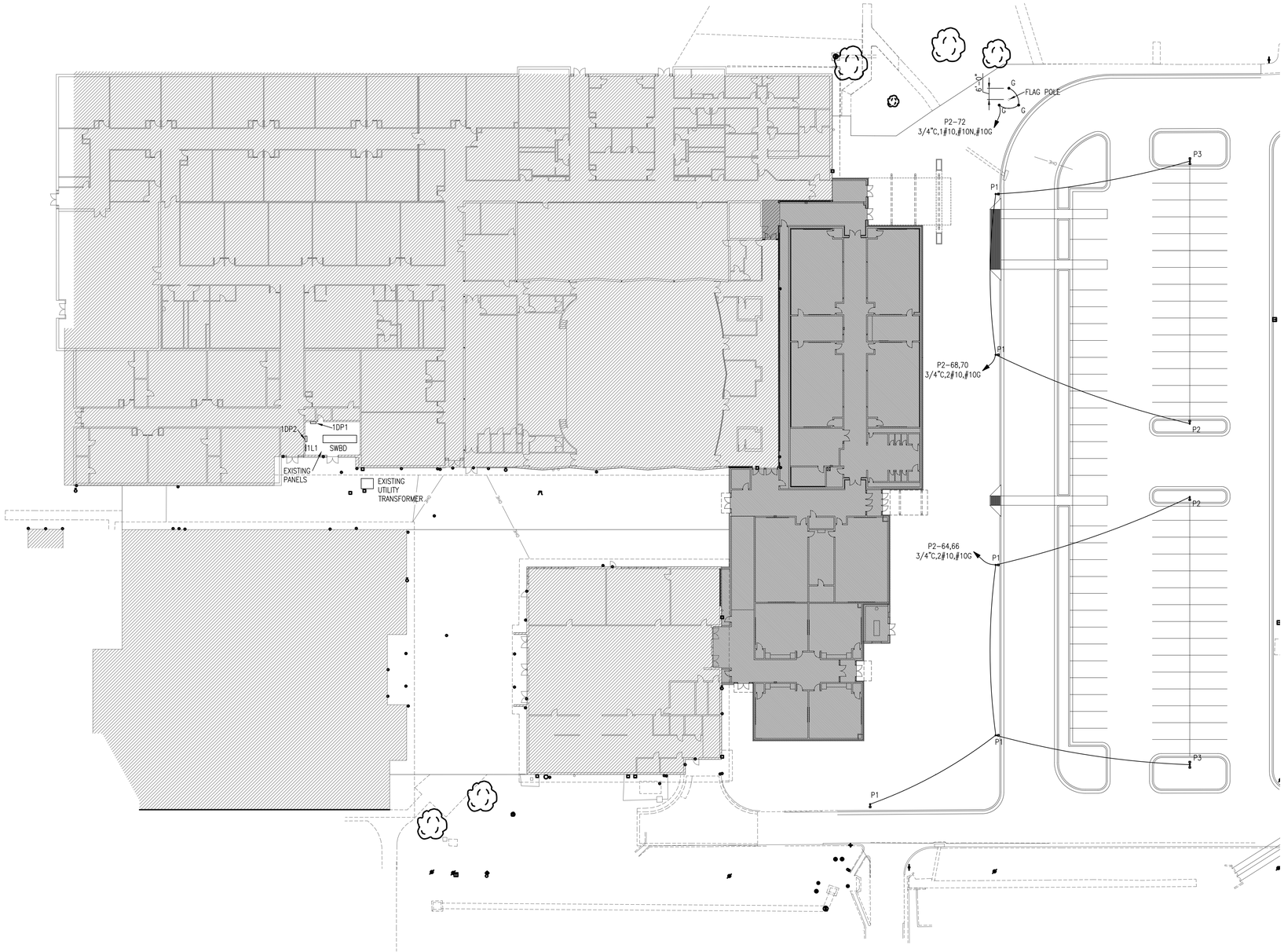

1 ELECTRICAL SITE PLAN

SCALE: 1" = 30'-0"

NORTH

GENERAL NOTES

1. COORDINATE EXACT LOCATIONS OF DEVICES SHOWN WITH OTHER EQUIPMENT.
2. EXTERIOR LIGHTING SHALL BE CONTROLLED BY RELAY TO INTERLOCK WITH EXISTING EXTERIOR LIGHTING CONTROLS. EC SHALL FIELD INVESTIGATE AND REPORT ANY ANOMALIES TO THE ARCHITECT AND ENGINEER PRIOR TO PROCEEDING.
3. THESE DRAWINGS ARE INTENDED TO BE DIAGRAMMATIC ONLY. CONSULT WITH GENERAL CONTRACTOR FOR DETAILS ON BIDDING; PROVIDE ALL PARTS AND LABOR FOR A COMPLETE AND CODE COMPLIANT FACILITY.
4. ELECTRICAL CONTRACTOR TO SHOW ACTUAL ROUTING OF ALL BELOW-GRADE CONDUITS AND WIRING ON AS-BUILT DRAWINGS. ROUTES SHOWN ARE GENERAL IN NATURE AND ACTUAL ROUTE SHALL BE DETERMINED BY GENERAL CONTRACTOR AND ELECTRICAL CONTRACTOR ONSITE.
5. PROVIDE GROUNDING AND BONDING AT EACH BUILDING IN ACCORDANCE WITH NEC 250.32.

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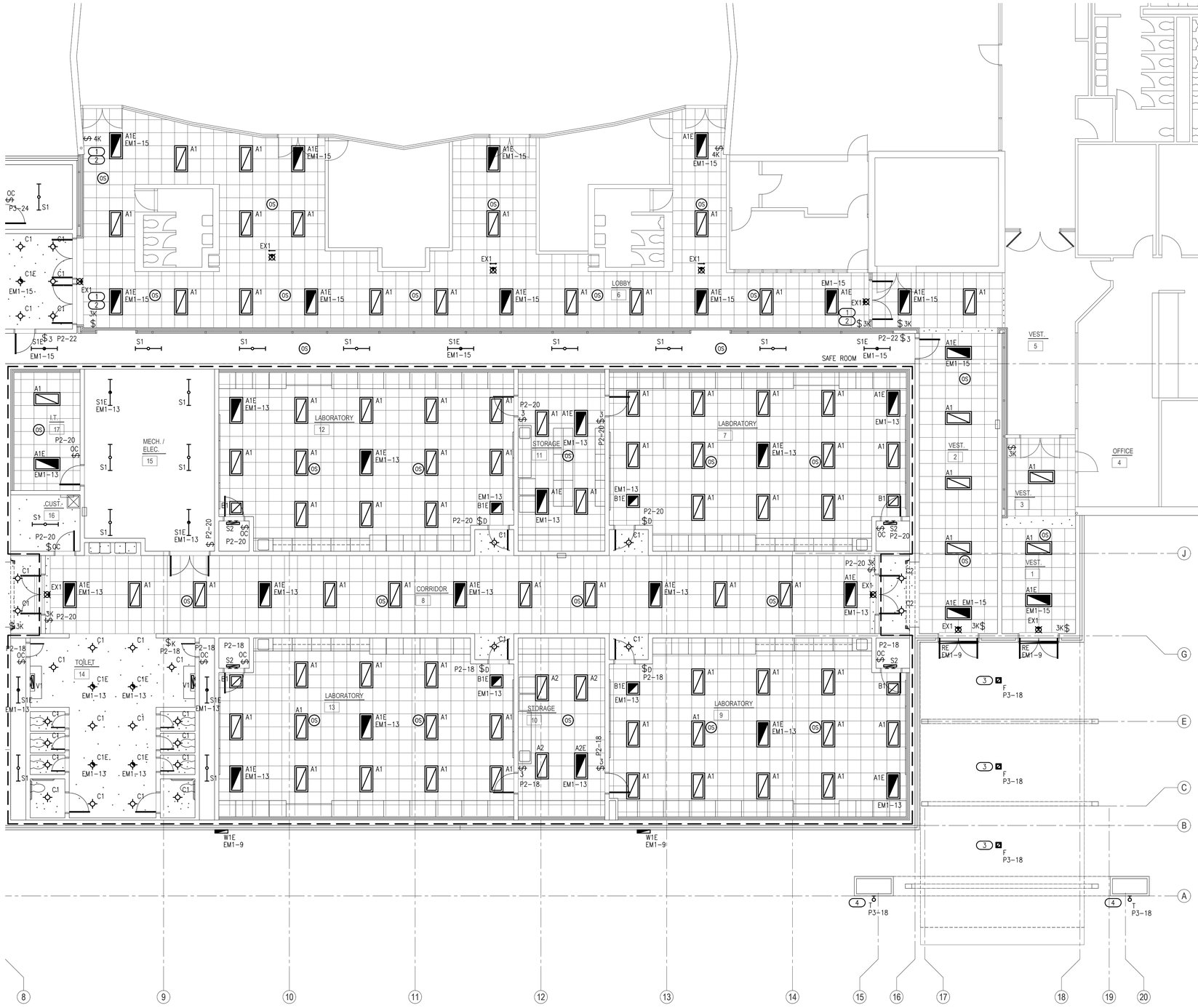


1 ELECTRICAL LIGHTING PLAN - AREA A

SCALE: 1/8" = 1'-0"

NORTH

LIGHTING GENERAL NOTES

1. OCCUPANCY SENSOR LOCATIONS SHOWN ARE FOR DESIGN INTENT ONLY. LOCATE OCCUPANCY SENSORS PER MANUFACTURER'S WRITTEN INSTALLATION INSTRUCTIONS.
2. CONNECT BATTERY PACKS TO UNSWITCHED HOT OF LOCAL LIGHTING CIRCUIT.
3. COORDINATE WITH ALL ASSOCIATED TRADES FOR THE EXACT LOCATIONS OF LIGHT FIXTURES WITH HVAC EQUIPMENT AND OTHER DEVICES/EQUIPMENT.
4. COORDINATE WITH THE ARCHITECT, OWNER, AND ASSOCIATED TRADES FOR THE EXACT HEIGHT/LOCATION OF EXTERIOR MOUNTED LIGHTING FIXTURES PRIOR TO ROUGH-IN.
5. LABEL SWITCH PLATES AND J-BOXES WITH CIRCUIT PER SPECS.
6. COORDINATE LIGHT SWITCHES WITH THERMOSTATS AND OTHER WALL MOUNT DEVICES.
7. EXTERIOR LIGHTING SHALL BE CONTROLLED BY RELAY TO INTERLOCK WITH EXISTING EXTERIOR LIGHTING CONTROLS. EC SHALL FIELD INVESTIGATE AND REPORT ANY ANOMILIES TO THE ARCHITECT AND ENGINEER PRIOR TO PROCEEDING.

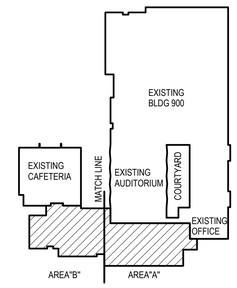
SAFEROOM GENERAL NOTES

PER ICC 500-2014, 309.1:

PENETRATIONS THROUGH THE STORM SHELTER ENVELOPE THAT ARE LARGER THAN:
1. 3.5" SQUARE INCHES IN AREA FOR RECTANGULAR OPENINGS, OR
2. 2 1/16" IN DIAMETER
SHALL BE CONSIDERED AN OPENING AND SHALL BE PROVIDED WITH AN OPENING PROTECTIVE DEVICE (SHROUD). REFERENCE STRUCTURAL DRAWINGS FOR A SAMPLE SHROUD DETAIL. THIS INCLUDES PENETRATIONS FOR BUNDLES OF CONDUIT.

KEYED NOTES

1. PANEL FEEDING EXISTING LIGHTING CIRCUITS TO BE REPLACED. PROVIDE NEW WIRING AND CONDUIT FOR ALL NEW LIGHTING. EXISTING WIRING AND CONDUIT MAY BE REUSED WHERE IN SERVICEABLE CONDITION. ANY WIRING TO BE REUSED SHALL BE WARRANTED AS IF NEW.
2. EMERGENCY LIGHTING TO BE CIRCUITED TO NEW PANEL 'EM1' AS INDICATED. UL924 DEVICES, AS INDICATED IN LIGHT FIXTURE SCHEDULE, SHALL BE USED TO CONTROL EMERGENCY LIGHTS WITH EXISTING LIGHTING CIRCUITS AS INDICATED IN KEYED NOTE #1 ABOVE.
3. COORDINATE LIGHT FIXTURE LOCATION AND CONDUIT ROUTING WITH ARCHITECT PRIOR TO ROUGH-IN.
4. COORDINATE MOUNTING HEIGHT WITH ARCHITECT PRIOR TO ROUGH-IN.



KEYPLAN

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OKLAHOMA PROFESSIONAL ENGINEER — TIMOTHY VOSTRAN — 32650 — 05/15/25

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CLASSROOM ADDITION
CENTRAL JUNIOR
HIGH SCHOOL

sheet no:

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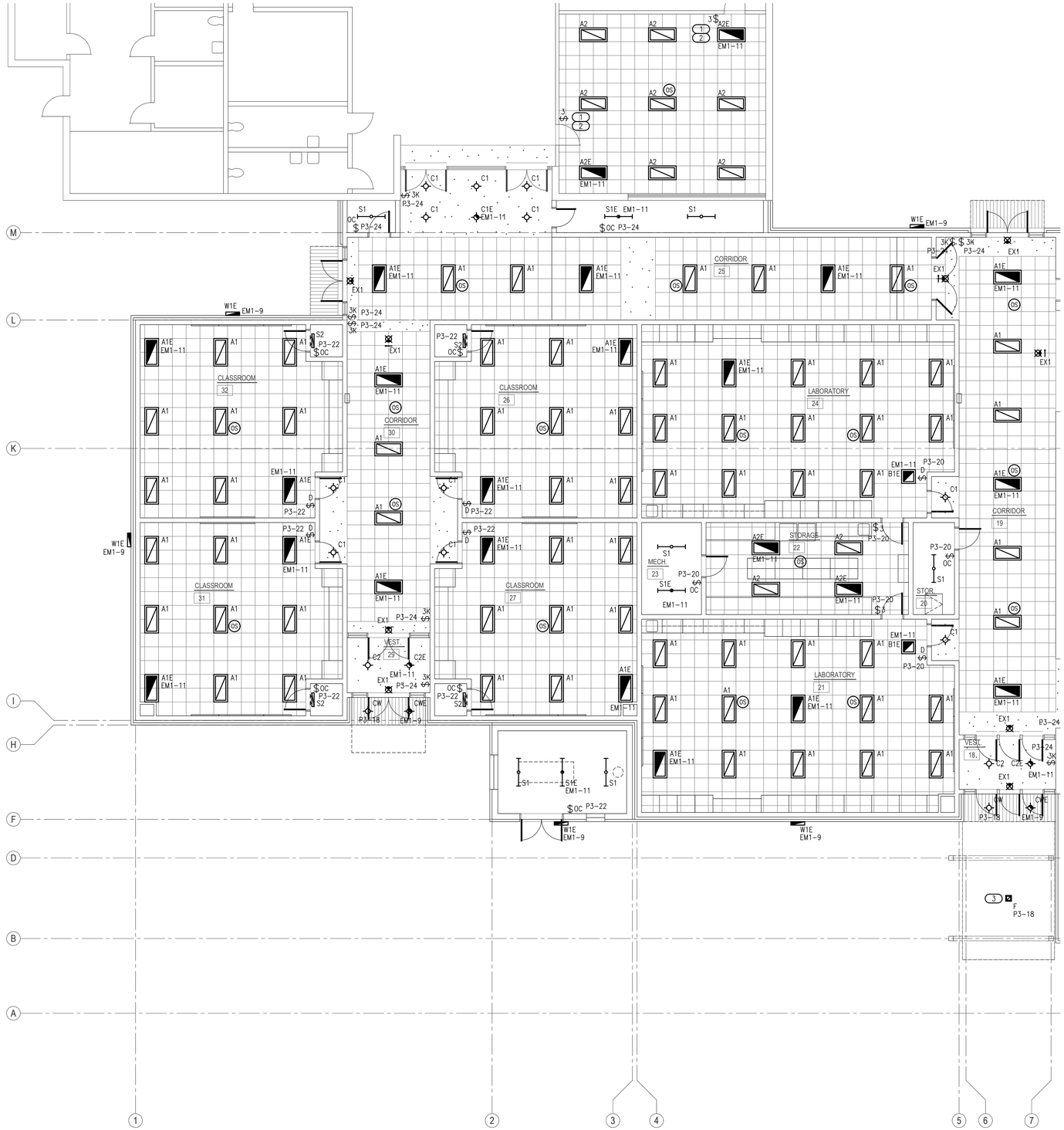


1 ELECTRICAL POWER PLAN - AREA B

SCALE: 1/8" = 1'-0"

LIGHTING GENERAL NOTES

1. OCCUPANCY SENSOR LOCATIONS SHOWN ARE FOR DESIGN INTENT ONLY. LOCATE OCCUPANCY SENSORS PER MANUFACTURER'S WRITTEN INSTALLATION INSTRUCTIONS.
2. CONNECT BATTERY PACKS TO UNSWITCHED HOT OF LOCAL LIGHTING CIRCUIT.
3. COORDINATE WITH ALL ASSOCIATED TRADES FOR THE EXACT LOCATIONS OF LIGHT FIXTURES WITH HVAC EQUIPMENT AND OTHER DEVICES/EQUIPMENT.
4. COORDINATE WITH THE ARCHITECT, OWNER, AND ASSOCIATED TRADES FOR THE EXACT HEIGHT/LOCATION OF EXTERIOR MOUNTED LIGHTING FIXTURES PRIOR TO ROUGH-IN.
5. LABEL SWITCH PLATES AND J-BOXES WITH CIRCUIT PER SPECS.
6. COORDINATE LIGHT SWITCHES WITH THERMOSTATS AND OTHER WALL MOUNT DEVICES.
7. EXTERIOR LIGHTING SHALL BE CONTROLLED BY RELAY TO INTERLOCK WITH EXISTING EXTERIOR LIGHTING CONTROLS. EC SHALL FIELD INVESTIGATE AND REPORT ANY ANOMILIES TO THE ARCHITECT AND ENGINEER PRIOR TO PROCEEDING.

SAFEROOM GENERAL NOTES

PER ICC 500-2014, 309.1:

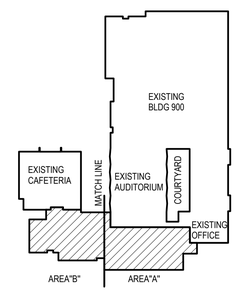
PENETRATIONS THROUGH THE STORM SHELTER ENVELOPE THAT ARE LARGER THAN:
1. 3.5" SQUARE INCHES IN AREA FOR RECTANGULAR OPENINGS, OR
2. 2 1/16" IN DIAMETER
SHALL BE CONSIDERED AN OPENING AND SHALL BE PROVIDED WITH AN OPENING PROTECTIVE DEVICE (SHROUD). REFERENCE STRUCTURAL DRAWINGS FOR A SAMPLE SHROUD DETAIL. THIS INCLUDES PENETRATIONS FOR BUNDLES OF CONDUIT.

KEYED NOTES

(1) LIGHT FIXTURES IN THIS AREA, EXCLUDING EMERGENCY LIGHTING SHALL BE CONNECTED TO EXISTING CIRCUITING. EXTEND WIRING AND CONDUIT AS NEEDED.

(2) EMERGENCY LIGHTING TO BE CIRCUITED TO NEW PANEL 'EM1' AS INDICATED. UL924 DEVICES, AS INDICATED IN LIGHT FIXTURE SCHEDULE, SHALL BE USED TO CONTROL EMERGENCY LIGHTS WITH EXISTING LIGHTING CIRCUITS AS INDICATED IN KEYED NOTE #1 ABOVE.

(3) COORDINATE LIGHT FIXTURE LOCATION AND CONDUIT ROUTING WITH ARCHITECT PRIOR TO ROUGH-IN.



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CLASSROOM ADDITION
CENTRAL JUNIOR HIGH SCHOOL

sheet no:

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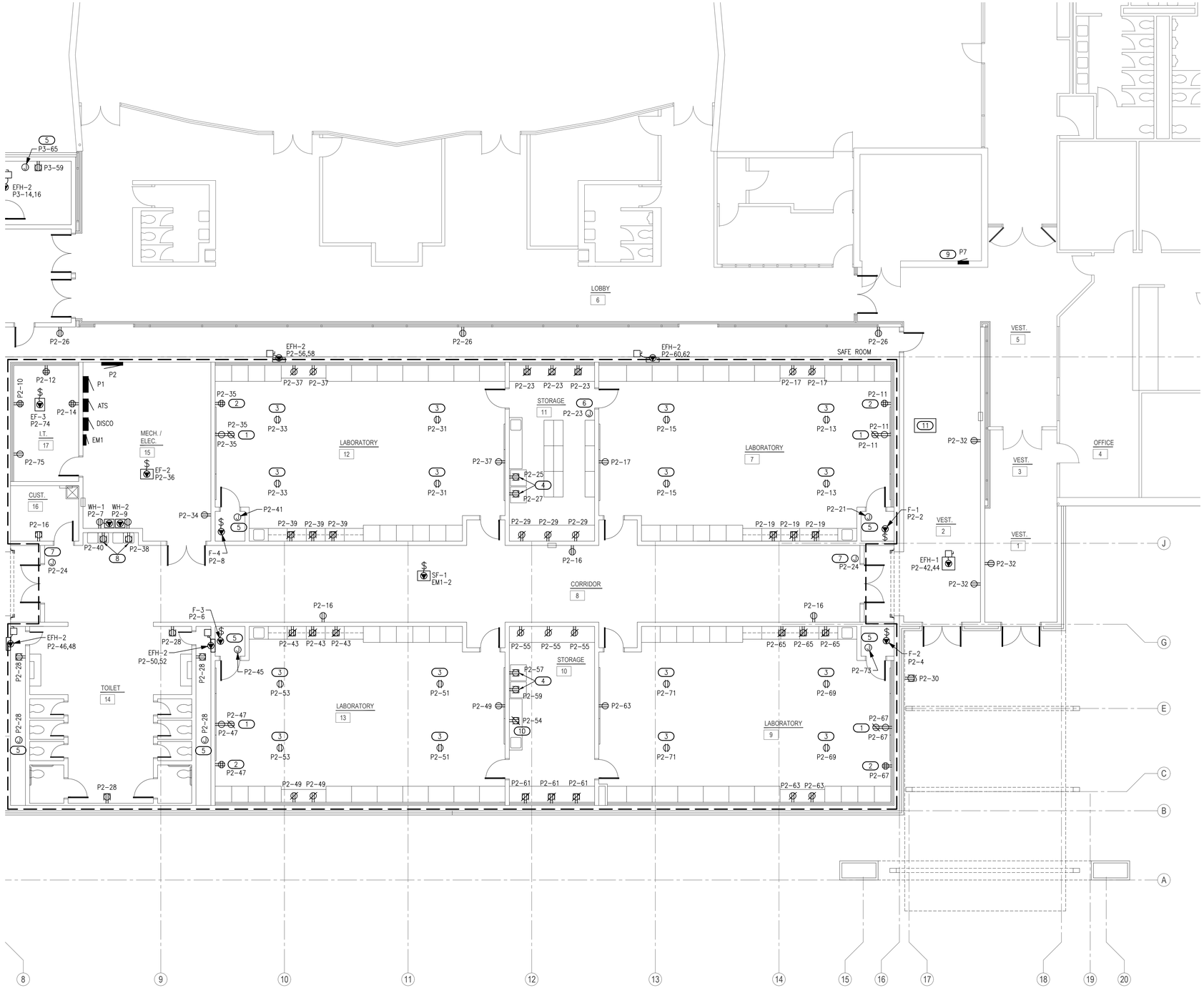


1 ELECTRICAL POWER PLAN - AREA A

SCALE: 1/8" = 1'-0"

NORTH

POWER GENERAL NOTES

1. COORDINATE EXACT LOCATIONS OF DEVICES SHOWN WITH OTHER EQUIPMENT. COORDINATE EXACT LOCATION OF CEILING MOUNTED DEVICES WITH LIGHTS, HVAC EQUIPMENT, AND OTHER DEVICES.
2. COORDINATE WITH MECHANICAL CONTRACTOR AND PROVIDE ALL RELAYS, CONNECTIONS, AND ALL DEVICES NECESSARY TO INTERLOCK EXHAUST FANS, DAMPERS, ETC WITH PROPER CONTROL DEVICES.
3. COORDINATE EXACT LOCATION OF MECHANICAL EQUIPMENT WITH MECHANICAL CONTRACTOR. REFER TO MECHANICAL PLANS AND MANUFACTURER FOR ADDITIONAL INFORMATION.
4. COORDINATE EXACT LOCATION OF PLUMBING EQUIPMENT WITH PLUMBING CONTRACTOR. REFER TO PLUMBING PLANS AND MANUFACTURER FOR ADDITIONAL INFORMATION.
5. ALL RECEPTACLES LOCATED AT COUNTERTOP HEIGHT SHALL BE ORIENTED HORIZONTALLY.
6. FIRE STOP ALL PENETRATIONS IN FIRE AND SMOKE RATED WALLS. REFER TO ARCHITECTURAL PLANS FOR LOCATIONS AND ADDITIONAL INFORMATION.
7. ALL EXISTING PANELS AND ASSOCIATED BRANCH CIRCUITING BELIEVED TO BE MISSING GROUNDING ELECTRODE CONDUCTOR AND/OR EQUIPMENT GROUNDING CONDUCTORS. FOR PANELS BEING REPLACED, CONTRACTOR TO INVESTIGATE EXISTING CONDITIONS AND PROVIDE NEW GROUNDING WIRES AS REQUIRED. REFER TO KEYED NOTE 9 FOR ADDITIONAL INFORMATION.

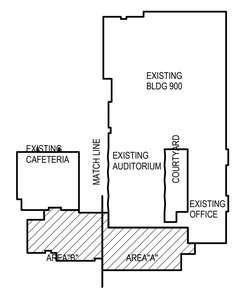
SAFEROOM GENERAL NOTES

PER ICC 500-2014, 309.1:

PENETRATIONS THROUGH THE STORM SHELTER ENVELOPE THAT ARE LARGER THAN:
1. 3.5" SQUARE INCHES IN AREA FOR RECTANGULAR OPENINGS, OR
2. 2 1/16" IN DIAMETER
SHALL BE CONSIDERED AN OPENING AND SHALL BE PROVIDED WITH AN OPENING PROTECTIVE DEVICE (SHROUD). REFERENCE STRUCTURAL DRAWINGS FOR A SAMPLE SHROUD DETAIL. THIS INCLUDES PENETRATIONS FOR BUNDLES OF CONDUIT.

KEYED NOTES

1. PROVIDE 120V CONNECTION FOR SMARTBOARD. COORDINATE FINAL LOCATION AND REQUIREMENTS WITH THE OWNER/ARCHITECT PRIOR TO ROUGH-IN. REFER TO DETAIL 'E502/1' FOR ADDITIONAL INFORMATION.
2. APPROXIMATE LOCATION OF TEACHERS DESK. COORDINATE FINAL LOCATION AND REQUIREMENTS WITH THE OWNER/ARCHITECT PRIOR TO ROUGH-IN. REFER TO DETAIL 'E502/1' FOR ADDITIONAL INFORMATION.
3. PROVIDE 120V DROP CORD RECEPTACLE FOR GENERAL USE. COORDINATE FINAL LOCATION AND REQUIREMENTS WITH THE OWNER/ARCHITECT PRIOR TO ROUGH-IN. REFER TO DETAIL 'E502/2 FOR ADDITIONAL INFORMATION.
4. PROVIDE DEDICATED 120V RECEPTACLES FOR REFRIGERATOR & FREEZER. COORDINATE FINAL LOCATIONS AND REQUIREMENTS WITH THE ARCHITECT/OWNER PRIOR TO ROUGH-IN.
5. PROVIDE 120V CONNECTION FOR TRAP PRIMER. COORDINATE FINAL LOCATION AND REQUIREMENTS WITH PLUMBING CONTRACTOR PRIOR TO ROUGH-IN.
6. PROVIDE EMERGENCY NATURAL GAS SHUT-OFF SWITCH INTERLOCKED WITH NATURAL GAS SOLENOID VALVE. COORDINATE EXACT LOCATION WITH PLUMBING CONTRACTOR PRIOR TO ROUGH-IN.
7. PROVIDE 120V CONNECTION FOR DOOR HOLD-OPEN SYSTEM. COORDINATE EXACT LOCATION AND REQUIREMENTS WITH LOW VOLTAGE CONTRACTOR.
8. PROVIDE 120V WATER COOLER CONNECTION. COORDINATE EXACT LOCATION AND REQUIREMENTS WITH THE ARCHITECT, OWNER, AND PLUMBING CONTRACTOR PRIOR TO ROUGH-IN.
9. EXISTING BRANCH CIRCUITS TO BE RECONNECTED TO NEW PANEL. PROVIDE NEW WIRING AND CONDUIT AS REQUIRED TO EXTEND CIRCUITS AS NEEDED. REFER TO GENERAL NOTES ABOVE, UPDATE GROUND WIRING AS REQUIRED.
10. PROVIDE 120V DEDICATED CONNECTION FOR 3D PRINTER. COORDINATE EXACT LOCATION WITH THE OWNER ON SITE.
11. MINI SPLIT INDOOR UNIT TO BE POWERED FROM OUTDOOR UNIT. COORDINATE EXACT REQUIREMENTS WITH MECHANICAL CONTRACTOR ON SITE.



KEYPLAN

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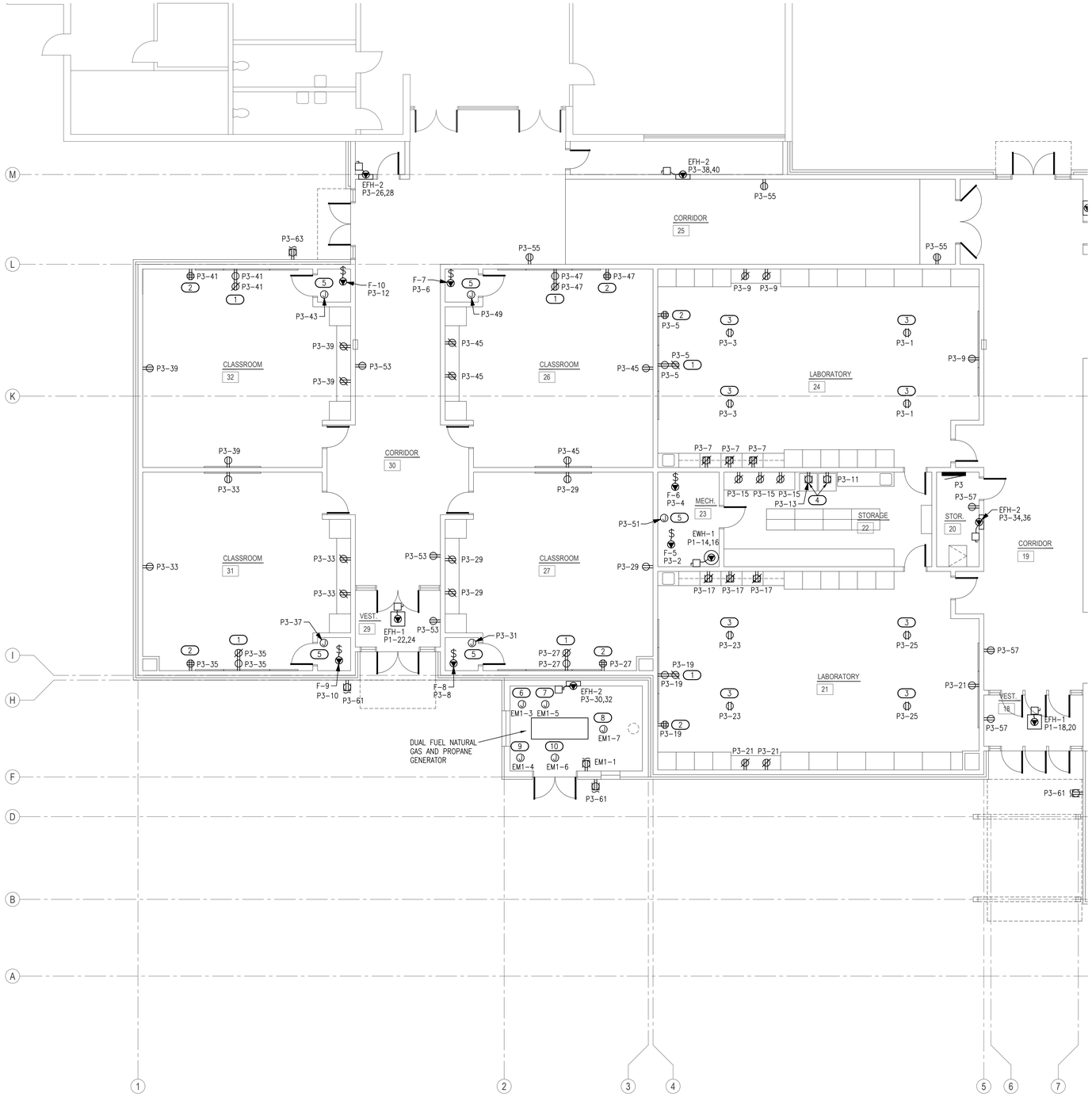


1 ELECTRICAL POWER PLAN - AREA B

SCALE: 1/8" = 1'-0"

NORTH

POWER GENERAL NOTES

1. COORDINATE EXACT LOCATIONS OF DEVICES SHOWN WITH OTHER EQUIPMENT. COORDINATE EXACT LOCATION OF CEILING MOUNTED DEVICES WITH LIGHTS, HVAC EQUIPMENT, AND OTHER DEVICES.
2. COORDINATE WITH MECHANICAL CONTRACTOR AND PROVIDE ALL RELAYS, CONNECTIONS, AND ALL DEVICES NECESSARY TO INTERLOCK EXHAUST FANS, DAMPERS, ETC WITH PROPER CONTROL DEVICES.
3. COORDINATE EXACT LOCATION OF MECHANICAL EQUIPMENT WITH MECHANICAL CONTRACTOR. REFER TO MECHANICAL PLANS AND MANUFACTURER FOR ADDITIONAL INFORMATION.
4. COORDINATE EXACT LOCATION OF PLUMBING EQUIPMENT WITH PLUMBING CONTRACTOR. REFER TO PLUMBING PLANS AND MANUFACTURER FOR ADDITIONAL INFORMATION.
5. ALL RECEPTACLES LOCATED AT COUNTERTOP HEIGHT SHALL BE ORIENTED HORIZONTALLY.
6. FIRE STOP ALL PENETRATIONS IN FIRE AND SMOKE RATED WALLS. REFER TO ARCHITECTURAL PLANS FOR LOCATIONS AND ADDITIONAL INFORMATION

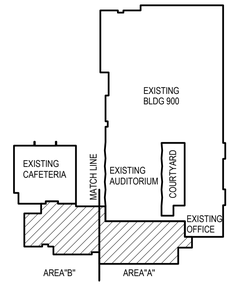
SAFEROOM GENERAL NOTES

PER ICC 500–2014, 309.1:

PENETRATIONS THROUGH THE STORM SHELTER ENVELOPE THAT ARE LARGER THAN:
1. 3.5" SQUARE INCHES IN AREA FOR RECTANGULAR OPENINGS, OR
2. 2 1/16" IN DIAMETER
SHALL BE CONSIDERED AN OPENING AND SHALL BE PROVIDED WITH AN OPENING PROTECTIVE DEVICE (SHROUD). REFERENCE STRUCTURAL DRAWINGS FOR A SAMPLE SHROUD DETAIL. THIS INCLUDES PENETRATIONS FOR BUNDLES OF CONDUIT.

KEYED NOTES

1. PROVIDE 120V CONNECTION FOR SMARTBOARD. COORDINATE FINAL LOCATION AND REQUIREMENTS WITH THE OWNER/ARCHITECT PRIOR TO ROUGH-IN. REFER TO DETAIL 'E502/1' FOR ADDITIONAL INFORMATION.
2. APPROXIMATE LOCATION OF TEACHERS DESK. COORDINATE FINAL LOCATION AND REQUIREMENTS WITH THE OWNER/ARCHITECT PRIOR TO ROUGH-IN. REFER TO DETAIL 'E502/1' FOR ADDITIONAL INFORMATION.
3. PROVIDE 120V DROP CORD RECEPTACLE FOR GENERAL USE. COORDINATE FINAL LOCATION AND REQUIREMENTS WITH THE OWNER/ARCHITECT PRIOR TO ROUGH-IN. REFER TO DETAIL 'E502/2 FOR ADDITIONAL INFORMATION.
4. PROVIDE DEDICATED 120V RECEPTACLES FOR REFRIGERATOR & FREEZER. COORDINATE FINAL LOCATIONS AND REQUIREMENTS WITH THE ARCHITECT/OWNER PRIOR TO ROUGH-IN.
5. PROVIDE 120V CONNECTION FOR TRAP PRIMER. COORDINATE FINAL LOCATION AND REQUIREMENTS WITH PLUMBING CONTRACTOR PRIOR TO ROUGH-IN.
6. PROVIDE 120V GENERATOR BLOCK HEATER CONNECTION.
7. PROVIDE 120V GENERATOR BATTERY HEATER CONNECTION.
8. PROVIDE 120V GENERATOR BATTERY CHARGER CONNECTION.
9. PROVIDE 120V CONNECTION FOR LP GAS SENSOR PANEL. COORDINATE EXACT LOCATION AND REQUIREMENTS WITH PLUMBING CONTRACTOR ON SITE.
10. PROVIDE 120V CONNECTION FOR LP GAS SOLENOID VALVE. COORDINATE EXACT LOCATION AND REQUIREMENTS WITH PLUMBING CONTRACTOR ON SITE.



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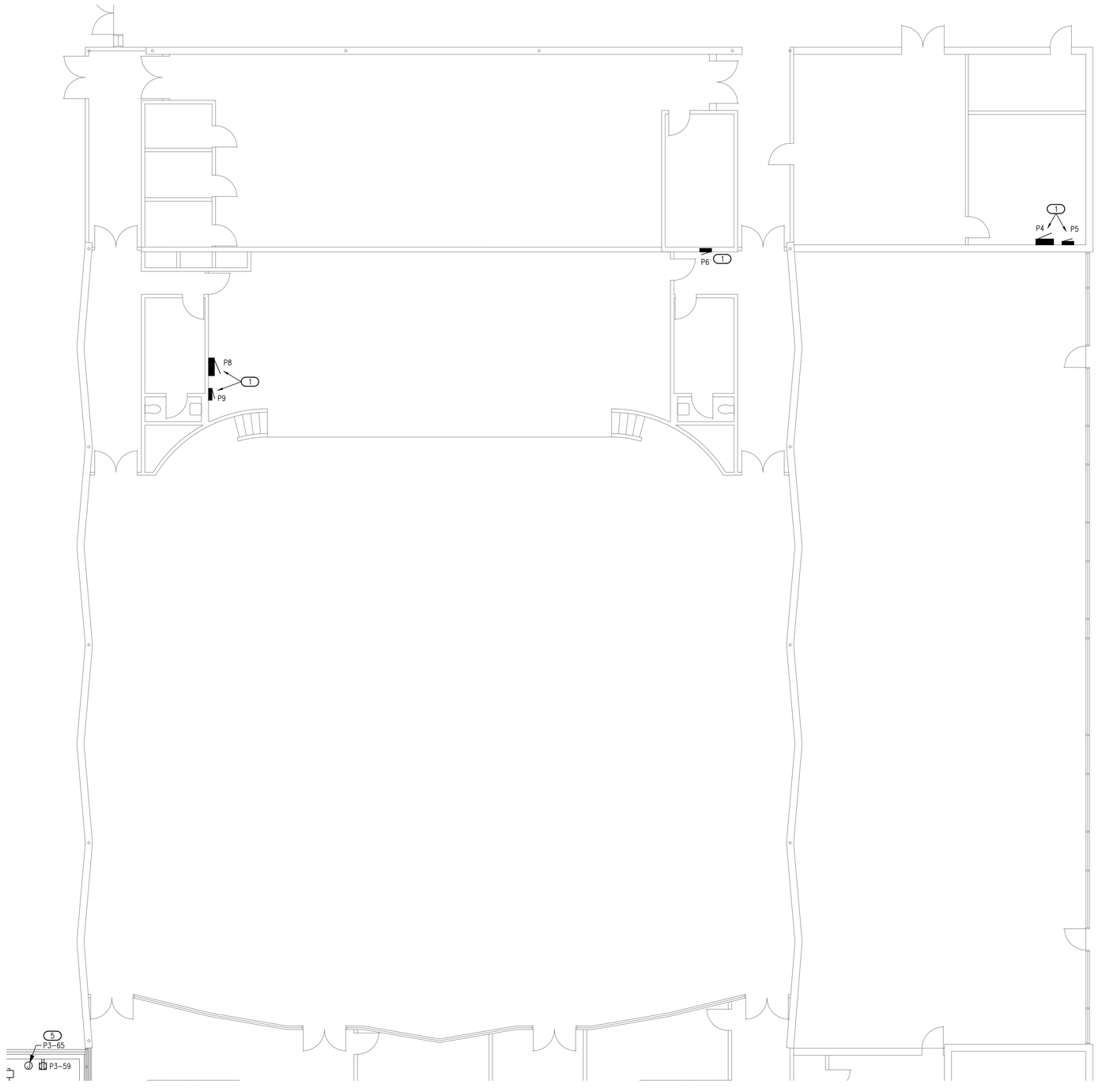
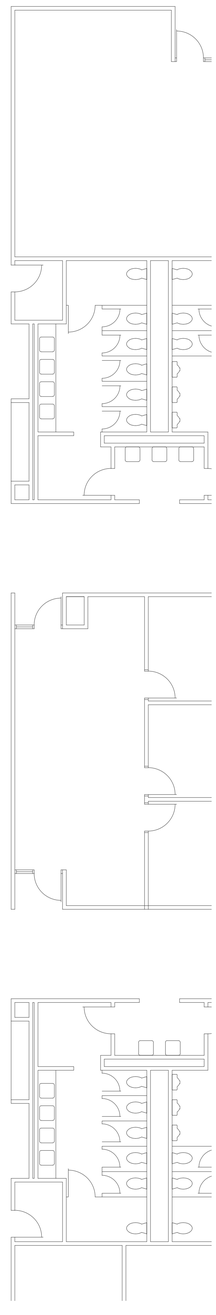




1 ELECTRICAL POWER PLAN - EXISTING AUDITORIUM

SCALE: 1/8" = 1'-0"

NORTH

POWER GENERAL NOTES

1. COORDINATE EXACT LOCATIONS OF DEVICES SHOWN WITH OTHER EQUIPMENT. COORDINATE EXACT LOCATION OF CEILING MOUNTED DEVICES WITH LIGHTS, HVAC EQUIPMENT, AND OTHER DEVICES.
2. COORDINATE WITH MECHANICAL CONTRACTOR AND PROVIDE ALL RELAYS, CONNECTIONS, AND ALL DEVICES NECESSARY TO INTERLOCK EXHAUST FANS, DAMPERS, ETC WITH PROPER CONTROL DEVICES.
3. COORDINATE EXACT LOCATION OF MECHANICAL EQUIPMENT WITH MECHANICAL CONTRACTOR. REFER TO MECHANICAL PLANS AND MANUFACTURER FOR ADDITIONAL INFORMATION.
4. COORDINATE EXACT LOCATION OF PLUMBING EQUIPMENT WITH PLUMBING CONTRACTOR. REFER TO PLUMBING PLANS AND MANUFACTURER FOR ADDITIONAL INFORMATION.
5. ALL RECEPTACLES LOCATED AT COUNTERTOP HEIGHT SHALL BE ORIENTED HORIZONTALLY.
6. FIRE STOP ALL PENETRATIONS IN FIRE AND SMOKE RATED WALLS. REFER TO ARCHITECTURAL PLANS FOR LOCATIONS AND ADDITIONAL INFORMATION
7. ALL EXISTING PANELS AND ASSOCIATED BRANCH CIRCUITING BELIEVED TO BE MISSING GROUNDING ELECTRODE CONDUCTOR AND/OR EQUIPMENT GROUNDING CONDUCTORS. FOR PANELS BEING REPLACED, CONTRACTOR TO INVESTIGATE EXISTING CONDITIONS AND PROVIDE NEW GROUNDING WIRES AS REQUIRED. REFER TO KEYED NOTE #1 FOR ADDITIONAL INFORMATION.

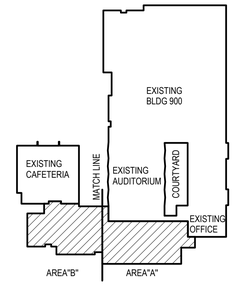
SAFEROOM GENERAL NOTES

PER ICC 500-2014, 309.1:

PENETRATIONS THROUGH THE STORM SHELTER ENVELOPE THAT ARE LARGER THAN:
1. 3.5" SQUARE INCHES IN AREA FOR RECTANGULAR OPENINGS, OR
2. 2 1/16" IN DIAMETER
SHALL BE CONSIDERED AN OPENING AND SHALL BE PROVIDED WITH AN OPENING PROTECTIVE DEVICE (SHROUD). REFERENCE STRUCTURAL DRAWINGS FOR A SAMPLE SHROUD DETAIL. THIS INCLUDES PENETRATIONS FOR BUNDLES OF CONDUIT.

KEYED NOTES

1. EXISTING BRANCH CIRCUITS TO BE RECONNECTED TO NEW PANEL. PROVIDE NEW WIRING AND CONDUIT AS REQUIRED TO EXTEND CIRCUITS AS NEEDED. REFER TO GENERAL NOTES ABOVE, UPDATE GROUND WIRING AS REQUIRED.



KEYPLAN

NO SCALE

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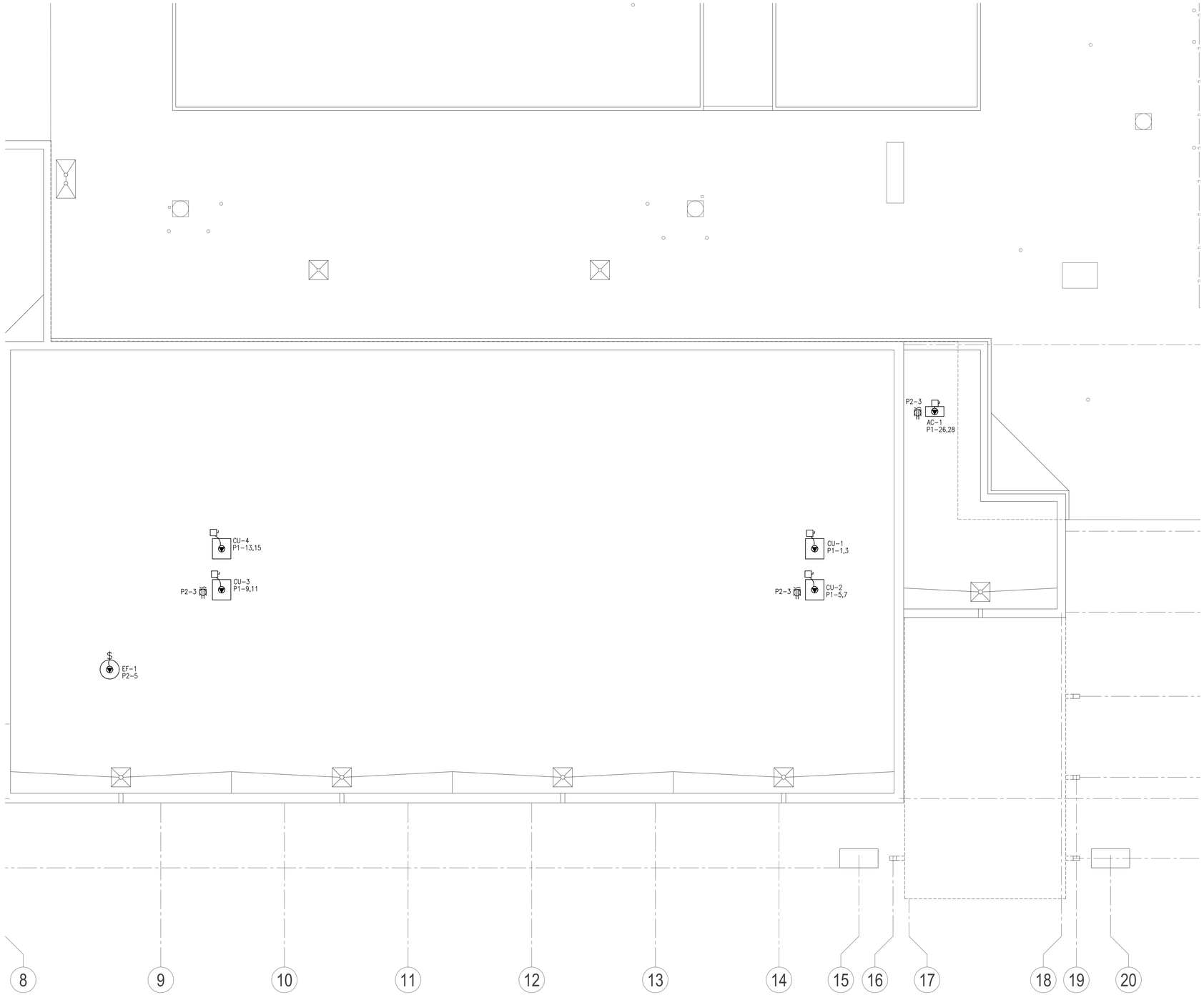


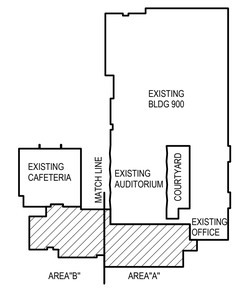
ROOF POWER GENERAL NOTES

1. COORDINATE EXACT LOCATIONS OF DEVICES SHOWN WITH OTHER EQUIPMENT.
2. COORDINATE WITH MECHANICAL CONTRACTOR AND PROVIDE ALL RELAYS, CONNECTIONS, AND ALL DEVICES NECESSARY TO INTERLOCK EXHAUST FANS, DAMPERS, ETC WITH PROPER DEVICES.
3. COORDINATE EXACT LOCATIONS OF MECHANICAL EQUIPMENT WITH MECHANICAL CONTRACTOR.
4. FIRMLY MOUNT WEATHERPROOF 120V CONVENIENCE OUTLET ON UNISTRUT/KINDORF. COORDINATE WITH OTHER TRADES PRIOR TO ROUGH-IN. REDUNDANT RECEPTACLES WHETHER STAND-ALONE OR INTEGRAL TO A UNIT, MAY BE OMITTED SO LONG AS ALL OF THE REQUIREMENTS OF NEC 210.63 ARE SATISFIED.

SAFEROOM GENERAL NOTES

PER ICC 500-2014, 309.1:

PENETRATIONS THROUGH THE STORM SHELTER ENVELOPE THAT ARE LARGER THAN:
1. 3.5" SQUARE INCHES IN AREA FOR RECTANGULAR OPENINGS, OR
2. 2 1/16" IN DIAMETER
SHALL BE CONSIDERED AN OPENING AND SHALL BE PROVIDED WITH AN OPENING PROTECTIVE DEVICE (SHROUD). REFERENCE STRUCTURAL DRAWINGS FOR A SAMPLE SHROUD DETAIL. THIS INCLUDES PENETRATIONS FOR BUNDLES OF CONDUIT.



KEYPLAN
NO SCALE

1 ELECTRICAL ROOF PLAN - AREA A
SCALE: 1/8" = 1'-0"

NORTH

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32650
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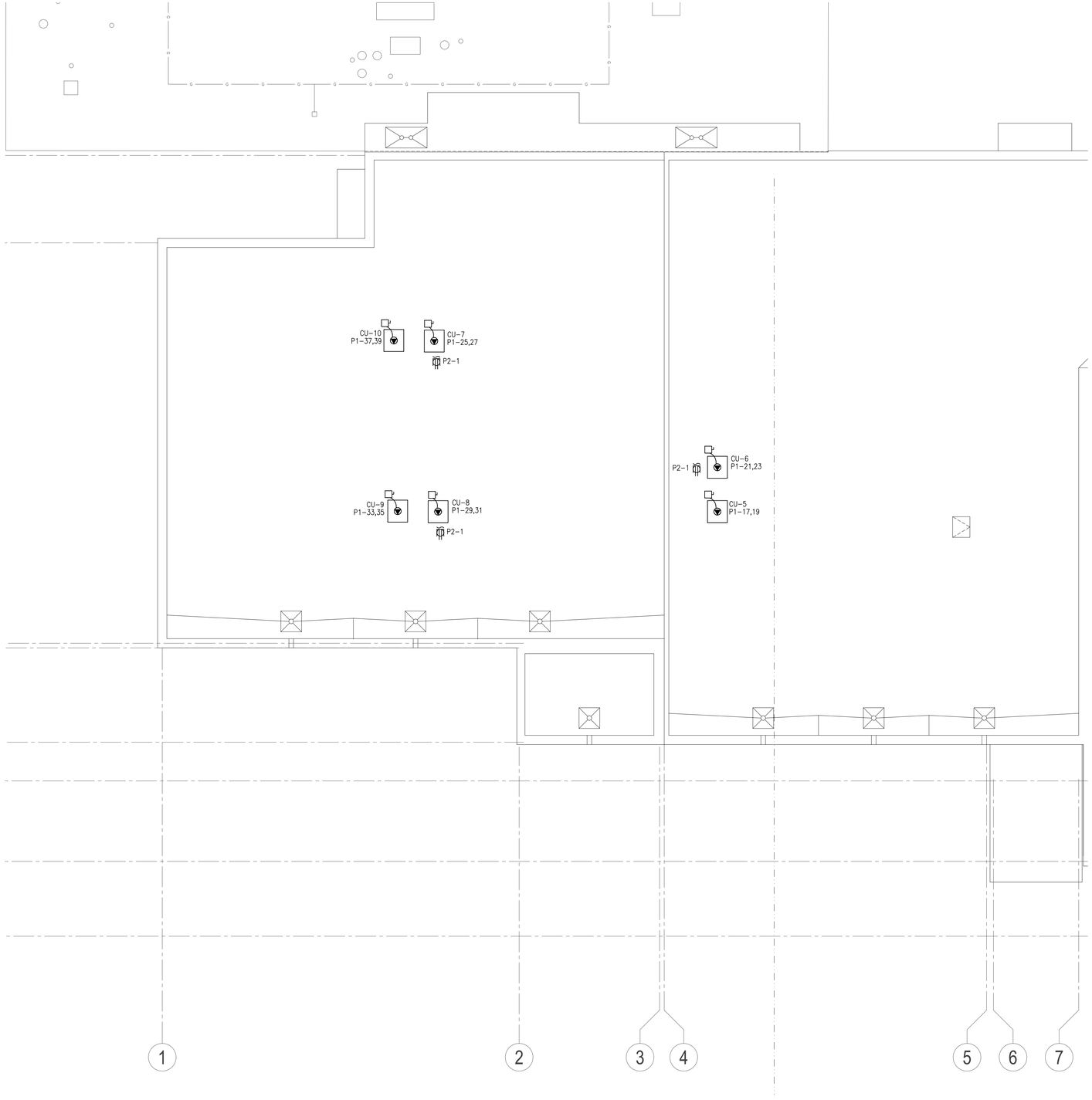

1 ELECTRICAL ROOF PLAN - AREA B

SCALE: 1/8" = 1'-0"

NORTH

ROOF POWER GENERAL NOTES

1. COORDINATE EXACT LOCATIONS OF DEVICES SHOWN WITH OTHER EQUIPMENT.
2. COORDINATE WITH MECHANICAL CONTRACTOR AND PROVIDE ALL RELAYS, CONNECTIONS, AND ALL DEVICES NECESSARY TO INTERLOCK EXHAUST FANS, DAMPERS, ETC WITH PROPER DEVICES.
3. COORDINATE EXACT LOCATIONS OF MECHANICAL EQUIPMENT WITH MECHANICAL CONTRACTOR.
4. FIRMLY MOUNT WEATHERPROOF 120V CONVENIENCE OUTLET ON UNISTRUT/KINDORF. COORDINATE WITH OTHER TRADES PRIOR TO ROUGH-IN. REDUNDANT RECEPTACLES WHETHER STAND-ALONE OR INTEGRAL TO A UNIT, MAY BE OMITTED SO LONG AS ALL OF THE REQUIREMENTS OF NEC 210.63 ARE SATISFIED.

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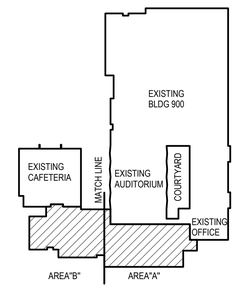

KEYPLAN

NO SCALE

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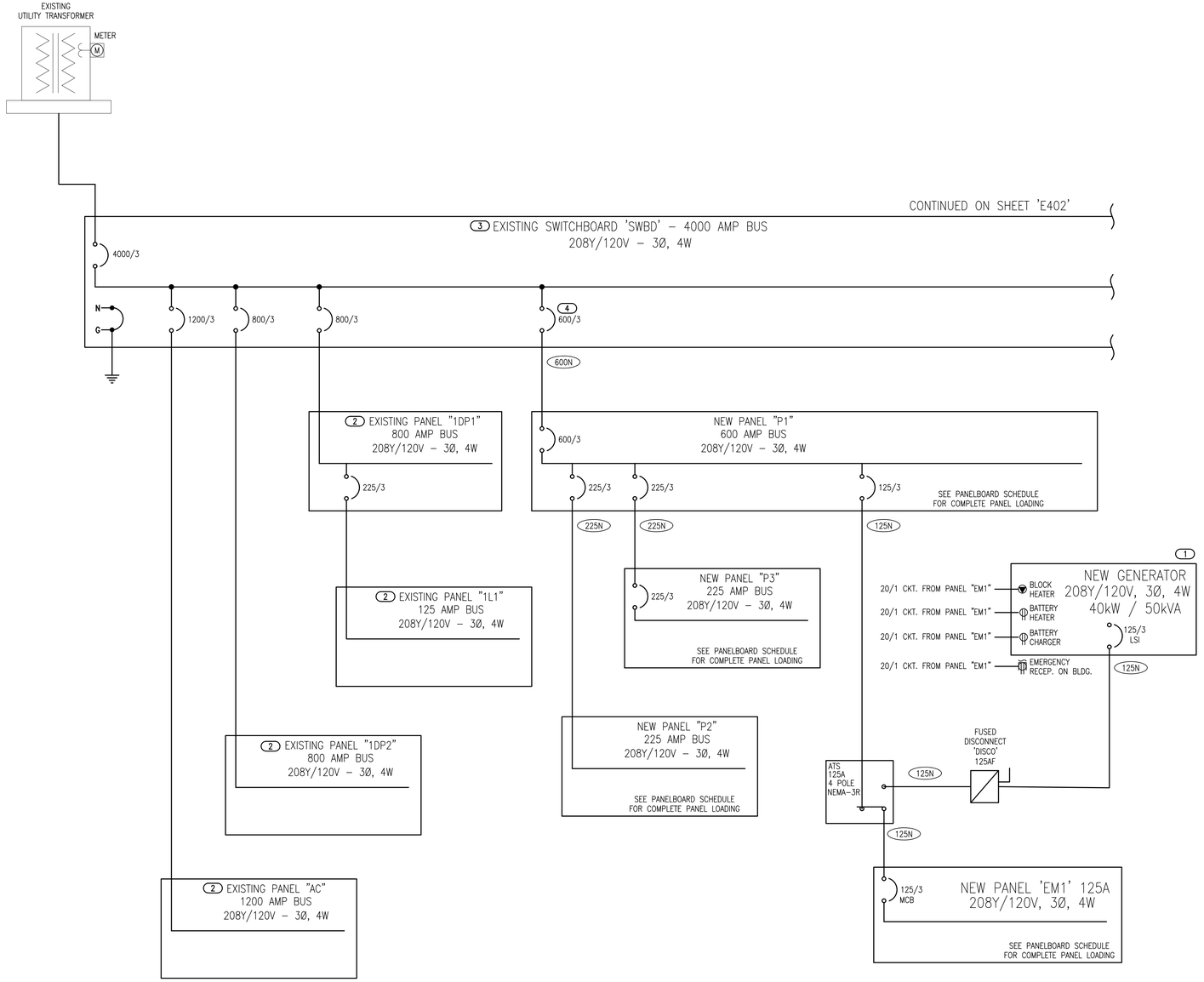

1 ONE-LINE DIAGRAM - PART ONE

NO SCALE

FEEDER SCHEDULE

AMPS	CONDUIT SIZE 4W	CONDUIT SIZE 3W	PHASE CONDUCTORS	EQUIPMENT GROUND CONDUCTOR
20	3/4"	3/4"	#12	#12
25	3/4"	3/4"	#10	#10
30	3/4"	3/4"	#10	#10
35	1"	3/4"	#8	#10
40	1"	3/4"	#8	#10
45	1"	1"	#6	#10
50	1"	1"	#6	#10
60	1 1/4"	1 1/4"	#4	#10
70	1 1/4"	1 1/4"	#4	#8
80	1 1/4"	1 1/4"	#3	#8
90	1 1/2"	1 1/4"	#2	#8
100	1 1/2"	1 1/4"	#2	#8
110	2"	1 1/2"	#1	#6
125	2"	1 1/2"	#1	#6
150	2"	1 1/2"	#1/0	#6
175	2"	2"	#2/0	#6
200	2"	2"	#3/0	#6
225	2 1/2"	2"	#4/0	#4
250	3"	2 1/2"	250 kcmil	#4
300	3"	3"	350 kcmil	#4
350	3 1/2"	3"	500 kcmil	#3
400	(2) 2"	(2) 2"	2 SETS OF #3/0	#3
450	(2) 2 1/2"	(2) 2"	2 SETS OF #4/0	#2
500	(2) 2 1/2"	(2) 2 1/2"	2 SETS OF 250 kcmil	#2
600	(2) 3"	(2) 3"	2 SETS OF 350 kcmil	#1
700	(2) 3 1/2"	(2) 3"	2 SETS OF 500 kcmil	#1/0
800	(3) 3"	(3) 2 1/2"	3 SETS OF 300 kcmil	#1/0
900	(3) 3 1/2"	(3) 3"	3 SETS OF 400 kcmil	#2/0
1000	(3) 3 1/2"	(3) 3"	3 SETS OF 500 kcmil	#2/0
1200	(4) 3"	(4) 3"	4 SETS OF 350 kcmil	#3/0
1600	(5) 3 1/2"	(5) 3"	5 SETS OF 500 kcmil	#4/0
1800	(6) 3 1/2"	(6) 3"	6 SETS OF 400 kcmil	250 kcmil
2000	(6) 3 1/2"	(6) 3"	6 SETS OF 500 kcmil	250 kcmil
2500	(7) 3 1/2"	(7) 3"	7 SETS OF 500 kcmil	350 kcmil

NOTES:

1. FEEDER SIZES ARE ON THE PLAN WHERE 60 REFERS TO A 60A FEEDER WITHOUT NEUTRAL AND 60N REFERS TO A 60A FEEDER WITH NEUTRAL.
2. SOME FEEDER SIZES DO NOT MATCH BREAKER SIZE DUE TO UP-SIZING OF THE FEEDER FOR VOLTAGE DROP.
3. CONDUITS ARE SIZED PER NEC TABLES FOR THHN/THWN AND MAY BE UPSIZED FOR EASE OF PULLING OR DOWNSIZED AS ALLOWED PER NEC FOR CONDUIT TYPE(S) BEING INSTALLED.
4. ALL CONDUCTORS 100A AND LESS ARE SIZED PER 60 DEGREE LUGS, EC MAY SIZE CONDUCTORS FOR ACTUAL RATING OF LUGS PER NEC.

GENERAL NOTES

1. AIC RATINGS ARE ESTIMATED BASED ON AVAILABLE DATA DURING DESIGN. CONTRACTOR TO VERIFY AVAILABLE FAULT CURRENT WITH UTILITY.
2. EXISTING PANELS AND ALL ASSOCIATED CIRCUITING BELIEVED TO BE MISSING GROUNDING ELECTRODE CONDUCTOR AND/OR EQUIPMENT GROUNDING CONDUCTOR. CONTRACTOR TO INVESTIGATE EXISTING CONDITIONS AND PROVIDE NEW GROUNDING WIRES AS REQUIRED.

KEYED NOTES

1. GENERATOR SHALL BE DUAL FUEL – NATURAL GAS AND PROPANE. GENERATOR SHALL HAVE FUEL TYPE AUTOMATIC SWITCHOVER CAPABILITY.
2. EXISTING PANEL TO REMAIN. NO ASSOCIATED WORK.
3. EXISTING SWITCHBOARD 'SIEMENS SB-3, SN# 17-29056-C10'.
4. PROVIDE NEW BREAKER IN EXISTING GEAR AS INDICATED.

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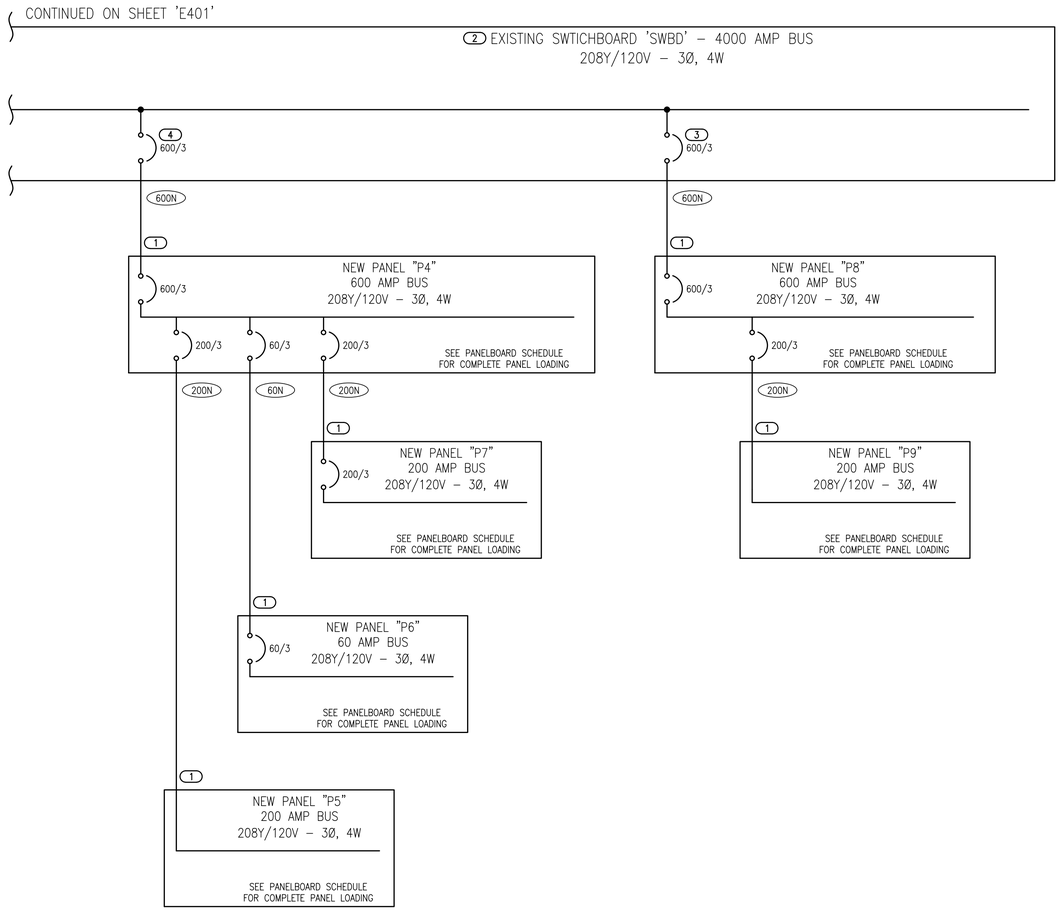

1 ONE-LINE DIAGRAM - PART TWO

NO SCALE

FEEDER SCHEDULE				
AMPS	CONDUIT SIZE 4W	CONDUIT SIZE 3W	PHASE CONDUCTORS	EQUIPMENT GROUND CONDUCTOR
20	3/4"	3/4"	#12	#12
25	3/4"	3/4"	#10	#10
30	3/4"	3/4"	#10	#10
35	1"	3/4"	#8	#10
40	1"	3/4"	#8	#10
45	1"	1"	#6	#10
50	1"	1"	#6	#10
60	1 1/4"	1 1/4"	#4	#10
70	1 1/4"	1 1/4"	#4	#8
80	1 1/4"	1 1/4"	#3	#8
90	1 1/2"	1 1/4"	#2	#8
100	1 1/2"	1 1/4"	#2	#8
110	2"	1 1/2"	#1	#6
125	2"	1 1/2"	#1	#6
150	2"	1 1/2"	#1/0	#6
175	2"	2"	#2/0	#6
200	2"	2"	#3/0	#6
225	2 1/2"	2"	#4/0	#4
250	3"	2 1/2"	250 kcmil	#4
300	3"	3"	350 kcmil	#4
350	3 1/2"	3"	500 kcmil	#3
400	(2) 2"	(2) 2"	2 SETS OF #3/0	#3
450	(2) 2 1/2"	(2) 2"	2 SETS OF #4/0	#2
500	(2) 2 1/2"	(2) 2 1/2"	2 SETS OF 250 kcmil	#2
600	(2) 3"	(2) 3"	2 SETS OF 350 kcmil	#1
700	(2) 3 1/2"	(2) 3"	2 SETS OF 500 kcmil	#1/0
800	(3) 3"	(3) 2 1/2"	3 SETS OF 300 kcmil	#1/0
900	(3) 3 1/2"	(3) 3"	3 SETS OF 400 kcmil	#2/0
1000	(3) 3 1/2"	(3) 3"	3 SETS OF 500 kcmil	#2/0
1200	(4) 3"	(4) 3"	4 SETS OF 350 kcmil	#3/0
1600	(5) 3 1/2"	(5) 3"	5 SETS OF 500 kcmil	#4/0
1800	(6) 3 1/2"	(6) 3"	6 SETS OF 400 kcmil	250 kcmil
2000	(6) 3 1/2"	(6) 3"	6 SETS OF 500 kcmil	250 kcmil
2500	(7) 3 1/2"	(7) 3"	7 SETS OF 500 kcmil	350 kcmil

NOTES:

1. FEEDER SIZES ARE ON THE PLAN WHERE 60 REFERS TO A 60A FEEDER WITHOUT NEUTRAL AND 60N REFERS TO A 60A FEEDER WITH NEUTRAL.
2. SOME FEEDER SIZES DO NOT MATCH BREAKER SIZE DUE TO UP-SIZING OF THE FEEDER FOR VOLTAGE DROP.
3. CONDUITS ARE SIZED PER NEC TABLES FOR THHN/THWN AND MAY BE UPSIZED FOR EASE OF PULLING OR DOWNSIZED AS ALLOWED PER NEC FOR CONDUIT TYPE(S) BEING INSTALLED.
4. ALL CONDUCTORS 100A AND LESS ARE SIZED PER 60 DEGREE LUGS, EC MAY SIZE CONDUCTORS FOR ACTUAL RATING OF LUGS PER NEC.

GENERAL NOTES

1. AIC RATINGS ARE ESTIMATED BASED ON AVAILABLE DATA DURING DESIGN. CONTRACTOR TO VERIFY AVAILABLE FAULT CURRENT WITH UTILITY.
2. EXISTING PANELS AND ALL ASSOCIATED CIRCUITING BELIEVED TO BE MISSING GROUNDING ELECTRODE CONDUCTOR AND/OR EQUIPMENT GROUNDING CONDUCTOR. CONTRACTOR TO INVESTIGATE EXISTING CONDITIONS AND PROVIDE NEW GROUNDING WIRES AS REQUIRED.

KEYED NOTES

(1) PROVIDE NEW WIRING AND CONDUIT TO REPLACE EXISTING PANEL FEED. EXISTING WIRE AND CONDUIT MAY BE REUSED WHERE IN SERVICEABLE CONDITION. REFER TO GENERAL NOTES ABOVE, UPDATE GROUND WIRING AS REQUIRED. ALL MATERIALS SHALL BE WARRANTIED AS IF NEW.

(2) EXISTING SWITCHBOARD 'SIEMENS SB-3, SN# 17-29056-C10'.

(3) EXISTING 600A 3P BREAKER LABELED AS FEEDING PANEL 'S'.

(4) PROVIDE NEW BREAKER IN EXISTING GEAR AS INDICATED.

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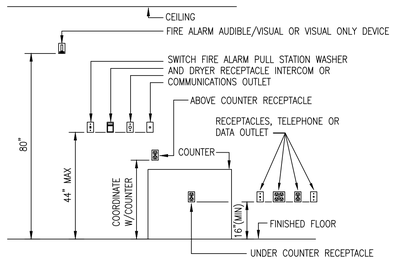
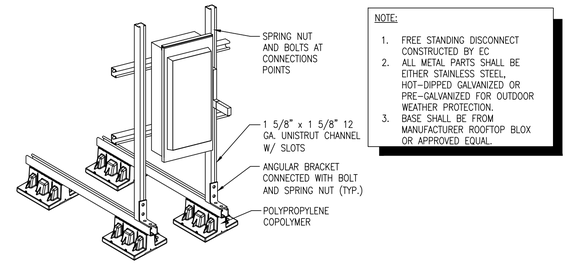


3 TYP OUTLET MOUNTING DETAIL
NO SCALE



2 DISCONNECT ROOF MOUNTING DETAIL
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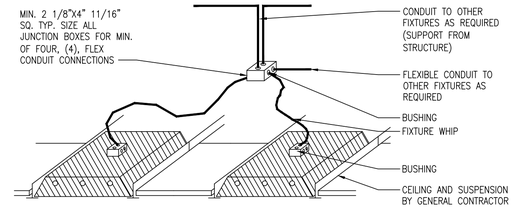
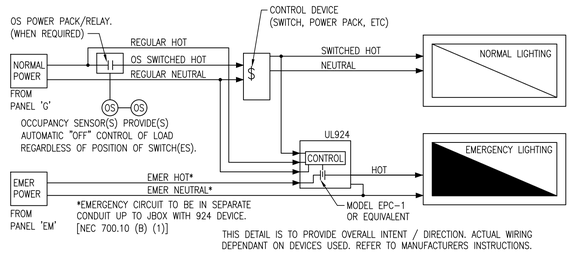
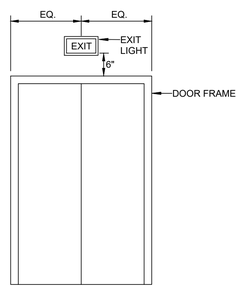


1 TYP.TROFFER POWER DETAIL
NO SCALE



6 EMERGENCY LIGHTING CONTROL
NO SCALE



5 TYP. EXIT SIGN LOCATION DETAIL
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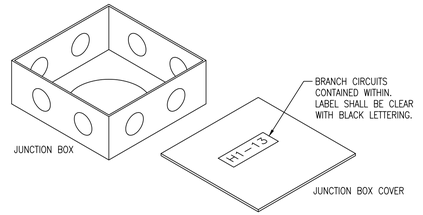
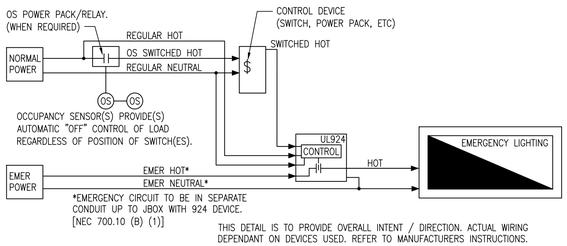
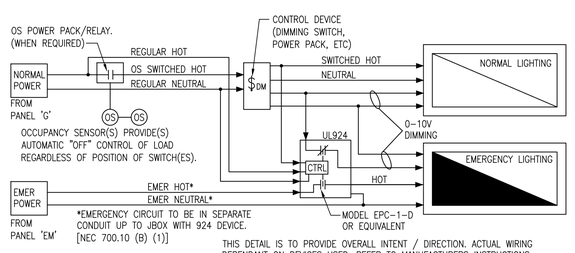


4 JUNCTION BOX LABELING DETAIL
NO SCALE



8 FIXTURES POWERED ONLY FROM EM POWER EMERGENCY LIGHTING CONTROL
NO SCALE



7 EMERGENCY LIGHTING CONTROL (WITH DIMMING)
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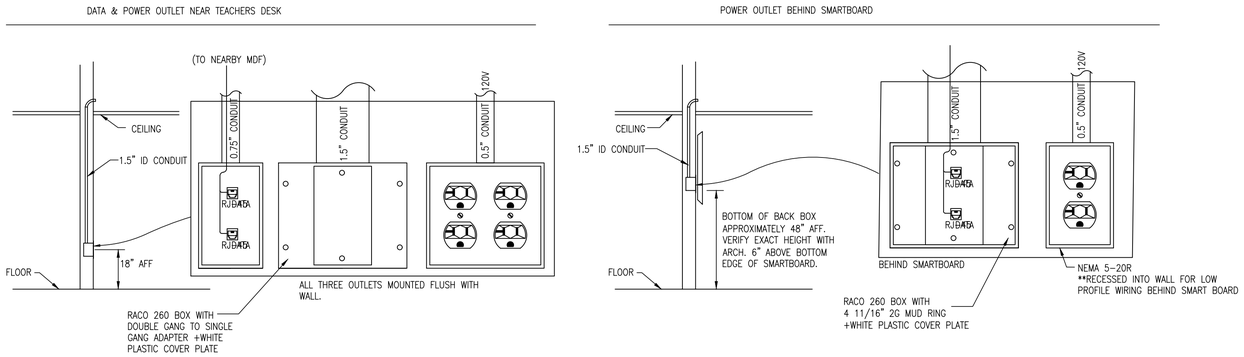
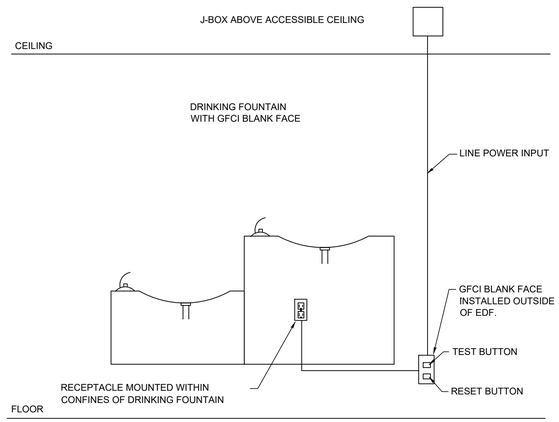
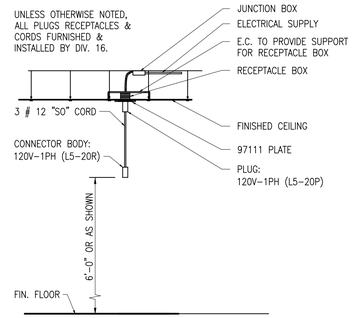


1 TEACHERS DESK & SMART BOARD WIRING DETAIL
NO SCALE



3 TYP. ELECTRICAL DRINKING FOUNTAIN DETAIL
NO SCALE



2 DROP CORD RECEPTACLE
NO SCALE

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CEDAR CREEK
CIVIL

KFC ENGINEERING
STRUCTURAL

SALAS O'BRIEN
MECHANICAL / ELECTRICAL

DWG
drawn by
TVO
checked by
APRIL 2025
date
revisions

MOORE PUBLIC SCHOOLS
BOARD OF EDUCATION
MOORE, OKLAHOMA

MOORE Public Schools
LEARNING FOR LIFE

CLASSROOM ADDITION
CENTRAL JUNIOR HIGH SCHOOL

sheet no:
E502

Salas O'Brien
2900 S. Telephone Road, Suite 120
Moore, OK 73160
Salas O'Brien Registration: CA# 7058
Expiration Date: 6/30/2025
Salas O'Brien Project Number: 2550-00564-00

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Panel P3

ROOM
MOUNTING SURFACE
FED FROM P1
NOTE [DOUBLE TUB]

VOLTS 208Y/120V 3P 4W
BUS AMPS 225
NEUTRAL 100%

AIC 65,000
MAIN BKR 225
LUGS STANDARD

CKT #	CKT BKR	LOAD KVA	CIRCUIT DESCRIPTION		CKT #	CKT BKR	LOAD KVA	CIRCUIT DESCRIPTION
1	20/1	0.36	RM 24 RECEPTACLE	a	2	20/1	1.92	F-5
3	20/1	0.36	RM 24 RECEPTACLE	b	4	20/1	1.66	F-6
5	20/1	0.72	RM 24 RECEPTACLE, SMARTBOARD, TEACHER DESK	c	6	20/1	1.18	F-7
7	20/1	0.54	RM 24 RECEPTACLE	a	8	20/1	1.18	F-8
9	20/1	0.54	RM 24 RECEPTACLE	b	10	20/1	1.18	F-9
11	20/1	0.8	RM 22 FREEZER	c	12	20/1	1.18	F-10
13	20/1	0.8	RM 22 REFRIGERATOR	a	14	20/2	2	EFH-2
15	20/1	0.54	RM 22 RECEPTACLE	b	16	|	|	
17	20/1	0.54	RM 21 RECEPTACLE	c	18	20/1	0.4	LIGHTING
19	20/1	0.72	RM 21 RECEPTACLE, SMARTBOARD, TEACHER DESK	a	20	20/1	1.29	LIGHTING
21	20/1	0.54	RM 21 RECEPTACLE	b	22	20/1	1.41	LIGHTING
23	20/1	0.36	RM 21 RECEPTACLE	c	24	20/1	0.883	LIGHTING
25	20/1	0.36	RM 21 RECEPTACLE	a	26	20/2	2	EFH-2
27	20/1	0.72	RM 27 RECEPTACLE, SMARTBOARD, TEACHER DESK	b	28	|	|	
29	20/1	0.72	RM 27 RECEPTACLE	c	30	20/2	2	EFH-2
31	20/1	0.1	TRAP PRIMER	a	32	|	|	
33	20/1	0.72	RM 31 RECEPTACLE	b	34	20/2	2	EFH-2
35	20/1	0.72	RM 31 RECEPTACLE, SMARTBOARD, TEACHER DESK	c	36	|	|	
37	20/1	0.1	TRAP PRIMER	a	38	20/2	2	EFH-2
39	20/1	0.72	RM 32 RECEPTACLE	b	40	|	|	
41	20/1	0.72	RM 32 RECEPTACLE, SMARTBOARD, TEACHER DESK	c	42	20/1	0	SPACE
43	20/1	0.1	TRAP PRIMER	a	44	20/1	0	SPACE
45	20/1	0.72	RM 26 RECEPTACLE	b	46	20/1	0	SPACE
47	20/1	0.72	RM 26 RECEPTACLE, SMARTBOARD, TEACHER DESK	c	48	20/1	0	SPACE
49	20/1	0.1	TRAP PRIMER	a	50	20/1	0	SPACE
51	20/1	0.1	TRAP PRIMER	b	52	20/1	0	SPACE
53	20/1	0.54	CORRIDOR 30 RECEPTACLE, RM 29 RECEPTACLE	c	54	20/1	0	SPACE
55	20/1	0.54	CORRIDOR 25 RECEPTACLE	a	56	20/1	0	SPACE
57	20/1	0.54	CORRIDOR 19 RECEPTACLE, RM 18 RECEPTACLE, RM 20 RECEPTACLE	b	58	20/1	0	SPACE
59	20/1	0.18	FIRE ALARM CONTROL PANEL	c	60	20/1	0	SPACE
61	20/1	0.54	EXTERIOR RECEPTACLE	a	62	20/1	0	SPACE
63	20/1	0.18	EXTERIOR RECEPTACLE	b	64	20/1	0	SPACE
65	20/1	0.1	TRAP PRIMER	c	66	20/1	0	SPACE
67	20/1	0	SPACE	a	68	20/1	0	SPACE
69	20/1	0	SPACE	b	70	20/1	0	SPACE
71	20/1	0	SPACE	c	72	20/1	0	SPACE
73	20/1	0	SPACE	a	74	20/1	0	SPACE
75	20/1	0	SPACE	b	76	20/1	0	SPACE
77	20/1	0	SPACE	c	78	20/1	0	SPACE
79	20/1	0	SPACE	a	80	20/1	0	SPACE
81	20/1	0	SPACE	b	82	20/1	0	SPACE
83	20/1	0	SPACE	c	84	20/1	0	SPACE

	CONN KVA	CALC KVA			CONN KVA	CALC KVA	
LIGHTING	3.98	4.98	(125%)	MOTORS	8.28	8.28	(100%)
LARGEST MOTOR	1.92	0.48	(25%)	RECEPTACLES	16.1	13	(50%>10)
				HEATING	10	10	(100%)
				TOTAL LOAD		36.8	
				BALANCED 3-PHASE LOAD		102 A	
				PHASE A		99.1%	
				PHASE B		109%	
				PHASE C		91.8%	

Panel P2

ROOM
MOUNTING SURFACE
FED FROM P1
NOTE [DOUBLE TUB]

VOLTS 208Y/120V 3P 4W
BUS AMPS 225
NEUTRAL 100%

AIC 65,000
MAIN BKR MLO
LUGS STANDARD

CKT #	CKT BKR	LOAD KVA	CIRCUIT DESCRIPTION		CKT #	CKT BKR	LOAD KVA	CIRCUIT DESCRIPTION
1	20/1	0.54	ROOFTOP RECEPTACLE	a	2	20/1	1.66	F-1
3	20/1	0.54	ROOFTOP RECEPTACLE	b	4	20/1	1.92	F-2
5	20/1	0.24	EF-1	c	6	20/1	1.92	F-3
7	20/1	0.1	WH-1	a	8	20/1	1.66	F-4
9	20/1	0.1	WH-2	b	10	20/1	0.36	I.T. RECEPTACLE
11	20/1	0.72	RM 7 RECEPTACLE, SMARTBOARD, TEACHER DESK	c	12	20/1	0.36	I.T. RECEPTACLE
13	20/1	0.36	RM 7 RECEPTACLE	a	14	20/1	0.36	I.T. RECEPTACLE
15	20/1	0.36	RM 7 RECEPTACLE	b	16	20/1	0.72	CORRIDOR 8 RECEPTACLE, RM 16 RECEPTACLE
17	20/1	0.54	RM 7 RECEPTACLE	c	18	20/1	1.5	LIGHTING
19	20/1	0.54	RM 7 RECEPTACLE	a	20	20/1	1.84	LIGHTING
21	20/1	0.1	TRAP PRIMER	b	22	20/1	0.21	LIGHTING
23	20/1	0.59	GAS SOLENOID VALVE, RM 11 RECEPTACLE	c	24	20/1	0.02	DOOR HOLD-OPEN SYSTEM
25	20/1	0.8	RM 11 FREEZER	a	26	20/1	0.54	CHASE RECEPTACLE
27	20/1	0.8	RM 11 REFRIGERATOR	b	28	20/1	0.92	PLUMBING CHASE RECEPTACLE, RM 14 RECEPTACLE, TRAP PRIMER
29	20/1	0.54	RM 11 RECEPTACLE	c	30	20/1	0.18	EXTERIOR RECEPTACLE
31	20/1	0.36	RM 12 RECEPTACLE	a	32	20/1	0.54	RECEPTACLE, RM 1 RECEPTACLE, RM 2 RECEPTACLE
33	20/1	0.36	RM 12 RECEPTACLE	b	34	20/1	0.18	RM 15 RECEPTACLE
35	20/1	0.72	RM 12 RECEPTACLE, SMARTBOARD, TEACHER DESK	c	36	20/1	0.24	EF-2
37	20/1	0.54	RM 12 RECEPTACLE	a	38	20/1	0.5	WATER COOLER
39	20/1	0.54	RM 12 RECEPTACLE	b	40	20/1	0.5	WATER COOLER
41	20/1	0.1	TRAP PRIMER	c	42	20/2	2	EFH-1
43	20/1	0.54	RM 13 RECEPTACLE	a	44	|	|	
45	20/1	0.1	TRAP PRIMER	b	46	20/2	2	EFH-2
47	20/1	0.72	RM 13 RECEPTACLE, SMARTBOARD, TEACHER DESK	c	48	|	|	
49	20/1	0.54	RM 13 RECEPTACLE	a	50	20/2	2	EFH-2
51	20/1	0.36	RM 13 RECEPTACLE	b	52	|	|	
53	20/1	0.36	RM 13 RECEPTACLE	c	54	20/1	1.2	3D PRINTER
55	20/1	0.54	RM 10 RECEPTACLE	a	56	20/2	2	EFH-2
57	20/1	0.8	RM 10 FREEZER	b	58	|	|	
59	20/1	0.8	RM 10 REFRIGERATOR	c	60	20/2	2	EFH-2
61	20/1	0.54	RM 10 RECEPTACLE	a	62	|	|	
63	20/1	0.54	RM 9 RECEPTACLE	b	64	20/2	0.798	LIGHTING
65	20/1	0.54	RM 9 RECEPTACLE	c	66	|	|	
67	20/1	0.72	RM 9 RECEPTACLE, SMARTBOARD, TEACHER DESK	a	68	20/2	0.665	LIGHTING
69	20/1	0.36	RM 9 RECEPTACLE	b	70	|	|	
71	20/1	0.36	RM 9 RECEPTACLE	c	72	20/1	0.3	LIGHTING
73	20/1	0.1	TRAP PRIMER	a	74	20/1	0.168	EF-3
75	20/1	0.18	ACP	b	76	20/1	0	SPACE
77	20/1	0	SPACE	c	78	20/1	0	SPACE
79	20/1	0	SPACE	a	80	20/1	0	SPACE
81	20/1	0	SPACE	b	82	20/1	0	SPACE
83	20/1	0	SPACE	c	84	20/1	0	SPACE

	CONN KVA	CALC KVA			CONN KVA	CALC KVA	
LIGHTING	5.31	6.64	(125%)	MOTORS	8	8	(100%)
LARGEST MOTOR	1.92	0.48	(25%)	RECEPTACLES	23.5	16.8	(50%>10)
				HEATING	10	10	(100%)
				TOTAL LOAD		41.9	
				BALANCED 3-PHASE LOAD		116 A	
				PHASE A		114%	
				PHASE B		87.7%	
				PHASE C		98.3%	

Panel P1

ROOM
MOUNTING SURFACE
FED FROM UTILITY
NOTE

VOLTS 208Y/120V 3P 4W
BUS AMPS 600
NEUTRAL 100%

AIC 65,000
MAIN BKR 600
LUGS STANDARD

CKT #	CKT BKR	LOAD KVA	CIRCUIT DESCRIPTION		CKT #	CKT BKR	LOAD KVA	CIRCUIT DESCRIPTION
1	45/2	4.66	CU-1	a	2	225/3	46.8	PANEL P2
3	|	|		b	4	|	|	
5	50/2	5.32	CU-2	c	6	|	|	
7	|	|		a	8	225/3	38.3	PANEL P3
9	50/2	5.32	CU-3	b	10	|	|	
11	|	|		c	12	|	|	
13	45/2	4.66	CU-4	a	14	30/2	4.5	EWH-1
15	|	|		b	16	|	|	
17	50/2	5.32	CU-5	c	18	20/2	2	EFH-1
19	|	|		a	20	|	|	
21	45/2	4.66	CU-6	b	22	20/2	2	EFH-1
23	|	|		c	24	|	|	
25	35/2	3.49	CU-7	a	26	20/2	2.33	AC-1
27	|	|		b	28	|	|	
29	35/2	3.49	CU-8	c	30	20/1	0	SPACE
31	|	|		a	32	20/1	0	SPACE
33	35/2	3.49	CU-9	b	34	20/1	0	SPACE
35	|	|		c	36	20/1	0	SPACE
37	35/2	3.49	CU-10	a	38	20/1	0	SPACE
39	|	|		b	40	20/1	0	SPACE
41	20/1	0	SPACE	c	42	20/1	0	SPACE

	CONN KVA	CALC KVA			CONN KVA	CALC KVA	
LIGHTING	9.29	11.6	(125%)	MOTORS	67	67	(100%)
LARGEST MOTOR	5.32	1.33	(25%)	RECEPTACLES	39.6	24.8	(50%>10)
				HEATING	24	24	(100%)
				TOTAL LOAD		129	
				BALANCED 3-PHASE LOAD		357 A	
				PHASE A		107%	
				PHASE B		101%	
				PHASE C		91.8%	

Panel EM1

ROOM
MOUNTING SURFACE
FED FROM UTILITY
NOTE

VOLTS 208Y/120V 3P 4W
BUS AMPS 125
NEUTRAL 100%

AIC 65,000
MAIN BKR 125
LUGS STANDARD

CKT #	CKT BKR	LOAD KVA	CIRCUIT DESCRIPTION		CKT #	CKT BKR	LOAD KVA	CIRCUIT DESCRIPTION
1	20/1	0.18	RECEPTACLE	a	2	20/1	1.06	SF-1
3	20/1	0.5	BLOCK HEATER	b	4	20/1	0.1	LP GAS SENSOR PANEL
5	20/1	0.5	BATTERY HEATER	c	6	20/1	0.05	LP GAS SOLENOID VALVE
7	20/1	0.5	BATTERY CHARGER	a	8	20/1	0	SPACE
9	20/1	0.266	LIGHTING	b	10	20/1	0	SPACE
11	20/1	1.23	LIGHTING	c	12	20/1	0	SPACE
13	20/1	1.09	LIGHTING	a	14	20/1	0	SPACE
15	20/1	0.713	LIGHTING	b	16	20/1	0	SPACE
17	20/1	0	SPACE	c	18	20/1	0	SPACE
19	20/1	0	SPACE	a	20	20/1	0	SPACE
21	20/1	0	SPACE	b	22	20/1	0	SPACE
23	20/1	0	SPACE	c	24	20/1	0	SPACE
25	20/1	0	SPACE	a	26	20/1	0	SPACE
27	20/1	0	SPACE	b	28	20/1	0	SPACE
29	20/1	0	SPACE	c	30	20/1	0	SPACE
31	20/1	0	SPACE	a	32	20/1	0	SPACE
33	20/1	0	SPACE	b	34	20/1	0	SPACE
35	20/1	0	SPACE	c	36	20/1	0	SPACE
37	20/1	0	SPACE	a	38	20/1	0	SPACE
39	20/1	0	SPACE	b	40	20/1	0	SPACE
41	20/1	0	SPACE	c	42	20/1	0	SPACE

	CONN KVA	CALC KVA			CONN KVA	CALC KVA	
LIGHTING	3.3	4.13	(125%)	MOTORS	1.06	1.06	(100%)
LARGEST MOTOR	1.06	0.264	(25%)	RECEPTACLES	1.83	1.83	(50%>10)
				TOTAL LOAD		7.28	
				BALANCED 3-PHASE LOAD		20.2 A	
				PHASE A		137%	
				PHASE B		76.5%	
				PHASE C		86.4%	

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sheet no:

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P7

Panel P7 | ROOM | VOLTS 208Y/120V 3P 4W | AIC 65,000
MOUNTING RECESSED | BUS AMPS 200 | MAIN BKR 200
FED FROM P4 | NEUTRAL 100% | LUGS STANDARD
NOTE CONFIRM EXISTING LOADS AND UPDATE PANEL DIRECTIORY ACCORDINGLY.

CKT #	CKT BKR	LOAD KVA	CIRCUIT DESCRIPTION		CKT #	CKT BKR	LOAD KVA	CIRCUIT DESCRIPTION
1	20/1	0	EXISTING	a	2	20/1	0	EXISTING
3	20/1	0	EXISTING	b	4	20/1	0	EXISTING
5	20/1	0	EXISTING	c	6	20/1	0	EXISTING
7	20/1	0	EXISTING	a	8	20/1	0	EXISTING
9	20/1	0	EXISTING	b	10	20/1	0	EXISTING
11	20/1	0	EXISTING	c	12	20/1	0	EXISTING
13	20/1	0	EXISTING	a	14	20/1	0	EXISTING
15	20/1	0	EXISTING	b	16	20/1	0	EXISTING
17	20/1	0	EXISTING	c	18	20/1	0	EXISTING
19	20/1	0	EXISTING	a	20	20/1	0	EXISTING
21	20/1	0	EXISTING	b	22	20/1	0	EXISTING
23	20/1	0	EXISTING	c	24	20/1	0	EXISTING
25	20/1	0	EXISTING	a	26	20/1	0	EXISTING
27	20/1	0	EXISTING	b	28	20/1	0	EXISTING
29	20/1	0	EXISTING	c	30	20/1	0	EXISTING
31	20/1	0	EXISTING	a	32	20/1	0	EXISTING
33	20/1	0	EXISTING	b	34	20/1	0	EXISTING
35	20/1	0	EXISTING	c	36	20/1	0	EXISTING
37	20/1	0	EXISTING	a	38	20/1	0	EXISTING
39	20/1	0	EXISTING	b	40	20/1	0	EXISTING
41	20/1	0	EXISTING	c	42	20/1	0	EXISTING
43	20/1	0	EXISTING	a	44	20/1	0	EXISTING
45	20/1	0	EXISTING	b	46	20/1	0	EXISTING
47	20/1	0	EXISTING	c	48	20/1	0	EXISTING
49	20/1	0	EXISTING	a	50	20/1	0	EXISTING
51	20/1	0	SPACE	b	52	20/1	0	SPACE
53	20/1	0	SPACE	c	54	20/1	0	SPACE
55	20/1	0	SPACE	a	56	20/1	0	SPACE
57	20/1	0	SPACE	b	58	20/1	0	SPACE
59	20/1	0	SPACE	c	60	20/1	0	SPACE

CONN KVA | CALC KVA

	CALC KVA
TOTAL LOAD	0
BALANCED 3-PHASE LOAD	0 A
PHASE A	0.00%
PHASE B	0.00%
PHASE C	0.00%

P4

Panel P4 | ROOM | VOLTS 208Y/120V 3P 4W | AIC 65,000
MOUNTING SURFACE | BUS AMPS 600 | MAIN BKR 600
FED FROM UTILITY | NEUTRAL 100% | LUGS STANDARD
NOTE CONFIRM EXISTING LOADS AND UPDATE PANEL DIRECTIORY ACCORDINGLY.

CKT #	CKT BKR	LOAD KVA	CIRCUIT DESCRIPTION		CKT #	CKT BKR	LOAD KVA	CIRCUIT DESCRIPTION
1	200/3	0	PANEL P5	a	2	60/3	0	PANEL P6
3	|			b	4	|		
5	|			c	6	|		
7	200/3	0	PANEL P7	a	8	30/3	0	EXISTING
9	|			b	10	|		
11	|			c	12	|		
13	30/3	0	EXISTING	a	14	60/3	0	EXISTING
15	|			b	16	|		
17	|			c	18	|		
19	60/3	0	EXISTING	a	20	20/1	0	SPACE
21	|			b	22	20/1	0	SPACE
23	|			c	24	20/1	0	SPACE
25	60/3	0	EXISTING	a	26	20/1	0	SPACE
27	|			b	28	20/1	0	SPACE
29	|			c	30	20/1	0	SPACE
31	20/1	0	SPACE	a	32	20/1	0	SPACE
33	20/1	0	SPACE	b	34	20/1	0	SPACE
35	20/1	0	SPACE	c	36	20/1	0	SPACE
37	20/1	0	SPACE	a	38	20/1	0	SPACE
39	20/1	0	SPACE	b	40	20/1	0	SPACE
41	20/1	0	SPACE	c	42	20/1	0	SPACE

CONN KVA | CALC KVA

	CALC KVA
TOTAL LOAD	0
BALANCED 3-PHASE LOAD	0 A
PHASE A	0.00%
PHASE B	0.00%
PHASE C	0.00%

P6

Panel P6 | ROOM | VOLTS 208Y/120V 3P 4W | AIC 65,000
MOUNTING RECESSED | BUS AMPS 60 | MAIN BKR 60
FED FROM P4 | NEUTRAL 100% | LUGS STANDARD
NOTE CONFIRM EXISTING LOADS AND UPDATE PANEL DIRECTIORY ACCORDINGLY.

CKT #	CKT BKR	LOAD KVA	CIRCUIT DESCRIPTION		CKT #	CKT BKR	LOAD KVA	CIRCUIT DESCRIPTION
1	20/1	0	EXISTING	a	2	20/1	0	EXISTING
3	20/1	0	EXISTING	b	4	20/1	0	EXISTING
5	20/1	0	EXISTING	c	6	20/1	0	EXISTING
7	20/1	0	EXISTING	a	8	20/1	0	EXISTING
9	20/1	0	EXISTING	b	10	20/1	0	EXISTING
11	20/1	0	EXISTING	c	12	20/1	0	EXISTING
13	20/1	0	EXISTING	a	14	20/1	0	EXISTING
15	20/1	0	EXISTING	b	16	20/1	0	EXISTING
17	20/1	0	EXISTING	c	18	20/1	0	EXISTING
19	20/1	0	EXISTING	a	20	20/1	0	SPACE
21	20/1	0	SPACE	b	22	20/1	0	SPACE
23	20/1	0	SPACE	c	24	20/1	0	SPACE

CONN KVA | CALC KVA

	CALC KVA
TOTAL LOAD	0
BALANCED 3-PHASE LOAD	0 A
PHASE A	0.00%
PHASE B	0.00%
PHASE C	0.00%

P9

Panel P9 | ROOM | VOLTS 208Y/120V 3P 4W | AIC 65,000
MOUNTING RECESSED | BUS AMPS 200 | MAIN BKR MLO
FED FROM P8 | NEUTRAL 100% | LUGS STANDARD
NOTE CONFIRM EXISTING LOADS AND UPDATE PANEL DIRECTIORY ACCORDINGLY.

CKT #	CKT BKR	LOAD KVA	CIRCUIT DESCRIPTION		CKT #	CKT BKR	LOAD KVA	CIRCUIT DESCRIPTION
1	20/1	0	EXISTING	a	2	20/1	0	EXISTING
3	20/1	0	EXISTING	b	4	20/1	0	EXISTING
5	20/1	0	EXISTING	c	6	20/1	0	EXISTING
7	20/1	0	EXISTING	a	8	20/1	0	EXISTING
9	20/1	0	EXISTING	b	10	20/1	0	EXISTING
11	20/1	0	EXISTING	c	12	20/1	0	EXISTING
13	20/1	0	EXISTING	a	14	20/1	0	EXISTING
15	20/1	0	EXISTING	b	16	20/1	0	EXISTING
17	20/1	0	EXISTING	c	18	20/1	0	EXISTING
19	20/1	0	EXISTING	a	20	20/1	0	EXISTING
21	20/1	0	EXISTING	b	22	20/1	0	EXISTING
23	40/3	0	EXISTING	c	24	40/3	0	EXISTING
25	|			a	26	|		
27	|			b	28	|		
29	40/3	0	EXISTING	c	30	20/1	0	SPACE
31	|			a	32	20/1	0	SPACE
33	|			b	34	20/1	0	SPACE
35	20/1	0	SPACE	c	36	20/1	0	SPACE
37	20/1	0	SPACE	a	38	20/1	0	SPACE
39	20/1	0	SPACE	b	40	20/1	0	SPACE
41	20/1	0	SPACE	c	42	20/1	0	SPACE

CONN KVA | CALC KVA

	CALC KVA
TOTAL LOAD	0
BALANCED 3-PHASE LOAD	0 A
PHASE A	0.00%
PHASE B	0.00%
PHASE C	0.00%

P5

Panel P5 | ROOM | VOLTS 208Y/120V 3P 4W | AIC 65,000
MOUNTING SURFACE | BUS AMPS 200 | MAIN BKR MLO
FED FROM P4 | NEUTRAL 100% | LUGS STANDARD
NOTE CONFIRM EXISTING LOADS AND UPDATE PANEL DIRECTIORY ACCORDINGLY.

CKT #	CKT BKR	LOAD KVA	CIRCUIT DESCRIPTION		CKT #	CKT BKR	LOAD KVA	CIRCUIT DESCRIPTION
1	20/1	0	EXISTING	a	2	20/1	0	EXISTING
3	20/1	0	EXISTING	b	4	20/1	0	EXISTING
5	20/1	0	EXISTING	c	6	20/1	0	EXISTING
7	20/1	0	EXISTING	a	8	20/1	0	EXISTING
9	20/1	0	EXISTING	b	10	20/1	0	EXISTING
11	20/1	0	EXISTING	c	12	20/1	0	EXISTING
13	20/1	0	EXISTING	a	14	20/1	0	EXISTING
15	20/1	0	EXISTING	b	16	20/1	0	EXISTING
17	20/1	0	EXISTING	c	18	20/1	0	EXISTING
19	20/1	0	EXISTING	a	20	20/1	0	EXISTING
21	20/1	0	EXISTING	b	22	20/1	0	EXISTING
23	20/1	0	EXISTING	c	24	20/1	0	EXISTING
25	20/1	0	EXISTING	a	26	20/1	0	EXISTING
27	20/1	0	EXISTING	b	28	20/1	0	EXISTING
29	20/1	0	EXISTING	c	30	20/1	0	EXISTING
31	20/1	0	EXISTING	a	32	20/1	0	EXISTING
33	20/1	0	EXISTING	b	34	20/1	0	EXISTING
35	20/1	0	EXISTING	c	36	20/1	0	EXISTING
37	20/1	0	SPACE	a	38	20/1	0	SPACE
39	20/1	0	SPACE	b	40	20/1	0	SPACE
41	20/1	0	SPACE	c	42	20/1	0	SPACE

CONN KVA | CALC KVA

	CALC KVA
TOTAL LOAD	0
BALANCED 3-PHASE LOAD	0 A
PHASE A	0.00%
PHASE B	0.00%
PHASE C	0.00%

P8

Panel P8 | ROOM | VOLTS 208Y/120V 3P 4W | AIC 65,000
MOUNTING SURFACE | BUS AMPS 600 | MAIN BKR 600
FED FROM UTILITY | NEUTRAL 100% | LUGS STANDARD
NOTE CONFIRM EXISTING LOADS AND UPDATE PANEL DIRECTIORY ACCORDINGLY.

CKT #	CKT BKR	LOAD KVA	CIRCUIT DESCRIPTION		CKT #	CKT BKR	LOAD KVA	CIRCUIT DESCRIPTION
1	200/3	0	PANEL P9	a	2	250/3	0	EXISTING
3	|			b	4	|		
5	|			c	6	|		
7	250/3	0	EXISTING	a	8	20/1	0	EXISTING
9	|			b	10	20/1	0	EXISTING
11	|			c	12	20/1	0	EXISTING
13	175/3	0	EXISTING	a	14	20/1	0	EXISTING
15	|			b	16	20/1	0	EXISTING
17	|			c	18	20/1	0	EXISTING
19	20/1	0	EXISTING	a	20	20/1	0	EXISTING
21	20/1	0	EXISTING	b	22	20/1	0	EXISTING
23	20/1	0	EXISTING	c	24	20/1	0	EXISTING
25	20/1	0	EXISTING	a	26	20/1	0	EXISTING
27	20/1	0	EXISTING	b	28	20/1	0	EXISTING
29	20/1	0	EXISTING	c	30	20/1	0	EXISTING
31	20/1	0	EXISTING	a	32	20/1	0	EXISTING
33	20/1	0	EXISTING	b	34	20/1	0	EXISTING
35	20/1	0	EXISTING	c	36	20/1	0	EXISTING
37	20/1	0	EXISTING	a	38	20/1	0	EXISTING
39	20/1	0	EXISTING	b	40	20/1	0	EXISTING
41	20/1	0	EXISTING	c	42	20/1	0	EXISTING
43	20/1	0	SPACE	a	44	20/1	0	SPACE
45	20/1	0	SPACE	b	46	20/1	0	SPACE
47	20/1	0	SPACE	c	48	20/1	0	SPACE
49	20/1	0	SPACE	a	50	20/1	0	SPACE
51	20/1	0	SPACE	b	52	20/1	0	SPACE
53	20/1	0	SPACE	c	54	20/1	0	SPACE
55	20/1	0	SPACE	a	56	20/1	0	SPACE
57	20/1	0	SPACE	b	58	20/1	0	SPACE
59	20/1	0	SPACE	c	60	20/1	0	SPACE

CONN KVA | CALC KVA

	CALC KVA
TOTAL LOAD	0
BALANCED 3-PHASE LOAD	0 A
PHASE A	0.00%
PHASE B	0.00%
PHASE C	0.00%

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MECHANICAL EQUIPMENT SCHEDULE

CALLOUT	DESCRIPTION	VOLTS	HP	KVA	MCA	MOCP	CIRCUIT	WIRE CALLOUT	DISCONNECT	DISC PROV BY	DISC INST BY
AC-1	MINI SPLIT	208V 2P 2W		2.33	14	20	P1-26,28	3/4"C,2#10,#10G	NON-FUSED	EC	EC
CU-1	CONDENSING UNIT	208V 2P 2W		4.66	28	45	P1-1,3	3/4"C,2#10,#10G	NON-FUSED	EC	EC
CU-2	CONDENSING UNIT	208V 2P 2W		5.32	32	50	P1-5,7	3/4"C,2#8,#10G	NON-FUSED	EC	EC
CU-3	CONDENSING UNIT	208V 2P 2W		5.32	32	50	P1-9,11	3/4"C,2#8,#10G	NON-FUSED	EC	EC
CU-4	CONDENSING UNIT	208V 2P 2W		4.66	28	45	P1-13,15	3/4"C,2#10,#10G	NON-FUSED	EC	EC
CU-5	CONDENSING UNIT	208V 2P 2W		5.32	32	50	P1-17,19	3/4"C,2#8,#10G	NON-FUSED	EC	EC
CU-6	CONDENSING UNIT	208V 2P 2W		4.66	28	45	P1-21,23	3/4"C,2#10,#10G	NON-FUSED	EC	EC
CU-7	CONDENSING UNIT	208V 2P 2W		3.49	21	35	P1-25,27	3/4"C,2#10,#10G	NON-FUSED	EC	EC
CU-8	CONDENSING UNIT	208V 2P 2W		3.49	21	35	P1-29,31	3/4"C,2#10,#10G	NON-FUSED	EC	EC
CU-9	CONDENSING UNIT	208V 2P 2W		3.49	21	35	P1-33,35	3/4"C,2#10,#10G	NON-FUSED	EC	EC
CU-10	CONDENSING UNIT	208V 2P 2W		3.49	21	35	P1-37,39	3/4"C,2#10,#10G	NON-FUSED	EC	EC
EF-1	EXHAUST FAN	120V 1P 2W		0.24			P2-5	3/4"C,1#10,#10N,#10G	TOGGLE SWITCH	EC	EC
EF-2	EXHAUST FAN	120V 1P 2W		0.24			P2-36	3/4"C,1#12,#12N,#12G	TOGGLE SWITCH	EC	EC
EF-3	EXHAUST FAN	120V 1P 2W		0.17			P2-74	3/4"C,1#12,#12N,#12G	TOGGLE SWITCH	EC	EC
EFH-1	ELECTRIC FAN FORCED HEATER	208V 2P 2W		2			P2-42,44	3/4"C,2#10,#10G	NON-FUSED	EC	EC
EFH-1	ELECTRIC FAN FORCED HEATER	208V 2P 2W		2			P1-18,20	3/4"C,2#12,#12G	NON-FUSED	EC	EC
EFH-1	ELECTRIC FAN FORCED HEATER	208V 2P 2W		2			P1-22,24	3/4"C,2#10,#10G	NON-FUSED	EC	EC
EFH-2	ELECTRIC FAN FORCED HEATER	208V 2P 2W		2			P3-14,16	3/4"C,2#12,#12G	NON-FUSED	EC	EC
EFH-2	ELECTRIC FAN FORCED HEATER	208V 2P 2W		2			P2-46,48	3/4"C,2#12,#12G	NON-FUSED	EC	EC
EFH-2	ELECTRIC FAN FORCED HEATER	208V 2P 2W		2			P2-50,52	3/4"C,2#12,#12G	NON-FUSED	EC	EC
EFH-2	ELECTRIC FAN FORCED HEATER	208V 2P 2W		2			P3-26,28	3/4"C,2#10,#10G	NON-FUSED	EC	EC
EFH-2	ELECTRIC FAN FORCED HEATER	208V 2P 2W		2			P2-56,58	3/4"C,2#12,#12G	NON-FUSED	EC	EC
EFH-2	ELECTRIC FAN FORCED HEATER	208V 2P 2W		2			P2-60,62	3/4"C,2#10,#10G	NON-FUSED	EC	EC
EFH-2	ELECTRIC FAN FORCED HEATER	208V 2P 2W		2			P3-34,36	3/4"C,2#12,#12G	NON-FUSED	EC	EC
EFH-2	ELECTRIC FAN FORCED HEATER	208V 2P 2W		2			P3-38,40	3/4"C,2#10,#10G	NON-FUSED	EC	EC
EFH-2	ELECTRIC FAN FORCED HEATER	208V 2P 2W		2			P3-30,32	3/4"C,2#10,#10G	NON-FUSED	EC	EC
EWH-1	ELECTRIC WATER HEATER	208V 2P 2W		4.5			P1-14,16	3/4"C,2#10,#10G	NON-FUSED	EC	EC
F-1	GAS FURNACE	120V 1P 2W	3/4 HP	1.66			P2-2	3/4"C,1#10,#10N,#10G	TOGGLE SWITCH	EC	EC
F-2	GAS FURNACE	120V 1P 2W	1 HP	1.92			P2-4	3/4"C,1#10,#10N,#10G	TOGGLE SWITCH	EC	EC
F-3	GAS FURNACE	120V 1P 2W	1 HP	1.92			P2-6	3/4"C,1#12,#12N,#12G	TOGGLE SWITCH	EC	EC
F-4	GAS FURNACE	120V 1P 2W	3/4 HP	1.66			P2-8	3/4"C,1#12,#12N,#12G	TOGGLE SWITCH	EC	EC
F-5	GAS FURNACE	120V 1P 2W	1 HP	1.92			P3-2	3/4"C,1#12,#12N,#12G	TOGGLE SWITCH	EC	EC
F-6	GAS FURNACE	120V 1P 2W	3/4 HP	1.66			P3-4	3/4"C,1#12,#12N,#12G	TOGGLE SWITCH	EC	EC
F-7	GAS FURNACE	120V 1P 2W	1/2 HP	1.18			P3-6	3/4"C,1#10,#10N,#10G	TOGGLE SWITCH	EC	EC
F-8	GAS FURNACE	120V 1P 2W	1/2 HP	1.18			P3-8	3/4"C,1#10,#10N,#10G	TOGGLE SWITCH	EC	EC
F-9	GAS FURNACE	120V 1P 2W	1/2 HP	1.18			P3-10	3/4"C,1#10,#10N,#10G	TOGGLE SWITCH	EC	EC
F-10	GAS FURNACE	120V 1P 2W	1/2 HP	1.18			P3-12	3/4"C,1#10,#10N,#10G	TOGGLE SWITCH	EC	EC
SF-1	SUPPLY FAN	120V 1P 2W		1.06			EM1-2	3/4"C,1#12,#12N,#12G	TOGGLE SWITCH	EC	EC
WH-1	WATER HEATER	120V 1P 2W		0.1			P2-7	3/4"C,1#12,#12N,#12G	DUPLEX RECEPTACLE	EC	EC
WH-2	WATER HEATER	120V 1P 2W		0.1			P2-9	3/4"C,1#12,#12N,#12G	DUPLEX RECEPTACLE	EC	EC

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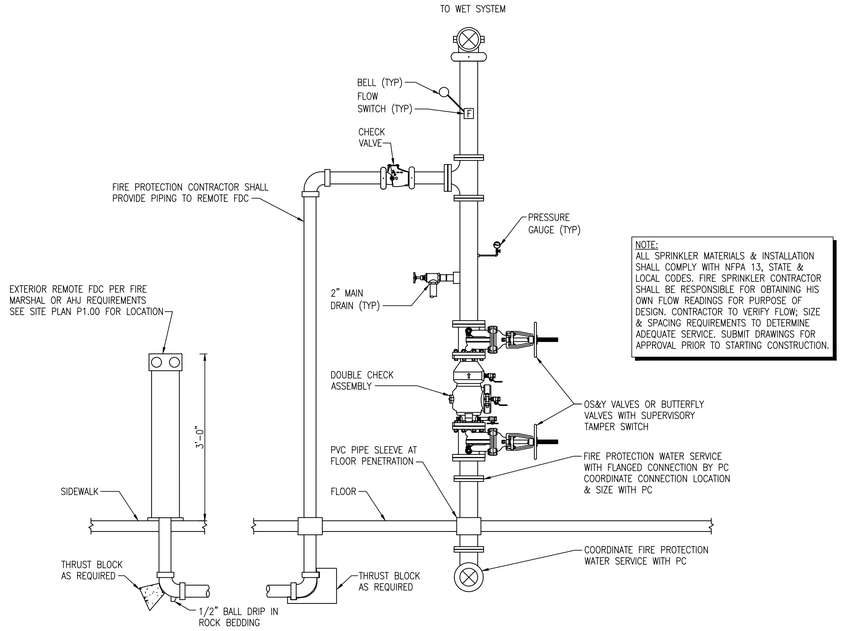

NOTE:
ALL SPRINKLER MATERIALS & INSTALLATION SHALL COMPLY WITH NFPA 13, STATE & LOCAL CODES. FIRE SPRINKLER CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING HIS OWN FLOW READINGS FOR PURPOSE OF DESIGN. CONTRACTOR TO VERIFY FLOW; SIZE & SPACING REQUIREMENTS TO DETERMINE ADEQUATE SERVICE. SUBMIT DRAWINGS FOR APPROVAL PRIOR TO STARTING CONSTRUCTION.

1 FIRE SPRINKLER RISER DETAIL
NOT TO SCALE

FIRE PROTECTION ABBREVIATIONS

AG	ABOVE GRADE	FT	FOOT (FEET)
ADD	ADDENDUM	GAL	GALLON
ADDL	ADDITIONAL	GC	GENERAL CONTRACTOR
ADJ	ADJUSTABLE	GPM	GALLONS PER MINUTE
AFF	ABOVE FINISH FLOOR	MC	MECHANICAL CONTRACTOR
AFG	ABOVE FINISH GRADE	MECH	MECHANICAL
ALT	ALTERNATE	MIN	MINIMUM
BG	BELOW GRADE	NTS	NOT TO SCALE
CI	CAST IRON	PC	PLUMBING CONTRACTOR
COL	COLUMN	PLBG	PLUMBING
CW	COLD WATER	QTY	QUANTITY
DN	DOWN	SCH	SCHEDULE
EC	ELECTRICAL CONTRACTOR	SPEC	SPECIFICATIONS
FD	FLOOR DRAIN	SS	STAINLESS STEEL
FDC	FIRE DEPARTMENT CONNECTION	TEMP	TEMPERATURE
FLR	FLOOR	TYP	TYPICAL
FP	FIRE PROTECTION	W/	WITH

FIRE PROTECTION SYMBOL LEGEND

	SHUTOFF VALVE
	CHECK VALVE
	DOUBLE CHECK VALVE
	END CAP
	FIRE DEPARTMENT CONNECTION(FDC)
	BELL

FIRE PROTECTION PIPING LINETYPES

LINETYPE	DESCRIPTION
————	NEW – ABOVE GRADE
– – – – – – – – – –	NEW – BELOW GRADE

FIRE PROTECTION GENERAL NOTES

1. CONTRACTOR SHALL PROVIDE DESIGN FOR SPRINKLER SYSTEMS FOR NEW SAFEROOM ADDITION AND CLASSROOM ADDITION.
2. COORDINATE INSTALLATION OF SPRINKLER PIPING AND ALL COMPONENTS WITH OTHER TRADES, OWNER, AND GENERAL CONTRACTOR.
3. FIRE PROTECTION SYSTEM TO COMPLY WITH NFPA 13, INSURANCE CARRIER AND ALL APPLICABLE STATE AND LOCAL CODES.
4. CUTTING OF STRUCTURAL AND/OR ARCHITECTURAL MEMBERS TO BE DONE ONLY WITH THE WRITTEN APPROVAL OF THE ARCHITECT AND STRUCTURAL ENGINEER.
5. PROVIDE MINIMUM 10 PSI SAFETY FACTOR.
6. WORKING DRAWINGS INDICATING SPRINKLER HEAD LOCATIONS AND EXPOSED AND CONCEALED PIPING ROUTING SHALL BE PROVIDED TO THE ARCHITECT/ENGINEER PRIOR TO INSTALLATION FOR APPROVAL.
7. FIRE PROTECTION CONTRACTOR IS RESPONSIBLE FOR ORGANIZING A COORDINATION MEETING WITH OTHER TRADES AND OWNER PRIOR TO INSTALLATION.
8. SYSTEM PIPING LOCATION: WET SYSTEM PIPING SHALL BE INSTALLED AT HIGHEST ELEVATION POSSIBLE. PIPING SHALL BE INSTALLED ABOVE ALL MECHANICAL EQUIPMENT, DUCTWORK, AND ALL PLUMBING SYSTEM PIPING. PROVIDE ADEQUATE CLEARANCE TO MECHANICAL UNITS. FIRE PROTECTION CONTRACTOR SHALL COORDINATE FIRE PROTECTION PIPING PRIOR TO INSTALLATION.
9. PROPERLY TORQUE MECHANICAL TEES TO MANUFACTURER'S RECOMMENDATIONS.
10. FIRE PROTECTION PLANS ARE FOR REFERENCE ONLY. OCCUPANCIES AND AREAS OF PROTECTION NOTED ON THE PLANS SHALL BE CONFIRMED WITH NFPA 13 AND AUTHORITIES HAVING JURISDICTION. THIS CONTRACTOR SHALL COMPLY WITH ANY CODE REQUIREMENTS AS REQUIRED.
11. REFER TO ARCHITECTURAL FIRE CODE PLAN FOR ADDITIONAL INFORMATION.
12. FIRESEAL ALL PENETRATIONS THRU RATED STRUCTURES TO MAINTAIN FIRE RATING.
13. SEMI-RECESSED PENDANT SPRINKLER HEADS SHALL HAVE WHITE FINISH.
14. UPRIGHT SPRINKLER HEADS SHALL BE BRASS. PROVIDE PROTECTIVE GUARD FOR HEAD.

FIRE PROTECTION SHEET INDEX

F000	FIRE PROTECTION TITLE SHEET
F101	FIRE PROTECTION PLAN – AREA A
F102	FIRE PROTECTION PLAN – AREA B

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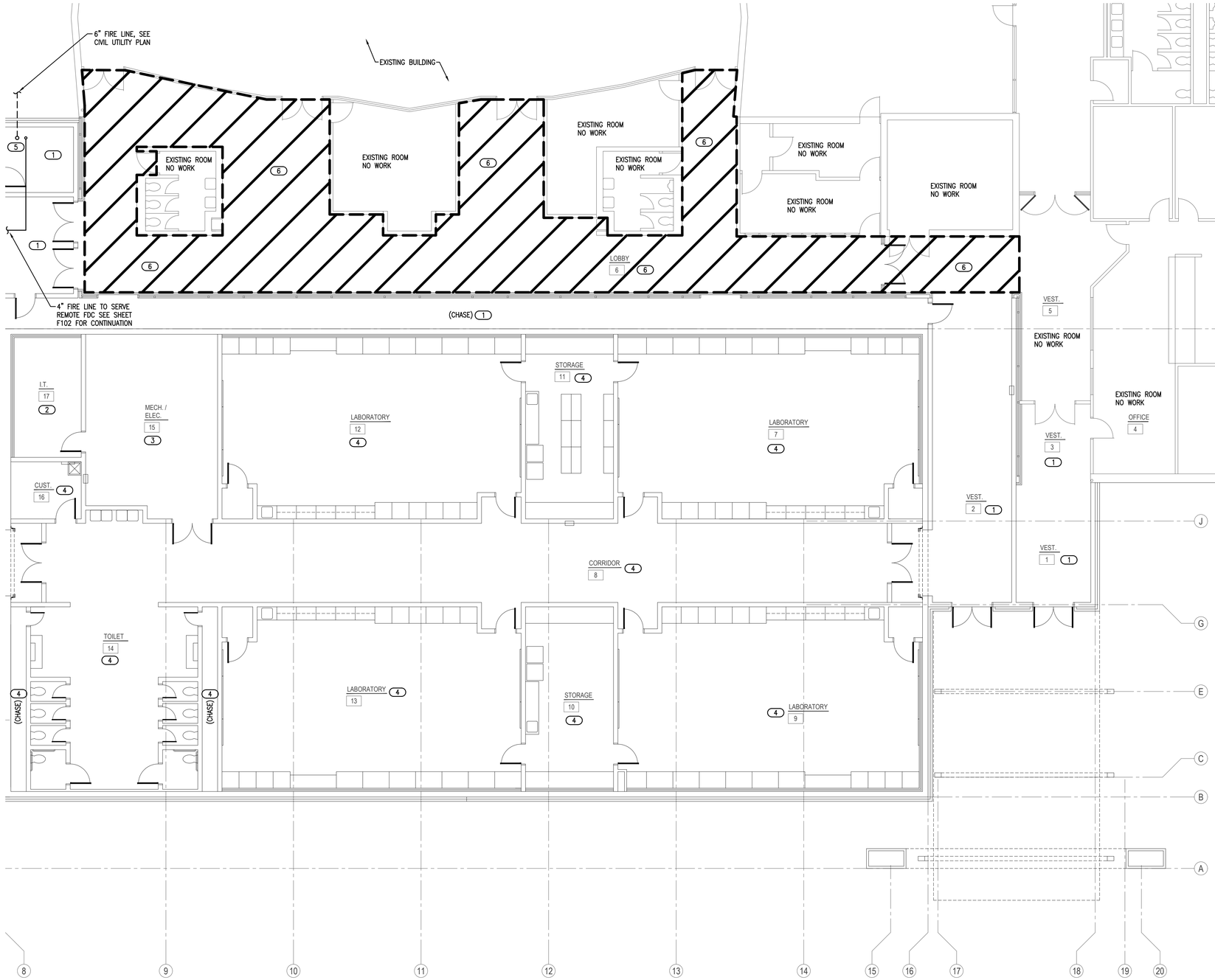


1 FIRE PROTECTION PLAN - AREA A

SCALE: 1/8" = 1'-0"

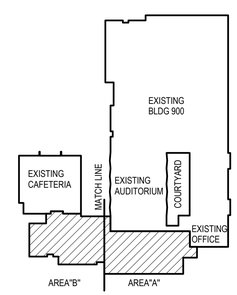
NORTH

GENERAL NOTES

1. COORDINATE WORK WITH ALL OTHER TRADES ON SITE.
2. REFER TO GENERAL NOTES ON SHEET F000.
3. FIELD VERIFY EXISTING CONDITIONS PRIOR TO COMMENCING WORK.
4. SEMI-RECESSED PENDANT SPRINKLER HEADS IN LAY-IN AND HARD CEILINGS SHALL HAVE WHITE FINISH. EXPOSED UPRIGHT HEADS SHALL BE BRASS WITH WIRE GUARDS.
5. FIRE SEAL ALL PENETRATIONS THRU RATED STRUCTURES TO MAINTAIN FIRE RATING.
6. COORDINATE FIRE DEPARTMENT CONNECTION LOCATIONS WITH LOCAL FIRE DEPARTMENT OR AHJ.
7. COORDINATE INSPECTORS TEST DRAIN LOCATION WITH ALL TRADES ON SITE.
8. CONTRACTOR SHALL COORDINATE ALL STORM SHELTER WALL AND ROOF PENETRATIONS WITH STRUCTURAL. REFER TO STRUCTURAL DETAIL SHEET FOR PENETRATION PROTECTION FOR RECTANGULAR OPENINGS GREATER THAN 3.5 SQUARE INCHES AND CIRCULAR OPENINGS GREATER THAN 2.125 INCHES PER 2014 ICC-500.

KEYED NOTES

1. LIGHT HAZARD – NEW ADDITION AREA. REFER TO ARCHITECTURAL PLANS FOR CEILING TYPE.
2. LIGHT HAZARD – IT ROOM – PROVIDE INTERMEDIATE TEMPERATURE TYPE HEADS. COORDINATE HEAD LOCATION WITH IT DEPARTMENT. IN SAFEROOM AREA.
3. ORDINARY HAZARD GROUP 1 – REFER TO ARCHITECTURAL PLANS FOR CEILING TYPE. IN SAFEROOM AREA.
4. LIGHT HAZARD AREA – REFER TO ARCHITECTURAL PLANS FOR CEILING TYPE. IN SAFEROOM AREA.
5. 6" FIRE SPRINKLER RISER. SEE DETAIL 1/F000. SEE PLUMBING PLAN P101 FOR CONTINUATION OF FIRE LINE INTO BUILDING.
6. LIGHT HAZARD – HATCHED AREAS – NEW CEILING LAYOUT IN EXISTING SPACE. MODIFY EXISTING SPRINKLER HEADS AS REQUIRED FOR NEW LAYOUT. COORDINATE HEAD PLACEMENT WITH ELECTRICAL, TECHNOLOGY AND MECHANICAL. REFER TO ARCHITECTURAL PLANS FOR CEILING TYPE.



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HIGH SCHOOL

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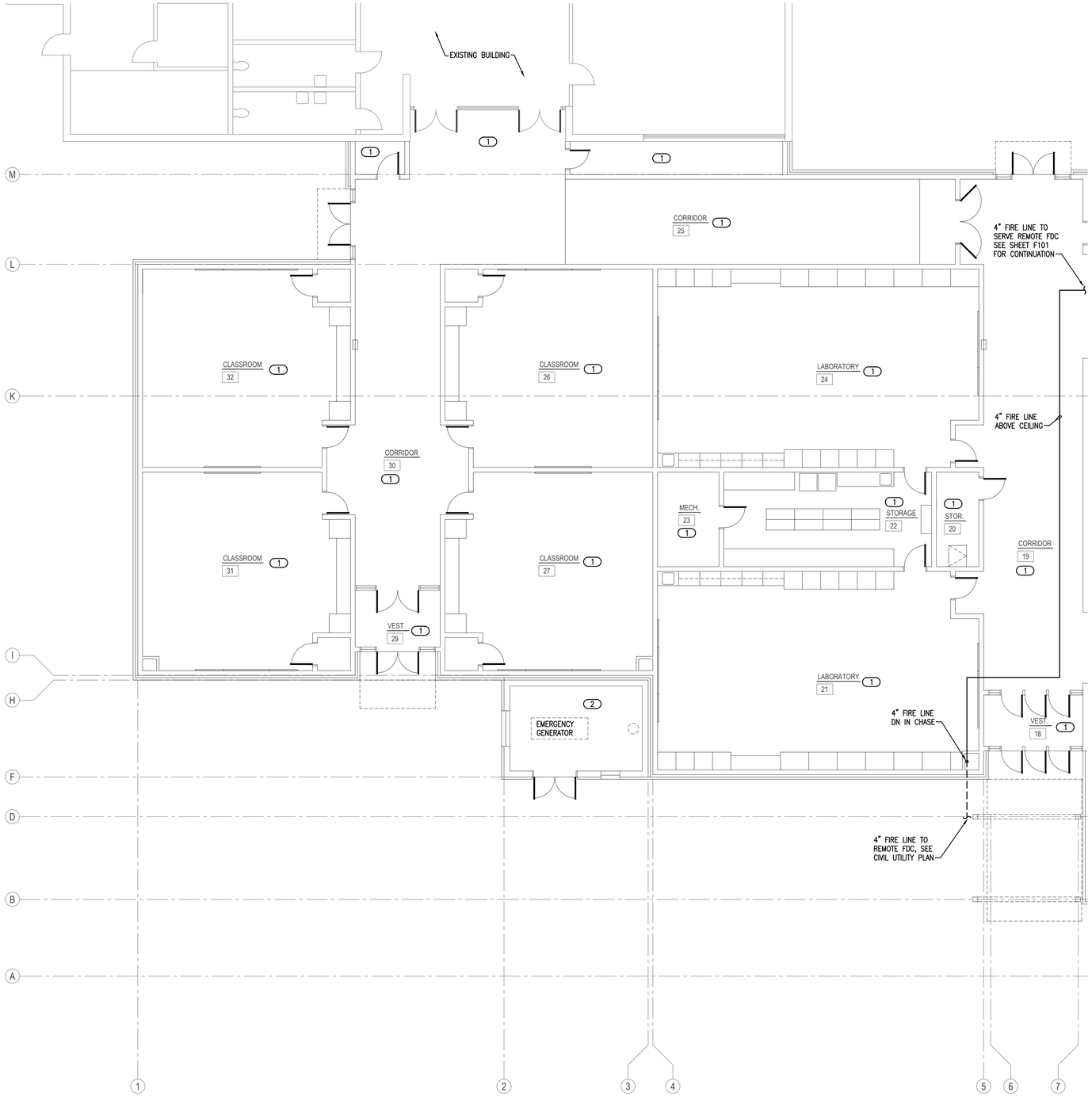


1 FIRE PROTECTION PLAN - AREA B

SCALE: 1/8" = 1'-0"

NORTH

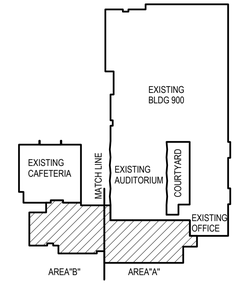
GENERAL NOTES

1. COORDINATE WORK WITH ALL OTHER TRADES ON SITE.
2. REFER TO GENERAL NOTES ON SHEET F000.
3. FIELD VERIFY EXISTING CONDITIONS PRIOR TO COMMENCING WORK.
4. SEMI-RECESSED PENDANT SPRINKLER HEADS IN LAY-IN AND HARD CEILINGS SHALL HAVE WHITE FINISH. EXPOSED UPRIGHT HEADS SHALL BE BRASS WITH WIRE GUARDS.
5. FIRE SEAL ALL PENETRATIONS THRU RATED STRUCTURES TO MAINTAIN FIRE RATING.
6. COORDINATE FIRE DEPARTMENT CONNECTION LOCATIONS WITH LOCAL FIRE DEPARTMENT OR AHJ.
7. COORDINATE INSPECTORS TEST DRAIN LOCATION WITH ALL TRADES ON SITE.

KEYED NOTES

(1) LIGHT HAZARD – NEW ADDITION AREA. REFER TO ARCHITECTURAL PLANS FOR CEILING TYPE.

(2) HAZARD – NEW EMERGENCY GENERATOR ENCLOSURE WITH UNIT HEATER. PROVIDE EXPOSED HIGH TEMPERATURE SPRINKLER HEADS WITH WIRE GUARD.



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GENERAL MECHANICAL NOTES

1. ALL WORK SHALL BE IN COMPLIANCE WITH STATE AND LOCAL CODES.
2. THE CONTRACTOR SHALL PAY FOR ALL FEES, PERMITS, LICENSES, ETC., NECESSARY FOR PROPER COMPLETION OF THE WORK.
3. INSTALL ALL EQUIPMENT IN ACCORDANCE WITH MANUFACTURERS RECOMMENDATIONS.
4. VERIFY ALL EXISTING CONDITIONS. NOTIFY ENGINEER OF ANY CONFLICTS BETWEEN CONTRACT DRAWINGS AND ACTUAL CONDITIONS.
5. EXISTING UTILITIES TO BE ABANDONED SHALL BE PROPERLY DISCONNECTED AND CAPPED AS REQUIRED BY CODE OR LOCAL ORDINANCE.
6. THESE DRAWINGS ARE DIAGRAMMATIC AND SHALL NOT BE SCALED. ADDITIONAL DATA SHALL BE FROM THE ENGINEER THROUGH WRITTEN CLARIFICATION ONLY. VERIFY ALL EXISTING CONDITIONS, ELEVATIONS, AND DIMENSIONS BEFORE PROCEEDING WITH ANY PORTION OF ANY WORK. THE CONTRACTOR SHALL PROVIDE ALL OFFSETS AND TRANSITIONS REQUIRED TO MEET EXISTING CONDITIONS.
7. THE CONTRACTOR SHALL PERFORM WORK IN A SKILLED AND PROFESSIONAL MANNER.
8. ALL CONTRACTORS ARE RESPONSIBLE TO FIELD COORDINATE WORK SCHEDULE WITH OWNER REPRESENTATIVE.
9. THE CONTRACTOR SHALL WORK AND COORDINATE WITH THE OTHER TRADES.
10. ALL EQUIPMENT SHALL BE NEW AND IN UNDAMAGED CONDITION. ANY EQUIPMENT FOUND DEFECTIVE SHALL BE IMMEDIATELY REMOVED FROM THE PROJECT.
11. PROVIDE 3 COPIES OF AN OPERATION AND MAINTENANCE MANUAL FOR ALL MAJOR EQUIPMENT REQUIRING SERVICE. MAJOR EQUIPMENT INCLUDES BUT IS NOT LIMITED TO COILS, FANS, AND CONTROL WIRING DIAGRAMS. EACH PIECE OF EQUIPMENT SHALL STATE THE CONTRACT DATE AND THE NAME, ADDRESS AND PHONE NUMBER FOR THE PRIME CONTRACTOR, SUBCONTRACTOR PERFORMING THE INSTALLATION, AND THE LOCAL VENDOR FOR SPARE PARTS. THE MANUALS SHALL CONTAIN MAINTENANCE INSTRUCTIONS REQUIRED FOR THE INSTALLED EQUIPMENT. MANUALS SHALL BE BOUND IN A THREE RING HARD COVER BINDER. O & M MANUALS SHALL BE SUBMITTED TO THE OWNER PRIOR TO FINAL WALK THROUGH OF THE PROJECT.
12. PROVIDE 8 HOURS OF OWNER TRAINING FOR THE INSTALLED EQUIPMENT. TRAINING SHALL BE HELD ONLY AFTER ALL OF THE EQUIPMENT IS INSTALLED AND PROPER OPERATION IS VERIFIED.
13. CONTRACTOR SHALL SUBMIT A CERTIFIED REPORT INDICATING SYSTEM PERFORMANCE INCLUDING, BUT NOT LIMITED TO, VOLTAGE AND AMPERAGE MEASUREMENTS OF ALL EQUIPMENT GREATER THAN 1/3 H.P. AIR BALANCE MEASUREMENTS OF OUTSIDE AIR DELIVERY, AIR HANDLING UNIT SUPPLY, SUPPLY DIFFUSERS, EXHAUST AND RETURN GRILLES. AIR BALANCE SHALL BE WITHIN 10% OF DESIGN CONDITIONS. THE REPORT CERTIFICATION SHALL BE AS FOLLOWS:

    I (name) of (company) CERTIFY THAT ALL MEASUREMENTS, FIGURES AND STATEMENTS INDICATED IN THIS REPORT WERE TAKEN BY ME OR UNDER MY SUPERVISION AND ARE ACCURATE AS OF (date). DESIGN FLOWS WERE BASED UPON PLANS DATED (xx/xx/xx).

14. DUCT MATERIAL SHALL BE GALVANIZED OR ALUMINUM CONSTRUCTION IN ACCORDANCE WITH SMACNA DUCT CONSTRUCTION STANDARD 2005 FOR THE PRESSURE AND SEAL CLASS LISTED IN DUCTWORK/INSULATION SCHEDULE.
15. DUCT SIZES LISTED ON PLANS ARE THE REQUIRED CLEAR INTERIOR DIMENSIONS.
16. SUPPLY AND RETURN BRANCH DUCTS MAY BE INSULATED FLEX DUCT IF THE RUN IS LESS THAN 5 FEET IN LENGTH. ANY LENGTHS OVER 5 FEET SHALL BE RIGID DUCTWORK, DUCT SHALL BE THE SAME SIZE AS THE LISTED DIFFUSER THROAT UNLESS NOTED OTHERWISE.
17. PROVIDE VOLUME CONTROL DAMPERS WHERE INDICATED AND AT ALL TAKEOFFS, BOTH SUPPLY AND RETURN SYSTEMS, AND MAJOR DUCT RUNS. DAMPERS SHALL BE FACTORY-FABRICATED WITH ZINC-PLATED, DIE-CAST CONTROL HARDWARE. CONTROL HARDWARE SHALL INCLUDE HEAVY GAUGE DIAL AND HANDLE WITH ELEVATED PLATFORM FOR INSULATED DUCT MOUNTING.
18. PROVIDE TURNING VANES IN ALL RECTANGULAR ELBOWS CONFORMING TO SMACNA DUCT CONSTRUCTION STANDARD 2005 FIG. 4-2 TYPE RE-3 WITH STANDARD RADIUS. WHERE SPACE PERMITS, PROVIDE RADIUSED ELBOWS IN ACCORDANCE WITH FIGURES 4-2, TYPE RE-1.
19. ALL RECTANGULAR MAIN TO RECTANGULAR BRANCH CONNECTIONS, BOTH CONVERGING AND DIVERGING CONFIGURATIONS, SHALL HAVE A 45 DEG. ENTRY TAP CONSTRUCTED IN ACCORDANCE WITH SMACNA DUCT CONSTRUCTION STANDARD 2005 FIG. 4-6.
20. DIFFUSER PATTERN 4-WAY UNLESS OTHERWISE INDICATED. PROVIDE FIBERGLASS DUCT INSULATION WITH VAPOR BARRIER AS SCHEDULED UNLESS NOTED OTHERWISE.
21. MECHANICAL CONTRACTOR TO REPAIR ANY DAMAGE DONE TO THE FIRE PROOFING WHILE INSTALLING THE MECHANICAL TRADES. SEAL ALL PENETRATIONS THROUGH RATED STRUCTURES WITH UL LISTED FIRE SEAL DESIGNED FOR THE SPECIFIED APPLICATION.
22. THE CONTRACTOR SHALL TAKE ALL PRECAUTIONARY MEASURES TO PROTECT THE PUBLIC AND ADJACENT PROPERTIES FROM DAMAGE THROUGHOUT CONSTRUCTION.
23. THE CONTRACTOR SHALL GUARANTEE ALL WORKMANSHIP AND MATERIALS FOR A PERIOD OF ONE (1) YEAR FROM THE DATE OF SUBSTANTIAL COMPLETION OR AS OTHERWISE REQUIRED IN THE SPECIFICATIONS.
24. MECHANICAL CONTRACTOR TO INCLUDE THE TEST AND BALANCE, AND ANY PERMIT FEES IN THEIR BID.
25. MECHANICAL CONTRACTOR SHALL VERIFY ALL ROOFTOP EQUIPMENT WEIGHTS, SIZES, LOCATIONS AND OPENINGS REQUIRED AND SHALL COORDINATE ANY CHANGES WITH THE ARCHITECT.
26. UPON PROJECT COMPLETION, RECORD (AS-BUILT) DRAWINGS SHALL BE PROVIDED BY THE CONTRACTOR TO THE BUILDING OWNER. ALL CHANGES MADE TO EQUIPMENT, DUCTWORK, AND GENERAL DESIGN SHALL BE NOTED ON THE DRAWINGS. PROVIDE IN PDF FORMAT OR PRINTED SET AT THE OWNER'S REQUEST.

ABBREVIATIONS

A	AMP
ADD	ADDENDUM
ADJ	ADJUSTABLE
AFF	ABOVE FINISH FLOOR
AHU	AIR HANDLER UNIT
AI	ANALOG INPUT
ALT	ALTERNATE
AO	ANALOG OUTPUT
APPRX	APPROXIMATE
ARCH	ARCHITECT, ARCHITECTURAL
BDD	BACK DRAFT DAMPER
BLDG	BUILDING
BTUH	BRITISH THERMAL UNIT PER HOUR
C	CENTER
CD	CEILING DIFFUSER
CFM	CUBIC FEET PER MINUTE
CO	CLEAN OUT
COND	CONDENSATE
CONT	CONTINUOUS
COP	COEFFICIENT OF PERFORMANCE
DB	DRY BULB
DET	DETAIL
DG	DOOR GRILLE
DI	DIGITAL INPUT
DIA OR ø	DIAMETER
DIM	DIMENSION
DN	DOWN
DO	DIGITAL OUTPUT
DWG	DRAWING
EA	EXHAUST AIR
EAT	ENTERING AIR TEMPERATURE
EC	ELECTRICAL CONTRACTOR
EER	ENERGY EFFICIENCY RATIO
EF	EXHAUST FAN
EG	EXHAUST GRILLE
ELEC	ELECTRICAL
ERV	ENERGY RECOVERY VENTILATOR
ESP	EXTERNAL STATIC PRESSURE
EWT	ENTERING WATER TEMPERATURE
EXIST	EXISTING
FA	FRESH AIR
FPM	FEET PER MINUTE
FT	FOOT (FEET)
GA	GAUGE/GAGE
GALV	GALVANIZED
GC	GENERAL CONTRACTOR
GPM	GALLONS PER MINUTE
GYP	GYPSUM
HORIZ	HORIZONTAL
HP	HORSEPOWER
HT	HEIGHT
I/O	INPUT/OUTPUT
IN	INCH
LAT	LEAVING AIR TEMPERATURE
LB	POUND
LWT	LEAVING WATER TEMPERATURE
MAX	MAXIMUM
MBH	1000 BTU PER HOUR
MC	MECHANICAL CONTRACTOR
MCA	MINIMUM CIRCUIT AMPS
MECH	MECHANICAL
MIN	MINIMUM
MFR	MANUFACTURER
NTS	NOT TO SCALE
OA	OUTSIDE AIR
OC	ON CENTER
P	PUMP
PC	PLUMBING CONTRACTOR
PLBG	PLUMBING
PSI	POUNDS PER SQUARE INCH
QTY	QUANTITY
RA	RETURN AIR
REQD	REQUIRED
REV	REVERSE OR REVISION
RG	RETURN AIR GRILLE
RPM	REVOLUTIONS PER MINUTE
RTU	ROOF TOP UNIT
SA	SUPPLY AIR
SQFT	SQUARE FEET
SG	SUPPLY GRILLE
SP	STATIC PRESSURE
SPEC	SPECIFICATIONS
SS	STAINLESS STEEL
T&B	TEST AND BALANCE
TEMP	TEMPERATURE OR TEMPORARY
TG	TRANSFER GRILLE
TYP	TYPICAL
V	VOLT
VAR	VARIABLE OR VARIES
VEL	VELOCITY
VFD	VARIABLE FREQUENCY DRIVE
VTR	VENT THRU ROOF
W/	WITH
W/IN	WITHIN
W/O	WITH OUT
WB	WET BULB
WC	WATER COLUMN (INCHES OF)
WT	WEIGHT

MECHANICAL HVAC LEGEND

EXHAUST AIR DUCT (DOWN)			EXHAUST AIR DUCT (UP)
RETURN AIR DUCT (DOWN)			RETURN AIR DUCT (UP)
OUTSIDE OR SUPPLY AIR DUCT (DOWN)			OUTSIDE OR SUPPLY AIR DUCT (UP)
DUCT SIZE	24x12		NEW DUCTWORK
FLEX DUCT			EXISTING DUCTWORK
DEMOLITION LINETYPE			SUPPLY AIR CEILING DIFFUSER
RETURN AIR GRILLE			EXHAUST AIR GRILLE
DIFFUSER, GRILLE, AND REGISTER CALL-OUTS	CALL-OUT / CFM		SCHEDULED EQUIPMENT TAG
MANUAL BALANCING DAMPER			PIPE PENETRATION THROUGH FIRE RATED WALL
FIRE DAMPER			SMOKE DAMPER
MOTORIZED DAMPER	M		FIRE/SMOKE DAMPER
THERMOSTAT	T	H	HUMIDISTAT
REMOTE SENSOR	S	C	CARBON DIOXIDE SENSOR
DUCT SMOKE DETECTOR		CO	CARBON MONOXIDE SENSOR

MECHANICAL SHEET INDEX

M000	MECHANICAL LEGEND AND NOTES
M101	MECHANICAL PLAN – AREA A
M102	MECHANICAL PLAN – AREA B
M201	MECHANICAL ROOF PLAN
M501	MECHANICAL DETAILS
M502	MECHANICAL DETAILS
M601	MECHANICAL SCHEDULES

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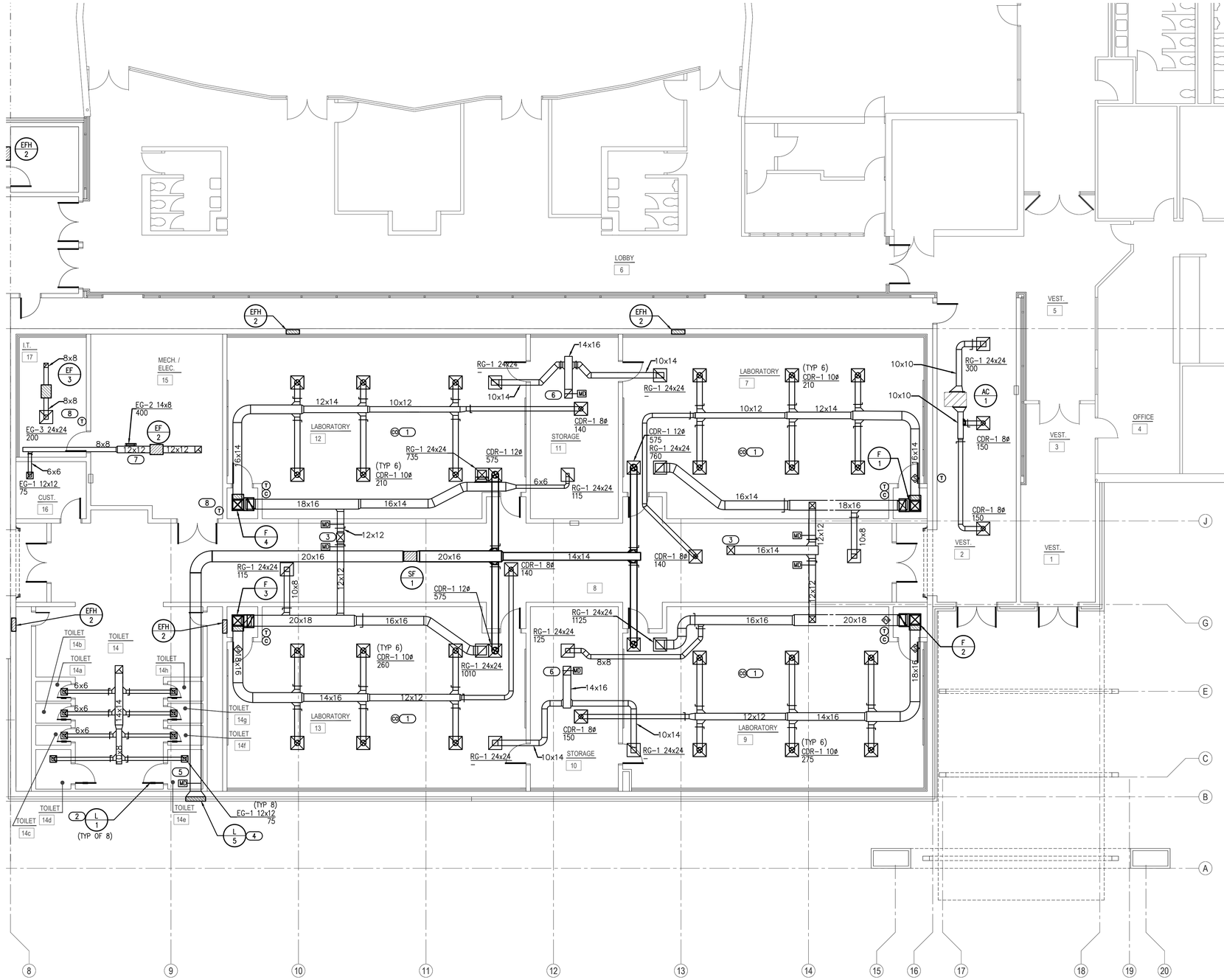


1 MECHANICAL FLOOR PLAN - AREA A

SCALE: 1/8" = 1'-0"

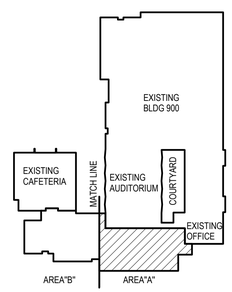
NORTH

GENERAL NOTES

1. COORDINATE INSTALLATION OF EQUIPMENT AND DUCTWORK WITH ALL TRADES.
2. COORDINATE LOCATION OF THERMOSTATS WITH E.C. ROUGH-IN BY E.C.
3. COORDINATE CARBON DIOXIDE SENSOR LOCATION WITH EARTHSMART PRIOR TO INSTALLATION.
4. M.C. SHALL PROVIDE CARBON MONOXIDE SENSORS WHERE NEEDED PER CODE FOR EXISTING EQUIPMENT THROUGHOUT THE ENTIRE BUILDING. M.C. IS RESPONSIBLE FOR SURVEYING ENTIRE BUILDING AND LOCATING FUEL BURNING HVAC EQUIPMENT FOR SENSOR LOCATIONS. COORDINATE WITH E.C FOR POWER CONNECTIONS.
5. ALL PENETRATIONS OVER 3 1/2 SQUARE INCHES OR 2 1/16 INCHES IN DIAMETER IN/OUT OF SHELTER REQUIRE SHROUD. REFER TO STRUCTURAL FOR ALL SHROUD DETAILS.
6. M.C. IS RESPONSIBLE TO ALL STRUCTURAL REQUIRED PENETRATION PROTECTION ITEMS FOR ALL MECHANICAL SYSTEMS PENETRATING THE SHELTER.
7. E.C. TO PROVIDE, LOCATE, AND INSTALL SWITCH FOR EMERGENCY VENTILATION FAN. M.C. SHALL PROVIDE CALL OUT LETTERING "EMERGENCY VENTILATION" ON PLACARD ABOVE SWITCH WITH 3/4" LETTERING FOR INSTALLATION BY G.C. COORDINATE WITH G.C. AND E.C.

KEYED NOTES

1. CARBON MONOXIDE DETECTOR TO BE INSTALLED ACCORDING TO ALL APPLICABLE CODES. DETECTOR SHALL BE INSTALLED CENTRALLY ON CEILING. ALSO INCLUDE BATTERY BACKUP IN EVENT PRIMARY POWER IS INTERRUPTED. ALARM SIGNAL SHALL BE ROUTED TO ADMINISTRATION OFFICE. COORDINATE WITH E.C. WITH PRIMARY POWER CONNECTION AND SYSTEM CONNECTION.
2. PLACE LOUVER 8" FROM BOTTOM OF DOOR.
3. DUCT UP 16X16 TO CONNECT TO THROAT OPENING OF ROOF HOOD.
4. LOUVER IS PART OF EMERGENCY VENTILATION SYSTEM. DUCT UP 20X16 TO TRANSITION INTO LOUVER.
5. MOTORIZED DAMPER TO BE 120V CONNECTED TO EMERGENCY POWER. DAMPER SHALL OPEN WHEN SUPPLY FAN TURNS ON.
6. ROOF HOOD PART OF THE EMERGENCY VENTILATION SYSTEM TO PROVIDE RELIEF AIR. MOTORIZED DAMPER SHALL OPERATE ON INVERTER. INTERLOCK WITH SF-1. DUCT DOWN TO 16X12.
7. ROUTE DUCT TO AVOID ELECTRICAL CONDUITS OR PANEL AREA CLEARANCES. COORDINATE WITH ELECTRICAL CONTRACTOR.
8. PROVIDE REVERSE ACTING THERMOSTAT TO BE SET BY OWNER.



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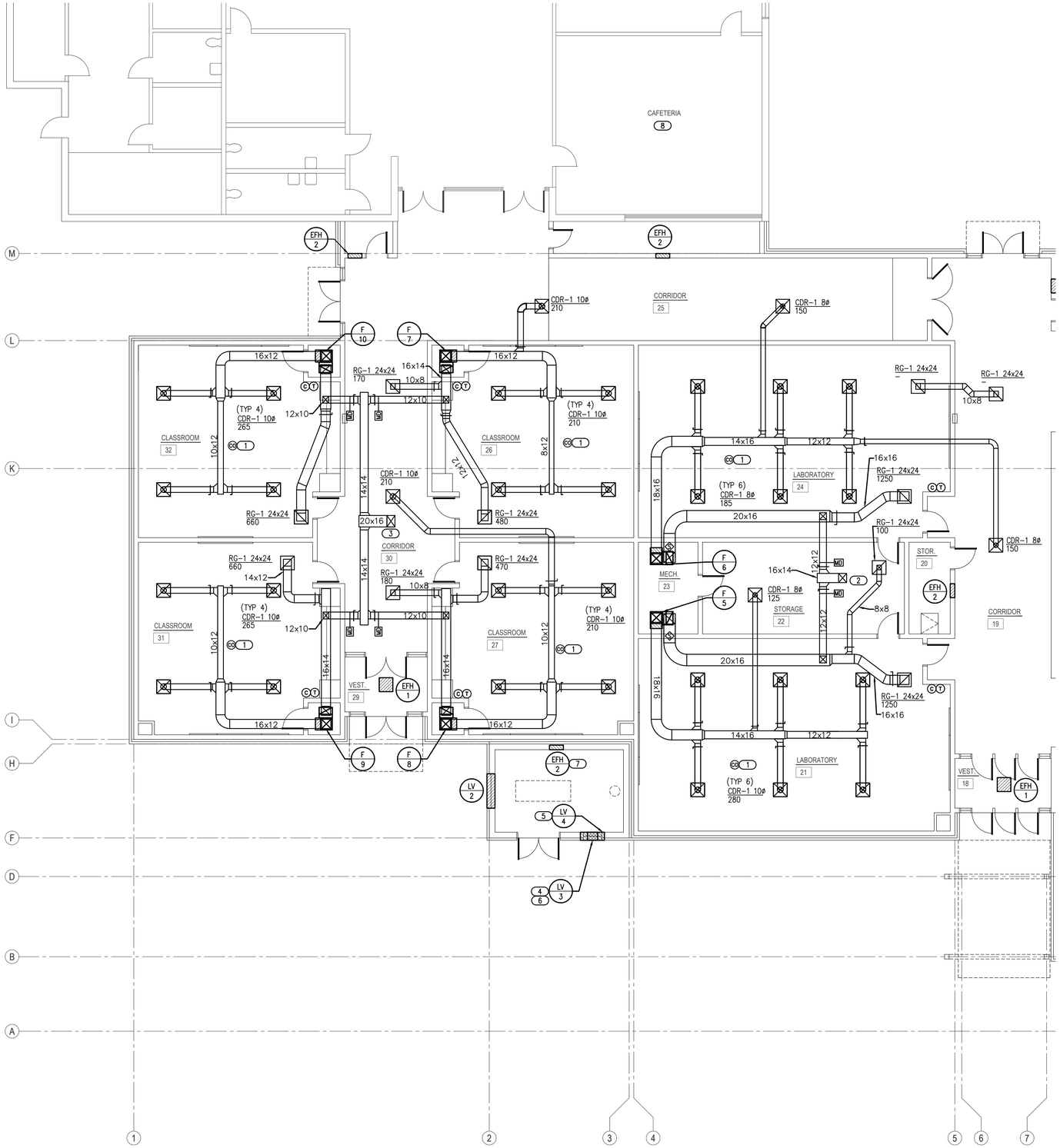


1 MECHANICAL FLOOR PLAN - AREA B

SCALE: 1/8" = 1'-0"

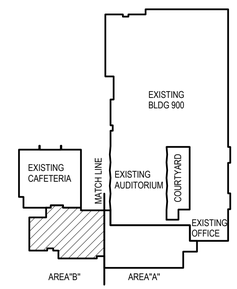
NORTH

GENERAL NOTES

1. COORDINATE INSTALLATION OF EQUIPMENT AND DUCTWORK WITH ALL TRADES.
2. COORDINATE LOCATION OF THERMOSTATS WITH E.C. ROUGH-IN BY E.C.
3. COORDINATE CARBON DIOXIDE SENSOR LOCATION WITH EARTHSMART PRIOR TO INSTALLATION.
4. M.C. SHALL PROVIDE CARBON MONOXIDE SENSORS WHERE NEEDED PER CODE FOR EXISTING EQUIPMENT THROUGHOUT THE ENTIRE BUILDING. M.C. IS RESPONSIBLE FOR SURVEYING ENTIRE BUILDING AND LOCATING FUEL BURNING HVAC EQUIPMENT FOR SENSOR LOCATIONS. COORDINATE WITH E.C FOR POWER CONNECTIONS.

KEYED NOTES

1. CARBON MONOXIDE DETECTOR TO BE INSTALLED ACCORDING TO ALL APPLICABLE CODES. DETECTOR SHALL BE INSTALLED CENTRALLY ON CEILING. ALSO INCLUDE BATTERY BACKUP IN EVENT PRIMARY POWER IS INTERRUPTED. ALARM SIGNAL SHALL BE ROUTED TO ADMINISTRATION OFFICE. COORDINATE WITH E.C. WITH PRIMARY POWER CONNECTION AND SYSTEM CONNECTION.
2. DUCT UP 16X16 TO CONNECT TO THROAT OPENING OF ROOF HOOD.
3. DUCT UP 20X16 TO CONNECT TO THROAT OPENING OF ROOF HOOD.
4. MOUNT BOTTOM OF LOUVER MINIMUM 60" ABOVE LV-4. LOUVER CONNECTION FOR ENGINE EXHAUST.
5. MOUNT BOTTOM OF LOUVER MINIMUM 18" AFF. LOUVER CONNECTION FOR RADIATOR EXHAUST.
6. PROVIDE EXHAUST DUCT TO GENERATOR RADIATOR CONNECTION. COORDINATE DUCT SIZE WITH GENERATOR MANUFACTURER DRAWINGS.
7. MOUNT HEATER MINIMUM OF 24" AFF.
8. EXISTING AIR DEVICES IN CAFETERIA ARE TO BE REUSED. CLEAN AIR DEVICES AND ENSURE IT IS IN GOOD WORKING ORDER. RECONNECT AIR DEVICES TO DUCTWORK AND ALIGN WITH NEW CEILING GRID.



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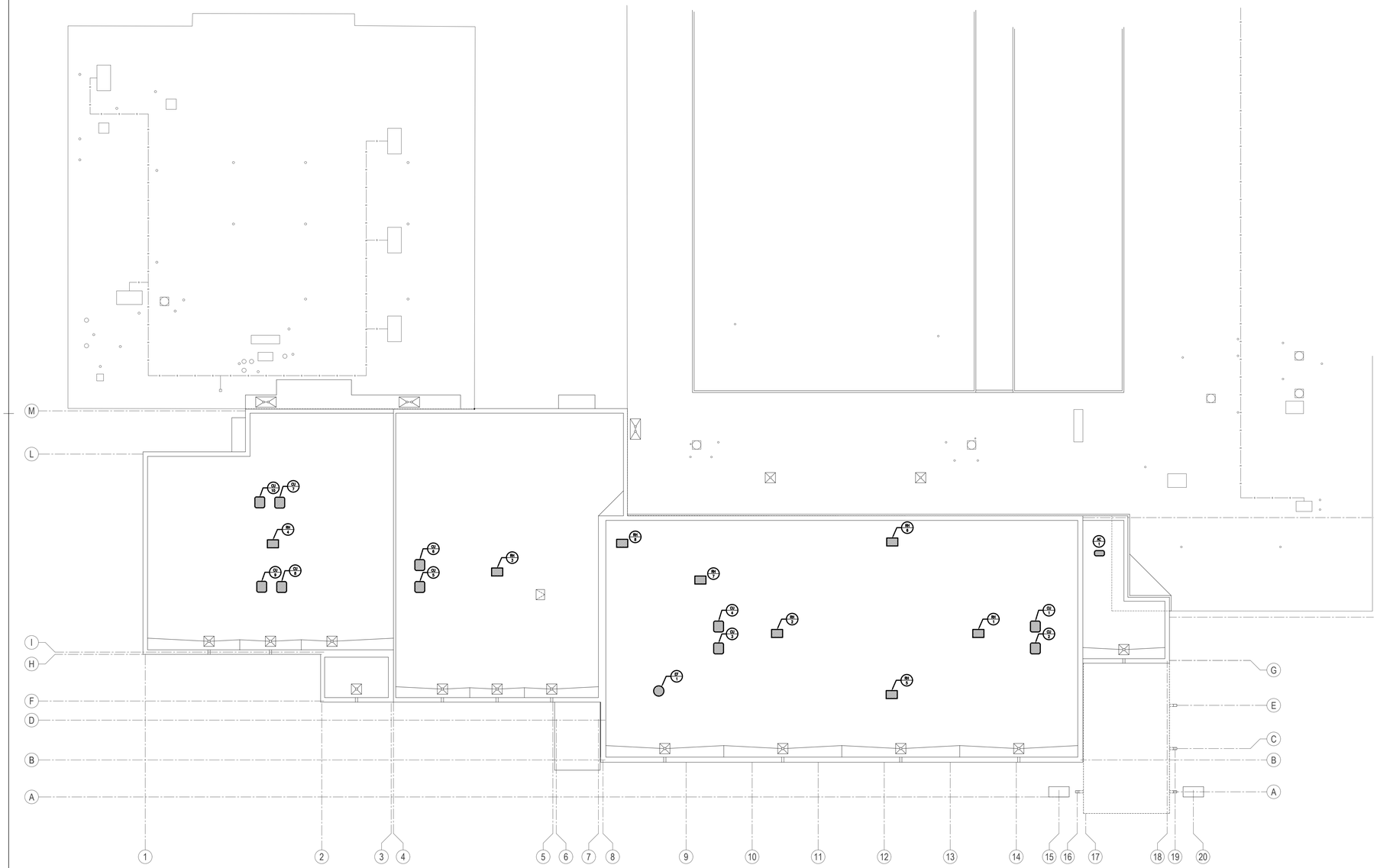
GENERAL NOTES

1. ALL ROOF TOP EQUIPMENT TO BE LOCATED A MINIMUM 10'-0" AWAY FROM ROOF EDGE.
2. MAINTAIN A MINIMUM OF 10'-0" HORIZONTAL CLEARANCE BETWEEN ALL EXHAUST OUTLETS AND ANY FRESH AIR INTAKES.
3. ALL ROOF SUPPORT SYSTEMS ARE TO BE MANUFACTURED FOR THE ROOF MATERIAL/SYSTEM TO BE INSTALLED. REFER TO ARCHITECTURAL PLANS FOR THE ROOF SYSTEM, CURB INSTALLATION TO BE WARRANTED BY ROOFING CONTRACTOR.



1 MECHANICAL ROOF PLAN

SCALE: 1/16" = 1'-0"

NORTH

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KFC ENGINEERING
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SALAS O'BRIEN
MECHANICAL / ELECTRICAL

PROFESSIONAL ENGINEER
Oklahoma
05/15/25

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CLASSROOM ADDITION
CENTRAL JUNIOR
HIGH SCHOOL

sheet no:

M201

Salas O'Brien
2900 S. Telephone Road, Suite 120
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Salas O'Brien Registration: CA# 7058
Expiration Date : 6/30/2025
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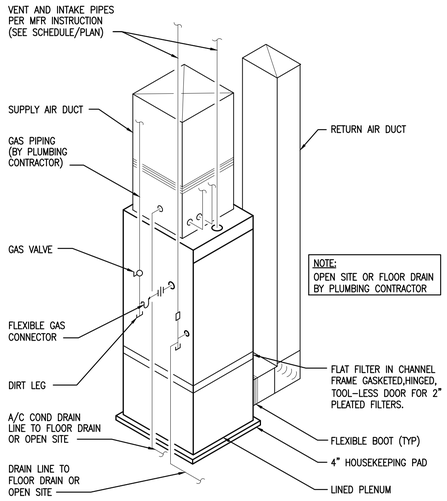
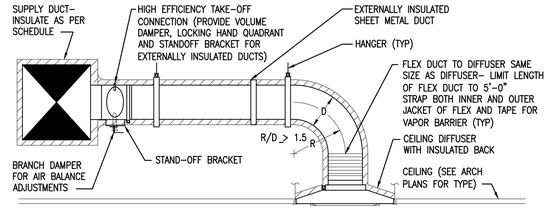
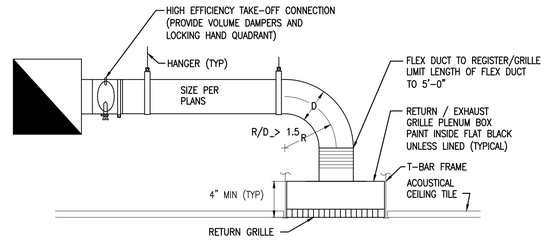


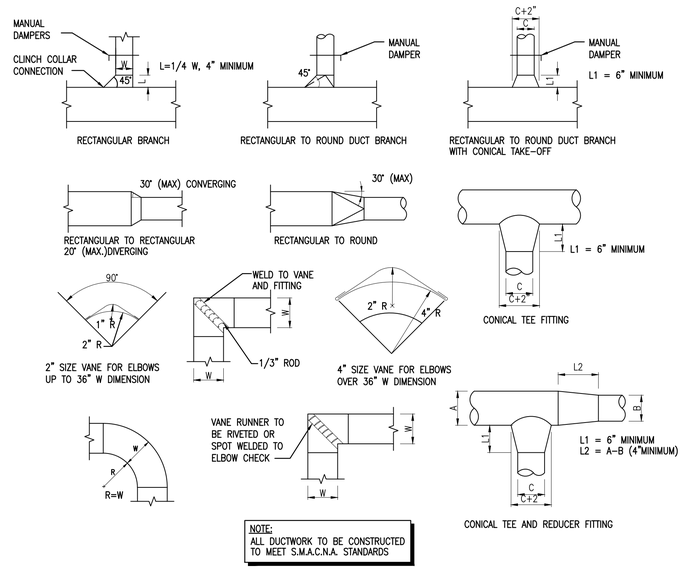
4 GAS FURNACE DETAIL - NEW CLASSROOMS
NOT TO SCALE



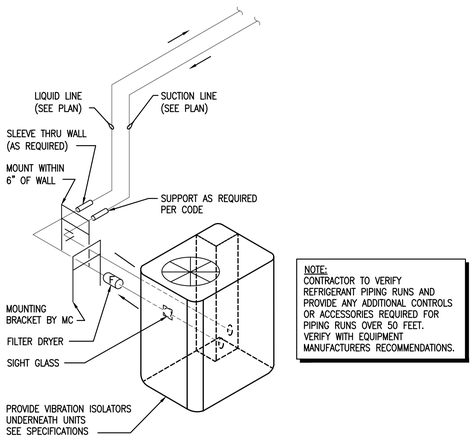
2 CEILING DIFFUSER DETAIL
NOT TO SCALE



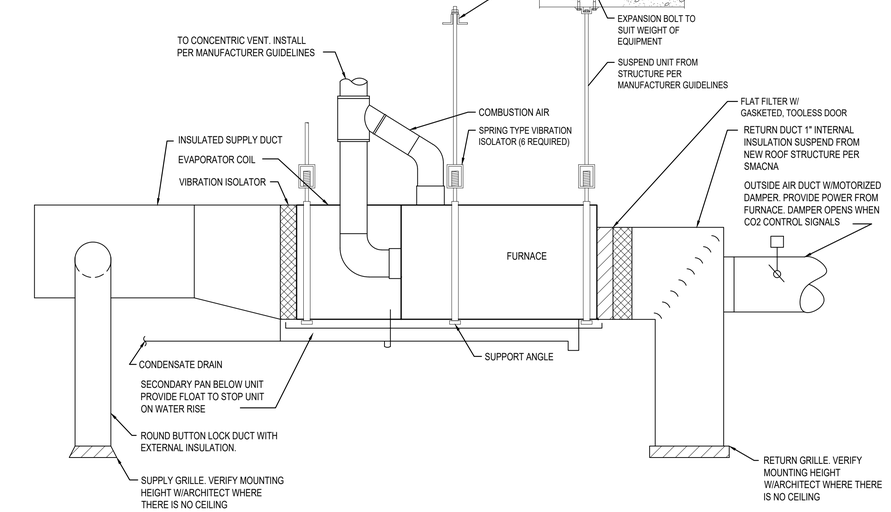
3 RETURN / EXHAUST AIR GRILLE PLENUM BOX
NOT TO SCALE



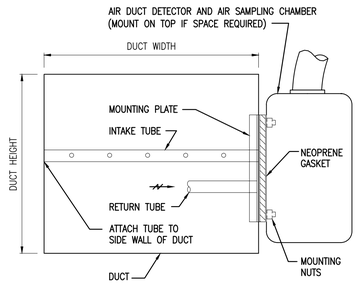
1 TYPICAL DUCTWORK DETAILS
NOT TO SCALE



7 CONDENSING UNIT PIPING DETAIL
NOT TO SCALE



6 TYPICAL HORIZONTAL GAS FIRED FURNACE
NOT TO SCALE



NOTES:
1. SMOKE DETECTOR FURNISHED AND WIRED BY ELECTRICAL CONTRACTOR, AND MOUNTED BY MECHANICAL CONTRACTOR.
2. INSTALL IN STRICT ACCORDANCE WITH MANUFACTURER'S INSTALLATION INSTRUCTIONS.
3. PROVIDE ACCESS DOOR AT SAMPLING TUBES.
4. THE TUBE SHALL BE INSTALLED PARALLEL TO LONG DIMENSION OF DUCT.
5. PRODUCT SHALL BE UL555 OR UL555S LISTED.
6. EC SHALL TEST ACCORDING TO UL AND CODES IN THE PRESENCE OF CODE AUTHORITY.

5 SMOKE DETECTOR MOUNTING DETAIL
NOT SCALE

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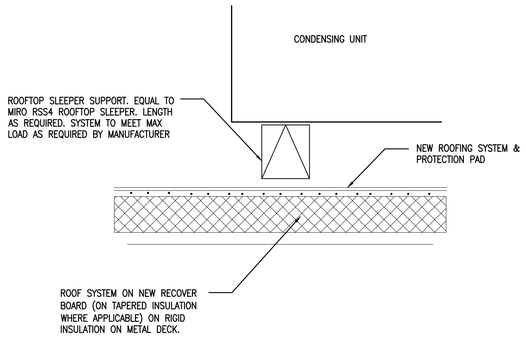
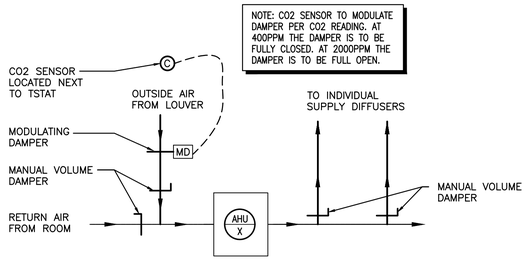
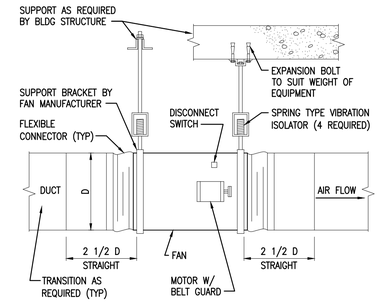


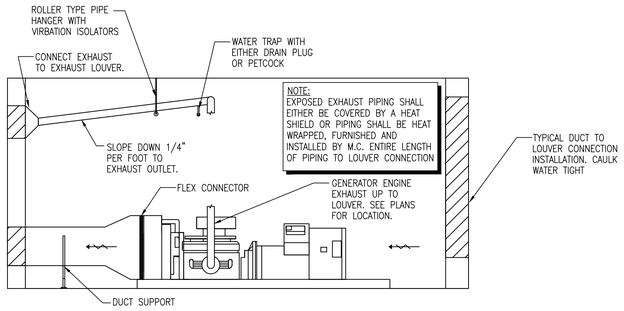
3 CONDENSING UNIT ROOF SUPPORT
NOT TO SCALE



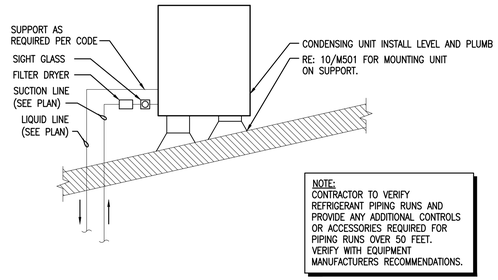
2 TYPICAL AIR BALANCING SCHEMATIC
NO SCALE



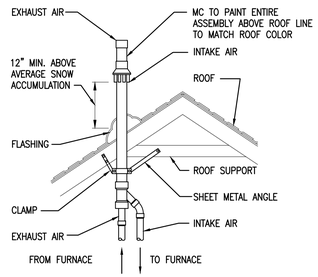
1 IN-LINE FAN MOUNTING DETAIL
NO SCALE



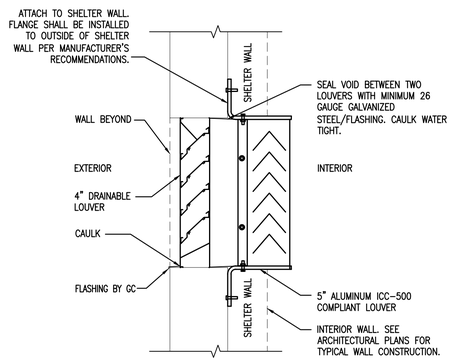
6 GENERATOR DETAIL
NOT TO SCALE



5 CONDENSING UNIT MOUNTING DETAIL
NOT TO SCALE



4 VENT TERMINATION DETAIL
NOT TO SCALE



7 LOUVER GENERATOR BUILDING
NOT TO SCALE

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ELECTRIC FAN FORCED HEATER SCHEDULE

EFH #	ROOM NO.	CFM	WALL OR CEILING	KW	MOUNTING	ELECTRICAL CHAR	AMPS	SPEEDS	CONTROL	RPM	MANUFACTURER & MODEL NUMBER	NOTES
1	VEST	300	CEILING	2	RECESSED	208 / 1	9.6	1	INT STAT	1400	BERKO FFCH-548	1,2,3,5
2	RISER	100	WALL	2	RECESSED	208 / 1	9.6	1	INT STAT	–	BERKO FRC-4020	1-5

NOTES: M.C. IS RESPONSIBLE FOR PROVIDING ANY AND ALL NECESSARY DIMENSIONAL, ELECTRICAL, MECHANICAL, AND STRUCTURAL ALTERATIONS NECESSITATED BY PROVIDING ALTERNATE EQUIPMENT.

1. PROVIDE INTERNAL THERMOSTAT.
2. RECESSED MOUNTED UNIT. PROVIDE RECESSED MOUNTING KIT.
3. PROVIDE BUILT-IN DISCONNECT.
4. WALL MOUNTING HEIGHT AFF AT A MINIMUM OF 18" OR PER MANUFACTURER'S RECOMMENDATION.
5. VERIFY QUANTITY OF HEATERS WITH FLOORPLAN.

GAS FURNACE SCHEDULE

F #	TYPE	INPUT MBH	OUTPUT MBH	CFM	MIN F.A.	EXT. S.P.	HEAT EXCH. MTL	BLOWER SIZE	BLOWER DRIVE	BLOWER H.P.	BLOWER ELEC. CHAR	PILOT	VENT	FILTER MERV 8 MIN.	MANUFACTURER & MODEL NO.	NOTES
1	VERT	80	77	1400	550	0.6	ALUMINIZED STL	11X11	DIRECT	.75	120/1	HOT S	3"	2" TA	YORK TM9V080C16MP12C	1-3
2	VERT	120	115	1800	550	0.6	ALUMINIZED STL	11X11	DIRECT	1	120/1	HOT S	3"	2" TA	YORK TM9V120D20MP12C	1-4
3	VERT	120	115	1800	550	0.6	ALUMINIZED STL	11X11	DIRECT	1	120/1	HOT S	3"	2" TA	YORK TM9V120D20MP12C	1-4
4	VERT	80	77	1400	550	0.6	ALUMINIZED STL	11X11	DIRECT	.75	120/1	HOT S	3"	2" TA	YORK TM9V080C16MP12C	1-3
5	VERT	120	115	1800	550	0.6	ALUMINIZED STL	11X11	DIRECT	1	120/1	HOT S	3"	2" TA	YORK TM9V120D20MP12C	1-3
6	VERT	80	77	1400	550	0.6	ALUMINIZED STL	11X11	DIRECT	.75	120/1	HOT S	3"	2" TA	YORK TM9V080C16MP12C	1-3
7	VERT	60	58	1050	400	0.6	ALUMINIZED STL	11X11	DIRECT	.5	120/1	HOT S	3"	2" TA	YORK TM9V060B12MP12C	1-3
8	VERT	60	58	1050	400	0.6	ALUMINIZED STL	11X11	DIRECT	.5	120/1	HOT S	3"	2" TA	YORK TM9V060B12MP12C	1-3
9	VERT	60	58	1060	400	0.6	ALUMINIZED STL	11X11	DIRECT	.5	120/1	HOT S	3"	2" TA	YORK TM9V060B12MP12C	1-3
10	VERT	60	58	1060	400	0.6	ALUMINIZED STL	11X11	DIRECT	.5	120/1	HOT S	3"	2" TA	YORK TM9V060B12MP12C	1-3

NOTES: M.C. IS RESPONSIBLE FOR PROVIDING ANY AND ALL NECESSARY DIMENSION, ELECTRICAL, MECHANICAL, AND STRUCTURAL ALTERATIONS NECESSITATED BY PROVIDING ALTERNATE EQUIPMENT.

1. PROVIDE CONCENTRIC VENT. INSTALL PER MANUFACTURER INSTRUCTIONS. MAINTAIN MINIMUM CLEARANCES: 36" BETWEEN VENTS, 10'-0" FROM ANY FRESH AIR INTAKE.
2. PROVIDE CO_2 SENSOR, INSTALLATION BY CONTROLS CONTRACTOR. INTERLOCK CO_2 SENSOR WITH MOTORIZED DAMPER IN OUTSIDE AIR DUCT.
3. PROVIDE FURNACE WITH 2 STAGE HEATING.
4. DUCT SMOKE DETECTOR AND REMOTE TEST STATION PROVIDED BY AND INSTALLED BY E.C. REMOTE TEST STATION TO BE LOCATED IN OCCUPIED SPACE AND CONNECTION TO FIRE ALARM SYSTEM BY E.C. COORDINATE WITH E.C.

CONDENSING UNIT SCHEDULE

CU #	CONDENSING UNIT NOMINAL TONNAGE	CONDENSING UNIT ELEC. CHAR	CONDENSING UNIT MCA	CONDENSING UNIT MOCP	CONDENSING UNIT S.E.E.R	CONDENSING UNIT WEIGHT (LBS)	CONDENSING UNIT MANUFACTURER& MODEL NO.	EVAPORATOR UNIT CFM	EVAPORATOR UNIT MAX S.P.	EVAPORATOR UNIT BLOWER MOTOR	EVAPORATOR UNIT ELEC. CHAR	EVAPORATOR UNIT MCA	EVAPORATOR UNIT MANUFACTURER & MODEL NO.	NOTES
1	4	208/1	28	45	16	295	YORK YXT48B21S	1400	0.3	– SEE FURNACE SCHEDULE –			YORK XAFC48FBCN1	1-7
2	5	208/1	32	50	15.5	295	YORK YXT60B21S	1800	0.3	– SEE FURNACE SCHEDULE –			YORK XAFD60GBCN1	1-7
3	5	208/1	32	50	15.5	295	YORK YXT60B21S	1800	0.3	– SEE FURNACE SCHEDULE –			YORK XAFD60GBCN1	1-7
4	4	208/1	28	45	16	295	YORK YXT48B21S	1400	0.3	– SEE FURNACE SCHEDULE –			YORK XAFC48FBCN1	1-7
5	5	208/1	32	50	15.5	295	YORK YXT60B21S	1800	0.3	– SEE FURNACE SCHEDULE –			YORK XAFD60GBCN1	1-7
6	4	208/1	28	45	16	295	YORK YXT48B21S	1400	0.3	– SEE FURNACE SCHEDULE –			YORK XAFC48FBCN1	1-7
7	3	208/1	21	35	15.75	265	YORK YXT36B21S	1050	0.3	– SEE FURNACE SCHEDULE –			YORK XAFB36DBCN1	1-7
8	3	208/1	21	35	15.75	265	YORK YXT36B21S	1050	0.3	– SEE FURNACE SCHEDULE –			YORK XAFB36DBCN1	1-7
9	3	208/1	21	35	15.75	265	YORK YXT36B21S	1060	0.3	– SEE FURNACE SCHEDULE –			YORK XAFB36DBCN1	1-7
10	3	208/1	21	35	15.75	265	YORK YXT36B21S	1060	0.3	– SEE FURNACE SCHEDULE –			YORK XAFB36DBCN1	1-7

NOTES: M.C. IS RESPONSIBLE FOR PROVIDING ANY AND ALL NECESSARY DIMENSIONAL, ELECTRICAL, MECHANICAL, AND STRUCTURAL ALTERATIONS NECESSITATED BY PROVIDING ALTERNATE EQUIPMENT.

1. E.C. TO PROVIDE AND INSTALL POWER DISCONNECT FOR UNIT. COORDINATE WITH M.C.
2. M.C. TO INCLUDE PRE-CHARGED LINE KIT. INSULATE SUCTION LINE.
3. TWO STAGE COOLING.
4. FOR LINE LENGTH EXCEEDING 50', M.C. MUST PROVIDE FACTORY DESIGNED AND FACTORY OR FIELD FABRICATED REFRIGERANT PIPING.
5. MOUNT UNITS ON CONDENSING UNIT SUPPORTS RE: 10/M501 FOR MORE INFORMATION.
6. INSULATE SUCTION LINE WITH 5/8" AP ARMAFLEX INSULATION OR EQUAL. SEAL ALL JOINTS WATER TIGHT TO PREVENT CONDENSATE IN THE CEILING.
7. PROVIDE UNIT WITH HAIL GUARD.

MINI SPLIT HEAT PUMP SCHEDULE - INDOOR & OUTDOOR UNIT

AC #	NOMINAL TON	OUTDOOR UNIT ELEC. CHAR	SEER	MCA	MOCP	COMPRESSOR TYPE	MANUFACTURER & MODEL NUMBER	INDOOR UNIT COOLING/ HEATING	CFM	MCA	MOCP	TYPE	CONDENSATE PUMP	MANUFACTURER & MODEL NUMBER	NOTES
1	1	208/1	17	14	24	INVERTER	TRANE NTXSKH12A112AA	BOTH	300	1	N/A	DUCTED	YES	TRANE NTXDKS12112AA	ALL

NOTES: M.C. IS RESPONSIBLE FOR PROVIDING ALL NECESSARY DIMENSION, ELECTRICAL, MECHANICAL, AND STRUCTURAL ALTERATIONS NECESSITATED BY PROVIDING ALTERNATE EQUIPMENT.

1. M.C. PROVIDE DISCONNECTS FOR INSTALLATION BY E.C.
2. PROVIDE AND INSTALL CONDENSATE PUMP. ROUTE CONDENSATE TO NEAREST OPEN SITE.
3. PROVIDE CONDENSER COIL HAIL GUARD.
4. M.C. SHALL PROVIDE HARD WIRED THERMOSTAT.
5. INDOOR UNIT POWERED BY OUTDOOR UNIT.

DUCTWORK/INSULATION SCHEDULE

SYSTEM	LOW PRESSURE MAX. PRES.	SEAL A	SEAL B	SEAL C	MED. PRESS MAX PRES.	MED. PRESS SEAL A	HIGH PRESS. MAX PRES.	HIGH PRESS. SEAL A	INSULATION INTERNAL	INSULATION THICKNESS	INSULATION EXTERNAL	INSULATION THICKNESS	NOTES
SUPPLY AIR WITHIN 10' OF UNIT	2"	X	–	–	–	–	–	–	YES	1"	NO	–	–
SUPPLY AIR BEYOND 10' OF UNIT	2"	X	–	–	–	–	–	–	NO	–	YES	2" FSK	–
RETURN AIR WITHIN 10' OF UNIT	2"	–	X	–	–	–	–	–	YES	1"	NO	–	–
RETURN AIR BEYOND 10' OF UNIT	2"	–	X	–	–	–	–	–	NO	–	YES	2" FSK	–
OUTSIDE AIR/MIXED AIR	2"	–	X	–	–	–	–	–	NO	–	YES	3" FSK	–
EXHAUST AIR	2"	–	X	–	–	–	–	–	NO	–	YES	2" FSK	–

NOTES:

GRILLE, REGISTER, AND DIFFUSER SCHEDULE

PLAN SYMBOL	DESCRIPTION	MANUFACTURER & MODEL NO.	MATERIAL	FINISH	NOISE CRITERIA
CDR-1	SQUARE FACE, ROUND NECK, 4-WAY DEFLECTION CEILING DIFFUSER, SPRING LOCK INNER CORE, FOR LAY-IN CEILING INSTALLATION.	PRICE SCD (4C)	STEEL	WHITE	–
RG-1	SQUARE PATTERN GRILLE, FIXED CORE OF 1/2"X1/2"X1/2" FABRICATED ALUMINUM SQUARES, FLAT FRAME WITH 1 1/4" MARGIN, FOR LAY-IN CEILING INSTALLATION.	PRICE 80	ALUMINUM	WHITE	–
EG-1	SQUARE PATTERN GRILLE, FIXED CORE OF 1/2"X1/2"X1/2" FABRICATED ALUMINUM SQUARES, FLAT FRAME WITH 1 1/4" MARGIN, FOR SURFACE MOUNT INSTALLATION.	PRICE 90	ALUMINUM	WHITE	–

NOTES:

SEE AIR BALANCE SCHEDULE ON M-101 THRU M-104 FOR QUANTITY AND SIZES.
M.C. TO FIELD VERIFY CEILING TYPE FOR ALL GRD BEFORE PURCHASING EQUIPMENT. PROVIDE REQUIRED MOUNTING.

ROOF HOOD SCHEDULE

RH #	THROAT SIZE DIMENSION (IN)	THROAT AREA (FT^2)	DAMPER BDD OR MOD	CONSTRUCTION	MANUFACTURER & MODEL NO.	COMMENTS	NOTES
1	16X20	2.22	MOD	ALUMINUM	GREENHECK FGI	COLOR BY ARCHITECT	1-3
2	16X20	2.22	MOD	ALUMINUM	GREENHECK FGI	COLOR BY ARCHITECT	1-3
3	16X20	2.22	MOD	ALUMINUM	GREENHECK FGI	COLOR BY ARCHITECT	1-3
4	16X20	2.22	MOD	ALUMINUM	GREENHECK FGI	COLOR BY ARCHITECT	1-3
5	16X16	1.78	BDD	ALUMINUM	GREENHECK FGI	COLOR BY ARCHITECT	1,2
6	16X16	1.78	BDD	ALUMINUM	GREENHECK FGI	COLOR BY ARCHITECT	1,2
7	12X12	1.0	–	ALUMINUM	GREENHECK FGI	COLOR BY ARCHITECT	1,2
8	12X12	1.0	–	ALUMINUM	GREENHECK FGI	COLOR BY ARCHITECT	1,2

NOTES: M.C. IS RESPONSIBLE FOR PROVIDING ANY AND ALL NECESSARY DIMENSIONAL, ELECTRICAL, MECHANICAL, AND STRUCTURAL ALTERATIONS NECESSITATED BY PROVIDING ALTERNATE EQUIPMENT.

1. M.C. TO PROVIDE ROOF HOOD WITH ALUMINUM BIRDSCREEN.
2. M.C. SHALL PROVIDE ROOF CURB. CURB INSTALLATION BY G.C.
3. M.C. SHALL PROVIDE LOW VOLTAGE MOTORIZED DAMPER.

FAN SCHEDULE

– #	LOCATION	SYSTEM	CFM	SP	FAN RPM	MOTOR H.P.	ELEC CHAR	AMPS	DAMPER BDD OR MOD	DRIVE	FAN TYPE	INTERLOCK/ CONTROL	WEIGHT	MANUFACTURER & MODEL NUMBER	NOTES
EF-1	ROOF	EXHAUST	675	0.25	1633	0.1	120/1	2	MOD	DIRECT	CENT	LIGHTS	50	GREENHECK G-090-VG	1-4
EF-2	ELEC	EXHAUST	475	0.50	1230	0.13	120/1	–	MOD	DIRECT	CEILING	THERMOSTAT	30	GREENHECK SP-A700-VG	1,4
EF-3	IT	EXHAUST	200	0.25	1221	01	120/1	1.4	MOD	DIRECT	INLINE	THERMOSTAT	45	GREENHECK SQ-80-VG	1,2,4
SF-1	HALL	SUPPLY	2300	0.5	1027	0.75	120/1	8.8	MOD	DIRECT	INLINE	SWITCH	145	GREENHECK SQ-160-VG	4-7

NOTES: M.C. IS RESPONSIBLE FOR PROVIDING ANY AND ALL NECESSARY DIMENSIONAL, ELECTRICAL, MECHANICAL, AND STRUCTURAL ALTERATIONS NECESSITATED BY PROVIDING ALTERNATE EQUIPMENT.

1. PROVIDE ELECTRONIC SPEED CONTROL MOUNTED ABOVE ACCESSIBLE CEILING.
2. M.C. SHALL PROVIDE LOW VOLTAGE MOTORIZED DAMPER.
3. OPERATION OF DEVICE ON OCCUPIED MODE OF RTU OR SWITCH WITH LIGHTS. SEE INTERLOCK/CONTROL COLUMN FOR TYPE.
4. PROVIDE UNIT MOUNTED DISCONNECT.
5. FAN AND MOTORIZED DAMPER ARE PART OF EMERGENCY POWER SYSTEM. COORDINATE ALL CIRCUITS WITH E.C.
6. ALL WIRING TO FAN AND DAMPER SHALL BE BY E.C.
7. PROVIDE 120V DAMPER.

LOUVER SCHEDULE

L #	CONNECTED TO	SIZE (IN) (WXH)	MINIMUM FREE AREA	FLANGE	CONSTRUCTION	INCLUDE MOD	MANUFACTURER AND MODEL NUMBER	COMMENTS	NOTES
1	WC DOOR	8.5X8.5	0.28	YES	STEEL	NO	AIR CONDITIONING PRODUCTS SDL	SIGHT PROOF DOOR LOUVER	1-2
2	GEN ENCLOSURE	60X48	9.6	YES	ALUMINUM	–	GREENHECK AFL-501	5" FEMA RATED LOUVER – PROVIDE ADDITIONAL DRAINABLE LOUVER (GREENHECK ESD-403)	1-2
3	GEN ENCLOSURE	18X18	1.55	YES	ALUMINUM	–	GREENHECK AFL-501	5" FEMA RATED LOUVER – PROVIDE ADDITIONAL DRAINABLE LOUVER (GREENHECK ESD-403)	1-2
4	GEN ENCLOSURE	42X36	4.75	YES	ALUMINUM	–	GREENHECK AFL-501	5" FEMA RATED LOUVER – PROVIDE ADDITIONAL DRAINABLE LOUVER (GREENHECK ESD-403)	1-2
5	SF-1	36X24	2.47	YES	ALUMINUM	–	GREENHECK AFL-501	5" FEMA RATED LOUVER – PROVIDE ADDITIONAL DRAINABLE LOUVER (GREENHECK ESD-403)	1-2

NOTES: M.C. IS RESPONSIBLE FOR PROVIDING ANY AND ALL NECESSARY DIMENSIONAL, ELECTRICAL, MECHANICAL, AND STRUCTURAL ALTERATIONS NECESSITATED BY PROVIDING ALTERNATE EQUIPMENT.

1. PROVIDE PAINTED KYNAR FINISH. COLOR BY ARCHITECT.
2. PROVIDE SLIP FIT COLLAR.

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GENERAL PLUMBING NOTES

1. THESE DRAWINGS SHALL NOT BE SCALED. SEE ARCHITECTURAL/CIVIL DRAWINGS FOR DIMENSIONAL INFORMATION. THIS ENGINEER WILL NOT BE LIABLE FOR MISCALCULATED PRODUCT TAKE-OFFS DUE TO SCALING OF DRAWINGS.
2. ALL SANITARY PIPING SHALL HAVE A 1/8" PER FOOT SLOPE UNLESS OTHERWISE NOTED. 2" SANITARY OR SMALLER SHALL HAVE A 1/4" PER FOOT SLOPE.
3. VENT PIPING SHOWN ON FLOOR PLANS IS DIAGRAMMATIC EXCEPT FOR VENT THRU ROOF (VTR) LOCATIONS.
4. VALVES AND FITTINGS SHALL BE OF SAME SIZE AS THE LINE ON WHICH THEY ARE LOCATED, UNLESS OTHERWISE INDICATED ON DRAWINGS.
5. CONTRACTOR SHALL COORDINATE ALL WORK WITH OTHER TRADES.
6. CONTRACTOR SHALL FIELD VERIFY ALL GIVEN MEASUREMENTS PRIOR TO LAYING AND CONNECTING ALL SANITARY AND WASTE PIPING AND NOTIFY ENGINEER OF ANY DISCREPANCIES.
7. CONTRACTOR SHALL BE RESPONSIBLE FOR MAINTAINING FIRE RATING AND WEATHERPROOFING INTEGRITY OF ALL PIPING AND PENETRATIONS.
8. ALL WATER SUPPLY AND SANITARY LINES SHALL BE RUN AS CLOSE TO PLANS AS POSSIBLE WITH NO CHANGES IN SIZING.
9. CHANGES IN THE DIRECTION OF SANITARY DRAIN PIPING SHALL NOT BE MADE WITH FITTINGS WHICH WILL CAUSE EXCESSIVE REDUCTION IN THE VELOCITY OF FLOW OR CREATE ANY OTHER ADVERSE EFFECT UNLESS PHYSICALLY IMPOSSIBLE (I.E.: USE OF SANITARY TEE IN A HORIZONTAL CONNECTION, USE OF A DOUBLE SANITARY TEE IN A VERTICAL STACK, IN GENERAL, USE OF SHORT-RADIUS FITTINGS FOR BRANCH TO HOUSE DRAIN OR STACK CONNECTION).
10. CONTRACTOR SHALL GIVE 48 HOURS HOUR EMERGENCY LOCATE NOTICE TO APPLICABLE UTILITY COMPANY PRIOR TO PERFORMING WORK INVOLVING UTILITIES.
11. ALL DRAINAGE PIPING SHALL BE MARKED WITH THE SEAL OF APPROVAL OF THE NATIONAL SANITATION FOUNDATION.
12. ROUTE ALL PIPING CONCEALED ABOVE CEILINGS, WITHIN WALLS, OR IN CHASES. PIPING EXPOSED SHALL BE SLOPED AND PAINTED TO MATCH ARCHITECTURAL FINISHES. PIPING IN MECHANICAL ROOMS MAY BE EXPOSED.
13. SITE UTILITY CONNECTIONS SHALL BE PROVIDED ON CIVIL DRAWINGS. ALL SERVICES SHOWN ON THIS SET OF PLANS TERMINATE 5'-0" FROM BUILDING, UNLESS SHOWN OTHERWISE ON DRAWINGS. PLUMBING CONTRACTOR SHALL MAKE FINAL CONNECTIONS TO SITE UTILITIES. (INC. CLEAN OUTS, INCREASES, BACKWATER VALVES, ETC.)
14. COORDINATE WITH ARCHITECT/GENERAL CONTRACTOR FOR INSTALLATION OF HOSE BIBS. HEIGHT OF INSTALLATION SHALL BE DETERMINED IN FIELD.
15. CONTRACTOR SHALL VERIFY INVERT ELEVATIONS OF SEWERS TO WHICH NEW SEWER LINES ARE TO BE CONNECTED BEFORE INSTALLATION OF NEW SEWER LINE.
16. ALL VENTS THROUGH ROOF SHALL BE MIN. 10'-0" FROM ANY AIR INTAKES.
17. CONTRACTOR SHALL INSTALL DIELECTRIC UNIONS AT CONNECTIONS OF DISSIMILAR METALS.
18. CONTRACTOR SHALL ROUGH-IN ALL WASTES AND SUPPLIES TO SPECIAL EQUIPMENT ACCORDING TO MANUFACTURER'S SHOP DRAWINGS AND MAKE FINAL CONNECTIONS. ALL SUPPLIES SHALL BE VALVED. INSTALL VACUUM BREAKERS WHERE REQUIRED BY CODE.
19. DO NOT PENETRATE WALL FOOTINGS WITH PIPING, COORDINATE WITH GENERAL CONTRACTOR TO DROP FOOTINGS AS REQUIRED TO CLEAR PLUMBING SERVICES WHERE ABSOLUTELY NECESSARY. ALL PIPING PENETRATING A BEARING WALL OR FOOTING MUST BE SLEEVED AND LOCATION APPROVED BY STRUCTURAL ENGINEER. PROVIDE LINK-SEALS IN ALL PENETRATIONS OF EXTERIOR WALLS.
20. ALL PIPING SHALL BE INSTALLED AS HIGH AS POSSIBLE IN PROVIDED CEILING SPACE.
21. COORDINATE PIPING INSTALLATION AS TO NOT INTERFERE WITH HVAC EQUIPMENT ACCESS.
22. ANY ERRORS OR AMBIGUITIES IN THE PLANS AND/OR SPECIFICATIONS THAT ARE DISCOVERED BY THE CONTRACTOR SHALL BE REPORTED TO THE ARCHITECT/ENGINEER BEFORE WORK IS STARTED. OMISSION OF PARTICULAR REFERENCE TO ANY ITEM NECESSARY FOR COMPLETE INSTALLATION AND PROPER OPERATION THEREOF SHALL NOT RELIEVE THE CONTRACTOR OF THE RESPONSIBILITY OF FURNISHING THE SAME AT NO EXTRA COST. THE CONTRACTOR IS RESPONSIBLE FOR REVIEWING ALL CONSTRUCTION DOCUMENTS FOR INFORMATION PRIOR TO BID.
23. VERIFY WITH ARCHITECT ON ALL EQUIPMENT AND FIXTURES REQUIRING PLUMBING PRIOR TO BID. COORDINATE EXACT LOCATIONS AND CONNECTIONS.
24. ALL WORK SHALL BE IN COMPLIANCE WITH STATE AND LOCAL CODES.
25. CONTRACTOR SHALL PAY ALL FEES, PERMITS, LICENSES, ETC. NECESSARY FOR PROPER COMPLETION OF WORK.
26. INSTALL ALL EQUIPMENT IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS.

PLUMBING PIPING LINETYPES

LINETYPE	DESCRIPTION
– – – – – – – – – –	DEMOLITION
——— G ———	GAS
———	SANITARY ABOVE GRADE
– — – — – — – —	SANITARY BELOW GRADE
———	STORM ABOVE GRADE
– – – – – – – – – –	STORM BELOW GRADE
– – – – – – – – – –	VENT ABOVE GRADE
- - - - - - - - - -	VENT BELOW GRADE
——— - ———	COLD WATER
– — – — – — – —	COLD WATER BELOW GRADE
——— - - ———	HOT WATER
– — – — – — – —	HOT WATER BELOW GRADE
——— - - - ———	RECIRC WATER
– — – — – — – —	RECIRC WATER BELOW GRADE

PLUMBING PIPING LEGEND

	CIRCUIT SETTER
	BALL VALVE OR SHUT-OFF VALVE
	SPRING CHECK VALVE
	END CAP
	NEW TO EXISTING PIPE CONNECTION
	FLOW DIRECTION ARROW
	NEW TO EXISTING POINT OF CONNECTION SYMBOL
	PIPE CONNECTION
	HAMMER ARRESTOR (PISTON TYPE)
	HAMMER ARRESTOR (BELLOWS TYPE)
	PIPING LINEWEIGHT: NEW/DEMOLITION
	PIPING LINEWEIGHT: EXISTING

PLUMBING ABBREVIATIONS

AG	ABOVE GRADE	MAU	MAKE-UP AIR UNIT
ADD	ADDENDUM	MC	MECHANICAL CONTRACTOR
ADDL	ADDITIONAL	MECH	MECHANICAL
ADJ	ADJUSTABLE	MIN	MINIMUM
AFF	ABOVE FINISH FLOOR	NG	NATURAL GAS
AFG	ABOVE FINISH GRADE	NTS	NOT TO SCALE
ALT	ALTERNATE	NPCW	NON POTABLE COLD WATER
BG	BELOW GRADE	ORD	OVERFLOW ROOF DRAIN
CO	CLEANOUT	OS	OPEN SITE
COL	COLUMN	OSD	OVERFLOW STORM DRAIN
CW	COLD WATER	PC	PLUMBING CONTRACTOR
DN	DOWN	PLBG	PLUMBING
DS	DOWNSPOUT	PRES	PRESSURE
EC	ELECTRICAL CONTRACTOR	QTY	QUANTITY
ECO	EXTERIOR CLEANOUT	RD	ROOF DRAIN
EQ	EQUAL	RTU	ROOFTOP UNIT
FCO	FLOOR CLEANOUT	SAN	SANITARY
FD	FLOOR DRAIN	SCH	SCHEDULE
FLR	FLOOR	SD	STORM DRAIN
FS	FLOOR SINK	SPEC	SPECIFICATIONS
FT	FOOT (FEET)	SS	STAINLESS STEEL
F	FURNACE	TEMP	TEMPERATURE
GAL	GALLON	TYP	TYPICAL
GC	GENERAL CONTRACTOR	UR	URINAL
GPM	GALLONS PER MINUTE	V	VENT
GI	GREASE INTERCEPTOR	VTR	VENT THRU ROOF
GW	GREASE WASTE	W/	WITH
HW	HOT WATER	WCO	WALL CLEANOUT
HWR	HOT WATER RETURN	WC	WATER CLOSET

PLUMBING SHEET INDEX

P000	PLUMBING TITLE SHEET
P101	PLUMBING PLAN – BELOW GRADE – AREA A
P102	PLUMBING PLAN – BELOW GRADE – AREA B
P110	PLUMBING PLAN – ABOVE GRADE – AREA A
P111	PLUMBING PLAN – ABOVE GRADE – AREA B
P201	PLUMBING ROOF PLAN
P301	PLUMBING ISOMETRIC – WASTE & VENT
P302	PLUMBING ISOMETRIC – DOMESTIC WATER
P501	PLUMBING DETAILS
P601	PLUMBING SCHEDULES

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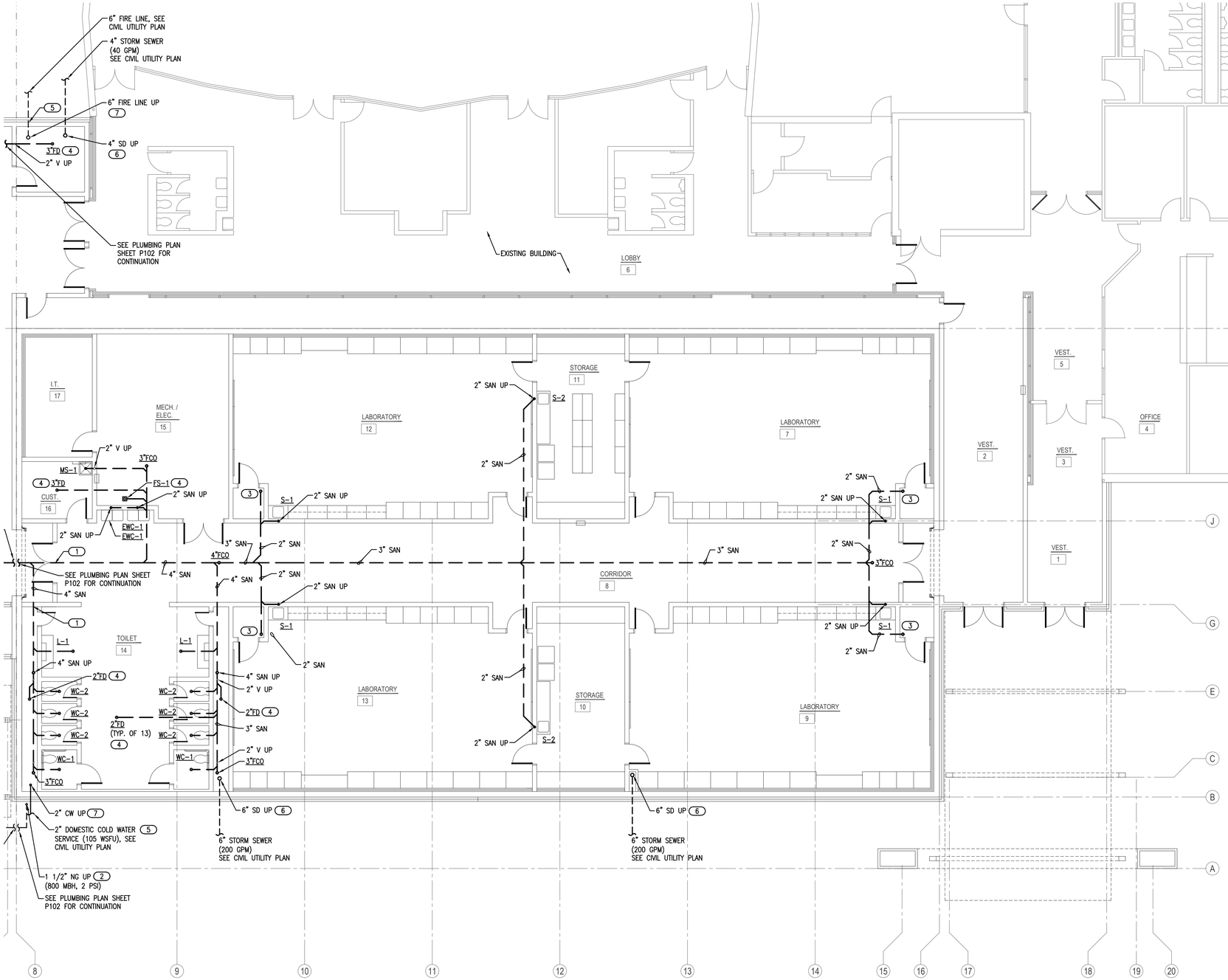


1 PLUMBING PLAN - BELOW GRADE - AREA A

SCALE: 1/8" = 1'-0"

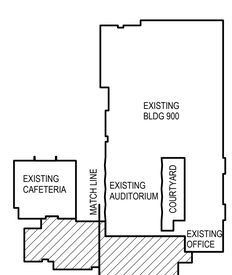
NORTH

GENERAL NOTES

1. COORDINATE WORK WITH ALL OTHER TRADES ON SITE.
2. COORDINATE ALL BELOW GRADE PIPE ROUTING WITH STRUCTURAL FOUNDATIONS AND REQUIRED PIPE SLEEVES THRU FOUNDATION PENETRATIONS.
3. FIELD VERIFY EXISTING CONDITIONS PRIOR TO COMMENCING WORK.
4. PRIOR TO COMMENCING WORK, COORDINATE WITH SITE CONTRACTOR FOR SANITARY SEWER AND WATER INVERT ELEVATIONS.
5. REFER TO PLUMBING FIXTURE SCHEDULE ON SHEET P601 FOR FIXTURE ROUGH-IN PIPE SIZES AND ISOMETRIC SHEET P301.
6. PIPE TRENCHES SHALL HAVE SAND BEDDING TO A MINIMUM POINT 6" ABOVE THE TOP OF PIPE. REFER TO SPECIFICATIONS.
7. INSTALL BELOW FLOOR 1/2" CW LINE TYPE K COPPER OR PEX-a FOR TRAP PRIMER TO FLOOR DRAINS. SLOPE LINE CONTINUOUSLY TOWARDS DRAIN. SEE DETAIL 1/P501.
8. INSTALL CAUTION TAPE AND TRACER WIRE ABOVE ALL NON-METALLIC GAS PIPING.

KEYED NOTES

1. PROVIDE CAST IRON PIPE SLEEVE FOR SANITARY PIPE BELOW OR THRU GRADE BEAM. INSTALL FOAM SPACER BLOCKS TO MAINTAIN PIPE IN CENTER OF SLEEVE. COORDINATE PIPE SLEEVE INSTALLATION WITH STRUCTURAL.
2. PROVIDE ANODELESS GAS RISER FOR TRANSITION FROM BELOW GRADE MDPE TUBING TO ABOVE GRADE BLACK IRON PIPE. COORDINATE GAS PIPE INSTALLATION WITH SITE CONTRACTOR.
3. ROUTE 2" SANITARY LINE UP TO 2" AFF AND INSTALL 2x4 FITTING FOR HUB DRAIN. COORDINATE INSTALLATION WITH MC. ROUTE TRAP PRIMER LINE TO HUB DRAIN. MC TO ROUTE FURNACE CONDENSATE DRAIN LINES TO HUB DRAIN. SEE DETAIL 11/P501.
4. INSTALL BELOW FLOOR 1/2" CW LINE TYPE K COPPER OR PEX-a FOR TRAP PRIMER TO FLOOR DRAIN. SLOPE LINE CONTINUOUSLY TOWARDS DRAIN. SEE DETAIL 1/P501.
5. PROVIDE PVC PIPE SLEEVE FOR WATER LINE BELOW OR THRU FOUNDATION WALL. INSTALL FOAM PIPE INSULATION ON WATER LINE IN SLEEVE AND SEAL SLEEVE OPENINGS WATERTIGHT. COORDINATE PIPE SLEEVE INSTALLATION WITH STRUCTURAL.
6. PROVIDE CAST IRON PIPE SLEEVE FOR STORM PIPE BELOW OR THRU GRADE BEAM. INSTALL FOAM SPACER BLOCKS TO MAINTAIN PIPE IN CENTER OF SLEEVE. COORDINATE PIPE SLEEVE INSTALLATION WITH STRUCTURAL.
7. PROVIDE PVC PIPE SLEEVE THRU CONCRETE FLOOR AND STUB UP 2" AFF FOR WATER LINE. INSTALL FOAM PIPE INSULATION ON WATER LINE IN SLEEVE AND SEAL SLEEVE OPENINGS WATERTIGHT. COORDINATE PIPE SLEEVE INSTALLATION WITH STRUCTURAL.



KEYPLAN

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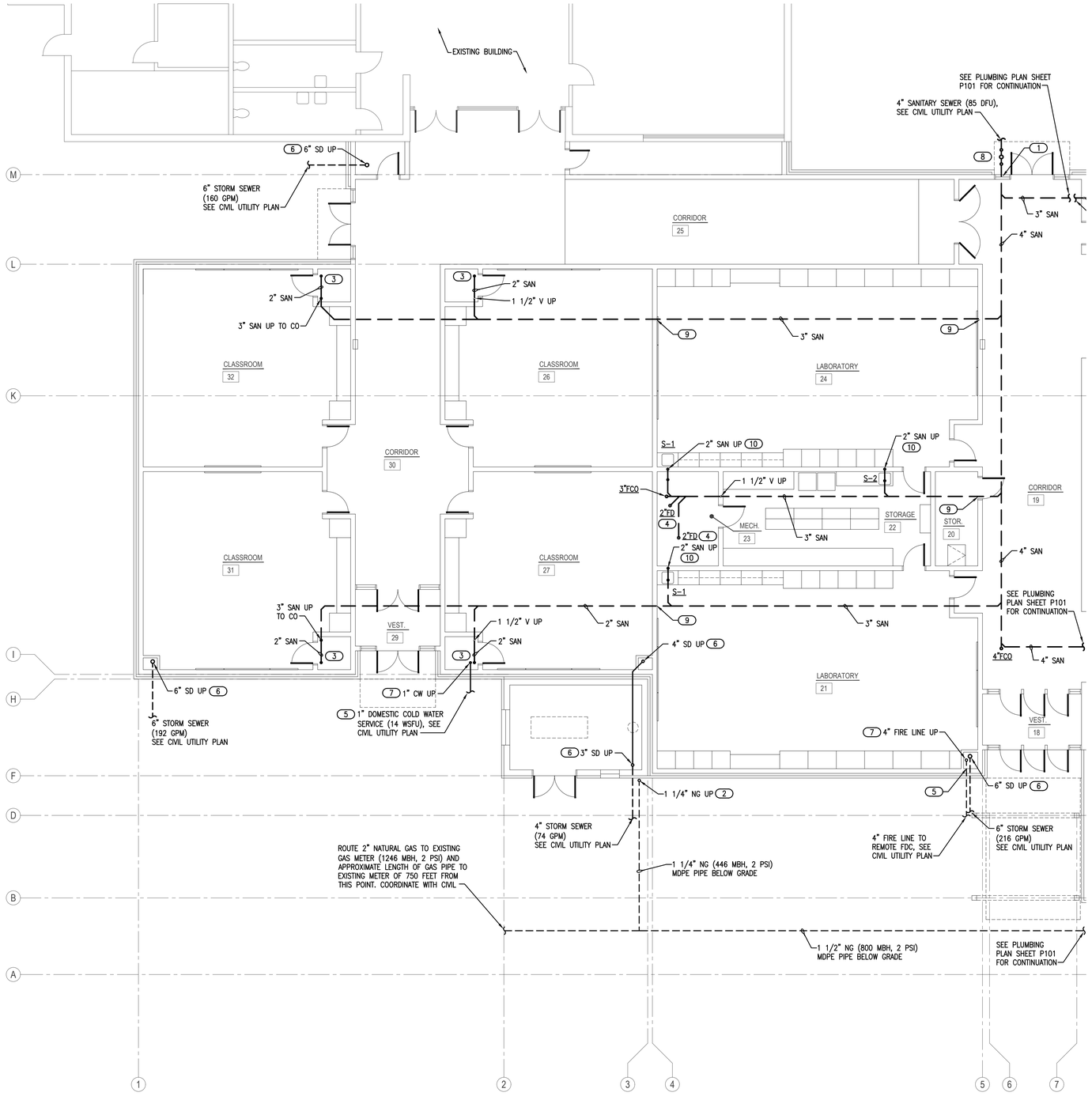


1 PLUMBING PLAN - BELOW GRADE - AREA B

SCALE: 1/8" = 1'-0"

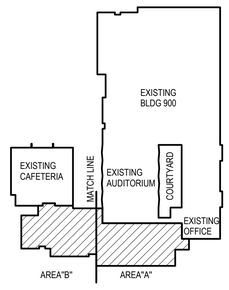
NORTH

GENERAL NOTES

1. COORDINATE WORK WITH ALL OTHER TRADES ON SITE.
2. COORDINATE ALL BELOW GRADE PIPE ROUTING WITH STRUCTURAL FOUNDATIONS AND REQUIRED PIPE SLEEVES THRU FOUNDATION PENETRATIONS.
3. FIELD VERIFY EXISTING CONDITIONS PRIOR TO COMMENCING WORK.
4. PRIOR TO COMMENCING WORK, COORDINATE WITH SITE CONTRACTOR FOR SANITARY SEWER AND WATER INVERT ELEVATIONS.
5. REFER TO PLUMBING FIXTURE SCHEDULE ON SHEET P601 FOR FIXTURE ROUGH-IN PIPE SIZES AND ISOMETRIC SHEET P301.
6. PIPE TRENCHES SHALL HAVE SAND BEDDING TO A MINIMUM POINT 6" ABOVE THE TOP OF PIPE. REFER TO SPECIFICATIONS.
7. INSTALL BELOW FLOOR 1/2" CW LINE TYPE K COPPER OR PEX-a FOR TRAP PRIMER TO FLOOR DRAINS. SLOPE LINE CONTINUOUSLY TOWARDS DRAIN. SEE DETAIL 1/P501.
8. INSTALL CAUTION TAPE AND TRACER WIRE ABOVE ALL NON-METALLIC GAS PIPING.

KEYED NOTES

1. PROVIDE CAST IRON PIPE SLEEVE FOR SANITARY PIPE BELOW GRADE BEAM. INSTALL FOAM SPACER BLOCKS TO MAINTAIN PIPE IN CENTER OF SLEEVE. COORDINATE PIPE SLEEVE INSTALLATION WITH STRUCTURAL.
2. PROVIDE ANODELESS GAS RISER FOR TRANSITION FROM BELOW GRADE MDPE TUBING TO ABOVE GRADE BLACK IRON PIPE. COORDINATE GAS PIPE INSTALLATION WITH SITE CONTRACTOR.
3. ROUTE 2" SANITARY LINE UP TO 2" AFF AND INSTALL 2x4 FITTING FOR HUB DRAIN. COORDINATE INSTALLATION WITH MC. ROUTE TRAP PRIMER LINE TO HUB DRAIN. MC TO ROUTE FURNACE CONDENSATE DRAIN LINES TO HUB DRAIN. SEE DETAIL 11/P501.
4. INSTALL ABOVE FLOOR 1/2" CW LINE TYPE K COPPER OR PEX-a FOR TRAP PRIMER TO FLOOR DRAINS. SLOPE LINE CONTINUOUSLY TOWARDS DRAIN. SEE DETAIL 1/P501.
5. PROVIDE PVC PIPE SLEEVE FOR WATER LINE BELOW OR THRU FOUNDATION WALL. INSTALL FOAM PIPE INSULATION ON WATER LINE IN SLEEVE AND SEAL SLEEVE OPENINGS WATERTIGHT. COORDINATE PIPE SLEEVE INSTALLATION WITH STRUCTURAL.
6. PROVIDE CAST IRON PIPE SLEEVE FOR STORM PIPE BELOW OR THRU GRADE BEAM. INSTALL FOAM SPACER BLOCKS TO MAINTAIN PIPE IN CENTER OF SLEEVE. COORDINATE PIPE SLEEVE INSTALLATION WITH STRUCTURAL.
7. PROVIDE PVC PIPE SLEEVE THRU CONCRETE FLOOR AND STUB UP 2" AFF FOR WATER LINE. INSTALL FOAM PIPE INSULATION ON WATER LINE IN SLEEVE AND SEAL SLEEVE OPENINGS WATERTIGHT. COORDINATE PIPE SLEEVE INSTALLATION WITH STRUCTURAL.
8. INSTALL 4" SANITARY BACKWATER VALVE AND 4" EXTERIOR CLEANOUTS. PROVIDE CONCRETE PAD AT GRADE. SEE DETAIL 4/P501.
9. PROVIDE CAST IRON PIPE SLEEVE FOR SANITARY PIPE THRU OR BELOW GRADE BEAM. INSTALL FOAM SPACER BLOCKS TO MAINTAIN PIPE IN CENTER OF SLEEVE. COORDINATE PIPE SLEEVE INSTALLATION WITH STRUCTURAL.
10. COORDINATE WITH STRUCTURAL FOR ROUTING 2" SANITARY PIPE TO ABOVE GRADE BEAM, BELOW FINISHED FLOOR AND UP IN WALL ABOVE.



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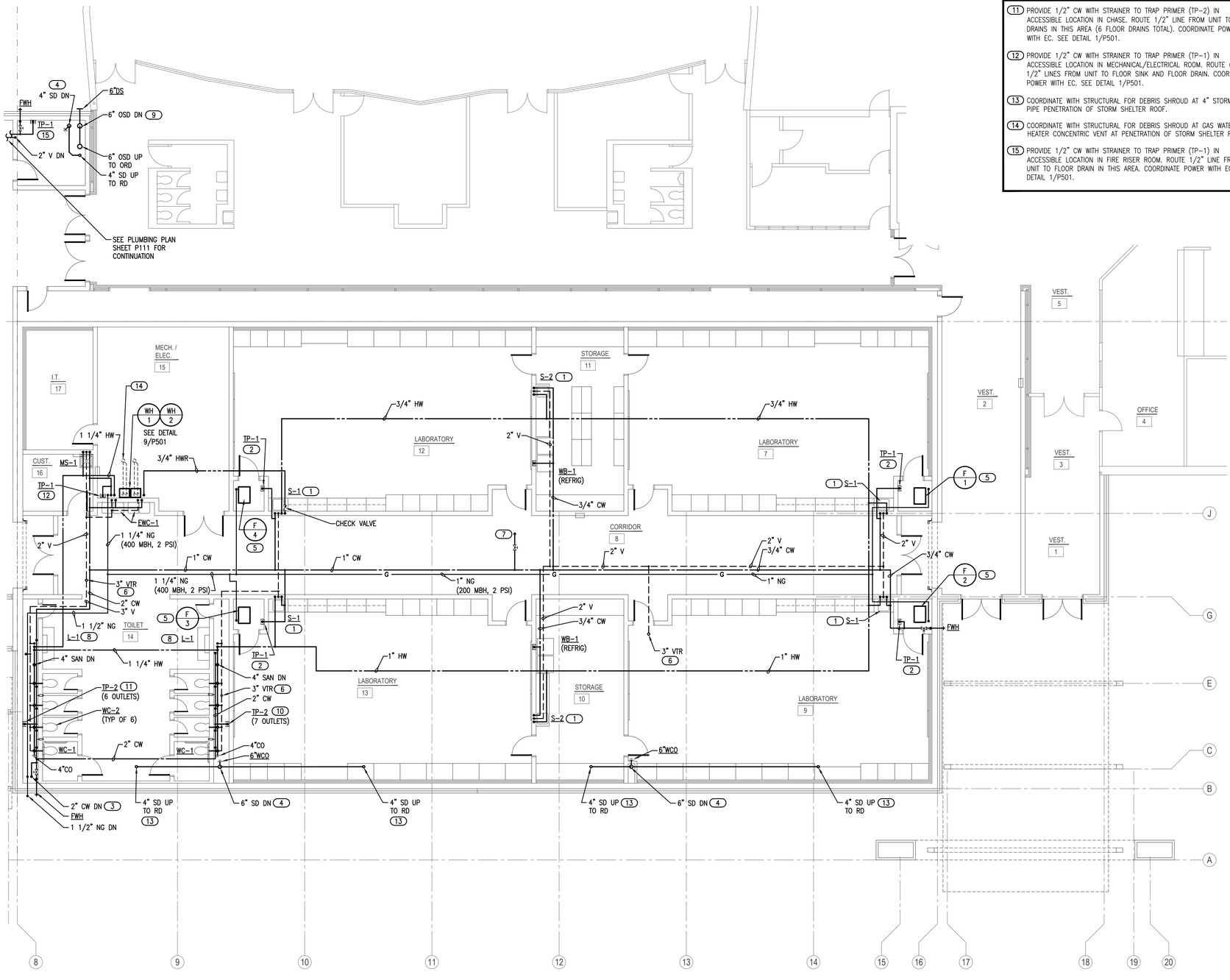


KEYED NOTES

(11) PROVIDE 1/2" CW WITH STRAINER TO TRAP PRIMER (TP-2) IN ACCESSIBLE LOCATION IN CHASE. ROUTE 1/2" LINE FROM UNIT TO FLOOR DRAINS IN THIS AREA (6 FLOOR DRAINS TOTAL). COORDINATE POWER WITH EC. SEE DETAIL 1/P501.

(12) PROVIDE 1/2" CW WITH STRAINER TO TRAP PRIMER (TP-1) IN ACCESSIBLE LOCATION IN MECHANICAL/ELECTRICAL ROOM. ROUTE (2) 1/2" LINES FROM UNIT TO FLOOR SINK AND FLOOR DRAIN. COORDINATE POWER WITH EC. SEE DETAIL 1/P501.

(13) COORDINATE WITH STRUCTURAL FOR DEBRIS SHROUD AT 4" STORM DRAIN PIPE PENETRATION OF STORM SHELTER ROOF.

(14) COORDINATE WITH STRUCTURAL FOR DEBRIS SHROUD AT GAS WATER HEATER CONCENTRIC VENT AT PENETRATION OF STORM SHELTER ROOF.

(15) PROVIDE 1/2" CW WITH STRAINER TO TRAP PRIMER (TP-1) IN ACCESSIBLE LOCATION IN FIRE RISER ROOM. ROUTE 1/2" LINE FROM UNIT TO FLOOR DRAIN IN THIS AREA. COORDINATE POWER WITH EC. SEE DETAIL 1/P501.

GENERAL NOTES

1. COORDINATE WORK WITH ALL OTHER TRADES ON SITE.
2. PROVIDE WATER HAMMER ARRESTORS (HA) ON WATER LINES TO FLUSH VALVES, SENSOR FAUCETS AND QUICK CLOSING VALVES. LOCATE UNITS IN ACCESSIBLE LOCATIONS.
3. SINK AND LAVATORY WATER SUPPLY STUB OUTS SHALL BE COPPER PIPE WITH SUPPORT BRACKET FASTENED IN WALL CAVITY.
4. FIRE SEAL ALL PENETRATIONS THRU RATED STRUCTURES TO MAINTAIN FIRE RATING.
5. REFER TO PLUMBING FIXTURE SCHEDULE ON SHEET P601 FOR FIXTURE ROUGH-IN PIPE SIZES AND ISOMETRIC SHEETS P301 AND P302.
6. PROVIDE ACCESS PANELS FOR ALL VALVES/DEVICES ABOVE HARD CEILINGS AND BEHIND WALLS.
7. ALL GAS PIPE SHALL COMPLY WITH IFGC. BRANCH LINES SHALL TAP OFF TOP OF GAS MAINS AND INSTALL SHUT-OFF VALVE ON BRANCH LINE.
8. TRAP PRIMER LINES SHALL BE COPPER TYPE "K" OR PEX-a TUBING WITH CONTINUOUS SLOPE TOWARDS DRAIN CONNECTION.
9. COORDINATE HEIGHT OF EXTERIOR FREEZELESS WALL HYDRANT (FWH) WITH GC AND/OR ARCHITECT. SEAL FIXTURE FLANGE WATERTIGHT.
10. INSULATE STORM DRAIN AND SLOPE DOWN AT 1/8" PER FOOT.
11. CONTRACTOR SHALL COORDINATE ALL SAFEROOM SHELTER PENETRATIONS WITH STRUCTURAL. REFER TO STRUCTURAL DETAIL SHEET FOR PENETRATION PROTECTION FOR RECTANGULAR OPENINGS GREATER THAN 3.5 SQUARE INCHES AND CIRCULAR OPENINGS GREATER THAN 2.125 INCHES PER 2014 ICC-500.

KEYED NOTES

(1) INSTALL THERMOSTATIC MIXING VALVE (TMV-1) BELOW SINK. LABORATORY SINKS SEE DETAIL 8/P501. STORAGE ROOM SINKS SEE DETAIL 5/P501.

(2) PROVIDE 1/2" CW WITH STRAINER TO TRAP PRIMER (TP-1) IN ACCESSIBLE LOCATION IN FURNACE CLOSET. ROUTE 1/2" LINE FROM UNIT TO HUB DRAIN. COORDINATE POWER WITH EC. SEE DETAILS 1/P501 AND 11/P501.

(3) ROUTE DOMESTIC WATER SERVICE DOWN WITH PRV-1 AND BALL VALVE AT 24" A.F.F. AND ROUTE DOWN TO BELOW FLOOR. SEE SHEET P101 FOR CONTINUATION.

(4) COORDINATE CHASE SIZE WITH GC FOR STORM DRAIN PIPE DOWN TO BELOW FLOOR. INSTALL WALL CLEANOUT AT MINIMUM 20" AFF. SEE SHEET P101 FOR CONTINUATION.

(5) ROUTE 3/4" NATURAL GAS (2 PSI) LINE TO FURNACE. PROVIDE BALL VALVE, DRIP LEG, PRESSURE REGULATOR AND FINAL UNIT CONNECTION. COORDINATE CONNECTION WITH MC. SEE DETAIL 7/P501.

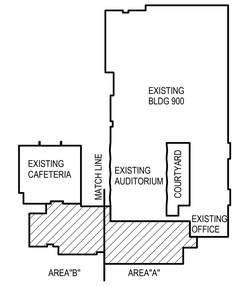
(6) COORDINATE WITH STRUCTURAL FOR DEBRIS SHROUD AT PLUMBING VENT PENETRATION OF STORM SHELTER ROOF.

(7) PROVIDE 3/4" CW WITH BALL VALVE TO CONNECTION FOR ROOF HYDRANT (FRH). COORDINATE WITH STRUCTURAL FOR DEBRIS SHROUD AT ROOF PENETRATION.

(8) PROVIDE 1/2" CW BRANCH LINE IN CHASE TO SERVE LAVATORY. ROUTE 1 1/4" HW DOWN IN CHASE AND BACK UP TO CEILING. CONNECT 1/2" HW TO LAVATORY. INSTALL THERMOSTATIC MIXING VALVE (TMV-1) BELOW FIXTURE. SEE DETAIL 6/P501.

(9) COORDINATE WITH GC FOR LOCATION OF OVERFLOW STORM DRAIN PIPE. INSTALL FLOOR PIPE SUPPORT FOR ELBOW NEAR FLOOR. INSTALL BOTTOM OF DOWNSPOUT NOZZLE AT 12" ABOVE GRADE. COORDINATE HEIGHT WITH GC.

(10) PROVIDE 1/2" CW WITH STRAINER TO TRAP PRIMER (TP-2) IN ACCESSIBLE LOCATION IN CHASE. ROUTE 1/2" LINES FROM UNIT TO FLOOR DRAINS IN THIS AREA (7 FLOOR DRAINS TOTAL). COORDINATE POWER WITH EC. SEE DETAIL 1/P501.



KEYPLAN
NO SCALE

1 PLUMBING PLAN - ABOVE GRADE - AREA A
SCALE: 1/8" = 1'-0"

NORTH

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MECHANICAL / ELECTRICAL

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Moore, OK 73160
Salas O'Brien Registration: CA# 7058
Expiration Date : 6/30/2025
Salas O'Brien Project Number: 2550-00564-00

KS
drawn by

KP
checked by

APRIL 2025
date

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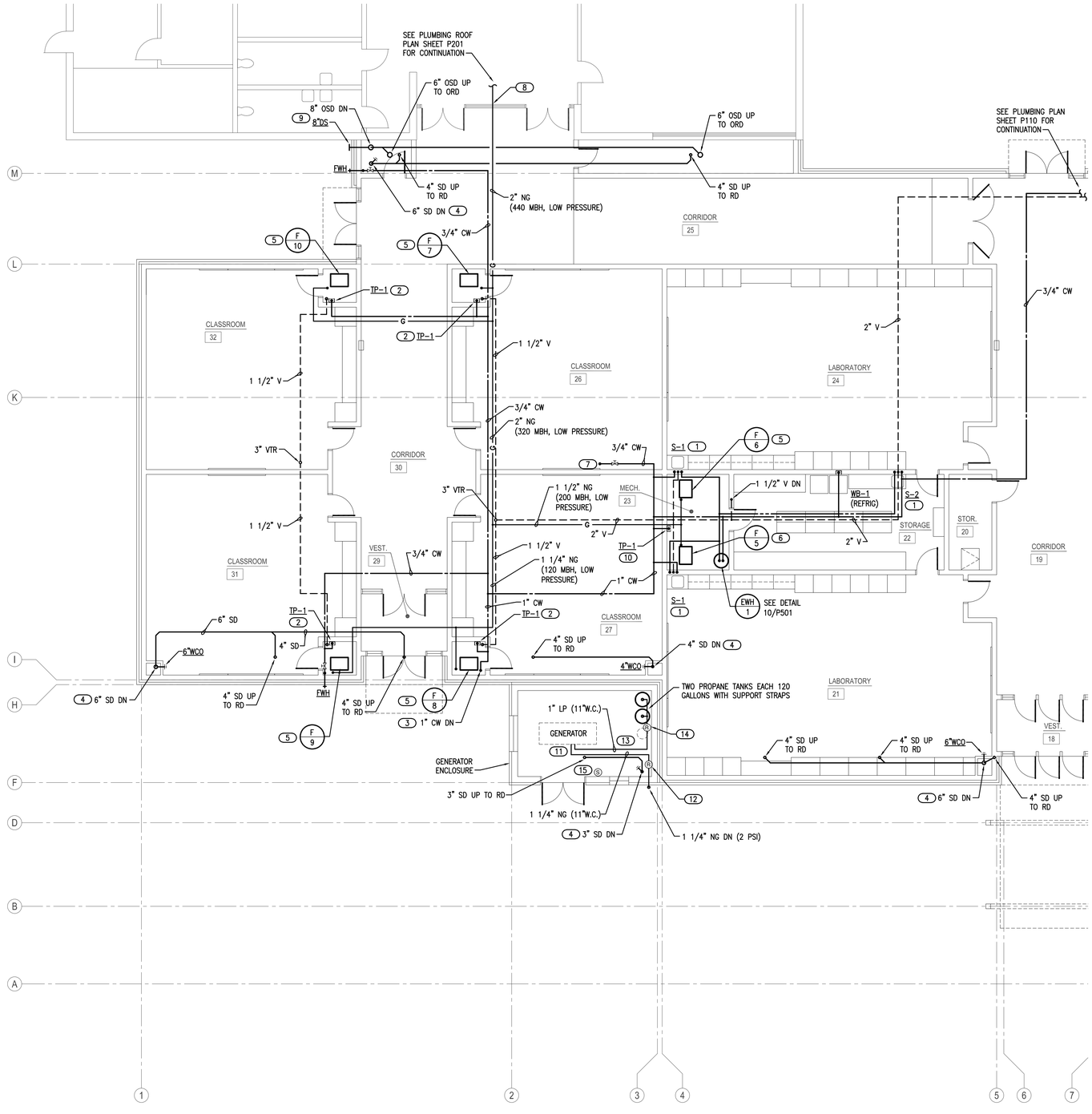


1 PLUMBING PLAN - ABOVE GRADE - AREA B

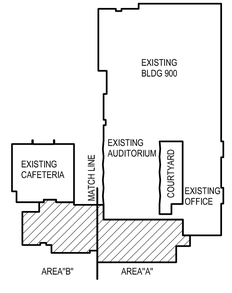
SCALE: 1/8" = 1'-0"

GENERAL NOTES

1. COORDINATE WORK WITH ALL OTHER TRADES ON SITE.
2. CONTRACTOR SHALL COORDINATE ALL SAFEROOM SHELTER PENETRATIONS WITH STRUCTURAL. REFER TO STRUCTURAL DETAIL SHEET FOR PENETRATION PROTECTION FOR RECTANGULAR OPENINGS GREATER THAN 3.5 SQUARE INCHES AND CIRCULAR OPENINGS GREATER THAN 2.125 INCHES PER 2014 ICC-500.
3. SINK AND LAVATORY WATER SUPPLY STUB OUTS SHALL BE COPPER PIPE WITH SUPPORT BRACKET FASTENED IN WALL CAVITY.
4. FIRE SEAL ALL PENETRATIONS THRU RATED STRUCTURES TO MAINTAIN FIRE RATING.
5. REFER TO PLUMBING FIXTURE SCHEDULE ON SHEET P601 FOR FIXTURE ROUGH-IN PIPE SIZES AND ISOMETRIC SHEETS P.301 AND P.302.
6. PROVIDE ACCESS PANELS FOR ALL VALVES/DEVICES ABOVE HARD CEILINGS AND BEHIND WALLS.
7. ALL GAS PIPE SHALL COMPLY WITH IFGC. BRANCH LINES SHALL TAP OFF TOP OF GAS MAINS AND INSTALL SHUT-OFF VALVE ON BRANCH LINE.
8. TRAP PRIMER LINES SHALL BE COPPER TYPE "K" OR PEX-a TUBING WITH CONTINUOUS SLOPE TOWARDS DRAIN CONNECTION.
9. COORDINATE HEIGHT OF EXTERIOR FREEZELESS WALL HYDRANT (FWH) WITH GC AND/OR ARCHITECT. SEAL FIXTURE FLANGE WATERTIGHT.
10. INSULATE STORM DRAIN AND SLOPE DOWN AT 1/8" PER FOOT.

KEYED NOTES

1. INSTALL THERMOSTATIC MIXING VALVE (TMV-1) BELOW SINK. LABORATORY SINKS SEE DETAIL 8/P501. STORAGE ROOM SINKS SEE DETAIL 5/P501.
2. PROVIDE 1/2" CW WITH STRAINER TO TRAP PRIMER (TP-1) IN ACCESSIBLE LOCATION IN FURNACE CLOSET. ROUTE 1/2" LINE FROM UNIT TO HUB DRAIN. COORDINATE POWER WITH EC. SEE DETAILS 1/P501 AND 11/P501.
3. ROUTE DOMESTIC WATER SERVICE DOWN WITH PRV-2 AND BALL VALVE AT 24" A.F.F. AND ROUTE DOWN TO BELOW FLOOR. SEE SHEET P102 FOR CONTINUATION.
4. COORDINATE CHASE SIZE WITH GC FOR STORM DRAIN PIPE DOWN TO BELOW FLOOR. INSTALL WALL CLEANOUT AT MINIMUM 20" AFF. SEE SHEET P102 FOR CONTINUATION.
5. ROUTE 1" NATURAL GAS (LOW PRESSURE) LINE TO FURNACE. PROVIDE BALL VALVE, DRIP LEG, AND FINAL UNIT CONNECTION. COORDINATE CONNECTION WITH MC. SEE DETAIL 7/P501.
6. ROUTE 1 1/4" NATURAL GAS (LOW PRESSURE) LINE TO FURNACE. PROVIDE BALL VALVE, DRIP LEG, AND FINAL UNIT CONNECTION. COORDINATE CONNECTION WITH MC. SEE DETAIL 7/P501.
7. PROVIDE 3/4" CW WITH BALL VALVE TO CONNECTION FOR ROOF HYDRANT (FRH). COORDINATE WITH STRUCTURAL FOR INSTALLATION.
8. ROUTE 2" NATURAL GAS LINE (440 MBH, LOW PRESSURE) FROM EXISTING ROOF INTO NEW ADDITION. COORDINATE WITH GC AND STRUCTURAL FOR PENETRATION OF NATURAL GAS LINE THRU WALL.
9. COORDINATE CHASE SIZE WITH GC FOR STORM DRAIN PIPE. INSTALL FLOOR PIPE SUPPORT FOR ELBOW. INSTALL BOTTOM OF DOWNSPOUT NOZZLE AT 12" ABOVE GRADE. COORDINATE HEIGHT WITH GC.
10. PROVIDE 1/2" CW WITH STRAINER TO TRAP PRIMER (TP-1) IN ACCESSIBLE LOCATION IN MECHANICAL ROOM. ROUTE 1/2" LINE FROM UNIT TO FLOOR SINK IN THIS AREA. COORDINATE POWER WITH EC. SEE DETAIL 1/P501.
11. DUAL FUEL (NATURAL GAS & PROPANE) GENERATOR BY EC. ROUGH-IN AND MAKE FINAL GAS CONNECTIONS PER MANUFACTURER'S RECOMMENDATIONS.
12. 1 1/4" NG (2 PSI) WITH BALL VALVE, DRIP LEG, PRESSURE REGULATOR AND 1 1/4" NG (446 MBH, 11" W.C. PRESSURE) PIPE TO GENERATOR.
13. PROVIDE FLOOR MOUNTED PIPE SUPPORTS FOR NATURAL GAS AND PROPANE PIPES.
14. 1/2" PROPANE FROM TANKS TO 2-STAGE REGULATOR WITH 11" WATER COLUMN PRESSURE OUT (477.5 MBH). ROUTE REGULATOR VENT TO ROOF PER CODE. EMERSON FISHER REGULATOR MODEL R232A OR EQUAL.
15. INSTALL PROPANE GAS SENSOR (PGS-1) AT 4'-0" AFF AND INTERLOCK WITH RELAY PANEL, EXTERIOR ALARM BEACON MOUNTED TO RIGHT OF DOOR, SHUT-OFF BUTTON INSIDE OF DOOR AND 1" PROPANE GAS SOLENOID VALVE. COORDINATE WITH EC FOR 120V POWER TO RELAY, SENSOR AND SOLENOID VALVE.



KEYPLAN

NO SCALE

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PROFESSIONAL ENGINEER Wayne Donald Reynolds OKLAHOMA 30822 12/15/25

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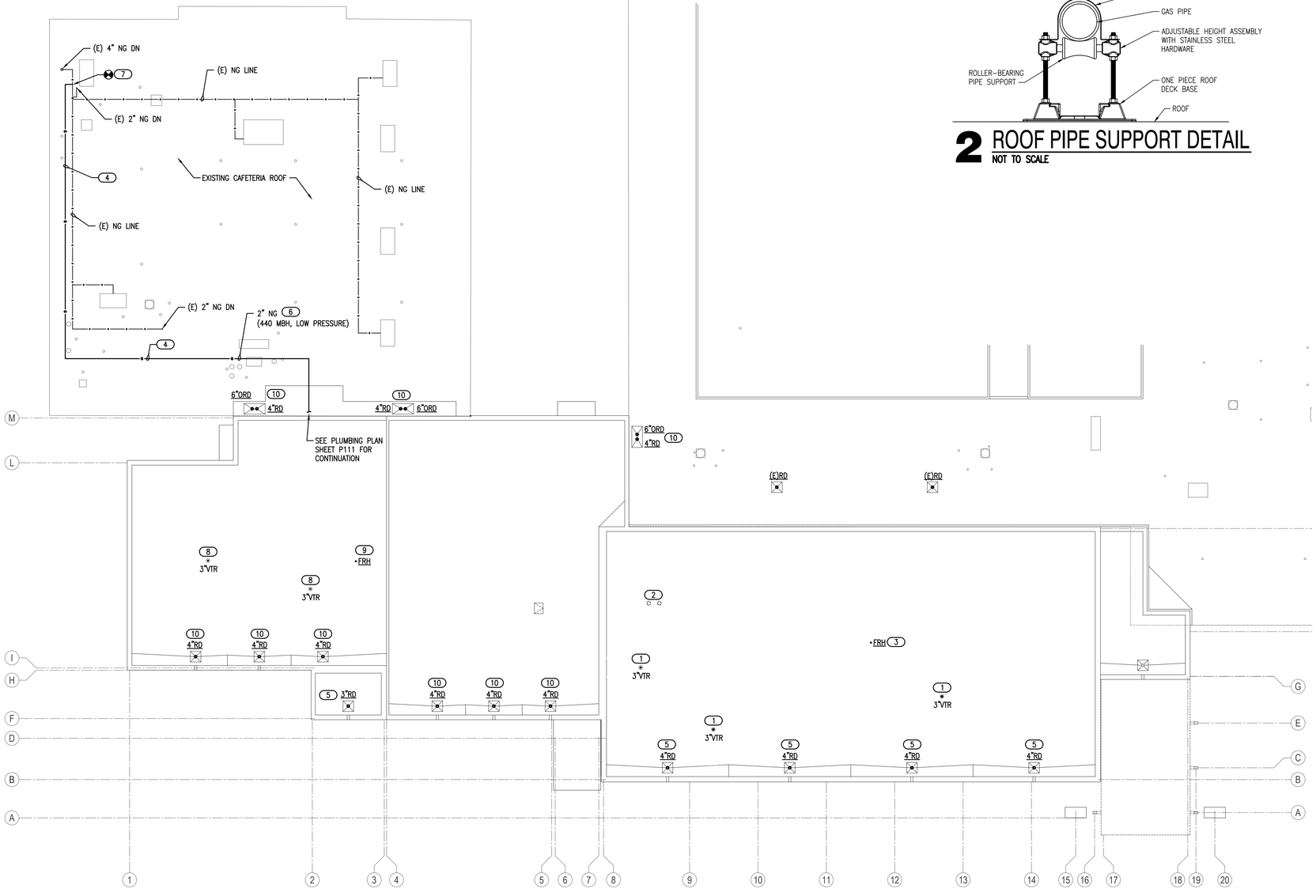
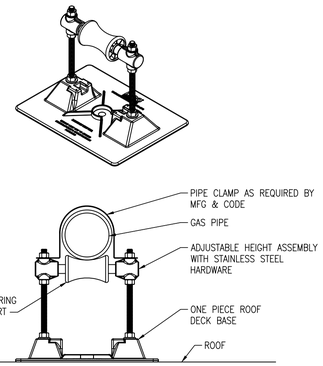


1 PLUMBING ROOF PLAN

SCALE: 1/16" = 1'-0"

NORTH



2 ROOF PIPE SUPPORT DETAIL

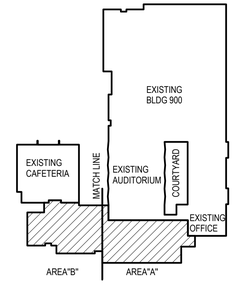
NOT TO SCALE

GENERAL NOTES

1. COORDINATE WITH WITH ALL OTHER TRADES ON SITE.
2. FIELD VERIFY EXISTING CONDITIONS PRIOR TO COMMENCING WORK.
3. MAINTAIN A MINIMUM OF 10'-0" CLEAR BETWEEN EXHAUST AND INTAKE VENTS WITH MECHANICAL EQUIPMENT AND OTHER ROOF OPENINGS.
4. ALL ABOVE GRADE EXTERIOR NATURAL GAS PIPE SHALL BE CLEANED AND DEGREASED PRIOR TO BEING PRIMED THEN PAINTED YELLOW WITH WEATHER RESISTANT ZINC RICH PAINT.
5. PIPE IDENTIFICATION SHALL BE THE WORDS "NATURAL GAS" IN BLACK LETTERS AT 5 FOOT INTERVALS USING PLASTIC PIPE MARKERS OR STENCILED PAINTED LETTERS.
6. ALL GAS PIPE SHALL COMPLY WITH IFGC. BRANCH LINES SHALL TAP OFF TOP OF GAS MAINS AND INSTALL SHUT-OFF VALVE ON BRANCH LINE.
7. CONTRACTOR SHALL COORDINATE ALL SAFEROOM SHELTER PENETRATIONS WITH STRUCTURAL. REFER TO STRUCTURAL DETAIL SHEET FOR PENETRATION PROTECTION FOR RECTANGULAR OPENINGS GREATER THAN 3.5 SQUARE INCHES AND CIRCULAR OPENINGS GREATER THAN 2.125 INCHES PER 2014 ICC-500

KEYED NOTES

1. COORDINATE INSTALLATION OF PLUMBING VENTS WITH ROOFING CONTRACTOR. INSTALL VENT A MINIMUM 10'-0" FROM ANY OPENINGS, EQUIPMENT, INTAKES OR EXHAUST VENTS. COORDINATE WITH STRUCTURAL FOR DEBRIS SHROUD BELOW PENETRATION OF STORM SHELTER ROOF.
2. COORDINATE INSTALLATION OF WATER HEATER CONCENTRIC VENT WITH ROOFING CONTRACTOR AND PER MANUFACTURER'S RECOMMENDATIONS. INSTALL VENT A MINIMUM OF 10'-0" FROM ANY OPENINGS, EQUIPMENT, INTAKES AND EXHAUST VENTS. COORDINATE WITH STRUCTURAL FOR DEBRIS SHROUD BELOW PENETRATION OF STORM SHELTER ROOF.
3. COORDINATE INSTALLATION OF FREEZELESS ROOF HYDRANT (FRH) WITH STRUCTURAL AND ROOFING CONTRACTOR. COORDINATE WITH STRUCTURAL FOR DEBRIS SHROUD BELOW PENETRATION OF STORM SHELTER ROOF.
4. INSTALL ROOF PIPE SUPPORTS FOR NATURAL GAS PIPE (LOW PRESSURE). PROVIDE MIRO INDUSTRIES MODEL 3-RAH-8 ROOF TOP SUPPORTS OR APPROVED EQUAL. INSTALL AT MAXIMUM OF 10'-0" ON CENTER FOR 1 1/4" PIPE OR LARGER. REFER TO GENERAL NOTES FOR PAINTING GAS PIPE. SEE DETAIL 2/P201.
5. COORDINATE WITH ROOFING CONTRACTOR AND STRUCTURAL FOR INSTALLATION OF ROOF DRAINS. COORDINATE WITH STRUCTURAL FOR DEBRIS SHROUD BELOW PENETRATION OF STORM SHELTER ROOF.
6. ROUTE NEW 2" NATURAL GAS LINE (440 MBH, LOW PRESSURE) ON EXISTING CAFETERIA ROOF.
7. FIELD VERIFY LOCATION OF EXISTING 4" NATURAL GAS MAIN ON CAFETERIA ROOF AND CONNECT NEW 2" NATURAL GAS LINE (440 MBH, LOW PRESSURE) WITH SHUT-OFF VALVE TO EXISTING. COORDINATE WITH GC.
8. COORDINATE INSTALLATION OF PLUMBING VENTS WITH ROOFING CONTRACTOR. INSTALL VENT A MINIMUM 10'-0" FROM ANY OPENINGS, EQUIPMENT, INTAKES OR EXHAUST VENTS.
9. COORDINATE INSTALLATION OF FREEZELESS ROOF HYDRANT (FRH) WITH STRUCTURAL AND ROOFING CONTRACTOR.
10. COORDINATE WITH ROOFING CONTRACTOR AND STRUCTURAL FOR INSTALLATION OF ROOF DRAINS.



KEYPLAN

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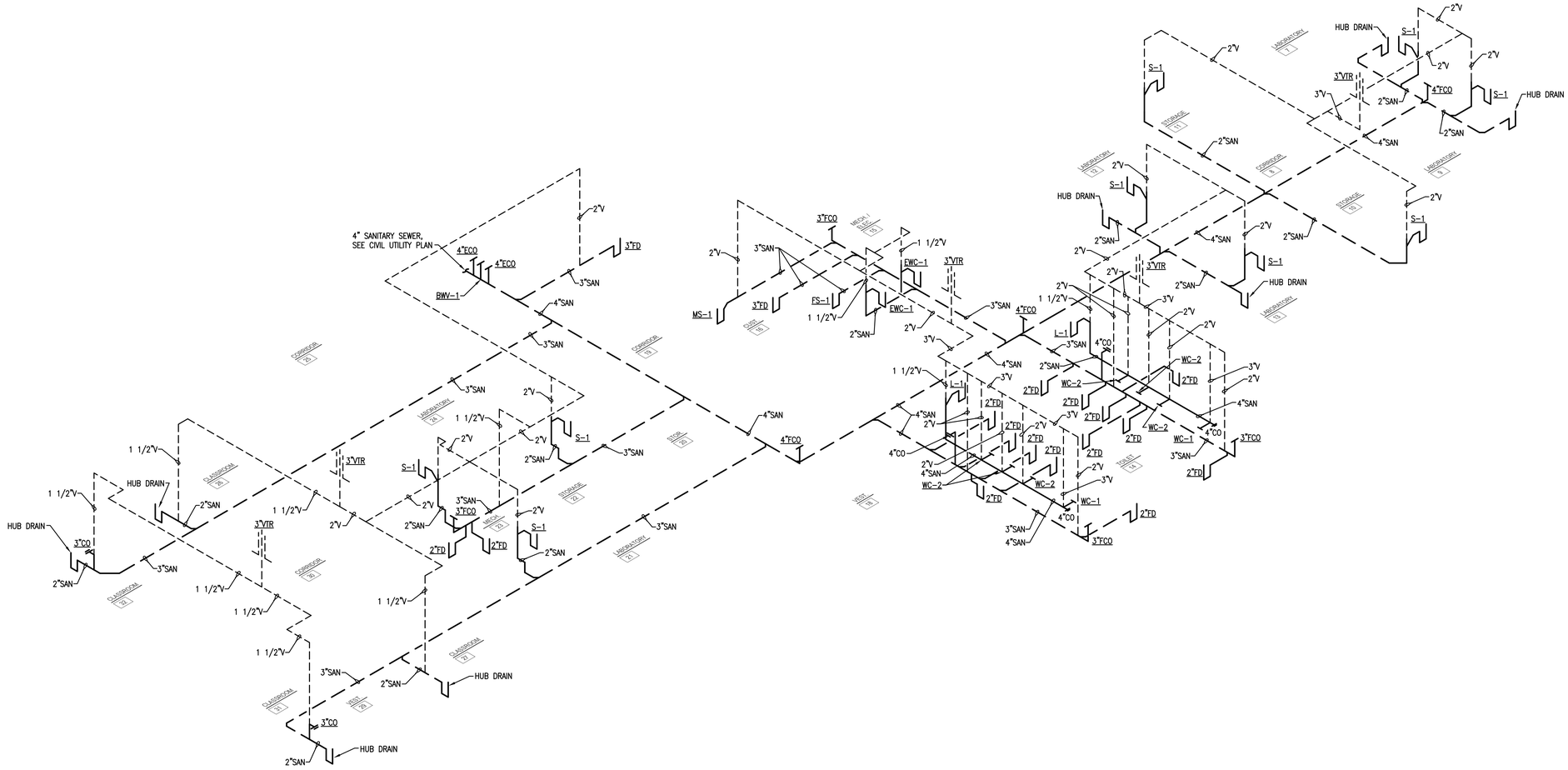
4" SANITARY SEWER, SEE CIVIL UTILITY PLAN
4"ECO
4"ECO
BWV-1
2"V
3"FD
3"SAN
4"SAN
3"SAN
CLASSROOM 15
CORRIDOR 15
3"SAN
2"V
LABORATORY 13
1 1/2"V
2"V
S-1
3"SAN
4"SAN
4"FCO
1 1/2"V
HUB DRAIN
CLASSROOM 16
3"VTR
2"SAN
1 1/2"V
2"V
CORRIDOR 16
HUB DRAIN
3"CO
2"SAN
3"SAN
CLASSROOM 17
1 1/2"V
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EWC-1
EWC-1
3"VTR
2"V
3"V
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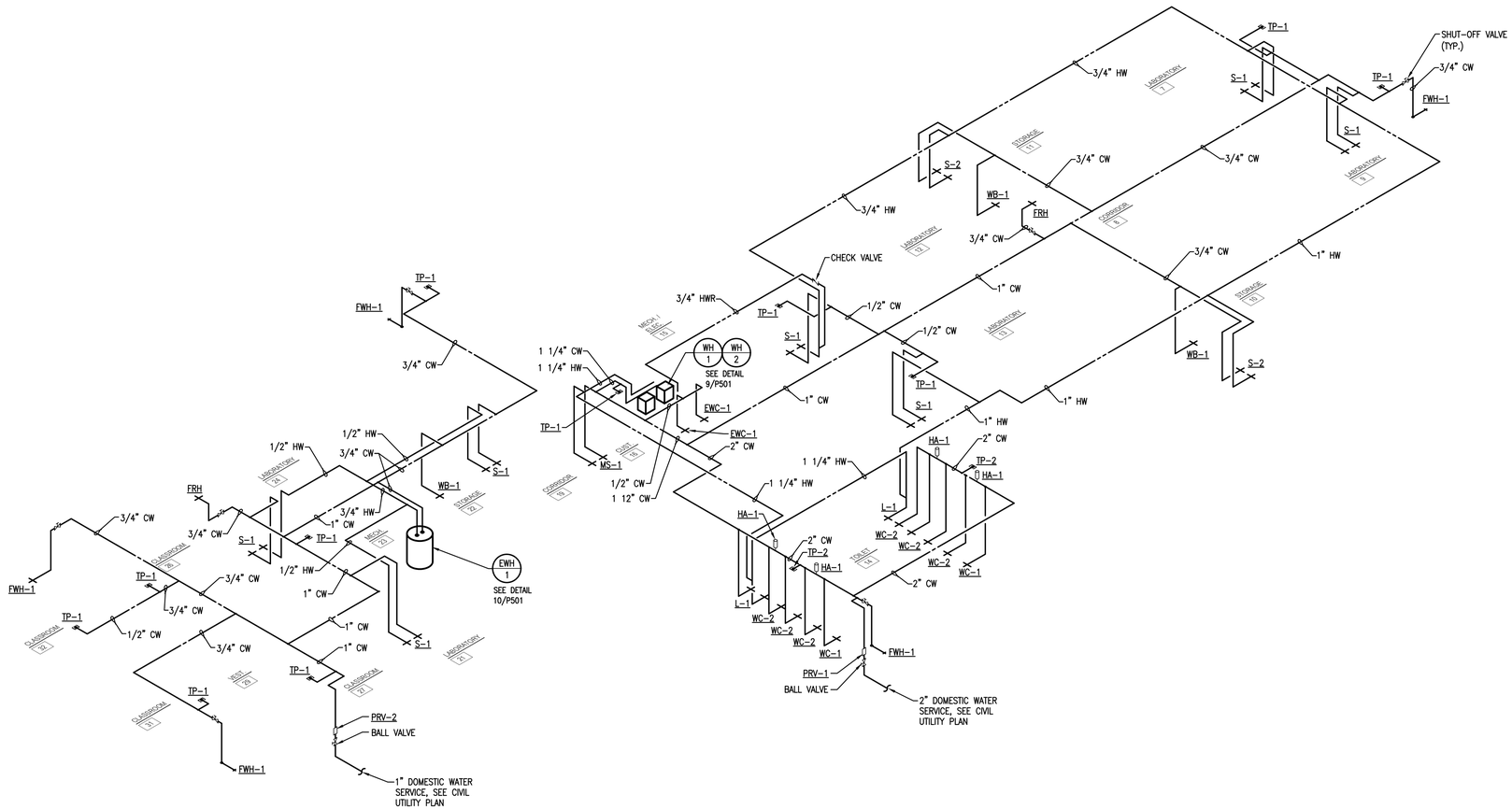

1 PLUMBING ISOMETRIC - DOMESTIC WATER

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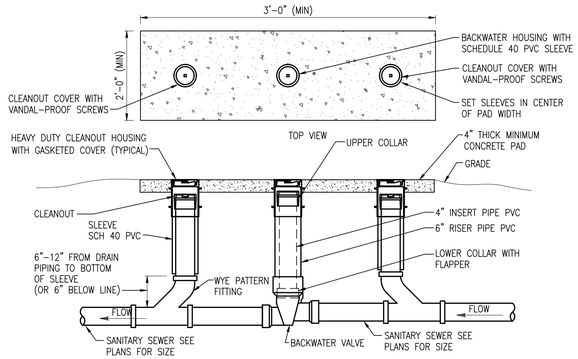

4 BACKWATER VALVE & EXTERIOR CLEANOUT DETAIL
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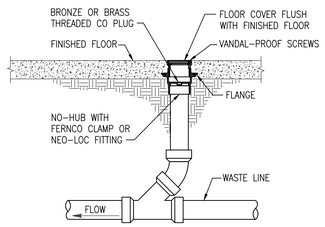
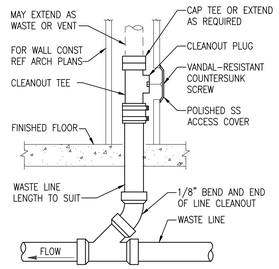
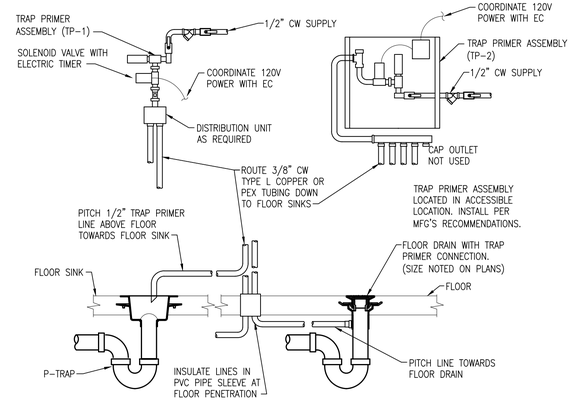


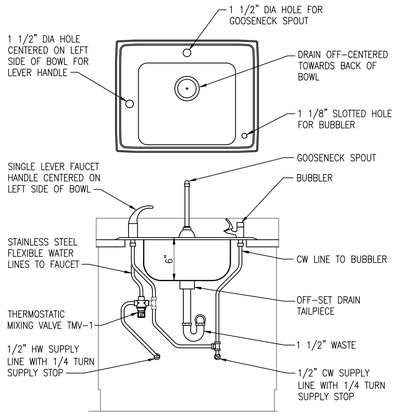
3 INTERIOR CLEANOUT DETAIL
NOT TO SCALE



2 WALL CLEANOUT DETAIL
NOT TO SCALE

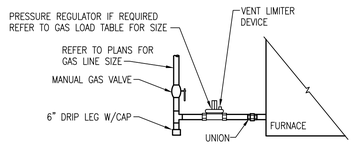


1 ELECTRIC TRAP PRIMER DETAIL
NOT TO SCALE



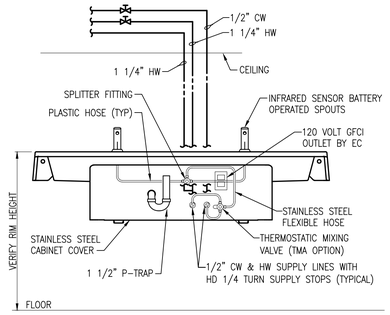
8 CLASSROOM SINK DETAIL
NOT TO SCALE

NOTE:
1. COORDINATE GAS CONNECTION TO UNIT WITH MC.
2. INSTALL PRESSURE REGULATOR (IF REQUIRED) PER MANUFACTURER'S RECOMMENDATIONS.
3. VENT GAS REGULATOR RELIEF TO ATMOSPHERE OR PROVIDE APPROVED VENT LIMITING DEVICE AS REQUIRED.



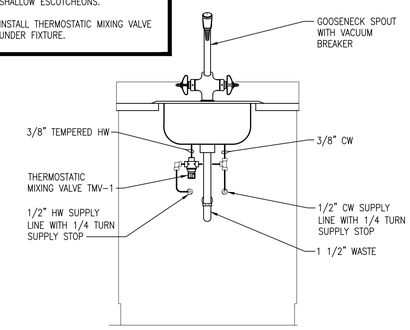
7 FURNACE GAS CONNECTION DETAIL
NOT TO SCALE

NOTE:
1. VERIFY FIXTURE HEIGHTS FOR EACH AREA WITH ARCHITECTURAL PLANS.
2. WASTE AND WATER PIPING SHALL BE CONCEALED IN CABINET COVER.
3. TMA OPTION INCLUDES: THERMOSTATIC MIXING VALVE, SUPPORT BRACKET, STAINLESS STEEL HOSES, SPLITTER FITTING, PLASTIC HOSES.
4. HWR LINE SHALL CONNECT TO HW LINE WITHIN 2'-0" OF STUB OUT TO SUPPLY STOP.

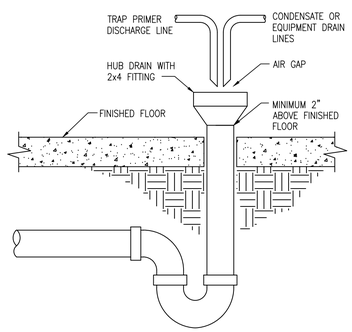


6 TWO STATION LAVATORY DETAIL
NOT TO SCALE

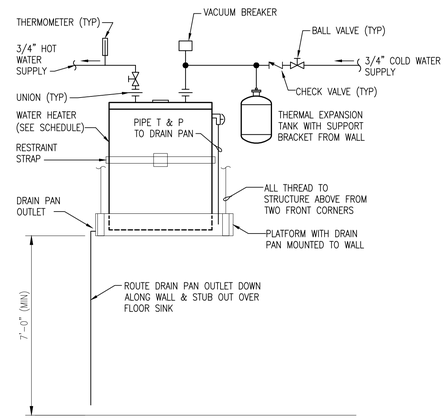
NOTE:
1. ALL EXPOSED WASTE PIPE SHALL BE POLISHED CHROME PLATED BRASS AND TRIMMED WITH POLISHED CHROME SHALLOW ESCUTCHEONS.
2. INSTALL THERMOSTATIC MIXING VALVE UNDER FIXTURE.



5 LAB STORAGE SINK DETAIL
NOT TO SCALE

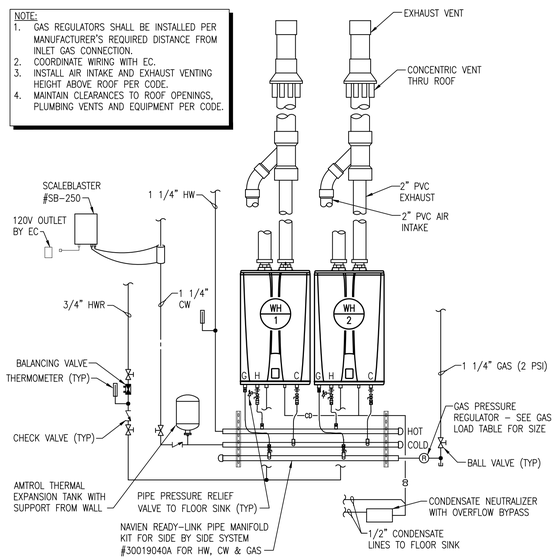


11 HUB DRAIN DETAIL
NOT TO SCALE



10 ELECTRIC WATER HEATER DETAIL
NOT TO SCALE

NOTE:
1. GAS REGULATORS SHALL BE INSTALLED PER MANUFACTURER'S REQUIRED DISTANCE FROM INLET GAS CONNECTION.
2. COORDINATE WIRING WITH EC.
3. INSTALL AIR INTAKE AND EXHAUST VENTING HEIGHT ABOVE ROOF PER CODE.
4. MAINTAIN CLEARANCES TO ROOF OPENINGS, PLUMBING VENTS AND EQUIPMENT PER CODE.



9 DUAL TANKLESS GAS WATER HEATERS DETAIL
NOT TO SCALE

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KFC ENGINEERING
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SALAS O'BRIEN
MECHANICAL / ELECTRICAL

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MOORE PUBLIC SCHOOLS
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MOORE Public Schools
LEARNING FOR LIFE

CLASSROOM ADDITION
CENTRAL JUNIOR HIGH SCHOOL

sheet no:

P501

Salas O'Brien
2900 S. Telephone Road, Suite 120
Moore, OK 73160
Salas O'Brien Registration: CA# 7058
Expiration Date : 6/30/2025
Salas O'Brien Project Number: 2550-00564-00

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PLUMBING FIXTURE SCHEDULE

MARK	FIXTURE	MANUFACTURER	MODEL	MOUNT	ROUGH-IN SCHEDULE				FITTINGS AND REMARKS
					COLD	HOT	WASTE	VENT	
L-1	LAVATORY ADA 2-STATIONS	BRADLEY	VERGE LVRD2	WALL	1/2"	1/2"	1 1/2"	1 1/2"	2-STATION UNIT, 4" CENTER-SET FAUCET DRILLING (2-FAUCETS), NO SOAP DISPENSER, STAINLESS STEEL ACCESS PANEL, PVC P-TRAP. PROVIDE SLOAN BASYS BATTERY INFRARED SENSOR FAUCET EFX650-202-0000 CP WITH THERMOSTATIC MIXING VALVE. PROVIDE MCGUIRE LFBV2165CC SUPPLY STOPS. ALL AVAILABLE COLORS FOR SELECTION BY ARCHITECT. REFER TO ARCHITECT'S PLANS FOR HEIGHT AND WALL TYPE. SEE DETAIL 6/P501.
WC-1	WATER CLOSET ADA	AMERICAN STANDARD	2257.101	WALL	1 1/4"	-	4"	-	COLOR WHITE. PROVIDE SLOAN ROYAL 111-1.6 SFSM BATTERY OPERATED FLUSH VALVE. PROVIDE BEMIS 1655SSCT OPEN FRONT ELONGATED SEAT, EXTERNAL CHECK HINGE, COLOR WHITE. WADE WALL CARRIER. REFER TO ARCHITECT'S PLANS FOR HEIGHT AND WALL TYPE. ADA INSTALLATION.
WC-2	WATER CLOSET	AMERICAN STANDARD	2257.101	WALL	1 1/4"	-	4"	-	COLOR WHITE. PROVIDE SLOAN ROYAL 111-1.6 SFSM BATTERY OPERATED FLUSH VALVE. PROVIDE BEMIS 1655SSCT OPEN FRONT ELONGATED SEAT, EXTERNAL CHECK HINGE, COLOR WHITE. WADE WALL CARRIER. REFER TO ARCHITECT'S PLANS FOR HEIGHT AND WALL TYPE.
MS-1	MOP SINK	FIAT	TSB-3000 24x24x12	FLOOR	1/2"	1/2"	3"	1 1/2"	PROVIDE 832AA HOSE & BRACKET, 889-CC MOP BRACKET, MSG 2424 SS WALL GUARDS. PROVIDE T&S BRASS FAUCET B-0665-BSTR. ASSE 1011 APPROVED HOSE CONNECTION VACUUM BREAKER, WATTS LF8A OR APPROVED EQUAL.
S-1	SINK (SCIENCE ROOM)	ELKAY	DRKAD282260 RC	COUNTER	1/2"	1/2"	1 1/2"	1 1/2"	SINK PACKAGE WITH FAUCET AT BACK, LEVER HANDLE ON LEFT SIDE CENTERED ON BOWL, BUBBLER ON RIGHT, 6" SINK DEPTH, LKAD35 OFFSET TAILPIECE W/STRAINER. PROVIDE MCGUIRE 8912 P-TRAP & LFBV2165SS SUPPLY STOPS. INSTALL MIXING VALVE TMV-1 UNDER SINK. SEE DETAIL 8/P501.
S-2	SINK (LAB STORAGE)	ELKAY	LRAD2219602	COUNTERTOP	1/2"	1/2"	1 1/2"	1 1/2"	SINGLE BOWL 6.0" DEEP, 2 FAUCET HOLES, REAR CENTER DRAIN. PROVIDE ELKAY LKAD35 OFFSET DRAIN & ELKAY LK406GN0S74 FAUCET, MCGUIRE 8912 P-TRAP & LFBV2165 SUPPLY STOPS. INSTALL MIXING VALVE TMV-1 UNDER SINK. SEE DETAIL 5/P501.
EWC-1	ELECTRIC WATER COOLER DUAL	ELKAY	LZSTL8WSVRSK	WALL	1/2"	-	1 1/2"	1 1/2"	DUAL LEVEL VANDAL-RESISTANT WITH PUSH BUTTON ACTIVATION, SENSOR WATER BOTTLE FILLING STATION ON LOWER UNIT, FILTERED, 120 VOLT. PROVIDE ELKAY CANE APRON LKAPREZL ON UPPER UNIT. PROVIDE PVC P-TRAP AND 1/4 TURN SUPPLY STOP. REFER TO ARCHITECT'S PLANS FOR MOUNTING HEIGHT & WALL TYPE. ADA INSTALLATION.
FD	FLOOR DRAIN	WADE	1100-DA6-1 VP	FLOOR	-	-	SEE PLANS	-	6" ROUND NICKEL BRONZE STRAINER, CAST IRON BODY ANCHOR FLANGE, CLAMP COLLAR, ADJUSTABLE COLLAR, ADJUSTABLE STRAINER HEIGHT, VANDAL-PROOF SECURED TOP, 1/2" TRAP PRIMER CONNECTION.
FS-1	FLOOR SINK	WADE	9110-64-15-26-27	FLOOR	-	-	3"	-	8"x8" TOP, 6" DEEP, CAST IRON BODY WITH WHITE A.R.E INTERIOR, 1/2 GRATE, SEDIMENT BUCKET, ANCHOR FLANGE WITH CLAMPING COLLAR.
FCO	FLOOR CLEANOUT	WADE	6000-1-VP	FLOOR	-	-	SEE PLANS	-	6" ROUND NICKEL BRONZE TOP, CAST IRON BODY, ADJUSTABLE COLLAR, ANCHOR FLANGE, COVER HEIGHT ADJUSTMENT AFTER FLOOR IS POURED, COVER WITH VANDAL RESISTANT SCREWS. SEE DETAIL 3/P501.
WCO	WALL CLEANOUT	WADE	8560-75 8304-VP	WALL	-	-	SEE PLANS	-	CAST IRON CLEANOUT TEE, THREADED BRASS PLUG, PROVIDE 8304-VP STAINLESS STEEL 6" ROUND ACCESS COVER WITH VANDAL RESISTANT SECURING SCREW. SEE DETAIL 2/P501.
ECO	EXTERIOR CLEANOUT	WADE	8401-12 COF4-VP-81	GRADE	-	-	SEE PLANS	-	CAST IRON CLEANOUT ACCESS HOUSING, ANCHOR FLANGE, SECURED GASKETED COVER WITH CLEANOUT FERRULE WITH ABS PLUG. VANDAL PROOF SCREWS. SEE DETAIL 4/P501.
BWV	BACKWATER VALVE (SANITARY)	RECTORSEAL	97034	GRADE	-	-	4"	-	PVC BODY, FLAPPER WITH EXTENSION AND CAP. PROVIDE PVC SLEEVE TO FLUSH WITH FINISH GRADE. FIELD VERIFY DEPTH OF ACCESS HOUSING. ASSEMBLY MEETS IPC CODES. SEE DETAIL 4/P501.
RD	ROOF DRAIN	WADE	3000-42-ADF -53	ROOF	-	-	SEE PLANS	-	DURA-COATED CAST IRON BODY, CAST IRON DOME, COMBINATION MEMBRANE FLASHING CLAMP/GRAVEL GUARD, ADJUSTABLE EXTENSION ASSEMBLY & UNDER DECK CLAMP.
ORD	OVERFLOW ROOF DRAIN	WADE	3000-42-ADF -53-D2	ROOF	-	-	SEE PLANS	-	DURA-COATED CAST IRON BODY, CAST IRON DOME, COMBINATION MEMBRANE FLASHING CLAMP/GRAVEL GUARD, ADJUSTABLE EXTENSION ASSEMBLY & UNDER DECK CLAMP, 2" HIGH EXTERNAL WATER DAM.
DS	DOWN SPOUT	RECTORSEAL	G-O-N	PIPE	-	-	SEE PLANS	-	CAST NICKEL BRASS BODY, OFFSET NOZZLE, WALL FLANGE.
FWH	FREEZELESS WALL HYDRANT	WOODFORD	B65	WALL	3/4"	-	-	-	CONCEALED BOX TYPE WITH HINGED DOOR, CHROME FINISH, ASSE STANDARD 1019, INSTALL AT MINIMUM 18" ABOVE GRADE, GIVE HYDRANT KEY TO OWNER.
FRH	FREEZELESS ROOF HYDRANT	WOODFORD	SRH-MS	ROOF	3/4"	-	-	-	FREEZELESS HYDRANT, ROOF MOUNTING ASSEMBLY & SUPPORT, THREADED HOSE OUTLET WITH DUAL CHECK BFP ASSE 1052. COORDINATE INSTALLATION WITH ROOFING CONTRACTOR.
HA-1	HAMMER ARRESTOR	SIOUX CHIEF	650 SERIES	PIPE	VARIES	-	-	-	LEAD-FREE CONSTRUCTION, ANSI/ASSE 1010 LISTED, PRE-CHARGED, PERMANENT SEALED AIR CHAMBER. INSTALL PER MANUFACTURER'S RECOMMENDATIONS.
TP-1	TRAP PRIMER ELECTRONIC	SIOUX CHIEF	695-ES01	PIPE	1/2"	-	-	-	SURFACE MOUNT, ELECTRIC UNIT WITH 24 HOUR ELECTRIC TIMER, SOLENOID VALVE, INTEGRAL BALL VALVE, WATER HAMMER ARRESTOR & AIR GAP, 1/2" CW INLET & OUTLET, 120V POWER HARD-WIRED, COORDINATE WITH EC. PROVIDE STRAINER PRIOR TO UNIT. PROVIDE DISTRIBUTION SPLITTER. SEE DETAIL 1/P501.
TP-2	TRAP PRIMER ELECTRONIC	SIOUX CHIEF	695-ES10	PIPE	1/2"	-	-	-	SURFACE MOUNT BOX, ELECTRIC UNIT WITH 24 HR ELECTRIC TIMER, SOLENOID VALVE, INTEGRAL BALL VALVE, WATER HAMMER ARRESTOR & VACUUM BREAKER, 1/2" CW INLET & 10 OUTLETS, 120V POWER HARD-WIRED, COORDINATE WITH EC. PROVIDE STRAINER PRIOR TO UNIT. SEE DETAIL 1/P501.
AP-1	ACCESS PANEL	ELMDOR	DW 14x14 CL-SS	WALL	-	-	-	-	14"x14" STEEL, 16 GAGE DOOR & FRAME, CONCEALED HINGE, CYLINDER LOCK & KEY, STAINLESS STEEL FINISH. CONCEALED FASTENING POINTS.
TMV-1	THEROMSTATIC MIXING VALVE	WATTS	LFMMV-M1	UNDER FIXTURE	1/2"	1/2'	-	-	MIXING VALVE WITH LEAD FREE DESIGN, ADJUSTABLE TEMPERATURE SET-POINT & LOCKABLE, INTEGRAL CHECK STOPS & STRAINERS, 3/8" INLETS & OUTLET. SET OUTLET TEMP AT 105 DEGREES F. ASSE 1070 LISTED.
WB-1	WATER BOX	SIOUX CHIEF	696-G1010WF	WALL	1/2"	-	-	-	RECESSED WALL MOUNTED BOX WITH FLANGE, 1/4 TURN BALL VALVE WITH HAMMER ARRESTER AND 1/4" OUTLET. COORDINATE INSTALL HEIGHT WITH EQUIPMENT SUPPLIER.
TBV-1	THERMOSTATIC BALANCING VALVE	CALEFFI	THERMOSETTER SERIES 116151AC-001	PIPE	3/4"	-	-	-	THERMOSTATIC BALANCING VALVE ASSEMBLY, TEMPERATURE GAUGE, CHECK VALVE, BALL VALVE ON EACH SIDE OF VALVE. COORDINATE HWR TEMPERATURE WITH OWNER.
PRV-1	PRESSURE REDUCING VALVE	WATTS	LF223-S	PIPE	2"	-	-	-	LEAD FREE BRASS BODY CONSTRUCTION WITH INLET STRAINER & THREADED CONNECTIONS, ADJUSTABLE REDUCED PRESSURE RANGE, SET OUTLET PRESSURE SETTING TO 65 PSI. MEETS ASSE STANDARD 1003.
PRV-2	PRESSURE REDUCING VALVE	WATTS	LF223-S	PIPE	1"	-	-	-	LEAD FREE BRASS BODY CONSTRUCTION WITH INLET STRAINER & THREADED CONNECTIONS, ADJUSTABLE REDUCED PRESSURE RANGE, SET OUTLET PRESSURE SETTING TO 65 PSI. MEETS ASSE STANDARD 1003.
PGS-1	PROPANE GAS SENSOR	AMERICAN GAS SAFETY	MINI MERLIN AGSLPGCO	WALL					DUAL CO & LPG DETECTOR (120V), RELAY AGSRGR (120V), AUDIBLE ALARM AGSAAB, 1" LP 120V SOLENOID VALVE AGSGSV1, EMERGENCY SHUT-OFF BUTTON AGSEGOTW.

GAS WATER HEATER SCHEDULE

MARK	LOCATION	TEMPERATURE RISE	FLOW RATE GAL/MIN	CAPACITY (GALLONS)	MBH INPUT MAX	AIR INTAKE	FLUE EXHAUST	MANUFACTURER & MODEL NO.	NOTES
WH 1	MECH/ELEC ROOM 15	(50°F - 120°F) 70°F	5.5	TANKLESS	199.9	3"	3"	NVAIEN NPE-240A2	ALL
WH 2	MECH/ELEC ROOM 15	(50°F - 120°F) 70°F	5.5	TANKLESS	199.9	3"	3"	NVAIEN NPE-240A2	ALL

NOTES:
1. INSTALL AND VENT PER MANUFACTURER'S RECOMMENDATIONS.
2. COORDINATE POWER SUPPLY WITH ELECTRICAL CONTRACTOR. POWER SUPPLY TO UNIT 120V, 2 AMP (GFCI OUTLET).
3. PROVIDE AMTROL ST-5 THERMAL EXPANSION TANK ON COLD WATER LINE.
4. PROVIDE CLEAR WATER ENVIRO TECHNOLOGIES SCALEBLASTER MODEL SB-250 ELECTRONIC DESCALER. COORDINATE 120 VOLT OUTLETS WITH EC.
5. PROVIDE NAVIEN CONDENSATE NEUTRALIZER KIT AND OVERFLOW BY-PASS PIPING TO FLOOR SINK PER MANUFACTURER'S RECOMMENDATIONS.
6. PROVIDE NAVIEN CONCENTRIC INTAKE/EXHAUST VENT THRU ROOF.
7. PROVIDE NAVIEN READY-LINK COMMUNICATIONS CABLE.
8. PROVIDE NAVIEN PLUMB EASY VALVE SET.
9. PROVIDE NAVIEN READY-LINK WALL MOUNT PIPING MANIFOLD SYSTEM FOR WATER HEATERS.
10. SEE DETAIL 9/P501 FOR MORE INFORMATION.

ELECTRIC WATER HEATER SCHEDULE

MARK	LOCATION	TEMPERATURE RISE	CAPACITY GALLONS	AMPS	ELEMENT KW	VOLTAGE	PHASE	MANUFACTURER & MODEL NO.	NOTES
EWH 1	MECH 23	70 DEG @ 25 GPH	30	22	4.5	208	1	AO SMITH DEL-30	ALL

NOTES:
1. INSTALL PER MANUFACTURER'S RECOMMENDATIONS.
2. SET OUTLET TEMPERATURE TO 120°F. VERIFY TEMPERATURE WITH OWNER.
3. PROVIDE AMTROL ST-5 THERMAL EXPANSION TANK ON COLD WATER LINE TO WATER HEATER.
4. PROVIDE HOLD RITE MODEL 50-SWHP-W WITH DRAIN PAN MODEL QP-26 OR APPROVED EQUAL.
5. COORDINATE WIRING WITH E.C.
6. SEE DETAIL 10/P501 FOR MORE INFORMATION.

GAS LOAD TABLE (2 PSI)

	INPUT(MBH)	REQUIRED PRESSURE	REQUIRED REGULATOR	SYSTEM PRESSURE	NOTES
F-1	80	7"	MAXITROL 325-3L	2 PSI	ALL
F-2	120	7"	MAXITROL 325-3L	2 PSI	ALL
F-3	120	7"	MAXITROL 325-3L	2 PSI	ALL
F-4	80	7"	MAXITROL 325-3L	2 PSI	ALL
GEN SET	446	11"	MAXITROL 325-7AL	2 PSI	ALL
WH-1	199.9	7"	MAXITROL 325-5L	2 PSI	ALL
WH-2	199.9	7"	MAXITROL 325-5L	2 PSI	ALL
TOTAL LOAD	1246 MBH				

NOTES:
1. INSTALL AND VENT REGULATOR PER MANUFACTURER'S RECOMMENDATIONS.
2. PROVIDE VENT LIMITING DEVICE IF REQUIRED FOR INDOOR REGULATORS EQUIPPED WITH INTEGRAL VENT LIMITING ORIFICE MODEL 12A09, 12A39 OR 12A49.
3. COORDINATE WITH MECHANICAL CONTRACTOR FOR EQUIPMENT LOCATIONS AND REQUIRED CONNECTION.
4. GAS SYSTEM DESIGN ON SAFEROOM ADDITION FOR INITIAL METER OUTLET PRESSURE OF 2 PSIG WITH PRESSURE DROP OF 1 PSIG AND TOTAL LENGTH OF 1500 FEET. SERVES FURNACES F-1 THRU F-4, GAS WATER HEATERS AND GENERATOR.

GAS LOAD TABLE (LOW PRESSURE)

	INPUT(MBH)	REQUIRED PRESSURE	REQUIRED REGULATOR	SYSTEM PRESSURE	NOTES
F-5	120	7"	NONE	LOW	ALL
F-6	80	7"	NONE	LOW	ALL
F-7	60	7"	NONE	LOW	ALL
F-8	60	7"	NONE	LOW	ALL
F-9	60	7"	NONE	LOW	ALL
F-10	60	7"	NONE	LOW	ALL
TOTAL LOAD	440 MBH				

NOTES:
1. COORDINATE WITH MECHANICAL CONTRACTOR FOR EQUIPMENT LOCATIONS AND REQUIRED CONNECTION.
2. GAS SYSTEM DESIGN ON NON SAFEROOM ADDITION FOR INITIAL METER OUTLET OF LOW PRESSURE WITH A PRESSURE DROP OF 0.5" W.C. AND TOTAL LENGTH OF 400 FEET. SERVES FURNACES F-5 THRU F-10.

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STRUCTURED CABLING LEGEND

SYMBOL	DESCRIPTION	ELEVATION	BACK BOX/RACEWAY	NOTES
*# WP	WALL MOUNTED NETWORK OUTLET D#: NUMBER OF DATA DROPS IN OUTLET AP: WIRELESS ACCESS POINT	+18" AFF, UNLESS OTHERWISE NOTED	4"X4"X2 1/8" BACK BOX WITH 1-G MUD RING, 1"C	
V#	COMMUNICATIONS OUTLET	FIELD COORDINATE	FIELD COORDINATE	
W	WALL MOUNTED NETWORK OUTLET	+44" AFF	4"X4"X2 1/8" BACK BOX WITH 1-G MUD RING, 1"C	
B	WALL MOUNTED BOX FOR FUTURE USE.	+18" AFF UNO	4"X4"X2 1/8" BACK BOX WITH 1-G MUD RING, 1"C	
D#	FLOOR MOUNTED NETWORK OUTLET	N/A	COORDINATE WITH ELECTRICAL CONTRACTOR	FINISHED HARDWARE PROVIDED BY DIV 27
D#	CEILING MOUNTED NETWORK OUTLET D#: NETWORK OUTLET	ABOVE CEILING	CEILING BRACKET WITH BISCUIT BLOCK	
AP D#	CEILING MOUNTED NETWORK OUTLET FOR ACCESS POINT D#: NETWORK DROP QUANTITIY	ABOVE CEILING	CEILING BRACKET WITH BISCUIT BLOCK	

NOTES:
1. #-G INDICATES BACK BOX SIZE.
2. #-C INDICATES CONDUIT SIZE.
3. UNO: UNLESS NOTED OTHERWISE
4. CONDUIT STUB UP AND SLEEVES SHALL HAVE A SOLID UNCUT PLASTIC PROTECTIVE BUSHING.
5. NO CONDUITS SHALL EXCEED FOR 40% MAXIMUM FILL RATIO. CONTRACTOR TO PROVIDE ADDITIONAL CONDUITS REQUIRED.

AUDIO/VIDEO LEGEND

SYMBOL	DESCRIPTION	ELEVATION	BACK BOX/RACEWAY	NOTES
WMP	WALL MOUNTED PROJECTOR AUDIO/VISUAL OUTPUT OUTLET	REFERENCE FLOOR PLANS.	4 11/16"X4 11/16"X2-1/8" BACK BOX WITH DOUBLE GANG RING, TWO(2) 1.25"C	NOTE #5
CMP	CEILING MOUNTED PROJECTOR AUDIO/VISUAL OUTPUT OUTLET	CEILING MOUNTED	N/A	NOTE #5
AV-1	WALL MOUNTED AUDIO/VIDEO INPUT OUTLET	+18" AFF UNO	4 11/16"X4 11/16"X2-1/8" BACK BOX WITH DOUBLE GANG RING, TWO(2) 1.25"C	
FSD-1	WALL MOUNTED FLAT SCREEN DISPLAY AUDIO/VISUAL OUTPUT OUTLET	REFERENCE FLOOR PLAN	4"X4"X2 1/8" BACK BOX WITH 1-G MUD RING, 1"C	NOTE #5
FSD-2	WALL MOUNTED FLAT SCREEN DISPLAY AUDIO/VISUAL OUTPUT OUTLET ASSOCIATED WITH AV-1 INPUT OUTLET	REFERENCE FLOOR PLAN	4 11/16"X4 11/16"X2-1/8" BACK BOX WITH DOUBLE GANG RING, TWO(2) 1.25"C	NOTE #5
IVD	INTERACTIVE VIDEO DISPLAY AUDIO/VISUAL OUTPUT OUTLET	REFERENCE FLOOR PLAN	4 11/16"X4 11/16"X2-1/8" BACK BOX WITH DOUBLE GANG RING, TWO(2) 1.25"C	NOTE #5
CP	AV CONTROL PANEL	+48" AFF TO TOP	4"X4"X2 1/8" BACK BOX WITH 1-G MUD RING, 1"C	
PS	LOCAL INSTRUCTIONAL SPACE PRESENTATION SPEAKER	CEILING	CONTRACTOR PROVIDED CEILING BOX	COORDINATE POWER WITH EC
	STREAMING CAMERA	CEILING UNO	N/A	NOTE #5

NOTES:
1. #-G INDICATES BACK BOX SIZE.
2. #-C INDICATES CONDUIT SIZE.
3. UNO: UNLESS NOTED OTHERWISE
4. THE SYSTEM INTEGRATOR SHALL COORDINATE ALL BOX AND CONDUIT SIZE REQUIREMENTS PRIOR TO ROUGH-IN BY THE PROJECTS ELECTRICAL CONTRACTOR.
5. PROVIDE AND INSTALL ONE (1) CATEGORY CABLE TO CONNECT DEVICE TO NETWORK

INTERCOM LEGEND

SYMBOL	DESCRIPTION	ELEVATION	BACK BOX/RACEWAY	NOTES
ICS	INTERCOM COMMUNICATIONS SYSTEM HEAD END UNIT.	FLOOR MOUNTED	COORDINATE WITH EC	COORDINATE POWER WITH EC
S	CEILING MOUNT INTERCOM SPEAKER, LAY-IN CEILING	CEILING	CONTRACTOR PROVIDED	
S2	CEILING MOUNT INTERCOM SPEAKER, HARD CEILING.	CEILING	CONTRACTOR PROVIDED	
S3	WALL MOUNT INTERIOR INTERCOM SPEAKER	REFERENCE FLOOR PLANS	CONTRACTOR PROVIDED	
S4	WALL MOUNT EXTERIOR INTERCOM SPEAKER	+10' AFF UNO	CONTRACTOR PROVIDED	
S5	PENDANT MOUNT INTERCOM SPEAKER	REFERENCE FLOOR PLANS	CONTRACTOR PROVIDED	
S6	SURFACE MOUNT INTERCOM SPEAKER, MOUNT TO STRUCTURE	CEILING	CONTRACTOR PROVIDED	
S7	CEILING MOUNTED EXTERIOR INTERCOM SPEAKER.	CEILING	CONTRACTOR PROVIDED	
#IP	IP BASED SPEAKER. '#' TO BE REPLACED WITH S, S2, S3, S4 INDICATING THE SPECIFIC TYPE OF SPEAKER.	REFERENCE FLOOR PLANS	CONTRACTOR PROVIDED	NOTE #5
#IP AMP	SPEAKER CONNECTED TO IP MODULE AND AMPLIFIER. '#' TO BE REPLACED WITH S, S2, S3, S4 INDICATING THE SPECIFIC TYPE OF SPEAKER.	REFERENCE FLOOR PLANS	CONTRACTOR PROVIDED	
VC	WALL MOUNTED VOLUME CONTROL	+48" AFF	4"X4"X2 1/8" BACK BOX WITH 1-G MUD RING, 1"C	
CB	INTERCOM CALL BUTTON	+48" AFF	4"X4"X2 1/8" BACK BOX WITH 1-G MUD RING, 1"C	
C	SINGLE FACE CLOCK	90" AFF UNO.	4"X4"X2 1/8" BACK BOX WITH 1-G MUD RING, 1"C	
C2	DOUBLE FACE CLOCK	90" AFF UNO.	4"X4"X2 1/8" BACK BOX WITH 1-G MUD RING, 1"C	
RPS	REMOTE PROGRAM SOURCE	DESK TOP	COORDINATE WITH EC	NOTE #5
ACS	ADMINISTRATIVE CALL STATION.	DESK TOP	N/A	NOTE #5

NOTES:
1. #-G INDICATES BACK BOX SIZE.
2. #-C INDICATES CONDUIT SIZE.
3. UNO: UNLESS NOTED OTHERWISE
4. THE SYSTEM INTEGRATOR SHALL COORDINATE ALL BOX AND CONDUIT SIZE REQUIREMENTS PRIOR TO ROUGH-IN BY THE PROJECTS ELECTRICAL CONTRACTOR.
5. PROVIDE AND INSTALL ONE (1) CATEGORY CABLE TO CONNECT DEVICE TO NETWORK

ACCESS CONTROL LEGEND

SYMBOL	DESCRIPTION	ELEVATION	BACK BOX/RACEWAY	NOTES
ACP	ACCESS CONTROL SYSTEM, CONTROL PANEL.	+60" AFF TO CENTER	AS REQUIRED	COORDINATE POWER. NOTE #4.
CR *#	ACCESS CONTROL PROXIMITY CARD READER. DEFAULT SYMBOL INDICATES WALL MOUNTED *M - INDICATES MULLION MOUNTED READER	+42" A.F.F.	1-G, 3/4" C	
CR	DOOR MOUNTED ACCESS CONTROL PROXIMITY CARD READER THAT IS INTEGRATED INTO THE DOOR HARDWARE.	+42" AFF	N/A	
DS *#	2-WAY AUDIO/VIDEO INTERCOM DOOR STATION. *DEFAULT INDICATES WALL MOUNTED *M - INDICATES MULLION MOUNTED DEVICE	+42" AFF	*W: 1-G, 3/4" C *M: 3/4"C	COORDINATE POWER. NOTE #4 & #5.
DS	DOOR MOUNTED, 2-WAY AUDIO/VIDEO INTERCOM DOOR STATION.	+42" AFF, FIELD COORDINATE		COORDINATE POWER. NOTE #4 & #5.
MS	2-WAY AUDIO/VIDEO INTERCOM MASTER STATION.	DESK MOUNTED UNO		COORDINATE POWER. NOTE #4
DR	DOOR RELEASE BUTTON	COORDINATE WITH GC	1-G, 3/4" C	
DH	PIR MOTION REQUEST TO EXIT DEVICE, DOOR CONTACT AND ELECTRIC STRIKE.			ACCESS CONTROL ONLY DOOR SHALL BE SPST. DOOR WITH BOTH ACCESS CONTROL AND INTRUSION SHALL BE DPDT. ONLY 1 DOOR CONTACT PER DOOR IF DH AND DC SYMBOL ARE SHOWN

NOTES:
1. #-G INDICATES BACK BOX SIZE.
2. #-C INDICATES CONDUIT SIZE.
3. UNO: UNLESS NOTED OTHERWISE
4. PROVIDE AND INSTALL ONE (1) CATEGORY CABLE TO CONNECT DEVICE TO NETWORK
5. AVIGILON PART # 3.0C-H4VI-RO1-IR.

VIDEO SURVEILLANCE LEGEND

SYMBOL	DESCRIPTION	ELEVATION	BACK BOX/RACEWAY	NOTES
	WALL/CORNER MOUNT 4-SENSOR CAMERA	REFERENCE FLOOR PLANS	4"X4"X2 1/8" BACK BOX WITH 1-G MUD RING, 1"C	NOTE #5 AND 6
	CEILING MOUNTED 4-SENSOR CAMERA	CEILING		NOTE #5
	3-SENSOR CAMERA	CEILING UNO		NOTE #5 AND 6
	2-SENSOR CAMERA	REFERENCE FLOOR PLANS	4"X4"X2 1/8" BACK BOX WITH 1-G MUD RING, 1"C	NOTE #5
	1-SENSOR CAMERA	REFERENCE FLOOR PLANS	4"X4"X2 1/8" BACK BOX WITH 1-G MUD RING, 1"C	
	SYMBOL ADDED TO CAMERA TO INDICATE WALL/CORNER MOUNT.	+9' AFF UNO		NOTE #6
VRS	VIDEO RECORDING SERVER			
#MU	VIDEO SURVEILLANCE MAIN UNIT	ABOVE CEILING		NOTE #5

NOTES:
1. #-G INDICATES BACK BOX SIZE.
2. #-C INDICATES CONDUIT SIZE.
3. UNO: UNLESS NOTED OTHERWISE
4. THE SYSTEM INTEGRATOR SHALL COORDINATE ALL BOX AND CONDUIT SIZE REQUIREMENTS PRIOR TO ROUGH-IN BY THE PROJECTS ELECTRICAL CONTRACTOR.
5. PROVIDE AND INSTALL ONE (1) CATEGORY CABLE TO CONNECT DEVICE TO NETWORK
6. EXTERIOR WALL MOUNT SPEAKERS SHALL BE MOUNTED +10'AFF.

INTRUSION LEGEND

SYMBOL	DESCRIPTION	ELEVATION	BACK BOX/RACEWAY	NOTES
IDP	INTRUSION DETECTION SYSTEM CONTROL PANEL	+60" AFF	TWO(2) - 1"C TO CONTRACTOR PROVIDED BACK BOX	COORDINATE POWER WITH EC. NOTE #5
KP	INTRUSION DETECTION SYSTEM KEYPAD.	+60" AFF	4"X4"X2 1/8" BACK BOX WITH 1-G MUD RING, 1"C	
MD *#	WALL MOUNTED MOTION DETECTOR *# = LR IF LONG RANGE	REFERENCE FLOOR PLAN	N/A	
GB	CEILING MOUNTED GLASS BREAK DETECTOR	CEILING	N/A	
DC	DOOR CONTACT	FLUSH MOUNTED IN DOOR FRAME	N/A	INTRUSION ONLY DOOR SHALL BE SPST. DOOR WITH BOTH ACCESS CONTROL AND INTRUSION SHALL BE DPDT. ONLY 1 DOOR CONTACT PER DOOR IF DH AND DC SYMBOL ARE SHOWN
ODC	OVERHEAD DOOR MOUNT MAGNETIC DOOR CONTACT.	SURFACE MOUNTED ON DOOR FRAME	N/A	
DB	DURESS PANIC BUTTON	UNDER DESK UNO	N/A	
SS	SECURITY SIREN	+9' AFF	SINGLE GANG BACKBOX	

NOTES:
1. #-G INDICATES BACK BOX SIZE.
2. #-C INDICATES CONDUIT SIZE.
3. UNO: UNLESS NOTED OTHERWISE
4. REFERENCE DIVISION 28 SPECIFICATION FOR ADDITIONAL INFORMATION AND REQUIREMENTS.
5. PROVIDE AND INSTALL ONE (1) CATEGORY CABLE TO CONNECT DEVICE TO NETWORK

FIRE ALARM

SYMBOL	DESCRIPTION
FACP	FIRE ALARM CONTROL
FAA	FIRE ALARM ANNUNCIATOR PANEL
NAC	NOTIFICATION APPLIANCE
F	FIRE ALARM PULL STATION

NOTES:

1. REFERENCE SHEET SPECIFICATIONS

2. A LICENSED FIRE ALARM PLANNING SUPERINTENDENT CERTIFIED TO A MINIMUM LEVEL 3, IN THE SUBFIELD OF FIRE ALARM SYSTEMS THROUGH THE NATIONAL INSTITUTE FOR CERTIFICATION IN ENGINEERING TECHNOLOGIES (NICET), SHALL PROVIDE PLANS AND CALCULATIONS FOR A MANUAL AND AUTOMATIC FIRE DETECTION AND ALARM SYSTEM TO COMPLY WITH THE BUILDING SPACE LAYOUT, BUILDING OCCUPANCY, CURRENT NFPA 72, LOCAL AND STATE CODE REQUIREMENTS, AND THE FIRE ALARM AND DETECTION SYSTEM SPECIFICATIONS.

SUBSCRIPTS AND ABBREVIATIONS

TEXT	DESCRIPTION
'WP'	DEVICE SHALL BE WEATHER PROOF AND RATED FOR EXTERIOR CONDITIONS
●	FIELD COORDINATE ELEVATION.
AFF	ABOVE FINISHED FLOOR
'UC'	DEVICE IS TO BE MOUNTED ON THE UNDERSIDE OF THE ELEVATED CANOPY.
'WM'	DEVICE IS TO BE WALL MOUNTED.
'WG'	WIRE GUARD TO BE PROVIDED AND INSTALLED TO PROTECT ASSOCIATED DEVICE.

SUBSCRIPTS LEGEND - EXISTING DEVICES

TEXT	DESCRIPTION
'E'	EXISTING TO REMAIN.
'D'	DEVICE IS EXISTING AND IS TO BE REMOVED. CONTRACTOR TO REMOVE THE DEVICE AND RETURN TO OWNER.
'R'	REMOVE EXISTING DEVICE AND RELOCATE TO A LOCATION INDICATED ON THE DRAWINGS.

NOTES TO CONTRACTOR

1. EVERY SYMBOL SHOWN ON LEGEND MAY NOT APPEAR ON DRAWINGS.
2. SYSTEM INSTALLERS SHALL COORDINATE LOCATIONS AND CONNECTIONS WITH THE PROJECT'S ELECTRICAL CONTRACTOR.
3. CONTRACTOR TO PROVIDE PROPERLY GROUNDED LIGHTING PROTECTION ON ALL CABLING ENTERING AND EXITING THE BUILDING.

RESPONSIBILITY MATRIX

SCOPE ITEM	RESPONSIBILITY			NOTES
COMMUNICATIONS - DIVISION 27	OFOI	CFCI	OFCI	
CATEGORY 6 STRUCTURED CABLING SYSTEM		X		
BUILDING INTERCOM/PA, BELL, AND CLOCK SYSTEM		X		
NETWORK EQUIPMENT				
→ MDF/IDF NETWORK EQUIPMENT	X			
→ VOIP TELEPHONES	X			
→ WIRELESS ACCESS POINTS	X			
→ UNITERRUPTABLE POWER SUPPLIES (UPS)		X		
RACEWAY: CONDUIT, BACK BOXES, SLEEVES, ETC.		X		SEE NOTE 1.
ELECTRICAL POWER		X		SEE NOTE 1.
LIFE SAFETY AND SECURITY - DIVISION 28	OFOI	CFCI	OFCI	
ACCESS CONTROL SYSTEM(ACS)		X		
INTRUSION DETECTION SYSTEM		X		
VIDEO SURVEILLANCE SYSTEM (VSS)				
→ VSS SERVERS		X		
→ VSS CAMERAS		X		
→ VSS PROGRAMMING		X		
→ VSS CABLING		X		SEE NOTE 2.
FIRE ALARM SMOKE DETECTION WITH VOICE EVACUATION		X		
RACEWAY: CONDUIT, BACK BOXES, SLEEVES, ETC.		X		SEE NOTE 1.
ELECTRICAL POWER		X		SEE NOTE 1.

OFOI - OWNER FURNISHED AND OWNER INSTALLED
CFCI - CONTRACTOR FURNISHED AND CONTRACTOR INSTALLED
OFCI - OWNER FURNISHED AND CONTRACTOR INSTALLED

REPONSIBILITY MATRIX NOTES:
1. BY DIVISION 26.
2. BY DIVISION 27.

1 TECHNOLOGY NOTES AND LEGENDS
NOT TO SCALE

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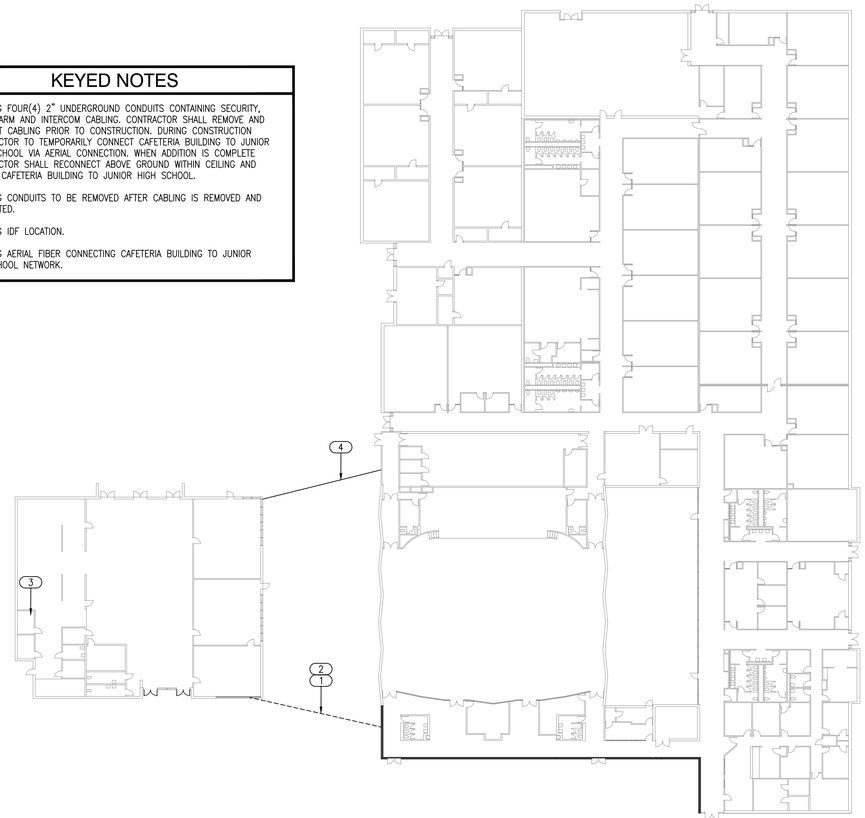
KEYED NOTES

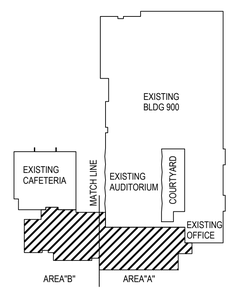
1. EXISTING FOUR(4) 2" UNDERGROUND CONDUITS CONTAINING SECURITY, FIRE ALARM AND INTERCOM CABLING. CONTRACTOR SHALL REMOVE AND PROTECT CABLING PRIOR TO CONSTRUCTION. DURING CONSTRUCTION CONTRACTOR TO TEMPORARILY CONNECT CAFETERIA BUILDING TO JUNIOR HIGH SCHOOL VIA AERIAL CONNECTION. WHEN ADDITION IS COMPLETE CONTRACTOR SHALL RECONNECT ABOVE GROUND WITHIN CEILING AND REWIRE CAFETERIA BUILDING TO JUNIOR HIGH SCHOOL.
2. EXISTING CONDUITS TO BE REMOVED AFTER CABLING IS REMOVED AND PROTECTED.
3. EXISTING IDF LOCATION.
4. EXISTING AERIAL FIBER CONNECTING CAFETERIA BUILDING TO JUNIOR HIGHSCHOOL NETWORK.



1 TECHNOLOGY DEMO COMPOSITE PLAN

SCALE: 1/32" = 1'-0"

NORTH



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KEYED NOTES

1. CAMERA TO BE REMOVED AND PROTECTED DURING CONSTRUCTION AND REINSTALLED IN THE SAME LOCATION IN NON-STAINABLE TILE AFTER CEILING IN THIS AREA HAS BEEN REPLACED.

DEMO GENERAL NOTES

A. REMOVE ALL EXISTING CAMERAS AND RETURN TO MPS TECHNOLOGY.

B. REMOVE CARD READERS AND DOOR STRIKES AND RETURN TO MPS TECHNOLOGY.

C. REMOVE EXISTING ALARM DOOR CONTACTS AND MOTION DETECTORS AND RETURN TO MPS TECHNOLOGY. WIRING TO BE INSULATED TO PREVENT GROUND FAULTS AND OTHER DAMAGE TO SYSTEM AND WIRING.

D. REMOVE EXISTING OUTSIDE SIREN & RETURN TO MPS TECHNOLOGY.

E. RELOCATE EXISTING AVIGILON DOOR STATION TO TEMPORARY OFFICE ENTRY DURING CONSTRUCTION. AFTER CONSTRUCTION IS COMPLETED, RELOCATE TO NEW OFFICE ENTRANCE. CONTRACTOR TO PROVIDE ONE(1) CATEGORY CABLE CONNECTION AT EACH LOCATION.

F. IN AUDITORIUM LOBBY REMOVE EXISTING SMOKE DETECTORS AND REPLACE WITH SX PROTOCOL DEVICES AND BE MOUNTED ON NON-STAINABLE TILES. CONTRACTOR TO REMOVE EXISTING INTERCOM SPEAKERS AND REPLACE WITH 2X2 LAY-IN SPEAKERS PER SPECS. CONTRACTOR TO FIELD VERIFY AND REPLACE IN SAME LOCATION TO ENSURE EQUAL COVERAGE AS EXISTING.

SUBSCRIPTS LEGEND - EXISTING DEVICES

TEXT	DESCRIPTION
'E'	EXISTING TO REMAIN.
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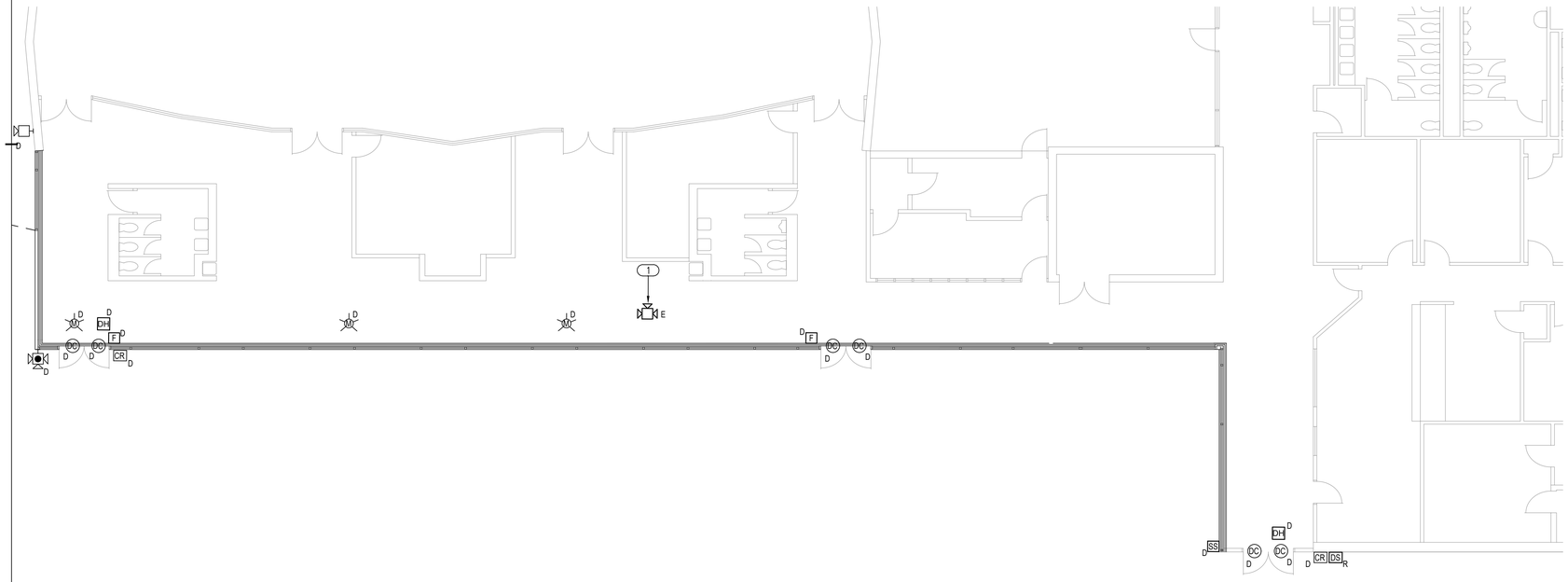
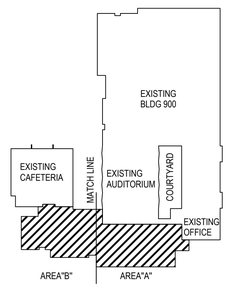


1 TECHNOLOGY DEMO FLOOR PLAN - AREA A

SCALE: 1/8" = 1'-0"

NORTH



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DEMO GENERAL NOTES

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B. REMOVE EXISTING ALARM DOOR CONTACTS AND MOTION DETECTORS AND RETURN TO MPS TECHNOLOGY. WIRING TO BE INSULATED TO PREVENT GROUND FAULTS AND OTHER DAMAGE TO SYSTEM AND WIRING.

C. REMOVE EXISTING OUTSIDE SIREN & RETURN TO MPS TECHNOLOGY.

D. RELOCATE EXISTING AVIGILON DOOR STATION TO TEMPORARY OFFICE ENTRY DURING CONSTRUCTION. AFTER CONSTRUCTION IS COMPLETED, RELOCATE TO NEW OFFICE ENTRANCE. CONTRACTOR TO PROVIDE ONE(1) CATEGORY CABLE CONNECTION AT EACH LOCATION.

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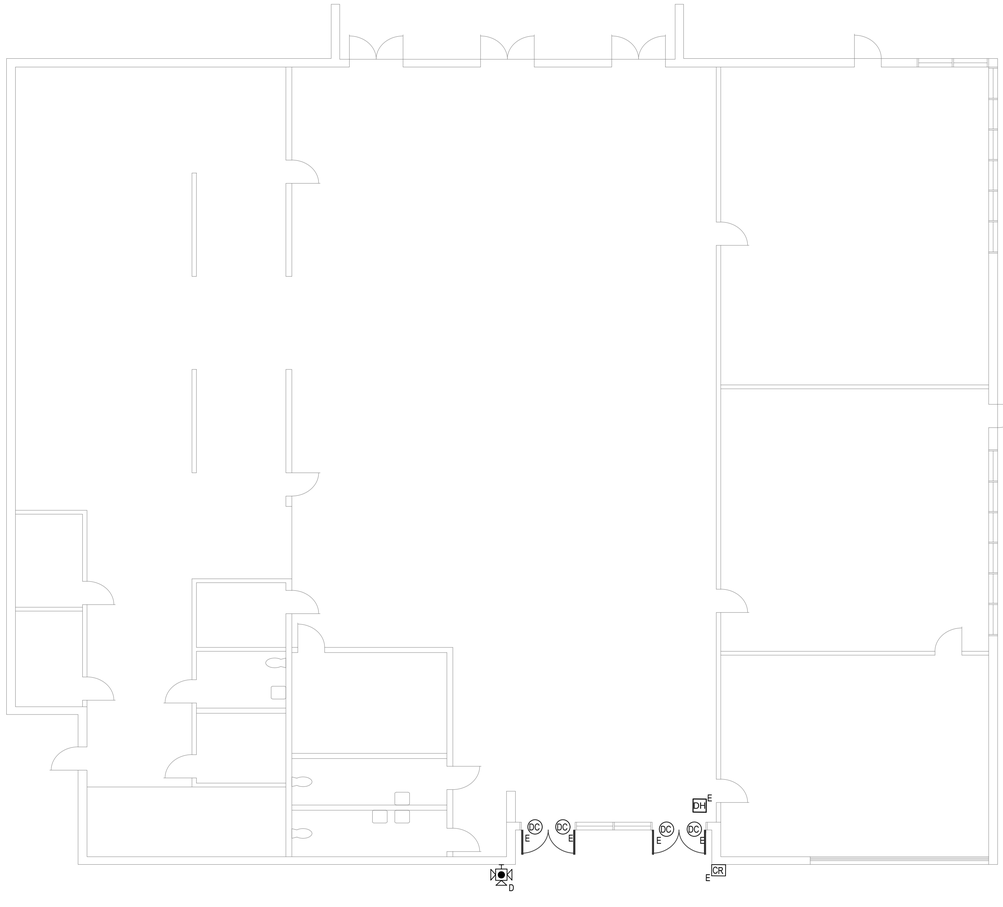
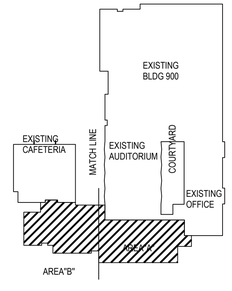


1 TECHNOLOGY DEMO FLOOR PLAN - AREA B

SCALE: 1/8" = 1'-0"

NORTH



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GENERAL NOTES

A. FIRE: REPLACE EXISTING SILENT KNIGHT 5820XL WITH NEW 6820XL (6820 EVS IF VOICE EVAC IS REQUIRED). REPLACE ALL SD PROTOCOL DEVICES WITH SK. SEE SPECS FOR PARTS LIST AND SYSTEM REQUIREMENTS. MAIN BUILDING, AUDITORIUM, CAFE BUILDING, 800 BUILDING AND ENROLLMENT BUILDINGS TO BE UPDATED TO SK PROTOCOL DEVICES.

B. SECURITY ALARM: CONNECT ALL NEW SECURITY DEVICES TO EXISTING DSC ZONE EXPANDER AND POWER SUPPLY.

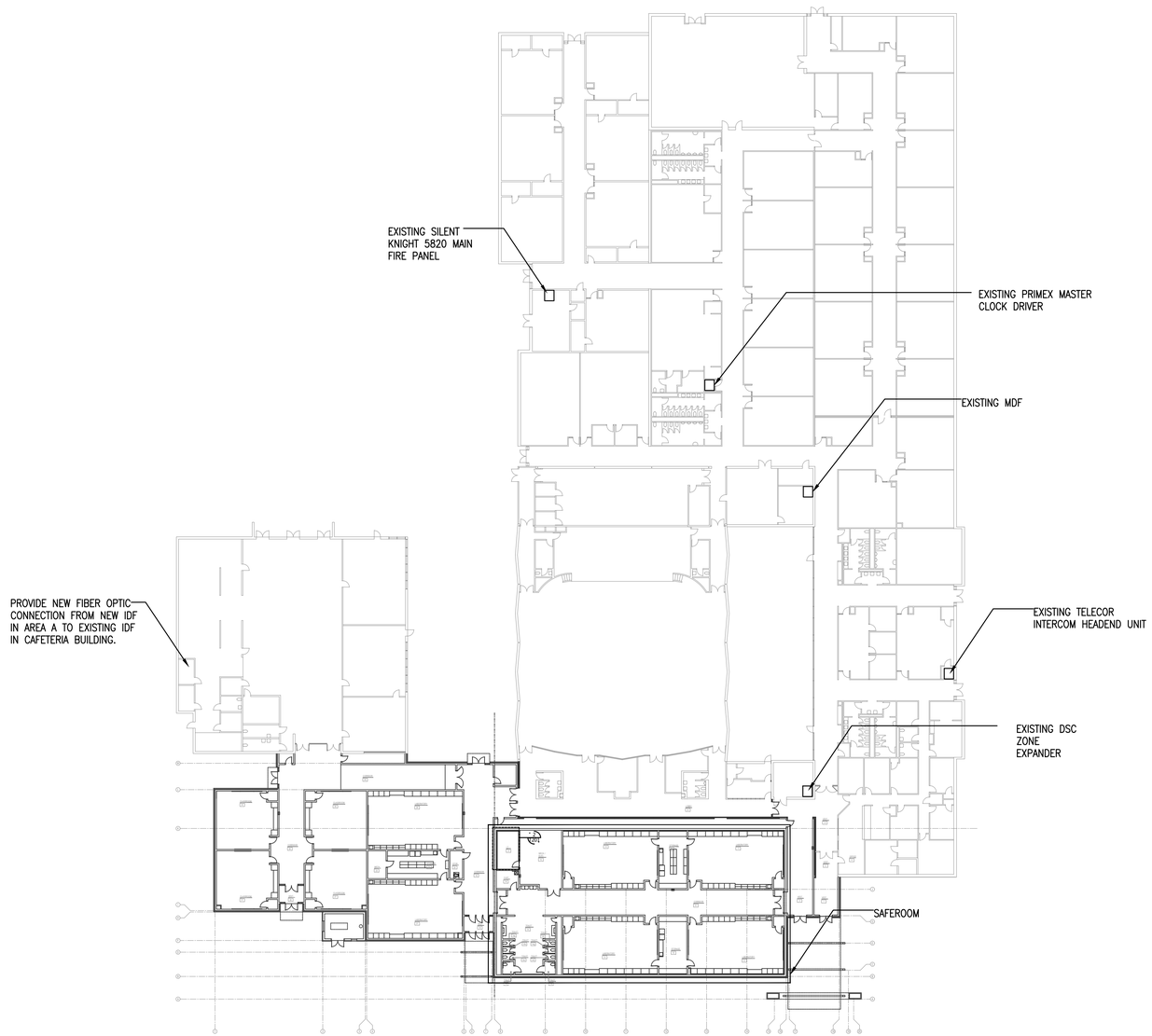
C. INTERCOM: CONNECT ALL NEW INTERCOM DEVICES TO EXISTING TELECOR INTERCOM SYSTEM. PROVIDE ALL LINE CARDS, ETC., NEEDED.

D. CLOCKS: CLOCKS SHALL BE PRIMEX DIGITAL CLOCKS. CONNECT NEW CLOCKS TO EXISTING PRIMEX CLOCK DRIVER. SUPPLY ALL REPEATERS, ETC., NEEDED.

E. ACCESS CONTROL: CONNECT ALL NEW ACCESS CONTROL DEVICES TO NEW CONTROLLER. SUPPLY CONTROLLER, READERS, STRIKES, ETC.

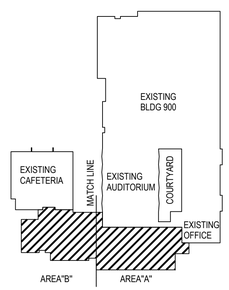
F. CONNECT NEW CAMERAS TO NEW IDF.

G. CONNECT NEW DATA, WIFI, CAMERA DROPS TO NEW IDF.CONNECT NEW IDF TO EXISTING MDF VIA FIBER & CAT-6. SEE NETWORK SPECIFICATIONS FOR FIBER OPTIC CABLE AND CAT 6 INFORMATION.



1 TECHNOLOGY COMPOSITE PLAN
SCALE: 1/32" = 1'-0"

NORTH



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SAFEROOM NOTE

PER ICC 500-2014, 309.1:

PENETRATIONS THROUGH THE STORM SHELTER ENVELOPE THAT ARE LARGER THAN:

1. 3.5 SQUARE INCHES IN AREA FOR RECTANGULAR OPENINGS, OR
2. 2 1/16" IN DIAMETER

SHALL BE CONSIDERED AN OPENING AND SHALL BE PROVIDED WITH AN OPENING PROTECTIVE DEVICE (SHROUD). REFERENCE STRUCTURAL DRAWINGS FOR A SAMPLE SHROUD DETAIL. THIS INCLUDES PENETRATIONS FOR BUNDLES OF CONDUIT.

ACTIVE DAS HYBRID SYSTEM NOTE

CONTRACTOR TO PROVIDE AND INSTALL A COMPLETE AND FUNCTIONING DAS SYSTEM IN THE STORM SHELTER PORTION OF THE BUILDING.

CONTRACTOR SHALL PROVIDE AND INSTALL A CEL-FI QUATRA 4000c SYSTEM BY NEXTIVITY.

REQUIREMENT THAT SYSTEM SHALL BOOST CELL SERVICE FOR VERIZON, T-MOBILE AND AT&T AND SUPPORT A MINIMUM OF 50 USERS.

KEYED NOTES

(1) DATA OUTLET RESERVED FOR 3D PRINTER NETWORK CONNECTION. COORDINATE FINAL LOCATION WITH OWNER.

(2) CONTRACTOR TO INTEGRATE ROLLING DOOR INTO FIRE ALARM SYSTEM.

TECHNOLOGY ENLARGED PLAN KEYED NOTES

1. INDICATES THE LOCATION OF A 8' TALL, 3/4" FIRE RATED PLYWOOD CONTRACTOR TO PROVIDE AND INSTALL PLYWOOD AND ALL REQUIRED MOUNTING HARDWARE. PLYWOOD SHALL BE PAINTED WHITE WITH FIRE RATED PAINT. TYPICAL FOR ALL SHOWN ON DRAWING.
2. INDICATES THE LOCATION OF A NEW WALL MOUNTED TELECOMMUNICATION GROUND BUS BAR (TGBB). CABLING CONTRACTOR TO PROVIDE BUS BAR AND ALL REQUIRED MATERIAL TO MOUNT AT THE LOCATION SHOWN. TGBB TO BE MOUNTED AT +93" A.F.F.
3. PROVIDE AND INSTALL A 12" WIDE, UNIVERSAL LADDER TRAY AND ALL REQUIRED MOUNTING HARDWARE. LADDER TRAY SHALL BE BLACK IN COLOR. TYPICAL FOR ALL SHOWN ON ENTIRE PROJECT.
4. PROVIDE AND INSTALL ONE (1) 2-POST, FLOOR MOUNTED, 7' RELAY RACK (BLACK IN COLOR). PROVIDE BONDING WASHERS, BOLTS, AND NUTS AT ALL MECHANICALLY CONNECTED LOCATIONS OF THE RACK TO ENSURE THAT ALL PIECES OF THE RACK ARE COMPLETELY BONDED. SCRAPING PAINT FROM RACKS TO MAKE A BOND WILL NOT BE ACCEPTED. ALL RACK MOUNTED COMPONENTS SHALL BE MOUNTED WITH BONDING SCREWS AND THE CONTRACTOR SHALL PROVIDE THE OWNER WITH (50) ADDITIONAL BONDING SCREWS FOR THE INSTALLATION OF OWNER EQUIPMENT. NO DAISY CHAINING GROUNDS FROM RACK TO CABLE TRAY OR TO OTHER RACKS WILL BE ACCEPTED. ALL GROUNDS SHALL BE HOME RUN TO THE TELECOMMUNICATIONS GROUND BUS BAR (TGBB). TYPICAL FOR ALL SHOWN ON THE ENTIRE PROJECT.
5. PROVIDE AND INSTALL ONE (1) 7'X6", FRONT AND REAR MANAGED, VERTICAL CABLE MANAGER (BLACK IN COLOR). CABLE MANAGERS SHALL BE INSTALLED ON EACH END OF THE RACK SYSTEMS AND BETWEEN EACH RACK. CABLE MANAGERS SHALL HAVE A SINGLE, SOLID, FULL HEIGHT HINGED DOOR IN THE FRONT AND WIDE SPACED CABLE RINGS WITH SPIN-OPEN LATCHES IN THE REAR. TYPICAL FOR ALL SHOWN IN THE ENTIRE PROJECT.
6. APPROXIMATE HEAD END LOCATION OF ACTIVE DAS HYBRID SYSTEM.

GENERAL NOTES

A. FIRE: REPLACE EXISTING SILENT KNIGHT 5820XL WITH NEW 6820XL (6820 EVS IF VOICE EVAC IS REQUIRED). REPLACE ALL SD PROTOCOL DEVICES WITH SK. SEE SPECS FOR PARTS LIST AND SYSTEM REQUIREMENTS. MAIN BUILDING, AUDITORIUM, CAFE BUILDING, 800 BUILDING AND ENROLLMENT BUILDINGS TO BE UPDATED TO SK PROTOCOL DEVICES.

B. SECURITY ALARM: CONNECT ALL NEW SECURITY DEVICES TO EXISTING DSC ZONE EXPANDER AND POWER SUPPLY.

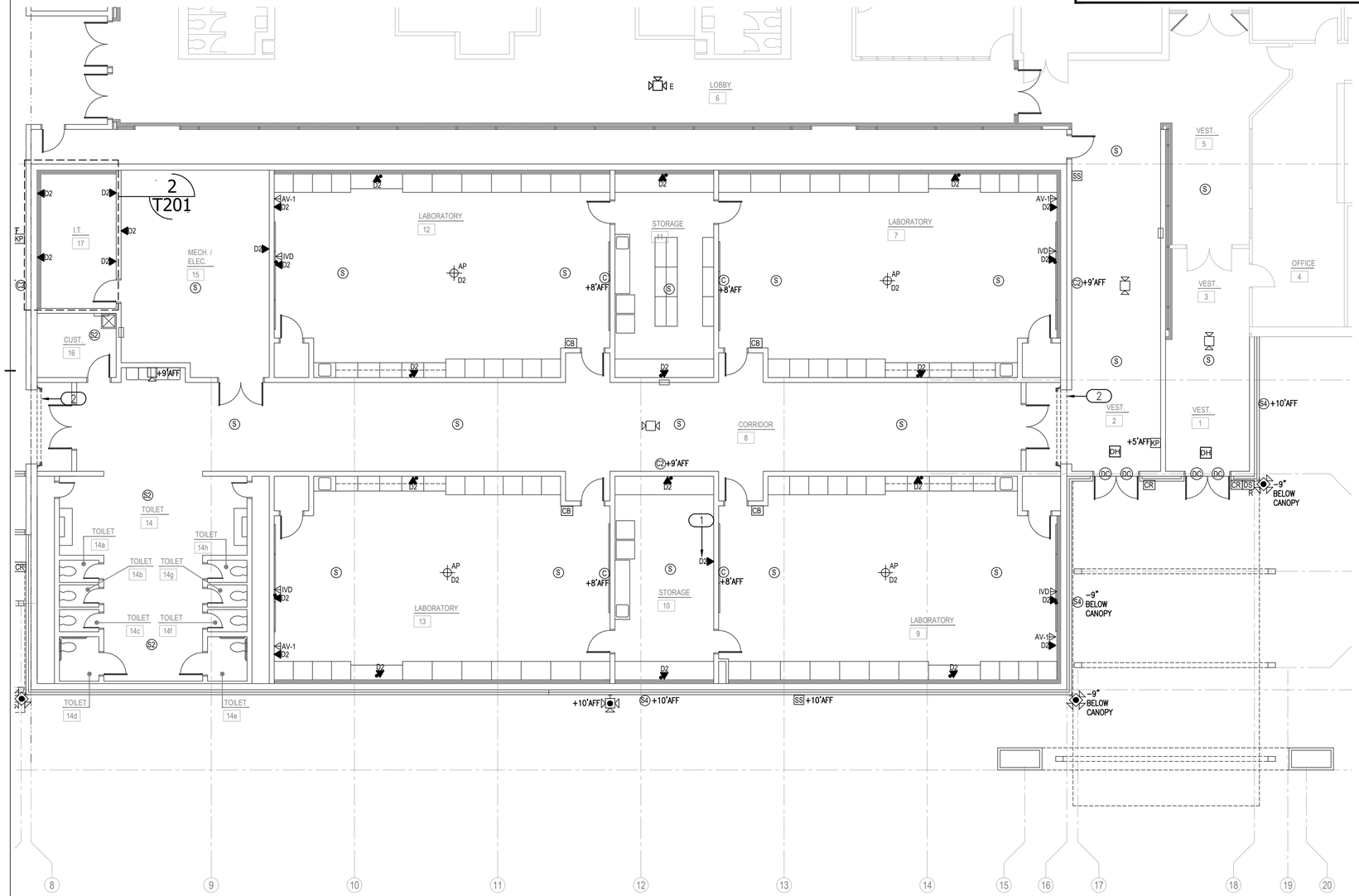
C. INTERCOM: CONNECT ALL NEW INTERCOM DEVICES TO EXISTING TELECOR INTERCOM SYSTEM. PROVIDE ALL LINE CARDS, ETC., NEEDED.

D. CLOCKS: CLOCKS SHALL BE PRIMEX DIGITAL CLOCKS. CONNECT NEW CLOCKS TO EXISTING PRIMEX CLOCK DRIVER. SUPPLY ALL REPEATERS, ETC., NEEDED.

E. ACCESS CONTROL: CONNECT ALL NEW ACCESS CONTROL DEVICES TO NEW CONTROLLER. SUPPLY CONTROLLER, READERS, STRIKES, ETC.

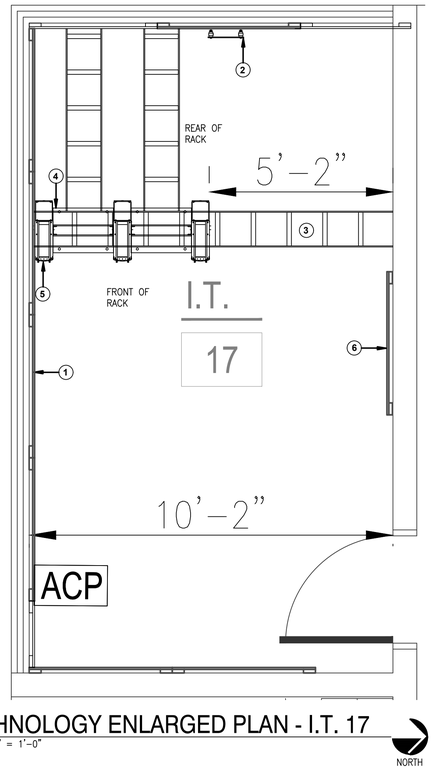
F. CONNECT NEW CAMERAS TO NEW IDF.

G. CONNECT NEW DATA, WIFI, CAMERA DROPS TO NEW IDF.CONNECT NEW IDF TO EXISTING MDF VIA FIBER & CAT-6. SEE NETWORK SPECIFICATIONS FOR FIBER OPTIC CABLE AND CAT 6 INFORMATION.



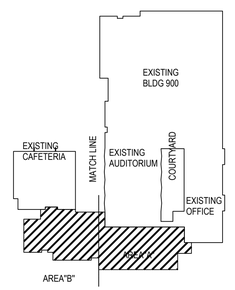
1 TECHNOLOGY FLOOR PLAN - AREA A
SCALE: 1/8" = 1'-0"

NORTH



2 TECHNOLOGY ENLARGED PLAN - I.T. 17
SCALE: 1/2" = 1'-0"

NORTH



KEYPLAN
NO SCALE

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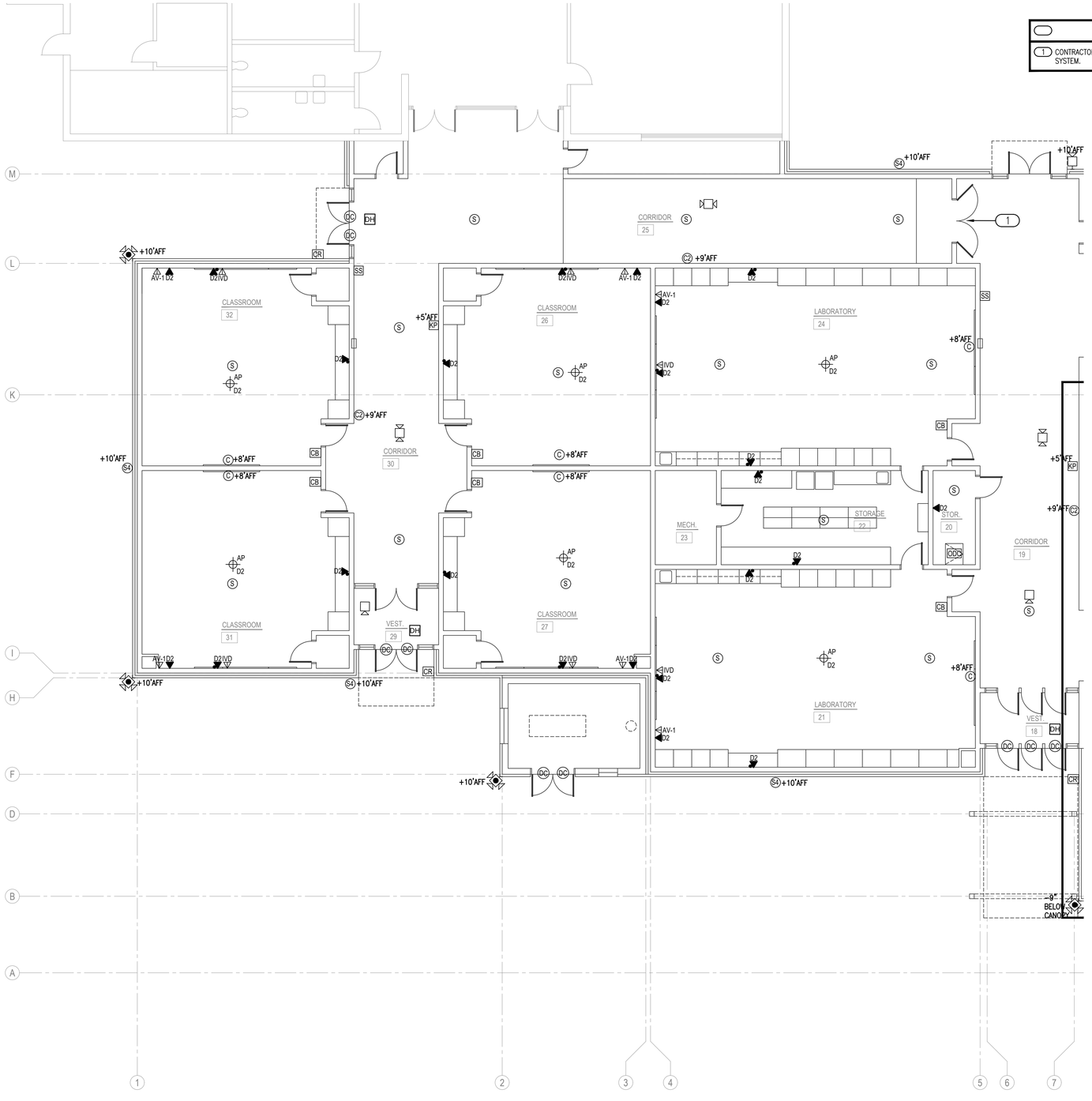


KEYED NOTES

1. CONTRACTOR TO TIE MAGNETIC DOOR HOLD OPENS INTO FIRE ALARM SYSTEM.

GENERAL NOTES

A. FIRE: REPLACE EXISTING SILENT KNIGHT 5820XL WITH NEW 6820XL (6820 EVS IF VOICE EVAC IS REQUIRED). REPLACE ALL SD PROTOCOL DEVICES WITH SK. SEE SPECS FOR PARTS LIST AND SYSTEM REQUIREMENTS. MAIN BUILDING, AUDITORIUM, CAFE BUILDING, 800 BUILDING AND ENROLLMENT BUILDINGS TO BE UPDATED TO SK PROTOCOL DEVICES.

B. SECURITY ALARM: CONNECT ALL NEW SECURITY DEVICES TO EXISTING DSC ZONE EXPANDER AND POWER SUPPLY.

C. INTERCOM: CONNECT ALL NEW INTERCOM DEVICES TO EXISTING TELECOR INTERCOM SYSTEM. PROVIDE ALL LINE CARDS, ETC., NEEDED.

D. CLOCKS: CLOCKS SHALL BE PRIMEX DIGITAL CLOCKS. CONNECT NEW CLOCKS TO EXISTING PRIMEX CLOCK DRIVER. SUPPLY ALL REPEATERS, ETC., NEEDED.

E. ACCESS CONTROL: CONNECT ALL NEW ACCESS CONTROL DEVICES TO NEW CONTROLLER. SUPPLY CONTROLLER, READERS, STRIKES, ETC.

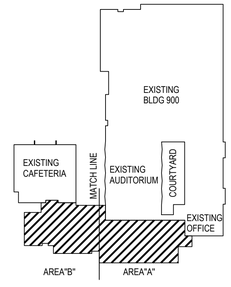
F. CONNECT NEW CAMERAS TO NEW IDF.

G. CONNECT NEW DATA, WIFI, CAMERA DROPS TO NEW IDF.CONNECT NEW IDF TO EXISTING MDF VIA FIBER & CAT-6. SEE NETWORK SPECIFICATIONS FOR FIBER OPTIC CABLE AND CAT 6 INFORMATION.

1 TECHNOLOGY FLOOR PLAN - AREA B

SCALE: 1/8" = 1'-0"

NORTH



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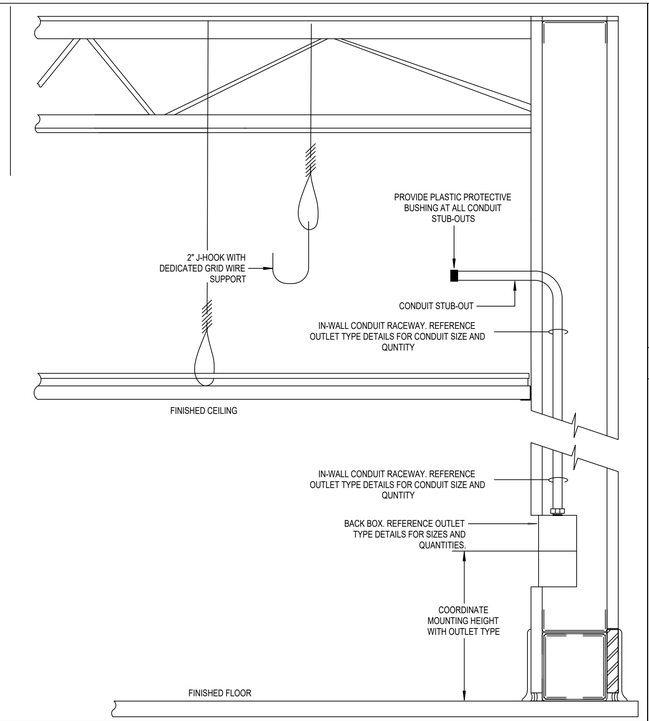
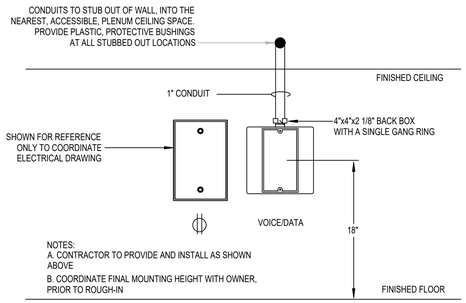
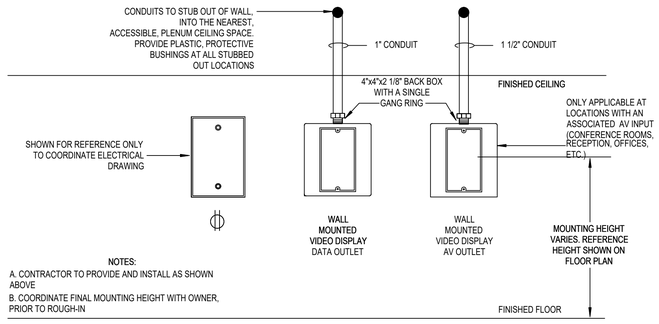


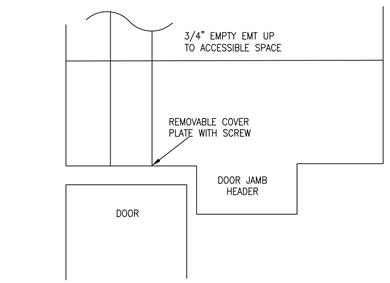
01 LOW VOLTAGE ELEVATION - IN-WALL RACEWAY NOT TO SCALE



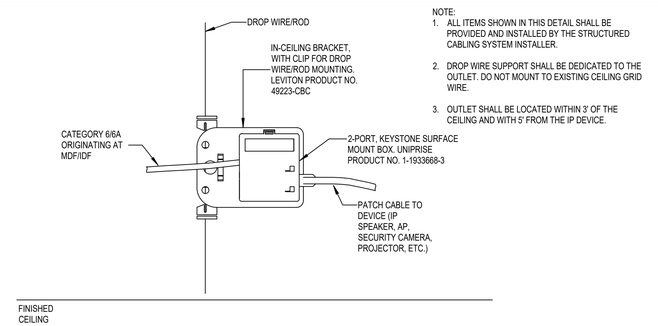
02 RACEWAY DETAIL - TYPICAL VOICE/DATA OUTLET NOT TO SCALE



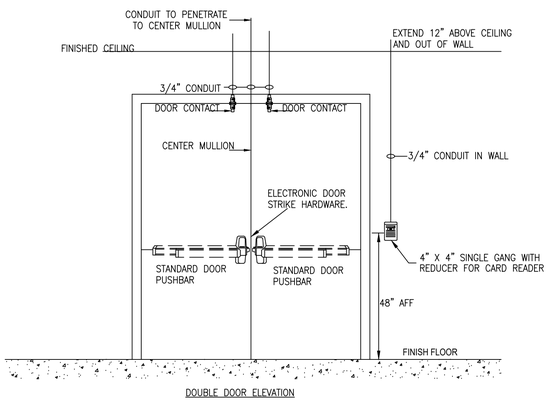
03 RACEWAY DETAIL - WALL MOUNTED DISPLAY NOT TO SCALE



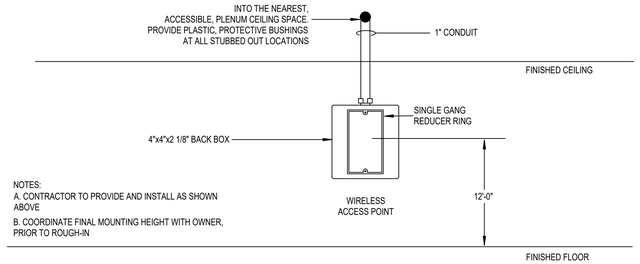
04 SECURITY CONDUIT DOOR JAMB HEADER NOT TO SCALE



05 ABOVE CEILING STAND ALONE OUTLET NOT TO SCALE

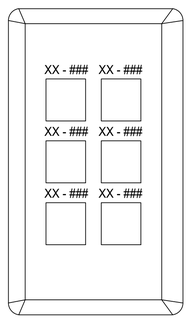


06 DOUBLE DOOR SECURITY & ACCESS CONTROL



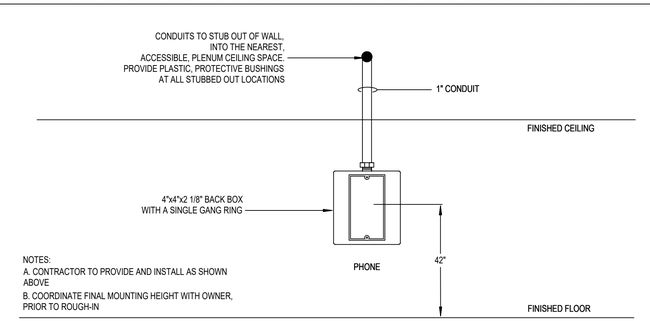
(TYPICAL LAYOUT FOR WALL MOUNTED WIRELESS ACCESS POINT)

07 RACEWAY DETAIL - WALL MOUNTED WIRELESS AP NOT TO SCALE

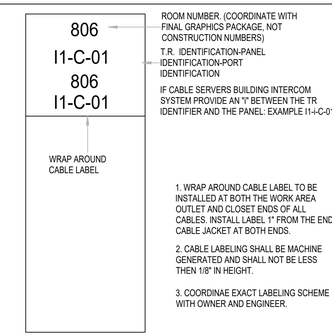


1. FACEPLATE LABELING SHALL BE MACHINE GENERATED AND SHALL NOT BE LESS THEN 1/4" IN HEIGHT
2. PROVIDE BLANK INSERTS FOR ANY UNUSED PORTS
3. COORDINATE EXACT LABELING SCHEME WITH OWNER AND ENGINEER.
4. XX = CABINET ID, ### = DROP NUMBER.

08 FACEPLATE LABEL DETAIL NOT TO SCALE



09 RACEWAY DETAIL - WALL MOUNTED TELEPHONE NOT TO SCALE



1. WRAP AROUND CABLE LABEL TO BE INSTALLED AT BOTH THE WORK AREA OUTLET AND CLOSET ENDS OF ALL CABLES. INSTALL LABEL 1" FROM THE END OF THE CABLE JACKET AT BOTH ENDS.
2. CABLE LABELING SHALL BE MACHINE GENERATED AND SHALL NOT BE LESS THEN 1/8" IN HEIGHT.
3. COORDINAE EXACT LABELING SCHEME WITH OWNER AND ENGINEER.

10 CABLE LABEL DETAIL NOT TO SCALE

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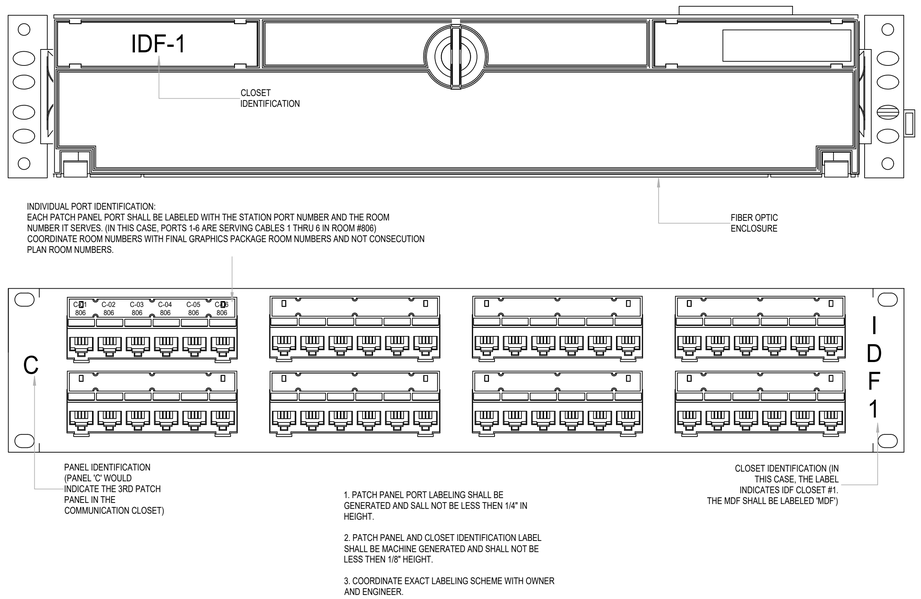
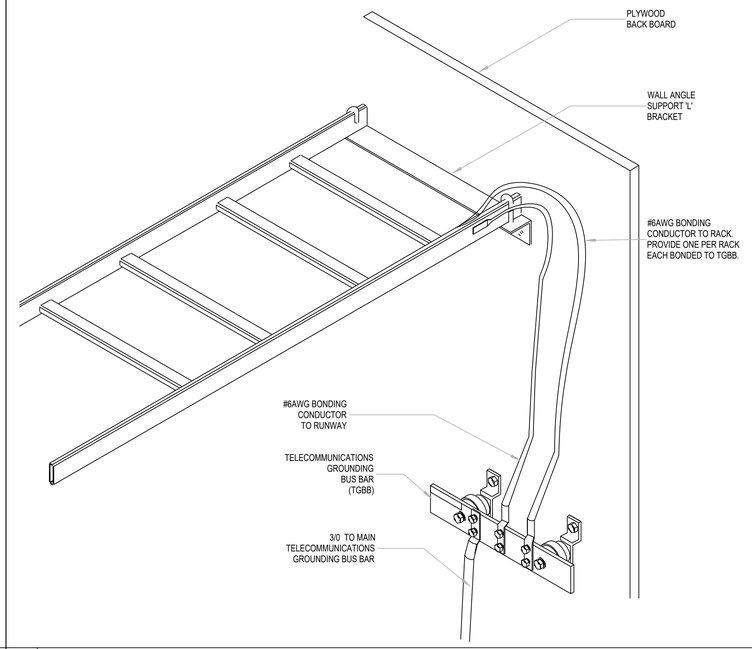
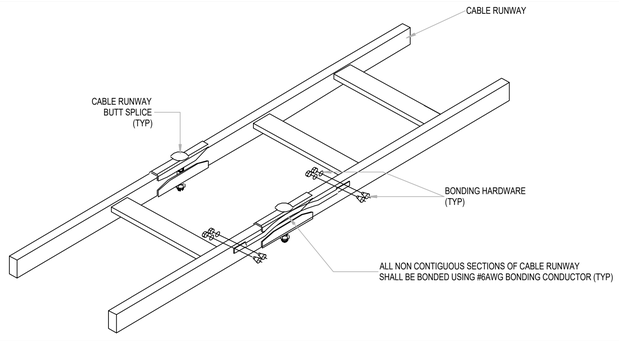


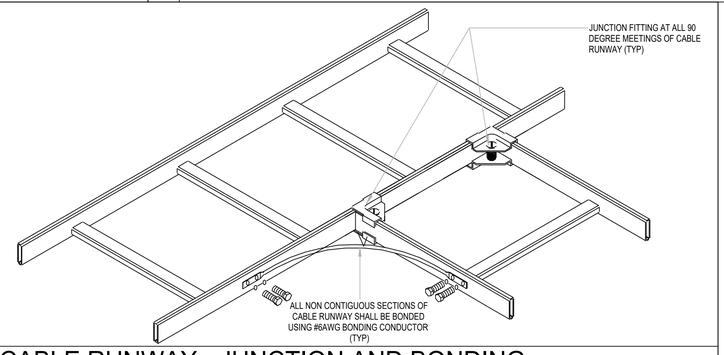
01 FIBER ENCLOSURE/ COPPER PATCH PANEL LABELING DETAIL — NOT TO SCALE



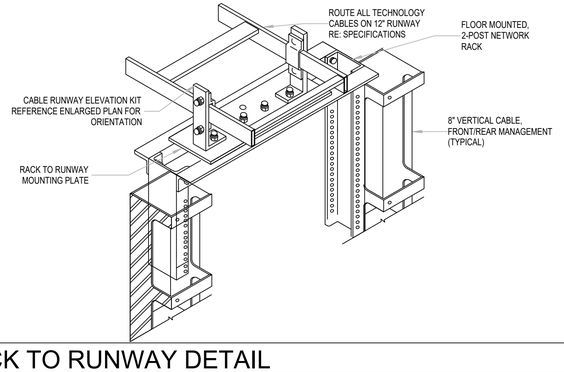
02 CABLE RUNWAY - GROUNDING AND BONDING — NOT TO SCALE



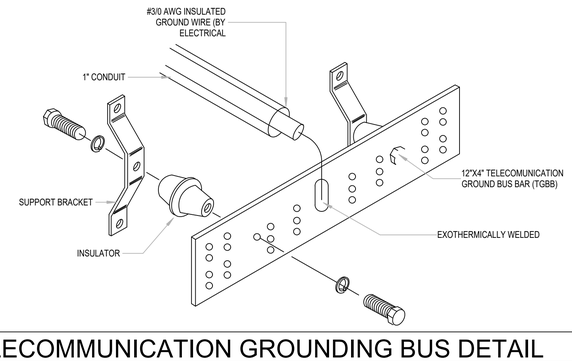
03 CABLE RUNWAY - BONDING AND BUTT SPLICE — NOT TO SCALE



04 CABLE RUNWAY - JUNCTION AND BONDING — NOT TO SCALE



05 RACK TO RUNWAY DETAIL — NOT TO SCALE



06 TELECOMMUNICATION GROUNDING BUS DETAIL — NOT TO SCALE

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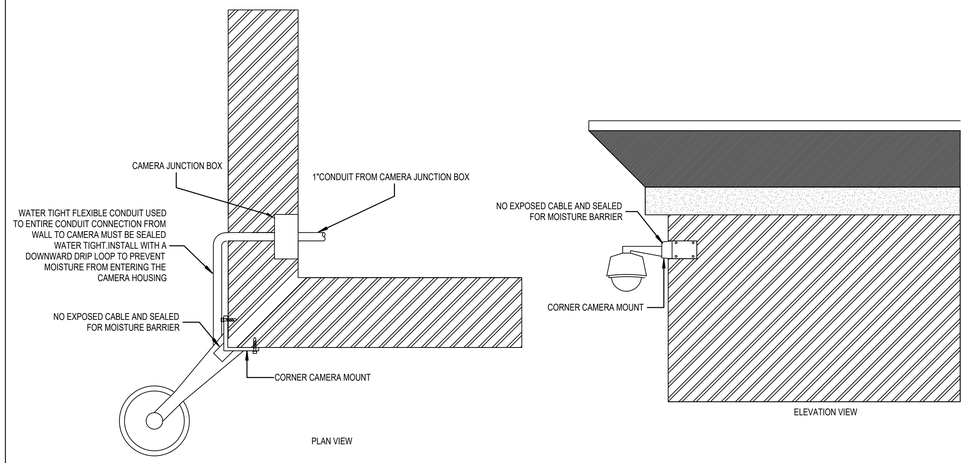
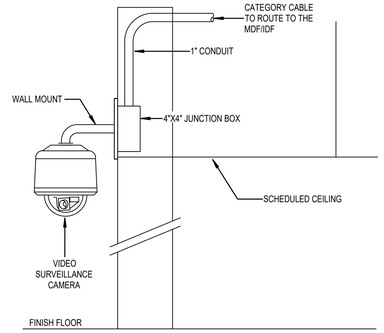


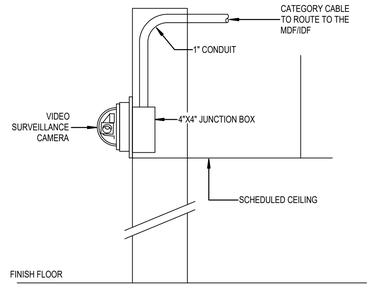
NOTE:

ELECTRICAL CONTRACTOR SHALL PROVIDE 1" CONDUIT WITH PULL STRING TO NEAREST AVAILABLE PLENUM SPACE. SECURITY CONTRACTORS SHALL PROVIDE CABLE FEED-THROUGH MOUNT FOR CAMERA. NO EXPOSED CABLE WILL BE ALLOWED. SECURITY CONTRACTOR TO COORDINATE MOUNTING HEIGHT WITH ELECTRICAL CONTRACTOR PRIOR TO ROUGH-IN.

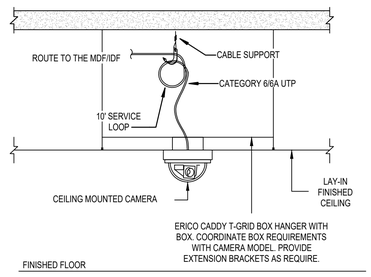
01 CORNER MOUNTING DETAIL — NOT TO SCALE



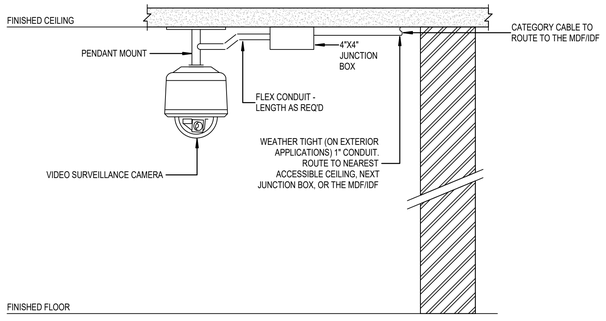
03 INTERIOR WALL MOUNTED DOME CAMERA — NOT TO SCALE



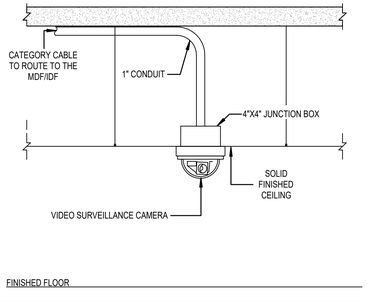
02 INTERIOR WALL MOUNT CAMERA-VERTICAL — NOT TO SCALE



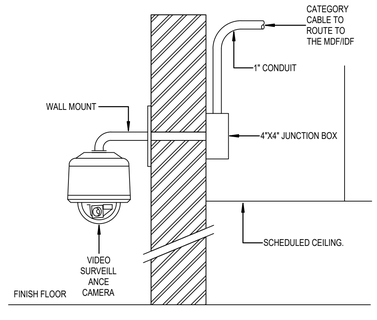
04 INTERIOR LAY-IN CEILING MOUNTED CAMERA — NOT TO SCALE



05 EXT./INT. PENDANT MOUNTED DOME CAMERA — NOT TO SCALE



06 EXTERIOR/INTERIOR SOLID CEILING MOUNT CAMERA — NOT TO SCALE



07 EXTERIOR WALL MOUNTED DOME CAMERA — NOT TO SCALE

GENERAL NOTES:

A. ELECTRICAL CONTRACTOR SHALL PROVIDE CONDUITS AND BACK BOXES. CONDUITS SHALL ROUTE TO THE NEAREST, ACCESSIBLE PLENUM SPACE.

B. ALL WALL, CORNER, PENDANT, AND UNDER CANOPY MOUNTING HEIGHTS SHALL BE COORDINATED WITH THE OWNER AND SECURITY CONSULTANT PRIOR TO ROUGH-IN.

C. SECURITY CONTRACTOR SHALL PROVIDE CAMERAS, MOUNTING HARDWARE, AND ANY OTHER COMPONENTS AND/OR HARDWARE REQUIRED FOR A COMPLETE INSTALLATION.

D. REFERENCE VIDEO SURVEILLANCE CAMERA SCHEDULES, FLOOR PLANS, AND SPECIFICATIONS FOR ADDITIONAL INSTRUCTIONS.

E. CABLE FEED-THROUGH MOUNT FOR CAMERA. NO EXPOSED CABLE WILL BE ALLOWED. SECURITY CONTRACTOR TO COORDINATE MOUNTING HEIGHT WITH ELECTRICAL CONTRACTOR PRIOR TO ROUGH-IN.

08 NOTES — NOT TO SCALE

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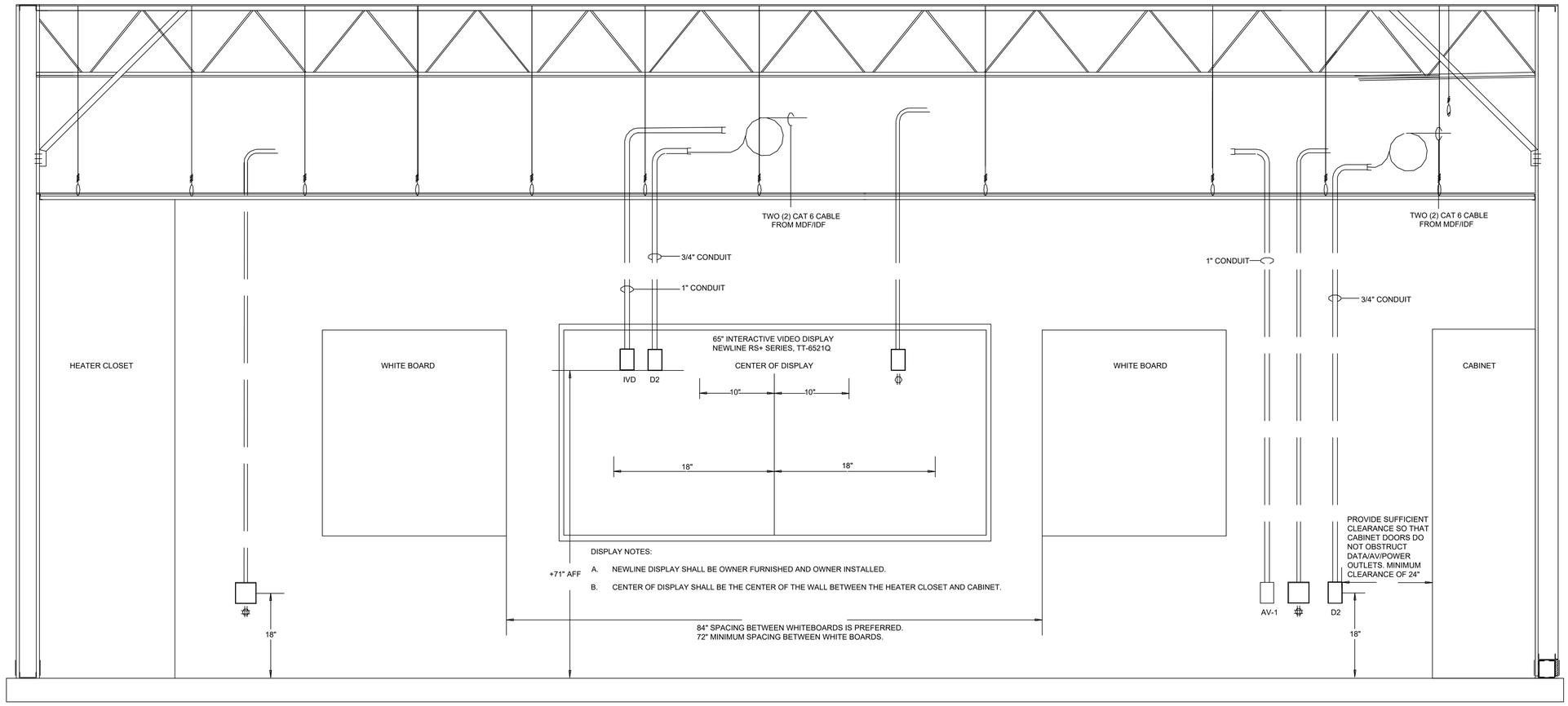
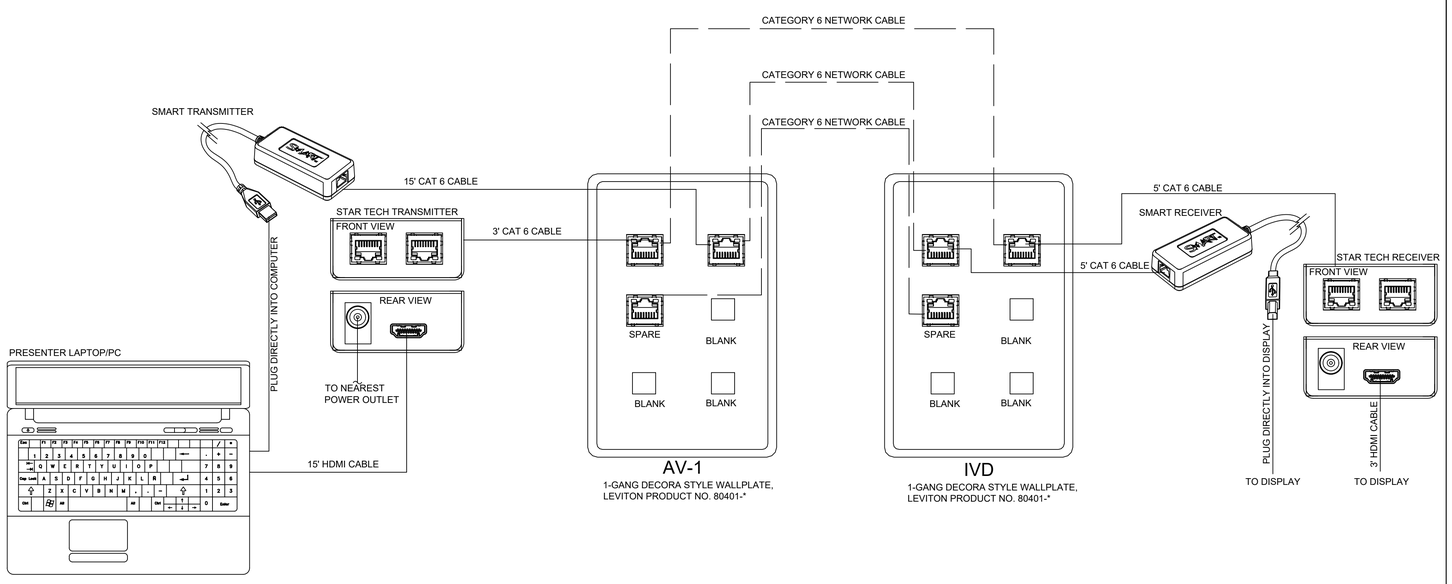


01 TYPICAL TECHNOLOGY WALL PRESENTATION - JUNIOR HIGH AND HIGH SCHOOL

NOT TO SCALE



02 TYPICAL 'IVD' 'AV-1' OUTLET DETAIL

NOT TO SCALE

03 NOTES

CONTRACTOR TO SUPPLY THE FOLLOWING FOR EACH ROOM

- (6) LEVITON 61110-RG6 (USE T-568B WIRING METHOD)
- (2) LEVITON 41080-6WP FACEPLATE. UNUSED PORTS SHALL BE BLANKED OFF.
- (1) 3' CAT 6 PATCH CORD (GREY IN COLOR)
- (2) 5' CAT 6 PATCH CORD (GREY IN COLOR)
- (1) 15' CAT 6 PATCH CORD (GREY IN COLOR)
- (1) 3' HDMI CABLE
- (1) 15' HDMI CABLE
- (1) SMART CAT5-XT-1100 USB EXTENDER
- (1) STAR-TECH TAA-ST121SHD50 HDMI EXTENDER

CONTRACTOR TO CONNECT PATCH CORDS/HDMI CABLES AND EXTENDERS IN EACH ROOM. CONTACT MOORE PUBLIC SCHOOLS TECHNOLOGY DEPARTMENT FOR CONFIGURATION 405-735-4001.

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CEDAR CREEK
CIVIL

KFC ENGINEERING
STRUCTURAL

SALAS O'BRIEN
MECHANICAL / ELECTRICAL

NY
drawn by

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checked by

APRIL 2025
date

revisions

MOORE PUBLIC SCHOOLS
BOARD OF EDUCATION
MOORE, OKLAHOMA

MOORE Public Schools
LEARNING FOR LIFE

CLASSROOM ADDITION
CENTRAL JUNIOR
HIGH SCHOOL

sheet no:

T504

Salas O'Brien
2900 S. Telephone Road, Suite 120
Moore, OK 73160
Salas O'Brien Registration: CA# 7058
Expiration Date : 6/30/2025
Salas O'Brien Project Number: 2550-00564-00

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STRUCTURED CABLING

Horizontal Cabling

Requirements

- Copper cable shall be Category 6 plenum rated cable (blue in Color) for all work station drops.
- Copper cable shall be Category 6 plenum rated cable (White in Color) for all Security camera drops.
- Copper cable shall be Category 6 plenum rated cable (Yellow in Color) for all Wifi drops.
- Approved Category 6 cables are as follows.

Superior Essex Cat6 Plenum Part #'s	77-240-2B blue 77-240-4B white 77-240-6B yellow 77-240-5B green
Mohawk Cat6 Plenum Part #'s	M58281B Blue M58280B white M58283B yellow M58286B green
Berk-Tech Cat6 Plenum Part #'s	10136226 blue 10136230 white 10136749 yellow 10136748 green
General Cat6 Plenum Part #'s	7131800 blue 7131841 white 7131802 yellow 7131806 green

- Connector shall be Leviton part # 61110-RO6 eXtreme 6 connector for all workstation drops.
- Connector shall be Leviton part # 61110-RW6 eXtreme 6 connector for all Security camera drops.
- Connector shall be Leviton part # 61110-RY6 eXtreme 6 connector for all Wifi drops.
- Contractor shall provide Moore Public Schools, Technology Department, one 5' category 6 patch cord, (blue in color) for each category 6 work station cable installed. To be installed by contractor at the network cabinet.
- Contractor shall provide Moore Public Schools, Technology Department, one 10' category 6 patch cord, (blue in color) for each category 6 work station cable installed. Leave in box at network cabinet. To be installed by MPS Technology Dept.
- Contractor shall provide Moore Public Schools, Technology Department, one 5' category 6 patch cord, (White in color) for each category 6 Security Camera cable installed. To be installed by contractor at the network cabinet.
- Contractor shall provide Moore Public Schools, Technology Department, one 10' category 6 patch cord, (White in color) for each category 6 Security Camera cable installed. Leave in box at network cabinet. To be installed by MPS Technology Dept.
- Contractor shall provide Moore Public Schools, Technology Department, one 5' category 6 patch cord, (Yellow in color) for each category 6 Wifi cable installed. To be installed by contractor at the network cabinet.
- Contractor shall provide Moore Public Schools, Technology Department, one 10' category 6 patch cord, (Yellow in color) for each category 6 Wifi cable installed. Leave in box at network cabinet. To be installed by MPS Technology Dept.
- Each cable shall be terminated on the patch panel in data closets.
- All Category 6 connectors shall be placed into QuickPort faceplates at the workstation end.
- Faceplate shall be Leviton part # 41080-6wp
- No substitutions.

Communications Backbone Cabling

Requirements - Optical fiber

- 1 Optical fiber cable shall be run from the MDF to each IDF.
- Fiber shall be terminated with LC connectors.
- Optical fiber cable shall be plenum rated Laser Optimized 50 micron Multi Mode distribution fiber.
- Optical fiber cable shall be an OM3 rated cable guaranteed to support 10 Gigabit Ethernet for 300 meters using 850 nm wavelength.
- Optical fiber cable shall have 24 strands using industry standard color coding.
- Optical fiber cable shall have a flame retardant and low smoke FEP jacket.
- Optical fiber cable shall support 10GBase-SX applications for the life of the system.
- Optical fiber cable shall be armor jacketed or protected inside plenum rated plastic inner duct orange or aqua in color.

  MIC Tight-buffered 024T88-33180-A3
- No substitutions.

Requirements - Copper backbone

- 6 Cat 6 cables shall be run from the MDF to each IDF.
- 3 Cat 6 cables shall be run from the phone Dmark to the MDF.
- Copper cable shall be Category 6 cable. Green in color
- Connector shall be Leviton part # 61110-RV6 eXtreme 6 connector.
- Each cable shall be terminated on the patch panel in data closets.
- Each cable end shall be terminated using the T568B pin/pair assignment.
- No substitutions.

Cable Installation

- Properly support horizontal cables in ceiling every 4'-5' using J-Hooks or cable tray only. (no slings, pouches, or D rings.)
- Place horizontal cables in pathways and spaces dedicated for communications cables. No pathways shall be in or above the red iron. Data cable will be run in separate pathways from all other cables.
- Provide 30' of slack at station end in ceiling and not inside wall.
- Slack shall be rolled neatly in a 2' loop and hanging from a j-hook in ceiling above drop location.
- Cat 6 data cables are to be terminated using the T568B standard.
- Leviton face plates that support 6 snap in jacks will be used with Leviton snap in blanks in unused slots.
- Ensure terminations are at 180 degrees to the jack with no more than ¼" un-twisting and no more than ½" un-jacketing and are in accordance with manufacturer's recommendations.
- Ensure terminations have no un-twisting and that tower separators are utilized to separate pairs.
- Ensure pulling tensions of cables are not exceeded.
- Maintain proper cable bend radius of 4 times the cable's outer diameter during placement.
- No splices are permitted.
- No link shall exceed 90 meters. Contractor is responsible for verifying proper footages.
- Pull one additional "Mule Tape" or ¼" Nylon rope when pulling cables through any conduit utilizing existing pull string.
- Mule Tape or Nylon rope is to be pulled into conduit separately and after all other cables have been installed.
- Install sleeves when puncturing walls.
- Cable shall not be installed between cinder block walls and roof decking.
- Cable shall not be installed between red iron and roof decking.
- Firestop all sleeves and conduit openings after cable installation.
- Terminate all pairs and conductors at all ends according to manufacturer's instructions following color code sequence.
- No splices are permitted in any fiber optic cable except when terminating connectors
- Terminate all Fiber pairs.
- All optical fiber cable shall be installed in the fiber panels in accordance with the manufacturer's instructions.
- Optical fiber Back bone cable length shall not exceed 300 meters.
- Copper backbone cable length shall not exceed 90 meters.
- All back bone cables (Fiber and Copper) shall have 20' of slack at both ends.
- Corning rack mount fiber patch panels are to be used where applicable.
- Outdoor rated fiber will be used for all outdoor fiber runs.
- Stress relief cable and the appropriate building fastener will be used on all aerial runs.
- All aerial cables will be fastened to the stress relief cables.
- 3" conduit is to be used for all buried runs, accessible at each end, with a pull string inside.
- A trace wire and warning tape will be buried with all buried runs
- All bends in conduit will be made with sweeps.
- Back bone cabling shall utilize a star topology with no more than 2 levels of backbone.
- Utilize Velcro ONLY in all closets.
- Install all components in a neat and workmanlike manner.
- Install all horizontal cables and termination frames in accordance with manufacturer's recommendations.

Labeling

- Label shall be a rap type with number printed multiple times enabling print to be legible from any angle.
- Machine label all termination panels and face plates with cabinet and cable number.
- Termination panels shall be labeled in numerical order.
- A single drop will be labeled a total of four times. The labels will be located on the patch panel in the rack, on both ends of the cable, and on the face plate at the work station end. The labels are to read exactly the same in all four locations.
- All 5' patch cables will be labeled at both ends. 5' cables will be installed at the cabinet.
- Numbering scheme will be 00-000 where the first two digits are the cabinet number and the last three are the drop number. Example, drop number 75 in cabinet 2 will read, 02-075.
- Camera drop labels numerically start at 500 in each cabinet. If camera drops already exist in said cabinet the next available consecutive number will be used.
- WiFi drop labels numerically start at 800 in each cabinet. If WiFi drops already exist in said cabinet the next available consecutive number will be used.

  Example for cabinet 1:
  Data (blue cable orange jacks) 01-001 to 01-499
  Camera (white cable white jacks) 01-500 to 01-799
  WiFi (yellow cable yellow jacks) 01-800 to 01-999
- Label all fiber optic cables at both ends on the cable and in the break out box

Test

- Test results for all Category 6 copper and fiber optic cables shall be provided to Moore Public Schools, Technology department.

End of Section

Communications Equipment Room Fittings

Equipment rack

- Free standing equipment rack shall be Chatsworth #55053-703.
- Free standing racks shall be sized to accept 19" spaced equipment and handle a total weight load of 1, 000 pounds.
- Free standing racks shall have 3" side rails tapped on both sides with universal hole patterns for threaded 12-24 screws.
- No substitutions.

Copper Patch panels

- Patch panel shall be a Leviton #49255-H24 Quick Port 110 panel with cable management bar.
- Patch panel shall have 24 ports taking up 1 rack mount unit.
- No substitutions.

Horizontal cable management

- Horizontal cable manager shall be a 2 RU Chatsworth part #30130-719.
- No substitutions.

Vertical cable management

- Vertical cable manager shall be Chatsworth part #30095-703.
- No substitutions.

Optical fiber patch panel / enclosure

- Optical fiber enclosure shall be Corning LC loaded rack mount panel.

  CCH-04U
  CCH-01U
  CCH-CP24-E4
  SOC-LC-900-OM4
- No substitutions.

Ladder racking

- Ladder racking shall be Chatsworth #10250-718.
- The appropriate Chatsworth mounting hardware shall be used.
- No substitutions.

Power protection power strips

- PDU's are to be placed in all data racks.
- PDU shall have overload protection and easy to reset circuit breaker.
- PDU shall be rack mountable.
- PDU shall be constructed from 18 AWG steel.
- PDU shall have light emitting diodes to indicate "Power On" and "Ground/Polarity OK" feature.
- PDU shall be rated for 20 Amps and have a 12' L5-20P plug and ten 5-20R receptacles.
- No substitutions.

Uninterruptible Power Supply (UPS)

- Contractor shall furnish and install a Cyber Power UPS in each new MDF/IDF.
- UPS manufacturer shall be Cyber Power. Model OL1500RTXL2UN

Installation

Free standing racks

- Assemble free standing racks according to manufacturer's instructions. Verify that equipment mounting rails are sized properly for rack-mount equipment before attaching the rack to the floor.
- All racks must be attached to the floor in four places using appropriate floor mounting anchors. When placed over a raised floor, threaded rods should pass through the raised floor tile and be secured in the structural floor below.
- All rack must be secured to the adjacent wall using ladder rack to stabilize the top of the rack and provide a cable pathway from the ceiling to the rack.
- Racks shall be grounded to the telecommunications bus bar using #6 AWG green insulated solid copper wire and any necessary attachment hardware provided by the Communications Contractor.
- Mount rack mount power strips on rack where active equipment will be placed.

Ladder rack

- Ladder rack shall be attached to the top of the rack to deliver cables to the rack. The rack should not be drilled to attach ladder rack. Use appropriate hardware from the ladder rack manufacturer.
- Ladder racking shall be supported every 5' with 3/8" threaded rod anchored and secured to permanent ceiling structure.
- Loading of cable rack shall not exceed 6" depth and should have retainers every 12" to prevent cables from spilling over the sides.
- Where ladder racking butts up against wall the appropriately sized wall mount bracket shall be utilized.
- Ladder rack shall extend vertically up wall and through drop ceiling to gain access to cavity above drop ceiling.
- Ladder racking shall utilize all appropriate radius drop stringers, corner bends and other devices to maintain cable bend radius when entering and exiting racks, cabinets and drop ceilings
- Mating pieces of ladder racking together shall utilize appropriate butt splice and junction splice kits.
- All cut and exposed sharp ends shall utilize a plastic end cap to prevent injury.

Cable management

- Vertical cable manager shall be installed on every rack vertical rail. Where two rack rails will be butted together there shall be two vertical wire managers between the racks.
- Horizontal wire managers shall be utilized above and below every copper and fiber patch panel.
- All cables shall sweep in and out of any cable management product without a deformation of cable jacket.
- Ensure cables are properly supported when using cable management to ensure cables do not sag.
- Utilize Velcro ONLY for securing of cables on cable management.

Copper and Fiber patching panels

- Route all cables to backside of termination panels in an asymmetrical orientation to ensure cable bundles are split evenly.
- Utilize rear wire management bars for supporting cables into point of termination.
- Secure all cables on all panels using Velcro ONLY to prevent cables from pulling away.

End of Section

Quality Assurance

- Install all components as directed by Manufacturer's installation guidelines.
- All products shall bear the mark of UL or ETL for performance level.
- System installation shall meet all applicable Local/State codes and safety requirements where project is located.
- All products shall be new and un-used in original packaging.
- Follow and adhere to installation practices specified by the applicable Telecommunications Industry Association standards.
- Follow and adhere to installation practices specified by BICSI Information Transport System Installation.
- Follow and adhere to installation practices specified by BICSI Telecommunications Distribution Methods.
- Follow and adhere to installation practices specified by NFPA-70 National Electric Code.
- Follow and adhere to installation practices specified by the Manufacturers.
- Contractor shall make available all ceiling and termination work for inspection by Manufacturer's representative or owner's representative.
- Contractor shall replace all defective components.

Bidder/Installer Qualifications

- Bidding Contractor shall be a licensed to install telecommunications systems in the state where work will be performed.
- Bidding Contractor shall be Leviton certified for at least one year
- Bidding Contractor shall have a minimum of 5 years experience installing structured cabling for telecommunications.
- Bidding Contractor shall have the capability to bond project in its entirety.
- Bidding Contractor shall be able to provide insurance at the request of the owner.
- Installer shall have an onsite supervisor and one technician who are certified by the Manufacturer to install the Manufacturer's telecommunications products.
- Communications Contractor shall have an RCDD on staff for at least one year, to certify that the Communications System can support the required applications on the various cabling media.
- Installer shall have obtained Leviton certification from the Manufacturer within 1 year prior to performing the Work.

Delivery, Storage, and Protection

- Communications Contractor shall ensure that materials delivery to work area shall be coordinated with construction site manager responsible for materials distribution to all trades.
- Communications Contractor is responsible for all materials, tools and vehicles left on the job site.
- Communications Contractor shall coordinate a disposal bin for the removal of all trash produced by the Communications Contractor personnel during the project.
- Communications Contractor shall ensure materials are stored in an environmental area where:

  Temperature does not exceed 120 degrees Fahrenheit nor below 32 degrees Fahrenheit.
  Humidity does not exceed 80 %.
  No direct exposure to sunlight.
- Follow Manufacturer's recommendations for handling of materials.

Warranty

- Communications Contractor shall provide a 1 year parts and labor warranty against defective workmanship and/or system component failure.
- Communications Contractor shall execute a Lifetime Applications Assurance Warranty for parts and labor to support stated applications from the connectivity Manufacturer.

End of Section

Moore Public Schools Intercom System Specifications

Part 1 - Equipment

1.01System Manufacture

- Intercom System Manufacturer shall be Telecor or Rauland Telecenter U IP. (Match existing system)
- Cable Manufacturer shall be Belden or Equivalent

  Locations where Telecor equipment is required. It may be purchased from the following authorized Telecor dealers
  Advanced Cabling, Inc - 405-418-4322
  High-Tech Tronics, Inc - 405-495-0215

  Locations where TelecenterU equipment is required. It may be purchased from the following authorized TelecenterU dealer
  Endex of Oklahoma Inc - 405-602-0001

1.02 Intercom Systems Equipment

1.02.a Telecor Intercom Equipment

- Intercom call in button shall be momentary close and compatible with existing intercom system
- Intercom ceiling speakers shall be Manufacture Clarity Model # S-522. (Or equivalent approved by MPS must have volume control accessible from the floor)
- Intercom outside paging horn shall be Manufacture Rauland Borg 3601. (Or equivalent approved by MPS)
- Locations where Telecor equipment is required. It may be purchased from the following authorized Telecor dealers

  Advanced Cabling, Inc - 405-418-4322
  High-Tech Tronics, Inc - 405-495-0215

1.02.b Rauland Telecenter U IP Intercom Systems Equipment

- Classroom Intercom Equipment
  - Call button shall be Part # 603302 Dual Level call switch.
  - Ceiling speakers shall be Part # BAFKIT2X2L8RJ - 8 Ohm ceiling tile replacement speaker with RJ45 connector.
  - IP Classroom Module shall be TCC2011 IP Module (*Module required for each classroom, *Requires POE network drop)
- Hallway/Commons/Outside Intercom Equipment
  - TCC2022-IP Zone page module (*Requires POE network drop)
  - Appropriate size amp for quantity of speakers.
  - BAFKIT2X2L- 25 volt ceiling tile replacement paging speaker (For all classroom & hallway locations)
  - Rauland Borg 3601 - Loud paging horn (For all outside & large area locations such as gymnasiums, etc.)
  - Rauland status light shall be part # TCC2088
  - Rauland status light trim ring shall be part # TCC2986

  Locations where TelecenterU equipment is required. It may be purchased from the following authorized TelecenterU dealer
  Endex of Oklahoma Inc - 405-602-0001

End of Section

Part 2 - Installation

2.01 Systems Installation

- All non-IP cabling shall be **shielded** and have a minimum of 5 conductors.
- All network IP cabling shall be Cat6 & Purple in color (See Structured Cabling System Specifications for cabling information)
- Each room with a call button shall have a status light mounted above the room door on the hallway side. (Rauland Telecenter U IP sites only)
- All circuits and cabling shall be labeled at all terminating ends.
- All Ceiling mounted devices shall be mounted on non-stainable ceiling tiles
- All devices shall be mounted according to the manufacture's specifications.
- All devices shall be properly adjusted and tested prior to job completion.
- All non-IP room circuits shall run from the intercom system to the call button then to the room speaker.
- All extra speaker wire taps shall be insulated.
- All rooms shall be individually wired and terminated at the intercom system on individual points. (No Doubling)
- All rooms shall be tested to verify proper room number programming and operation.
- All call buttons shall be labeled with their corresponding system point number.
- Protective grommets shall be installed on all conduits to protect wire.
- All wire shall be run in J hooks above ceiling with a minimum space of 4" from ceiling deck. All wire shall be in separate pathways 6" from other system wiring. No wire ties allowed. No wire shall be run between the red iron and roof deck.
- All wire ran between building shall be in conduit and shall be direct burial cable. It shall be a minimum of 5 conductor 18 AWG copper. Lighting suppression shall be installed at entry points.
- Installer shall supply the electrical and or masonry contractors with specialty back boxes and coordinate with them to ensure that all necessary conduits, back boxes, etc. are installed in the proper locations.
- Follow and adhere to installation practices specified by NFPA-70 National Electric Code, Edition 2008.
- Follow and adhere to installation practices specified by the Manufacturers.

2.02 Quality Assurance

- Install all components as directed by Manufacturer's installation guidelines.
- All products shall bear the mark of UL or ETL for performance level.
- System installation shall meet all applicable Local/State codes and safety requirements where project is located.
- All products shall be new and un-used in original packaging.

2.03 Bidder/Installer Qualifications

- Bidding contractor shall have a minimum of 5 years experience installing school intercom systems.
- Bidding contractor shall be able to provide insurance at the request of the owner.

2.04 Delivery, Storage, and Protection

- Contractor shall ensure that materials delivery to work area shall be coordinated with construction site manager responsible for materials distribution to all trades.
- Contractor is responsible for all materials, tools and vehicles left on the job site.
- Follow Manufacturer's recommendations for handling of materials.

2.05 Scheduling

- Contractor shall provide a detailed construction schedule with hard dates for completion of roughing in cables, terminations and testing once scheduling sequence has been determined to the Owner's Project Manager.

2.06 Warranty

- Contractor shall provide a 1 year parts and labor warranty against defective workmanship and/or system component failure.

End of Section

Part 3 - Execution

3.01 Field Quality Control

- Contractor shall make available all ceiling and termination work for inspection by Manufacturer's representative or owner's representative.
- Contractor shall replace all defective components.

3.02 Adjusting

- No additional work outside of the contract scope of work shall be completed without the approval of the Owner or Owner's representative.

3.03 Protection

- It is the responsibility of the Contractor to ensure equipment is protected from dust and water during the project with appropriate materials.
- Remove all protective covers and protective materials from equipment prior to turnover to Owner.

3.04 Schedules

- Coordinate work with Owner's project manager and follow scheduling sequence as established by Owner's project manager.
- It is recommended that the Contractor schedule closely with any other systems contractor to ensure turnover date is met.
- Contractor bidding will supply the electrical and or masonry contractors with any specialty back boxes such as clock recessed back boxes etc. and coordinate with them to ensure that all necessary conduits, back boxes, etc. are installed in the proper locations.

3.05 Submittals

1.03.01 Prior to installation

- Show compete map of system design for approval by Owner.

3.06 System Requirements

Intercom system shall be capable of communicating to all rooms and shall have adequate number of room points as to not double up on any given point.

End of Section

Intercom System Installation Completion Check List

Part 4 - Check List

4.01 Section Includes

- Intercom System Completion Check List

4.02 Completion Check List

- Main control panel has a map of the entire system inside and a copy has been given to Jack Phillips with MPS.
- All intercom programming such as bell times, tornado drill alert, etc has been checked and is correct.
- Intercom has been tested for proper operation.
- All rooms have been tested to verify proper description at console.
- All speakers have been tested to verify proper operation and volume.
- All extra speaker wires have been tapped or insulated
- All call buttons are labeled and have been tested for proper operation.

End of Section

Moore Public Schools Clock System Specifications

Part 1 - General

1.01System Manufacture

- Clock Equipment shall be Telecor, Rauland, Sapling or Primex. See plans for the specific manufacturer required. (No Substitutions)

  Locations where Telecor equipment is required. It may be purchased from the following authorized Telecor dealers

  Advanced Cabling, Inc - 405-418-4322
  High-Tech Tronics, Inc - 405-495-0215

1.03Intercom Clock Systems Equipment Description

- Contractor to provide and install primex 4" digital clocks at all locations shown on the drawings.
- Clocks shall connect to existing primex master clock. Provide additional repeaters as needed.
- Clocks shall not be battery powered.

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Moore Public Schools Clock System Specifications cont.

1.02 Systems Installation

- All devices shall be mounted according to the manufacture's specifications.
- All Ceiling mounted devices shall be mounted on non-stainable ceiling tiles
- All devices shall be properly adjusted and tested prior to job completion.
- All extra wire taps shall be insulated.
- Protective grommets shall be installed on all conduits to protect wire.
- All wire shall be run in J hooks above ceiling with a minimum space of 4" from ceiling deck. All wire shall be in separate pathways 6" from other system wiring. No wire ties allowed.
- All wire ran between building shall be in conduit and shall be direct burial cable. It shall be a minimum of 5 conductor 18 AWG copper and shall have lightning suppression installed at building entry.
- Installer shall supply the electrical and or masonry contractors with specialty back boxes such as clock recessed back boxes etc. and coordinate with them to ensure that all necessary conduits, back boxes, etc. are installed in the proper locations.
- Follow and adhere to installation practices specified by NFPA-70 National Electric Code, Edition 2008.
- Follow and adhere to installation practices specified by the Manufacturers.

1.03Quality Assurance

1.03.01 Qualifications

- Install all components as directed by Manufacturer's installation guidelines.
- All products shall bear the mark of UL or ETL for performance level.
- System installation shall meet all applicable Local/State codes and safety requirements where project is located.
- All products shall be new and un-used in original packaging.

1.03.02 Bidder/Installer Qualifications

- Bidding contractor shall have a minimum of 5 years experience installing school intercom systems.
- Bidding contractor shall be able to provide insurance at the request of the owner.

1.04Delivery, Storage, and Protection

- Contractor shall ensure that materials delivery to work area shall be coordinated with construction site manager responsible for materials distribution to all trades.
- Contractor is responsible for all materials, tools and vehicles left on the job site.
- Follow Manufacturer's recommendations for handling of materials.

1.05 Scheduling

- Contractor shall provide a detailed construction schedule with hard dates for completion of roughing in cables, terminations and testing once scheduling sequence has been determined to the Owner's Project Manager.

1.06 Warranty

- Contractor shall provide a 1 year parts and labor warranty against defective workmanship and/or system component failure.

Part 3 - Execution

3.01 Field Quality Control

- Contractor shall make available all ceiling and termination work for inspection by Manufacturer's representative or owner's representative.
- Contractor shall replace all defective components.

3.02 Adjusting

- No additional work outside of the contract scope of work shall be completed without the approval of the Owner or Owner's representative.

3.03 Protection

- It is the responsibility of the Contractor to ensure equipment is protected from dust and water during the project with appropriate materials.
- Remove all protective covers and protective materials from equipment prior to turnover to Owner.

3.04 Schedules

- Coordinate work with Owner's project manager and follow scheduling sequence as established by Owner's project manager.
- It is recommended that the Contractor schedule closely with any other systems contractor to ensure turnover date is met.
- Contractor bidding will supply the electrical and or masonry contractors with any specialty back boxes such as clock recessed back boxes etc. and coordinate with them to ensure that all necessary conduits, back boxes, etc. are installed in the proper locations.

End of Section

1.04 Submittals

1.04.01 Prior to installation

- Show compete map of system design for approval by Owner.

End of Section

Clock System Installation Completion Check List

Part 1 - General

1.01Section Includes

- Clock System Completion Check List

1.02 Completion Check List

- All Clocks have been tested for proper operation and synchronization.

End of Section

Moore Public Schools Security System Specifications

Part 1 - General

2.01 Manufacturers

- Security System Manufacturer shall be DSC or DMP. See plans for the specific manufacturer required. (No Substitutions)
- Installer shall be certified by manufacturer to install & program the specified systems. (No Substitutions)
- Peripheral device Manufacturers shall be according to equipment list. (No Substitutions)
- Cable Manufacturer shall be Genesis. (Or Equivalent)

Security Systems Equipment

- Security alarm control shall be DSC Model # PC4020 or DMP Model # XR550NL-G. (No Substitutions)
- Security alarm control communicator shall be DSC Model # T-LinkTL250. DPM N/A. (No Substitutions)
- Security alarm keypad shall be DSC Model # LCD4501 or DMP Model # 7873. (No Substitutions)
- Security alarm keypad for all kitchen locations shall be DSC Model # LCD4501 or DMP Model # 7073. (No Substitutions)
- Security alarm 8 zone hardwire expander shall be DSC Model # PC4108 or DMP Model # 714-8. (No Substitutions)
- Security alarm 16 zone hardwire expander shall be DSC Model # PC4116 or DMP Model # 714-16. (No Substitutions)
- Security alarm power supply shall be DSC Model # PC4204 or DMP systems = Altronix Model # SMP3PMCTX. (No Substitutions)
- Security alarm power supply cabinet shall be DSC Model # PC4051C. DMP N/A. (No Substitutions)
- Security alarm cabinet locks shall be DSC Model # L1 or DMP Model # 301. (No Substitutions)
- Security alarm wireless receiver shall be DMP Model # 1100XH, DSC N/A
- Security alarm wireless transmitter shall be DMP Model # 1103, DSC N/A
- Security alarm 35'x35' motion detector shall be Honeywell Model # DT-8035. (No Substitutions)
- Security alarm 50'x60' motion detector shall be Honeywell Model # DT-8050. (No Substitutions)
- Security alarm window glass break sensor shall be Honeywell Model # FG-730. (No Substitutions)
- Security alarm hold-up button shall be Potter HUSK-20
- Security alarm door contact shall be GE Model # 1076D-M. Double Pole Double Throw for all doors (No Substitutions)
- Each single door or double door shall be wired with 4 conductor wire.
- DMP systems shall be wired with 2 zones per single door or double door. One zone for Security alarm and one zone for "Door Held Open Alert"
- Security alarm C channel door magnets shall be GRI Model # MC180
- Security alarm surface window contact shall be Aleph Model # PS-1541. (Or equivalent approved by MPS)
- Security alarm overhead door & roof hatch contact shall be Amseco Model # ODC-59A or for rail mount applications Interlogix GE2315AL. (No Substitutions)
- Security alarm indoor siren shall be Ademco Model # Wave2EX. (No Substitutions)
- Security alarm outdoor siren shall be ATW Model # DS301SET. (No Substitutions)
- Security alarm outdoor strobe shall be Amseco Model # SL401C. (No Substitutions)

1.01 Systems Installation

- Keypad zones shall not be used. All zones shall wire to the main control or zone expanders.
- Installer shall be certified by manufacturer to install & program the specified systems.
- Installer shall perform all programming required to complete the installation. Moore Public Schools shall not be required to assist in any part of the installation or programming.
- All alarm junctions and or splices shall be soldered and insulated.
- All circuits and wiring shall be labeled at all terminating ends.
- All devices shall be mounted according to the manufacture's specifications.
- All devices shall be properly adjusted and tested prior to job completion.
- All DSC 4108 & 4116 zone expanders shall be installed with a DSC PC4204 power supply and DSC PC4051C with L1 lock
- All DMP 714-8 & 714-16 zone expanders shall be installed with a power supply Altronix Model # SMP3PMCTX keyed with DMP Model # 301.
- All cabinets shall be labeled outside with their corresponding module and zone numbers and installed with lock.
- All cabinets shall be labeled inside with module number by the corresponding module and zone list definitions.
- If a new DSC main control panel is required, it shall have a T-LinkTL250 installed
- All new DSC or DMP main control panels shall have a Cat 6 cable ran back to the nearest IDF for network connectivity.
- Each expansion cabinets shall have two non-sheilded16 gauge 4 conductor cables ran from the main control to the expansion cabinet.
- All keypads shall be wired individually back to new power supply.
- All sirens shall be wired individually and connected to new power supply.
- All devices such as door contact (double doors wire as one), motion detectors, glass break detectors, etc. shall be hardwired individually on separate zones with end of line resistors at the devices.
- All devices such as motion detectors, glass break detectors, door contacts, keypads, sirens, etc. shall be labeled with their corresponding module and or zone number. Label shall be visible from the floor.
- All motion detectors shall be sealed to prevent air and insects from entering.
- All steel doors shall have wide gap contacts installed.
- All door contacts shall be recessed, and door magnets shall be glued in place.
- All holdup buttons shall be connected via wireless.
- Protective grommets shall be installed on all conduits and enclosures to protect wire.
- All devices shall be wired with **NON-shielded** cable.
- All panels, power supplies and modules shall be grounded.
- All roof hatches shall have an alarm contact installed and connected to the alarm system.
- All wire shall be run in J hooks above ceiling with a minimum space of 4" from ceiling deck. All wire shall be in separate pathways 6" from other system wiring. No wire ties allowed. No wire shall be run between the red iron and roof deck.
- All wire visible from the finished floor shall be covered in decorative wire molding.
- All wire ran between building shall be in conduit and shall be **non-shielded** direct burial cable. It shall be a minimum of 4 conductor 16 AWG copper and shall have lightning suppression installed at building entry.
- Installer shall have a commercial burglar technician on the job site at all times during installation.
- Installer will work closely with the electrical and or masonry contractors to ensure conduit, back boxes, door frame access conduit, etc. are in the proper locations and accessible.
- Follow and adhere to installation practices specified by NFPA-70 National Electric Code, Edition 2008.
- Follow and adhere to installation practices specified by the Manufacturers.

1.02 Products Installed but not Supplied Under This Section

- All conduit and EMT required for Fire cabling pathway in/out of closets and in/out of wall cavities at the work area. EMT or Conduit for pathways shall have no more than two 90 degree sweeps and no continuous section over 100'.
- All core holes and poke through devices in the floor for the installation of Fire cabling.
- All core holes and EMT sleeves between floors for the routing of Fire cabling.
- Back boxes for the mounting of Fire Devices.
- Drag line or pull string at the back boxes fished through EMT or conduit to the other end for installing Fire Cabling.

1.03 Quality Assurance

1.03.01 Qualifications

- Install all components as directed by Manufacturer's installation guidelines.
- All products shall bear the mark of UL or ETL for performance level.
- System installation shall meet all applicable Local/State codes and safety requirements where project is located.
- All products shall be new and un-used in original packaging.

1.03.02 Bidder/Installer Qualifications

- Bidding contractor shall be a local licensed Commercial Burglar Alarm Company with licensed Commercial Burglar Alarm technician(s) on staff.
- Bidding contractor shall be certified by manufacturer to install & program the specified systems.
- Bidding contractor shall perform all programming required to complete the installation. Moore Public Schools shall not be required to assist in any part of the installation or programming.
- Bidding contractor shall have at least one year experience installing DSC/DMP equipment.
- Bidding contractor shall have a minimum of 5 years experience installing commercial burglar alarms.
- Bidding contractor shall be able to provide insurance at the request of the owner.
- Bidding contractor shall have a commercial burglar technician on the job site at all times during installation.

1.04 Delivery, Storage, and Protection

- Contractor shall ensure that materials delivery to work area shall be coordinated with construction site manager responsible for materials distribution to all trades.
- Contractor is responsible for all materials, tools and vehicles left on the job site.
- Follow Manufacturer's recommendations for handling of materials.

1.05 Project Conditions

1.05.01 Environmental Requirements

- Contractor shall ensure that any pollutants produced during the Work are disposed off according to local, state or national regulations. Follow the most stringent guidelines.
- It is preferred that the Contractor recycle any used or un-used components during the course of the construction project.

1.06 Sequencing

- Contractor shall coordinate with Owner's project manager on sequencing of various trades and construction teams for the lifecycle of the project.

1.07 Scheduling

- Contractor shall provide a detailed construction schedule with hard dates for completion of roughing in cables, terminations and testing once scheduling sequence has been determined to the Owner's Project Manager.

1.08 Warranty

- Contractor shall provide a 1 year parts and labor warranty against defective workmanship and/or system component failure. (1 year warranty shall begin at job completion)

Part 2 - Products

2.02 Source Quality Control

- Materials shall be purchased from Distributors authorized by system Manufacturers to sell new and unused components.

Part 3 -

3.01 Field Quality Control

- Contractor shall make available all ceiling and termination work for inspection by Manufacturer's representative or owner's representative.
- Contractor shall replace all defective components.

3.02 Adjusting

- No additional work outside of the contract scope of work shall be completed without the approval of the Owner or Owner's representative.

3.03 Cleaning

- Contractor shall sweep and mop the floors of all equipment rooms or connection point closets prior to turnover to the Owner.

3.04 Protection

- It is the responsibility of the Contractor to ensure equipment is protected from dust and water during the project with appropriate materials.
- Remove all protective covers and protective materials from equipment prior to turnover to Owner.

3.05 Schedules

- Coordinate work with Owner's project manager and follow scheduling sequence as established by Owner's project manager.
- It is recommended that the Contractor schedule closely with any other systems contractor to ensure turnover date is met.
- Contractor bidding will work closely with the electrical and or masonry contractors to ensure conduit, back boxes, door frame access conduit, etc. are in the proper locations and accessible.

End of Section

1.02 Submittals

1.03.01 Prior to installation

- Show compete map of system design for approval by Owner.

Security System Installation Completion Check List

Part 1 - General

1.01 Section Includes

- Security System Completion Check List

1.02 Completion Check List

- A map of the entire system showing device numbers and wire routes has been left inside the main control panel and a copy has been given to Jack Phillips with MPS.
- All panel programming has been checked and is correct.
- Panel(s) has been tested for proper operation.
- All zones have been tested to verify proper description at keypad.
- All zones have been tested to verify proper reporting to the monitoring station.
- All zones have been tested to verify they are in their proper partition(s).
- All sirens and strobes have been tested for proper operation.
- All motion detectors have been adjusted for proper sensitivity and have been walk tested.
- All motion detectors have been sealed to prevent air and insects from entering.
- All glass break detectors have been adjusted for proper sensitivity and tested.
- All cabinets are labeled on the outside with module numbers and zone numbers.
- All cabinets are labeled on the inside with module numbers by the corresponding module and zone descriptions.
- All user codes have been programmed and tested for proper partition access.
- The monitoring station has the correct account information such as call list, zone descriptions etc.

End of Section

1.09 References

- NFPA-70 National Electrical Code 2008 edition
- NFPA-72 National Fire Alarm Code
- UL 1666 - Standard for Safety of Flame Propagation Height
- NFPA 262 - Flame Travel and Smoke of Wires and Cables
- *Local Authority Having Jurisdiction*

1.10 Definitions

AWG - American Wire Gauge

BICSI - Building Industry Consulting Service International

EIA - Electronics Industry Alliance

FCC - Federal Communications Commission

NECA - National Electrical Contractors Association

NFPA - National Fire Protection Agency

UL - Underwriters Laboratory

Access Control System Specifications

Access Control Equipment

Part 1 - Manufacture

- Access Control Manufacturer shall be Keyscan. (No Substitutions)
- Peripheral device Manufacturers shall be according to equipment list. (No Substitutions)
- Cable Manufacturer shall be Genesis. (Or Equivalent)

1.01 Access Control Equipment Description

- Access Control System Manufacture shall be Keyscan (No Substitutions)
- Access Control Management Software = Aurora (This software is already installed and in use. It is listed for information purposes only)
- Reader Control Panels shall be (No Substitutions)
  Keyscan CA 4500 = 4 Door
  Keyscan CA 8500 = 8 Door
- Each Reader Control Panel shall be equipped with (2) 16VAC 40VA Transformer
- Each Reader Control Panel shall be equipped with (1) 12V 7AH Battery
- One 2,4 or 8 Door Reader Control Panel per site shall be equipped with (1) Keyscan Netcom2p module. If the site has an existing 2,4 or 8 Door Control Panel with a Netcom2P already installed, then a Netcom 2P is not needed and CIM or CIM-Link modules shall be used to connect the new Control Panel to the existing Control Panel.
- All Reader Control Panels shall be linked together with either CIM or CIM-Link modules.
- Each new Reader Control Panel shall be capable of 4 doors minimum

Card Readers shall be (No Substitutions)

- HID 40NKS00000000 Signo Wall Mount reader (for use in all locations except where mullion mount reader size is required to fit)
- HID 20NKS00000000 Signo 20 Mullion Reader (For use on mullion mount locations where single gang reader is too large.
- ALL READERS REQUIRE 22/6 STR OAS WIRE.

Access Control Strikes and locks shall be (No Substitutions unless approved by Moore Public Schools)
RCI 0163X32D ½ inch Rim(ONLY USE IF ¾ INCH RIM WILL NOT FIT)
RCI 0162X32D ¾ inch Rim
RCI F0162X32D ¾ inch Rim Fire Rated
RCI F2164 RECESSED ALL-IN-ONE STRIKE

- Where storm doors are installed, install compatible power motor and power supply to activate door hardware unless installed by door contractor.
- Egress Motions shall be (No Substitutions)
  BOSCH DS160 OR HONEYWELL IS310
- Door Contacts shall be GE Model # 1076D-M Double Pole Double Throw (To be utilized for Access Control and Security Alarm) (See security alarm specs)
- DOOR LOCK RELEASE BUTTON SHALL BE (NO SUBSTITUTIONS)
  RCI PART # 909S ROCKER SWITCH
- Power Supply for locking hardware
  **Power supply in Keyscan Controller is for the Control and Readers only.
- Power Supplies shall be sized to meet requirements of Strikes and locks with a maximum of 80% amp load.
- Power Supply shall have form "C" contacts for supervision that is connected to Keyscan Control Aux Input.
- 24 VDC Securitron- AccuPower- AQM20-8C/16C, AQD5-8C or equal.

2.01 Systems Installation

- All junctions and or splices shall be soldered and insulated.
- All circuits and wiring shall be labeled at all terminating ends.
- All devices shall be mounted in accordance to the manufactures specifications.
- All devices shall be properly adjusted and tested prior to job completion.
- All controllers shall be labeled outside with their corresponding modules and installed with lock.
- All controllers shall have a Cat 6 network cable Blue in color ran from the nearest network cabinet and labeled with drop number.
- All card readers shall be labeled with their corresponding reader number.
- All doors with access control shall have contacts installed for door status indication. Steel doors shall have wide gap door contacts installed.
- All doors with access control shall have egress motions installed to allow system to detect proper egress. (including doors with panic exit hardware.)
- Protective grommets shall be installed on all conduits to protect wire.
- All panels, power supplies and modules shall be grounded.
- All wire shall be run in J hooks above ceiling with a minimum space of 6" from ceiling deck. All wire shall be in separate pathways 6" from other system wiring. No wire ties allowed. No wire shall be run between the red iron and roof deck.
- All wire visible from the finished floor shall be covered in decorative wire molding.
- All wire ran between building shall be in conduit and shall be direct burial cable.
- Installer shall have a licensed Access Control technician on the job site at all times during installation.
- Installer will work closely with the electrical and or masonry contractors to ensure conduit, back boxes, door frame access conduit, etc. are in the proper locations and accessible.
- Follow and adhere to installation practices specified by NFPA-70 National Electric Code, Edition 2008.
- Follow and adhere to installation practices specified by the Manufacturers.

3.01 Bidder/Installer Qualifications

- Bidding contractor shall be a local licensed Access Control Company with licensed Access Control technician(s) on staff.
- Bidding contractor shall have at least one year experience installing Keyscan Access Control Systems.
- Bidding contractor shall have a minimum of 5 years experience installing commercial Access Control Systems.
- Bidding contractor shall be able to provide insurance at the request of the owner.
- Bidding contractor shall have a commercial Access Control technician on the job site at all times during installation.

3.01.1 Submittals

3.01.2 Prior to installation

- Show compete map of system design for approval by Owner.

3.01.3 Prior to final acceptance

- Provide a soft CAD copy As-Built showing layout of Controller Panel, Card Readers, Power Supplies and all mounted equipment upon Substantial Completion.
- Ensure all warranties specify that the Owner is entitled to all rights guaranteed by the warranty for various components.

3.02 Quality Assurance

3.02.1 Qualifications

- Install all components as directed by Manufacturer's installation guidelines.
- All products shall bear the mark of UL or ETL for performance level.
- System installation shall meet all applicable Local/State codes and safety requirements where project is located.
- All products shall be new and un-used in original packaging.

Access Control Installation Completion Check List

Part 4 - General

4.01 Section Includes

- Access Control System Completion Check List

4.02 Completion Check List

- A map of the entire system showing device numbers and wire routes has been left inside the main controller panel and a copy has been given to Rodney Cobb with MPS.
- All system programming has been checked and is correct.
- Panel(s) has been tested for proper operation.
- All card readers are labeled with reader number and have been tested to verify proper operation.
- All user card and key fobs have been programmed into system and tested to verify proper operation.
- All egress motion detectors have been adjusted for proper sensitivity and have been walk tested.
- All controllers are labeled on the outside with module numbers.
- All controllers are labeled on the inside with module numbers by the corresponding module.

Moore Public Schools Video Intercom Door System Specifications

MANUFACTURE

AVIGILON (NO SUBSTITUTIONS).

AVIGILON REQUIRED EQUIPMENT

3.0CH4VIRO1-IR
3.0 MP; H4 Video Intercom; WDR:LightCatcher; Day/Night; 1.83mm
f/2.4; Integrated IR; Recessed Mount

H4VI-AC-RELY1
Safety Relay for H4 Video Intercom

H4VI-MT-SURF1
Surface mount adapter for H4 Video Intercom

ACC7-ENT
ACC 7 Enterprise camera channel license

INSTALLATION

- Video Intercom system requires a Cat 6 network drop ran to the nearest IDF
- Video Intercom system requires an 18 gauge 4 conductor cable ran between the video intercom station and the entry door Keyscan controller unit. **MPS to have final determination of camera location and field of view) (Call Jack Phillips for final location and view phone 473-5225)**
- Each installed Video Intercom System requires a license.
- All network drops shall be connected with patch cords to a switch at each rack location.
- No Substitutions.

Horizontal Cabling

Requirements

- See MPS Structured Cabling Specifications for camera network cabling installation, labelling and testing requirements.

Warranty

- Contractor shall provide a 1 year parts and labor warranty against defective workmanship and/or system component failure.
- Contractor shall execute a Lifetime Applications Assurance Warranty for parts and labor to support stated applications from the connectivity Manufacturer.

End of Section

Salas O'Brien
2900 S. Telephone Road, Suite 120
Moore, OK 73160
Salas O'Brien Registration: CA# 7058
Expiration Date : 6/30/2025
Salas O'Brien Project Number: 2550-00564-00

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STRUCTURAL

SALAS O'BRIEN
MECHANICAL / ELECTRICAL

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APRIL 2025
date

revisions

MOORE PUBLIC SCHOOLS
BOARD OF EDUCATION
MOORE, OKLAHOMA

MOORE Public Schools
LEARNING FOR LIFE

CLASSROOM ADDITION
CENTRAL JUNIOR
HIGH SCHOOL

sheet no:

T602

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4.03 Products Installed but not Supplied Under This Section

- All conduit and EMT required for Fire cabling pathway in/out of closets and in/out of wall cavities at the work or Conduit for pathways shall have no more than two 90 degree sweeps and no continuous section over EMT 100'.
- All core holes and poke through devices in the floor for the installation of cabling.
- All core holes and EMT sleeves between floors for the routing of cabling.
- Back boxes for the mounting of Devices.
- Drag line or pull string at the back boxes fished through EMT or conduit to the other end for installing Cabling.

4.04 References

- NFPA-70 National Electrical Code 2008 edition
- NFPA-72 National Fire Alarm Code
- UL 1666 - Standard for Safety of Flame Propagation Height
- NFPA 262 - Flame Travel and Smoke of Wires and Cables
- Local Authority Having Jurisdiction

4.05 Definitions

AWG - American Wire Gauge

BICSI - Building Industry Consulting Service International

EIA - Electronics Industry Alliance

FCC - Federal Communications Commission

NECA - National Electrical Contractors Association

NFPA - National Fire Protection Agency

UL - Underwriters Laboratory

4.06 Delivery, Storage, and Protection

- Contractor shall ensure that materials delivery to work area shall be coordinated with construction site manager responsible for materials distribution to all trades.
- Contractor is responsible for all materials, tools and vehicles left on the job site.
- Follow Manufacturer's recommendations for handling of materials.

4.07 Project Conditions

4.07.1 Environmental Requirements

- Contractor shall ensure that any pollutants produced during the Work are disposed off according to local, state or national regulations. Follow the most stringent guidelines.
- It is preferred that the Contractor recycle any used or un-used components during the course of the construction project.

4.07.2 Field Measurements

- Contractor shall coordinate with electrical engineer on project that the main electrical service ground has a resistance to earth of less than 5 ohms.
- Contractor shall ensure that all field testers have been calibrated from the Manufacturer within 1 year.
- All field test results will be documented and submitted to Moore Public Schools, Technology Department.

4.08 Sequencing

- Contractor shall coordinate with Owner's project manager on sequencing of various trades and construction teams for the lifecycle of the project.

4.09 Scheduling

- Contractor shall provide a detailed construction schedule with hard dates for completion of roughing in cables, terminations and testing once scheduling sequence has been determined to the Owner's Project Manager.

4.10 Warranty

- Contractor shall provide a 1 year parts and labor warranty against defective workmanship and/or system component failure. (1 year warranty shall begin at job completion)

4.11 Source Quality Control

- Materials shall be purchased from Distributors authorized by system Manufacturers to sell new and unused components.

Part 5 -

5.01 Field Quality Control

- Contractor shall make available all ceiling and termination work for inspection by Manufacturer's representative or owner's representative.
- Contractor shall replace all defective components.

5.02 Adjusting

- No additional work outside of the contract scope of work shall be completed without the approval of the Owner or Owner's representative.

5.03 Cleaning

- Contractor shall sweep and mop the floors of all equipment rooms or connection point closets prior to turnover to the Owner.

5.04 Protection

- It is the responsibility of the Contractor to ensure equipment is protected from dust and water during the project with appropriate materials.
- Remove all protective covers and protective materials from equipment prior to turnover to Owner.

5.05 Schedules

- Coordinate work with Owner's project manager and follow scheduling sequence as established by Owner's project manager.
- It is recommended that the Contractor schedule closely with any other systems contractor to ensure turnover date is met.
- Contractor bidding will work closely with the electrical and or masonry contractors to ensure conduit, back boxes, door frame access conduit, etc. are in the proper locations and accessible.

End of Section

Moore Public Schools
Fire System Specifications SK Protocol Only

Part 1 - General

2.01 Manufacturers

- Fire System Manufacturer shall be Silent Knight. (No Substitutions)
- Notification appliance Manufacturer shall be System Sensor. (No Substitutions)
- Device Manufacture shall be as specified in equipment description. (No Substitutions)
- Cable Manufacturer shall be Genesis. (Or Equivalent)

1.03Fire Systems Equipment Description

- **NOTE:** Contractor shall use SK Protocol devices. If location has existing SD Protocol devices, contractor shall replace all SD Protocol devices with SK Protocol devices. Contractor shall not combine SD & SK protocol devices to one system.
- Fire alarm control shall be Silent Knight Model # 6820XL or 6820EVS (If voice evac is required). (No Substitutions) If location has an existing 5820XL, contractor shall replace with a 6820XL or 6820EVS.
- Fire Alarm signaling line circuit expander shall be Silent Knight Model # 6815. (No Substitutions) If location has existing 5815XL, contractor shall replace with 6815 to support SK Protocol devices. Contractor shall not combine SD & SK protocol devices to one system.
- Fire alarm distributed power module NAC Expansion shall be Silent Knight SK-PS6 / SK-PS10 or Fire-Lite Model #'s FL-PS6 / FL-PS10. (No Substitutions)
- Fire alarm intelligent power supply shall be Silent Knight Model # 5895XL. (No Substitutions)
  NOTE: The 5895XL NAC circuits will not sync with the main control panels NAC circuits. If new NAC circuit synchronization is required with existing NAC circuits, use the SK-PS6/FL-PS6 or SK-PS10/FL-PS10
- Fire alarm remote Annunciator shall be Silent Knight Model # 5860 (Grey) and surface mount trim ring 5860TG (Grey) shall be used if surface mounted. (No Substitutions)
- Fire alarm addressable manual pull station shall be Silent Knight Model # SK-PULL-DA. (No Substitutions)
- Fire alarm addressable photoelectric smoke detector shall be Silent Knight Model # SK-PHOTO-W. (No Substitutions)
- Fire alarm addressable heat detector shall be Silent Knight Model # SK-HEAT-W. (No Substitutions)
- Fire alarm base shall be Silent Knight Model # B300-6. (No Substitutions)
- Smoke Detectors in areas that require a CO Detector shall be SK-FIRE-CO-W. (No Substitutions)
- Fire alarm addressable input module shall be Silent Knight Model # SK-MONITOR or SK-MONITOR-2. (No Substitutions)
- Fire alarm addressable relay module shall be a Silent Knight Model # SK-RELAY. (No Substitutions)
- Fire alarm SLC line isolator shall be Silent Knight Model # SK-ISO. (No Substitutions)
- Fire alarm Duct detectors and Duct Detector Remote Test Stations shall be Silent Knight Model #'s SK-DUCT and RTS151KEY. If a Form-C relay is required, please add an SK-RELAY. (No Substitutions)
- Fire alarm Horn / Strobe signaling device shall be System Sensor Model # P2WL. (Model PC2WL can be substituted if mounted on non-stainable ceiling tile. No other Substitutions)
- Fire alarm Strobe signaling device shall be System Sensor Model # SWL. (Model SCWL can be substituted if mounted on non-stainable ceiling tile. No other Substitutions)
- Fire alarm strobe synch module shall be System Sensor Model # MDL3. (Not needed on version 9 panels or newer) (No Substitutions)
- Fire alarm Outdoor strobe signaling device shall be System Sensor Model # P2RK. (No Substitutions)
- Fire alarm Speaker / Strobe signaling device shall be System Sensor Model # SPSWL. (Model SPSCWL can be substituted if mounted on non-stainable ceiling tile. No other Substitutions)
- Fire alarm Speaker signaling device shall be System Sensor Model # SPWL. (No Substitutions)
- Fire alarm 50-watt Voice Evac expansion system shall be as needed Silent Knight SKE-450 (Single Zone), SKE-450-ZN4 (4 Zone) or SKE-450-ZN6 (6 Zone). (No Substitutions)

1.01 Systems Installation

- All fire alarm junctions and or splices shall be soldered and insulated.
- All Ceiling mounted devices shall be mounted on non-stainable ceiling tiles.
- All circuits and wiring shall be labeled at all terminating ends.
- All fire system wiring shall be RED in color and non-shielded.
- All devices shall be mounted according to the manufacture's specifications.
- All devices shall be properly adjusted and tested prior to job completion.
- All fire pulls shall be dual action.
- All Initiating Devices shall be labeled with their corresponding module and point number. Smoke detector label shall be on smoke detector and smoke detector base and be clearly visible from the finished floor.
- Each Initiating Device Circuits (IDC) shall have Line Isolator Modules installed at the SLC Head End.
- All Initiating Device Circuits (IDC) shall be wired Class B (NFPA Style B).
- All Initiating Device Circuits (IDC) shall be wired with minimum 18 AWG gauge red **NON-Shielded cable**.
- All duct detectors shall be connected to fire system and shall have remote test stations installed accessible and visible from the finished floor. They shall be labeled with their corresponding module and point number.
- All duct detector ARM / AIM shall be installed adjacent to the remote test stations and shall be accessible and visible from the finished floor. They shall be labeled with their corresponding module and point number. (ARM/AIM should not be needed when using SD505-DUCTR duct det.)
- All modules shall have their corresponding module number.
- All notification devices shall be wall mounted where possible. Where wire is exposed decorative wire molding shall be installed from the ceiling to the device. If ceiling mount devices are used, they shall be mounted on a non-stainable ceiling tile.
- All notification devices shall be labeled with their corresponding module, circuit number and device number. Label shall be on the base and be clearly visible from the finished floor. EOL Device shall be labeled as such.
- All horn / strobes and strobes shall be synchronized.
- All Notification Appliance Circuits (NAC) shall be wired Class B (NFPA Style Y).
- All Notification Appliance Circuits (NAC) shall be wired with minimum 16 AWG gauge red **NON-Shielded** cable.
- Protective grommets shall be installed on all conduits to protect wire.
- All SBUS and SLC circuits shall be wired with red **NON-shielded cable.**
- All wire shall be run in J hooks above ceiling with a minimum space of 6" from ceiling deck. All wire shall be in separate pathways 6" from other system wiring. No wire ties allowed. No wire shall be run between the red iron and roof deck.
- Main control panel shall have a CAT 6 cable ran between the main control and the phone company DMARC for monitoring purposes.
- All wire ran between building shall be in conduit and shall be **Non-shielded** direct burial cable. It shall be a minimum of 4 conductor 16 AWG copper. Wire shall have lightning suppression installed where it enters building.
- Installer shall have a commercial fire technician on the job site at all times during the installation.
- Installer shall supply the electrical and or masonry contractors with specialty back boxes such as remote annunciator recessed back boxes etc. and coordinate with them to ensure that all necessary conduits, back boxes, etc. are installed in the proper locations.
- Follow and adhere to installation practices specified by the applicable NFPA 72 standards.
- Follow and adhere to installation practices specified by NFPA-70 National Electric Code, Edition 2008.
- Follow and adhere to installation practices specified by the Manufacturers.

1.02 Products Installed but not Supplied Under This Section

- All conduit and EMT required for Fire cabling pathway in/out of closets and in/out of wall cavities at the work area. EMT or Conduit for pathways shall have no more than two 90-degree sweeps and no continuous section over 100'.
- All core holes and poke through devices in the floor for the installation of Fire cabling.
- All core holes and EMT sleeves between floors for the routing of Fire cabling.
- Back boxes for the mounting of Fire Devices.
- Drag line or pull string at the back boxes fished through EMT or conduit to the other end for installing Fire Cabling.

1.03 Quality Assurance

1.03.01 Qualifications

- Install all components as directed by Manufacturer's installation guidelines.
- All products shall bear the mark of UL or ETL for performance level.
- System installation shall meet all applicable Local/State codes and safety requirements where project is located.
- All products shall be new and un-used in original packaging.

1.03.02 Bidder/Installer Qualifications

- Bidding contractor shall be a local licensed Commercial Fire Alarm Company with licensed Commercial Fire Alarm technician(s) on staff.
- Bidding contractor shall have a minimum of one year experience installing Silent Knight Addressable fire panels.
- Bidding contractor shall have a minimum of 5 years experience installing commercial fire alarms.
- Bidding contractor shall be able to provide insurance at the request of the owner.
- Bidding contractor shall have a commercial fire technician on the job site at all times during the installation.

1.04Sequencing

- Contractor shall coordinate with Owner's project manager on sequencing of various trades and construction teams for the lifecycle of the project.

1.05 Scheduling

- Contractor shall provide a detailed construction schedule with hard dates for completion of roughing in cables, terminations and testing once scheduling sequence has been determined to the Owner's Project Manager.

1.06 Warranty

- Contractor shall provide a 1-year parts and labor warranty against defective workmanship and/or system component failure. (1-year warranty shall begin at job completion)

Part 2 - Products

2.02 Source Quality Control

- Materials shall be purchased from Distributors authorized by system Manufacturers to sell new and unused components.

Part 3 -

3.01 Field Quality Control

- Contractor shall make available all ceiling and termination work for inspection by Manufacturer's representative or owner's representative.
- Contractor shall replace all defective components.

3.02 Adjusting

- No additional work outside of the contract scope of work shall be completed without the approval of the Owner or Owner's representative.

3.03 Protection

- It is the responsibility of the Contractor to ensure equipment is protected from dust and water during the project with appropriate materials.
- Remove all protective covers and protective materials from equipment prior to turnover to Owner.

End of Section

1.04 Submittals

1.04.01 Prior to installation

- Show compete map of system design for approval by Owner.

1.04.02 Prior to final acceptance

- Provide a soft CAD copy As-Built showing layout of panel, initiating devices, notification devices and all mounted equipment upon Substantial Completion.
- Ensure all warranties specify that the Owner is entitled to all rights guaranteed by the warranty for various components.

Fire System Installation Completion Check List

Part 1 - General

- Fire System Completion Check List

1.01Completion Check List

- A map of the entire system showing device numbers and wire routes has been left inside the main control panel and a copy has been given to Jack Phillips with MPS.
- All panel programming has been checked and is correct.
- Panel(s) has been tested for proper operation.
- All zones have been tested to verify proper description at keypad.
- All zones have been tested to verify proper reporting to the monitoring station.
- All points have been tested to verify proper description at the keypad.
- All horn/strobes and strobes have been tested for proper operation.
- All smoke detectors have been tested and dust covers removed.
- All devices have been tested for proper operation.
- All cabinets are labeled on the outside with module numbers and point numbers.
- All cabinets are labeled on the inside with module numbers by the corresponding module and point descriptions.
- A list of all zone numbers and zone descriptions have been provided to Moore Public Schools for alarm monitoring purposes.

End of Section

Moore Public Schools - IP Camera Specifications
IP CAMERA MANUFACTURE is AVIGILON (NO SUBSTITUTIONS).

AVIGILON EQUIPMENT
INDOOR DOME SINGLE HEAD CAMERA REQUIRED EQUIPMENT LIST
4.0C-H6A-D1-IR
ACC7-ENT LICENSE - 1 per camera
INDOOR MULTI-HEAD 2 HEAD CAMERA REQUIRED EQUIPMENT LIST
10.0C-H5DH-DO1-IR
ACC7-ENT LICENSE - 1 per camera

INDOOR FISHEYE CAMERA REQUIRED EQUIPMENT LIST
12.0C-H6A-FE-360-DO1-IR
ACC7-ENT LICENSE - 1 per camera

INDOOR MULTI-HEAD 3 HEAD CAMERA REQUIRED EQUIPMENT LIST
9C-H5A-3MH (3x3MP)
Axis T8134 Midspan 60W Power Injector
ACC7-ENT LICENSE - 1 per camera
H5AMH-AD-DOME1
H5AMH-DC-COVR1
H4AMH-AD-IRIL1

INDOOR MULTI-HEAD 4 HEAD CAMERA REQUIRED EQUIPMENT LIST
12C-H5A-3MH (4x3MP)
Axis T8134 Midspan 60W Power Injector
ACC7-ENT LICENSE - 1 per camera
H5AMH-AD-DOME1
H5AMH-DC-COVR1

OUTDOOR DOME**SINGLE HEAD CAMERA REQUIRED EQUIPMENT LIST**
6.0C-H6A-DO1-IR
ACC7-ENT LICENSE - 1 per camera

OUTDOOR MULTI-HEAD 2 HEAD CAMERA REQUIRED EQUIPMENT LIST
16.0C-H6ADH-DO1-IR
NPTA-1201
WLMT-1021
ACC7-ENT LICENSE - 1 per camera

OUTDOOR MULTI-HEAD 3 HEAD CAMERA CORNER MOUNT REQUIRED EQUIPMENT LIST
15C-H5A-3MH (3x5MP)
Axis T8134 Midspan 60W Power Injector
ACC7-ENT LICENSE - 1 per camera
H5AMH-AD-PEND1
H5AMH-DO-COVR1
H5AMH-AD-IRIL1
WLMT-1001
CRNMT-1001
OUTDOOR MULTI-HEAD 3 HEAD CAMERA WALL MOUNT REQUIRED EQUIPMENT LIST
15C-H5A-3MH (3x5MP)
Axis T8134 Midspan 60W Power Injector
ACC7-ENT LICENSE - 1 per camera
H5AMH-AD-PEND1
H5AMH-DO-COVR1
H5AMH-AD-IRIL1
WLMT-1001

CAMERA SERVER INFORMATION, CONTRACTOR TO PROVIDE THE FOLLOWING AT NEW BUILDINGS OR AS NEEDED TO ACCOMMODATE ADDITIONAL CAMERAS TO EXISTING SYSTEM:
1 - Dell Server part# NVR6-PRM-FORM-D-72TB-S22
1 - SFP fiber connector, part# NVR6-AINVR2-FORM-D-SFPPLUS-SR

INSTALLATION

- Install cameras on adjacent walls were possible. If it must be mounted on ceiling, it shall be on a water-resistant non-stainable ceiling tile. **MPS to have final determination of camera location and field of view) (Call Jack Phillips for final location and view phone 473-5225)**
- Any cameras installed on ceiling shall be mounted on a water-resistant non-stainable ceiling tile. (BIDDING CONTRACTOR SHALL PROVIDE NON-STAINABLE TILE)
- Each installed camera needs a camera license.
- All network drops shall be connected with patch cords to a switch at each rack location.
- No Substitutions.

Horizontal Cabling

Requirements

- See MPS Structured Cabling Specifications for camera network cabling installation, labelling and testing requirements.

Warranty

- Communications Contractor shall provide a 1 year parts and labor warranty against defective workmanship and/or system component failure.
- Communications Contractor shall execute a Lifetime Applications Assurance Warranty for parts and labor to support stated applications from the connectivity Manufacturer.

End of Section

Audio Visual Systems for Instructional Spaces Specifications

Part 1 - General

1.01 Instructional Spaces

- Reference technology drawings and detail sheet T504 for classroom configuration and part numbers.

1.02 Special Spaces

- Reference technology drawings and one line diagrams.

1.03 Flat Panel Displays

- All non interactive Flat Panel displays shall be 43" Samsung BE Series.
- Bio Lab 37 displays shall be ceiling mounted.
- Career Tech 12 and Career Tech 15 displays shall be wall mounted 55" AFF to center of display.

End of Section

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BOARD OF EDUCATION
MOORE, OKLAHOMA

MOORE Public Schools
LEARNING FOR LIFE

CLASSROOM ADDITION
CENTRAL JUNIOR
HIGH SCHOOL

sheet no:

T603

Salas O'Brien
2900 S. Telephone Road, Suite 120
Moore, OK 73160
Salas O'Brien Registration: CA# 7058
Expiration Date : 6/30/2025
Salas O'Brien Project Number: 2550-00564-00

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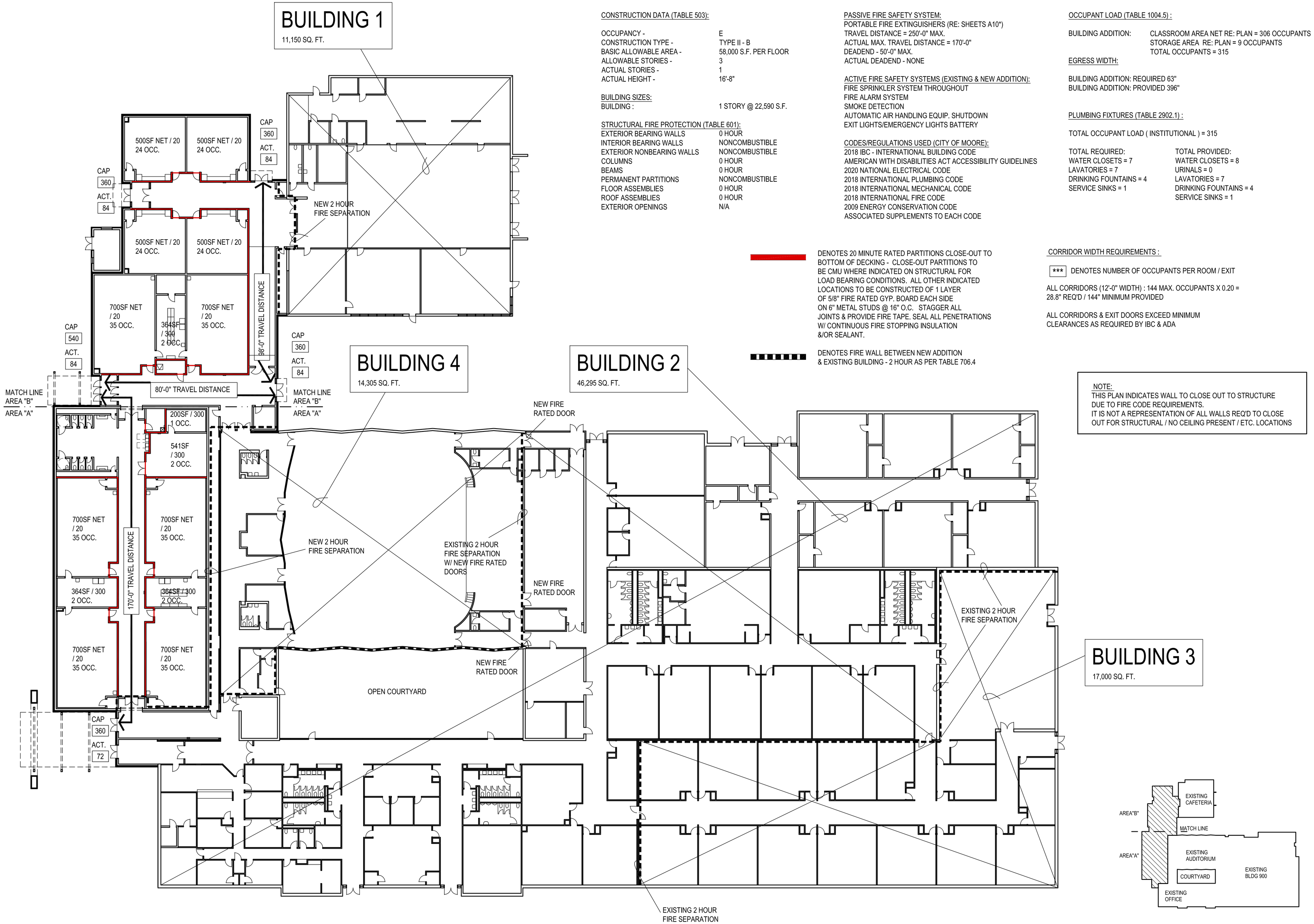

1 LIFE SAFETY PLAN

1" = 20'-0"

NORTH

CONSTRUCTION DATA (TABLE 503):

OCCUPANCY -	E
CONSTRUCTION TYPE -	TYPE II - B
BASIC ALLOWABLE AREA -	58,000 S.F. PER FLOOR
ALLOWABLE STORIES -	3
ACTUAL STORIES -	1
ACTUAL HEIGHT -	16'-8"

BUILDING SIZES:

BUILDING :	1 STORY @ 22,590 S.F.

STRUCTURAL FIRE PROTECTION (TABLE 601):

EXTERIOR BEARING WALLS	0 HOUR
INTERIOR BEARING WALLS	NONCOMBUSTIBLE
EXTERIOR NONBEARING WALLS	NONCOMBUSTIBLE
COLUMNS	0 HOUR
BEAMS	0 HOUR
PERMANENT PARTITIONS	NONCOMBUSTIBLE
FLOOR ASSEMBLIES	0 HOUR
ROOF ASSEMBLIES	0 HOUR
EXTERIOR OPENINGS	N/A

PASSIVE FIRE SAFETY SYSTEM:
PORTABLE FIRE EXTINGUISHERS (RE: SHEETS A10")
TRAVEL DISTANCE = 250'-0" MAX.
ACTUAL MAX. TRAVEL DISTANCE = 170'-0"
DEADEND - 50'-0" MAX.
ACTUAL DEADEND - NONE

ACTIVE FIRE SAFETY SYSTEMS (EXISTING & NEW ADDITION):
FIRE SPRINKLER SYSTEM THROUGHOUT
FIRE ALARM SYSTEM
SMOKE DETECTION
AUTOMATIC AIR HANDLING EQUIP. SHUTDOWN
EXIT LIGHTS/EMERGENCY LIGHTS BATTERY

CODES/REGULATIONS USED (CITY OF MOORE):
2018 IBC - INTERNATIONAL BUILDING CODE
AMERICAN WITH DISABILITIES ACT ACCESSIBILITY GUIDELINES
2020 NATIONAL ELECTRICAL CODE
2018 INTERNATIONAL PLUMBING CODE
2018 INTERNATIONAL MECHANICAL CODE
2018 INTERNATIONAL FIRE CODE
2009 ENERGY CONSERVATION CODE
ASSOCIATED SUPPLEMENTS TO EACH CODE

OCCUPANT LOAD (TABLE 1004.5) :

BUILDING ADDITION:	CLASSROOM AREA NET RE: PLAN = 306 OCCUPANTS
	STORAGE AREA RE: PLAN = 9 OCCUPANTS
	TOTAL OCCUPANTS = 315

EGRESS WIDTH:

BUILDING ADDITION: REQUIRED 63"
BUILDING ADDITION: PROVIDED 396"

PLUMBING FIXTURES (TABLE 2902.1) :

TOTAL OCCUPANT LOAD (INSTITUTIONAL) = 315

TOTAL REQUIRED:	TOTAL PROVIDED:
WATER CLOSETS = 7	WATER CLOSETS = 8
LAVATORIES = 7	URINALS = 0
DRINKING FOUNTAINS = 4	LAVATORIES = 7
SERVICE SINKS = 1	DRINKING FOUNTAINS = 4
	SERVICE SINKS = 1

DENOTES 20 MINUTE RATED PARTITIONS CLOSE-OUT TO BOTTOM OF DECKING - CLOSE-OUT PARTITIONS TO BE CMU WHERE INDICATED ON STRUCTURAL FOR LOAD BEARING CONDITIONS. ALL OTHER INDICATED LOCATIONS TO BE CONSTRUCTED OF 1 LAYER OF 5/8" FIRE RATED GYP. BOARD EACH SIDE ON 6" METAL STUDS @ 16" O.C. STAGGER ALL JOINTS & PROVIDE FIRE TAPE. SEAL ALL PENETRATIONS W/ CONTINUOUS FIRE STOPPING INSULATION &/OR SEALANT.

DENOTES FIRE WALL BETWEEN NEW ADDITION & EXISTING BUILDING - 2 HOUR AS PER TABLE 706.4

CORRIDOR WIDTH REQUIREMENTS :

*** DENOTES NUMBER OF OCCUPANTS PER ROOM / EXIT

ALL CORRIDORS (12'-0" WIDTH) : 144 MAX. OCCUPANTS X 0.20 = 28.8" REQ'D / 144" MINIMUM PROVIDED

ALL CORRIDORS & EXIT DOORS EXCEED MINIMUM CLEARANCES AS REQUIRED BY IBC & ADA

NOTE:
THIS PLAN INDICATES WALL TO CLOSE OUT TO STRUCTURE DUE TO FIRE CODE REQUIREMENTS.
IT IS NOT A REPRESENTATION OF ALL WALLS REQ'D TO CLOSE OUT FOR STRUCTURAL / NO CEILING PRESENT / ETC. LOCATIONS

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MOORE, OKLAHOMA

CLASSROOM ADDITION
CENTRAL JUNIOR
HIGH SCHOOL

sheet no:

A100

LIFE SAFETY PLAN

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NEW FIRE RATED DOORS & FRAME - CLOSE OUT NEW 6" MTL. STUD WALL TO STRUCT. ABOVE, RE: 22A501

NEW FIRE RATED DOORS & FRAME - CLOSE OUT NEW 6" MTL. STUD WALL TO STRUCT. ABOVE, RE: 22A501

NEW FIRE RATED DOORS & FRAME - CLOSE OUT NEW 6" MTL. STUD WALL TO STRUCT. ABOVE, RE: 22A501

MATCH LINE AREA "B" / AREA "A"

CLASSROOM 32 · CLASSROOM 31 · CLASSROOM 26 · CLASSROOM 27 · LABORATORY 24 · LABORATORY 21 · CORR. 25 · CORR. 30 · CORR. 19 · RISER 33 · MECH. 23 · STOR. 22 · STOR. 20 · VEST. 29 · GENERATOR 28 · VEST. 18 · chase · LOBBY 6 · VEST. 5 · I.T. 17 · CUST. 16 · M. / E. 15 · LABORATORY 12 · STOR. 11 · LABORATORY 7 · VEST. 3 · OFFICE 4 · VEST. 2 · VEST. 1 · CORRIDOR 8 · TOILET 14 · LABORATORY 13 · STOR. 10 · LABORATORY 9

116'-3" · 58'-0" · 106'-11" · 56'-8" · 4'-8" · 12'-8" · 16'-8" · 1'-4" · 8" · 13'-8" · 12'-10" · 1'-2" · 5'-7" · 16'-1" · 11'-8" · 9'-4" · 8'-8" · 1'-6" · 29'-2" · 18'-2" +/- F.V. · 48'-4" · 27'-4" · 1'-4" · 12'-8" · 13'-2" · 12'-8" · 3'-4" · 9'-4"

1'-4" · 50'-8" · 20'-8" · 4" · 61'-0" · 141'-2" · 8" · 51'-8" · 20'-4" · 8" · 45'-6" · 1'-2" · 13'-4" · 1'-4" · 24'-4" · 19'-4" · 19'-4" · 19'-4" · 19'-4" · 19'-4" · 12'-6" · 5'-4" · 8" · 23'-10" · 2'-4" · 5'-4" · 1'-0" · 10" · 274'-6"

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 15.8 16 17 18 19 20

A B C D E F G H I J K L M

NORTH

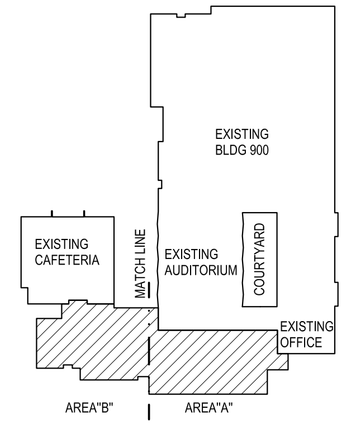
1 OVERALL FLOOR PLAN

1/16" = 1'-0" 22,590 sq. ft.

DENOTES ROOM NAME
DORM ROOM
102
DENOTES ROOM NUMBER
102
DENOTES DOOR NUMBER

MISCELLANEOUS NOTES:

1. F.E.C. - FIRE EXTINGUISHER AND CABINET
2. REFER A116, A117 & A118 FOR FLOORING FINISH LAYOUT
3. DO NOT SCALE DRAWINGS TO OBTAIN MATERIAL QUANTITIES. USE DRAWINGS WHICH ARE DIMENSIONED OR COORDINATE W/ EXISTING CONDITIONS &/OR ARCHITECT & ENGINEERS.



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CLASSROOM ADDITION
CENTRAL JUNIOR HIGH SCHOOL

sheet no:

A101

OVERALL FLOOR PLAN

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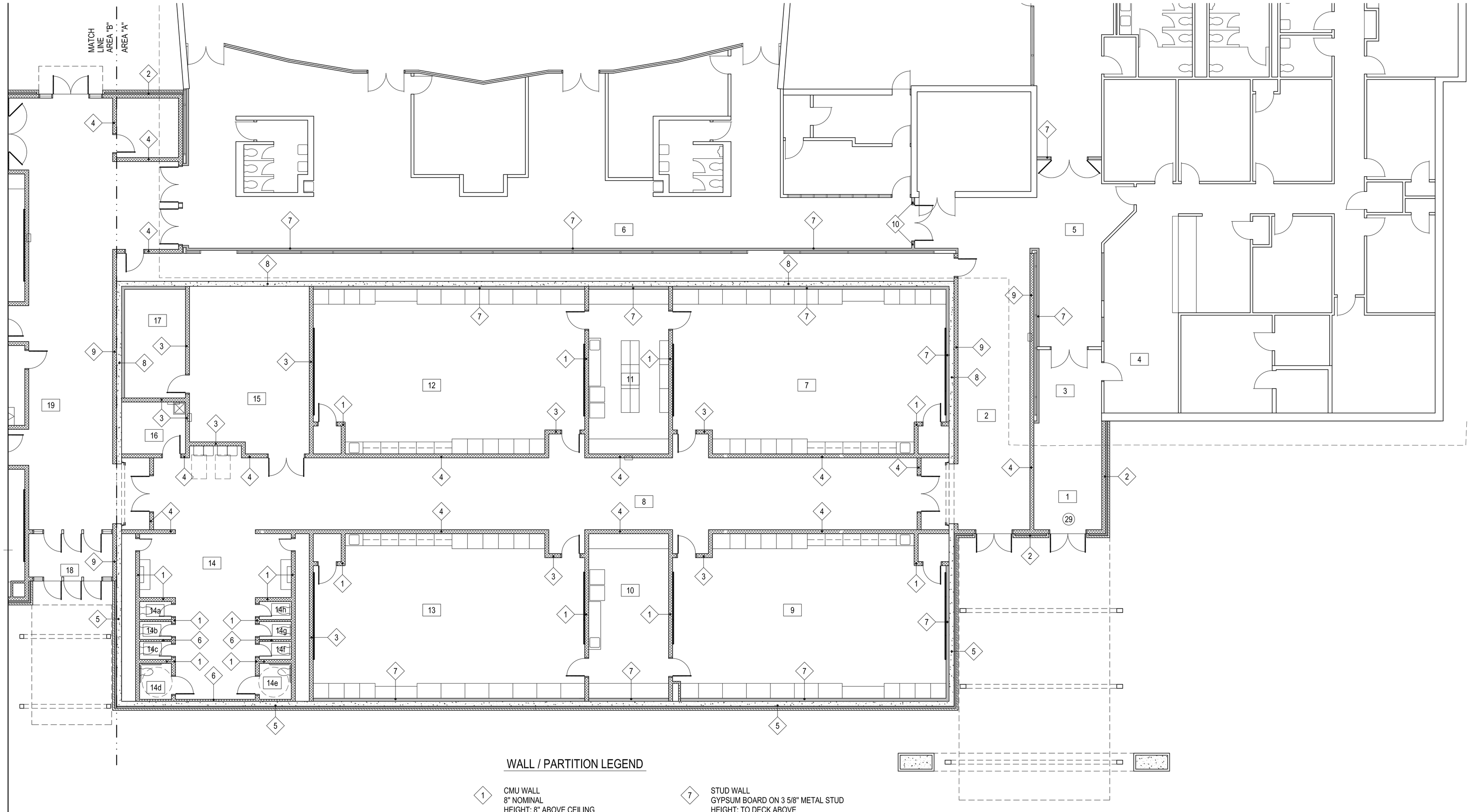


WALL / PARTITION LEGEND

1. CMU WALL
   8" NOMINAL
   HEIGHT: 8" ABOVE CEILING
2. CMU WALL
   BRICK VENNER, AIR GAP, RIGID INSULATION, VAPOR BARRIER, 8" NOMINAL CMU
   HEIGHT TO 16'-8" ABOVE FINISH FLOOR
3. CMU WALL
   8" NOMINAL
   HEIGHT: 8" ABOVE CEILING
   GYPSUM BOARD EACH SIDE, METAL STUDS
   HEIGHT: ABOVE CMU TO DECK
4. CMU WALL
   8" NOMINAL
   HEIGHT: TO DECK RE: STRUCTURAL
5. CONCRETE WALL
   10" NOMINAL
   BRICK VENEER, AIR GAP, RIGID INSULATION, VAPOR BARRIER
   HEIGHT TO 16'-8" ABOVE FINISH FLOOR
6. CMU WALL
   4" NOMINAL
   HEIGHT: 8" ABOVE CEILING
7. STUD WALL
   GYPSUM BOARD ON 3 5/8" METAL STUD
   HEIGHT: TO DECK ABOVE
8. CONCRETE WALL
   10" NOMINAL
   HEIGHT TO 16'-8" ABOVE FINISH FLOOR
9. CMU WALL
   8" NOMINAL
   HEIGHT TO 16'-8" ABOVE FINISH FLOOR
10. STUD WALL
    GYPSUM BOARD EA. SIDE ON 6" METAL STUD
    HEIGHT: TO DECK ABOVE

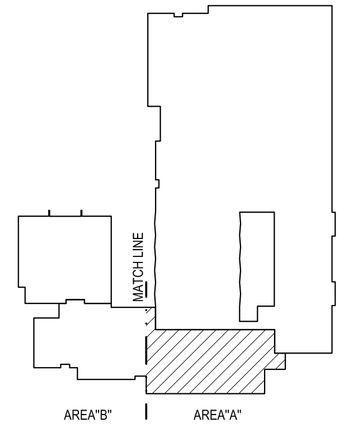
NORTH

1 WALL TYPE FLOOR PLAN - AREA "A"

1/8" = 1'-0"

NOTES:

1. REFER ROOM FINISH SCHEDULE FOR WALL FINISHES HEIGHT TO 16'-8" ABOVE FINISH FLOOR
2. DO NOT SCALE DRAWINGS TO OBTAIN MATERIAL QUANTITIES. USE DRAWINGS WHICH ARE DIMENSIONED OR COORDINATE W/ EXISTING CONDITIONS & / OR ARCHITECT & ENGINEERS.



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WALL TYPE PLAN

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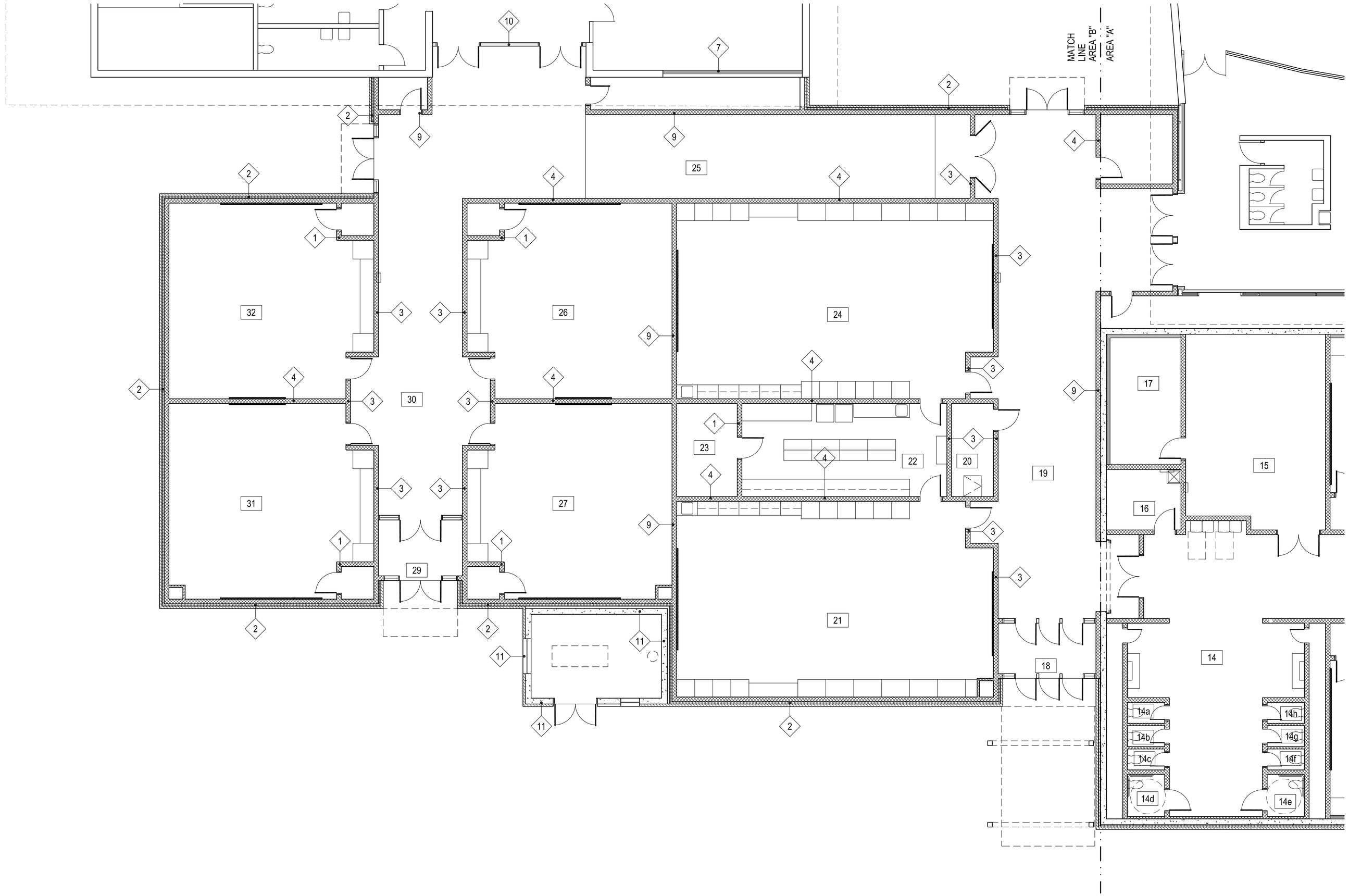

WALL / PARTITION LEGEND

1. CMU WALL
   8" NOMINAL
   HEIGHT: 8" ABOVE CEILING
2. CMU WALL
   BRICK VENNER, AIR GAP, RIGID INSULATION, VAPOR BARRIER, 8" NOMINAL CMU
   HEIGHT TO 16'-8" ABOVE FINISH FLOOR
3. CMU WALL
   8" NOMINAL
   HEIGHT: 8" ABOVE CEILING
   GYPSUM BOARD EACH SIDE, METAL STUDS
   HEIGHT: ABOVE CMU TO DECK
4. CMU WALL
   8" NOMINAL
   HEIGHT: TO DECK RE: STRUCTURAL
5. CONCRETE WALL
   10" NOMINAL
   BRICK VENEER, AIR GAP, RIGID INSULATION, VAPOR BARRIER
   HEIGHT TO 16'-8" ABOVE FINISH FLOOR
6. CMU WALL
   4" NOMINAL
   HEIGHT: 8" ABOVE CEILING
7. STUD WALL
   GYPSUM BOARD ON 3 5/8" METAL STUD
   HEIGHT: TO DECK ABOVE
8. CONCRETE WALL
   10" NOMINAL
   HEIGHT TO 16'-8" ABOVE FINISH FLOOR
9. CMU WALL
   8" NOMINAL
   HEIGHT TO 16'-8" ABOVE FINISH FLOOR
10. STUD WALL
    GYPSUM BOARD EA. SIDE ON 6" METAL STUD
    HEIGHT: TO DECK ABOVE
11. CONCRETE WALL
    10" NOMINAL
    BRICK VENNER, AIR GAP, VAPOR BARRIER
    HEIGHT TO 16'-8" ABOVE FINISH FLOOR

NORTH

1 WALL TYPE FLOOR PLAN - AREA "B"

1/8" = 1'-0"

NOTES:

1. REFER ROOM FINISH SCHEDULE FOR WALL FINISHES HEIGHT TO 16'-8" ABOVE FINISH FLOOR
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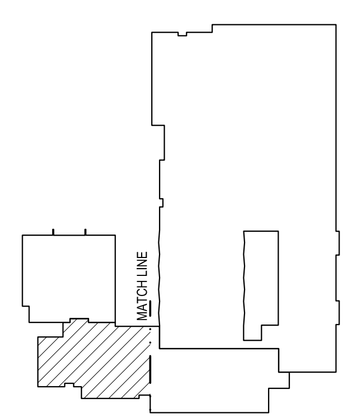

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FLOOR PLAN

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RE: SHEET A101 FOR DOOR #55, 56 & 57 LOCATION

MATCH LINE AREA "B" / AREA "A"

LOBBY 6

I.T. 17

CORRIDOR 19

CUST. 16

MECH. / ELEC. 15

F.E.C.

LABORATORY 12

LABORATORY 7

STORAGE 11

CORRIDOR 8

LABORATORY 13

LABORATORY 9

STORAGE 10

TOILET 14

TOILET 14a

TOILET 14b

TOILET 14c

TOILET 14d

TOILET 14e

TOILET 14f

TOILET 14g

TOILET 14h

VEST. 18

OFFICE 4

VEST. 5

VEST. 3

VEST. 2

VEST. 1

RISER 33

10'-10" +/-F.V.

4'-0" - CORRDINATE ALL WORK WITH ARCHITECT

8'-6" +/- F.V.

7'-3" +/- F.V.

9'-11" +/- F.V.

5'-10" +/- F.V.

18'-6" +/- F.V.

RE: 1A106

15A501, SIM.

34A501, SIM.

10A501 TYP.

2A104, TYP.

3A502 OPP.

6A501 SIM.

7A501

5A302, OPP.

5A302

6A502

1A401, OPP.

2A401, OPP.

13'-4" 8" 24'-4" 19'-4" 19'-4" 19'-4" 19'-4" 19'-4" 12'-6" 5'-4" 8" 10" 23'-10" 2'-4" 5'-4"

141'-2"

1 FLOOR PLAN - AREA "A"

1/8" = 1'-0"

NORTH

MISCELLANEOUS NOTES:

1. F.E.C. - FIRE EXTINGUISHER AND CABINET
2. REFER A111 & A112 FOR FLOORING FINISH LAYOUT
3. * INDICATES ROOM WALLS & RECESS WALLS PAINTED ACCENT COLOR
4. PROVIDE BULLNOSE @ ALL EXPOSED CMU CORNERS & ENDS (b.n.)
5. DO NOT SCALE DRAWINGS TO OBTAIN MATERIAL QUANTITIES. USE DRAWINGS WHICH ARE DIMENSIONED OR COORDINATE W/ EXISTING CONDITIONS &/OR ARCHITECT & ENGINEERS.

DENOTES ROOM NAME

DORM ROOM

102

DENOTES ROOM NUMBER

102

DENOTES DOOR NUMBER

PROVIDE HARDWARE CLOTH @ 1'-4" O.C. VERT., TYP.

VERIFY SIZE W/ ARCHITECT

4" CMU

1'-0" / 2'-0"

2'-0" / 3'-0"

2 CHASE

3/4" = 1'-0"

KEY PLAN

AREA"B" AREA"A" MATCH LINE

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MECHANICAL / ELECTRICAL

STATE OF OKLAHOMA
MICHAEL L. ABLA
2639
REGISTERED ARCHITECT
4/25/25

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MOORE PUBLIC SCHOOLS

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MOORE, OKLAHOMA

CLASSROOM ADDITION
CENTRAL JUNIOR HIGH SCHOOL

sheet no:

A104

FLOOR PLAN

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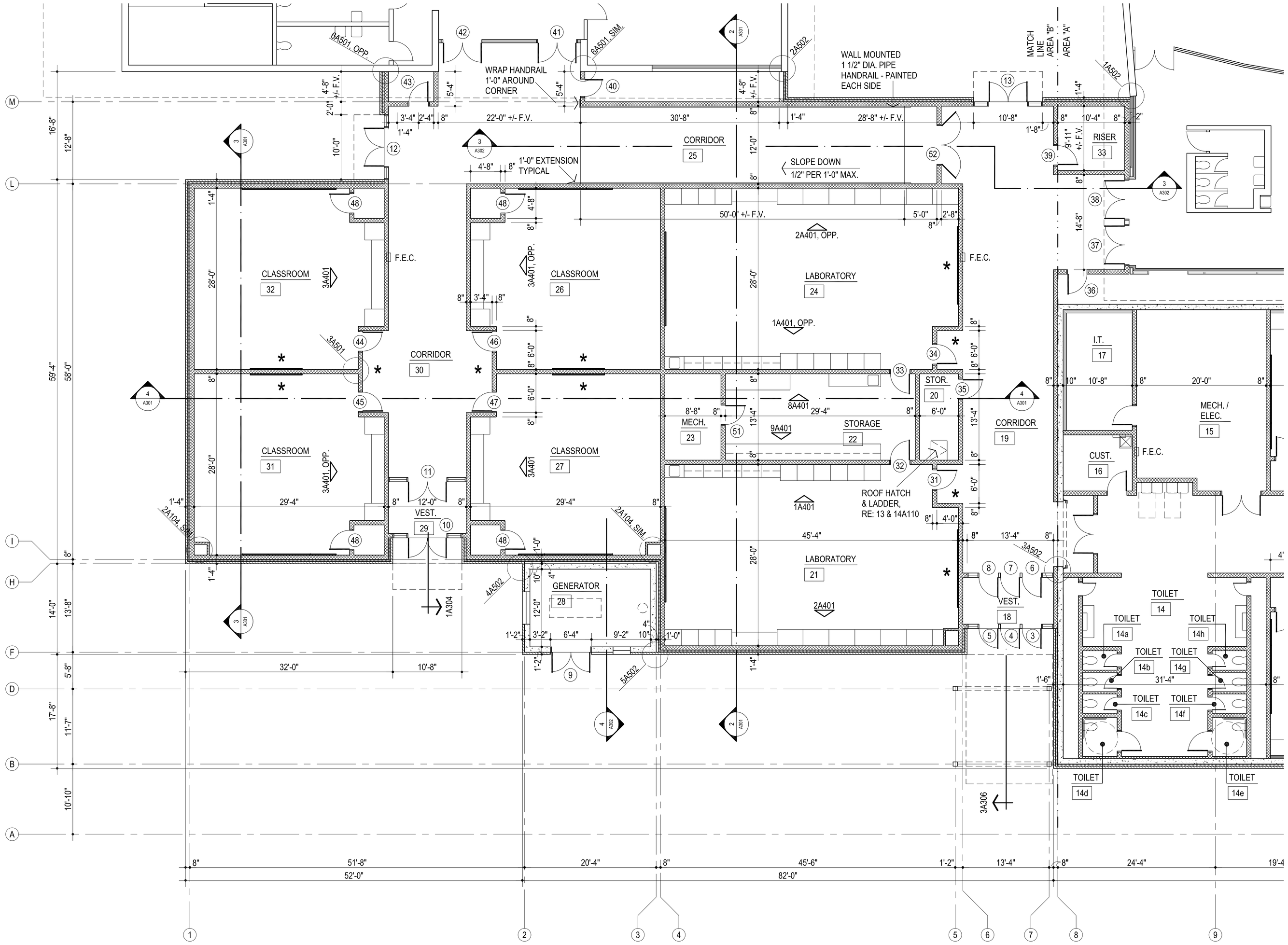


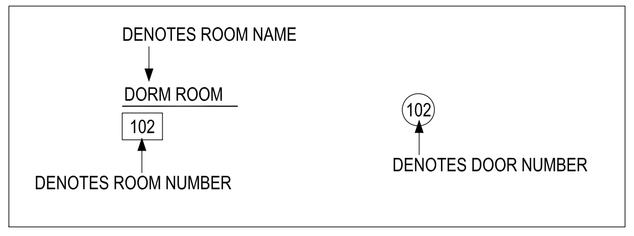
1 FLOOR PLAN - AREA "B"

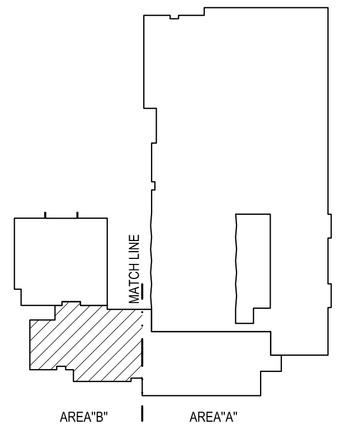
1/8" = 1'-0"

NORTH

MISCELLANEOUS NOTES:

1. F.E.C. - FIRE EXTINGUISHER AND CABINET
2. REFER A111 & A112 FOR FLOORING FINISH LAYOUT
3. * INDICATES ROOM WALLS & RECESS WALLS PAINTED ACCENT COLOR
4. PROVIDE BULLNOSE @ ALL EXPOSED CMU CORNERS & ENDS (b.n.)
5. DO NOT SCALE DRAWINGS TO OBTAIN MATERIAL QUANTITIES. USE DRAWINGS WHICH ARE DIMENSIONED OR COORDINATE W/ EXISTING CONDITIONS &/OR ARCHITECT & ENGINEERS.





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CLASSROOM ADDITION
CENTRAL JUNIOR
HIGH SCHOOL

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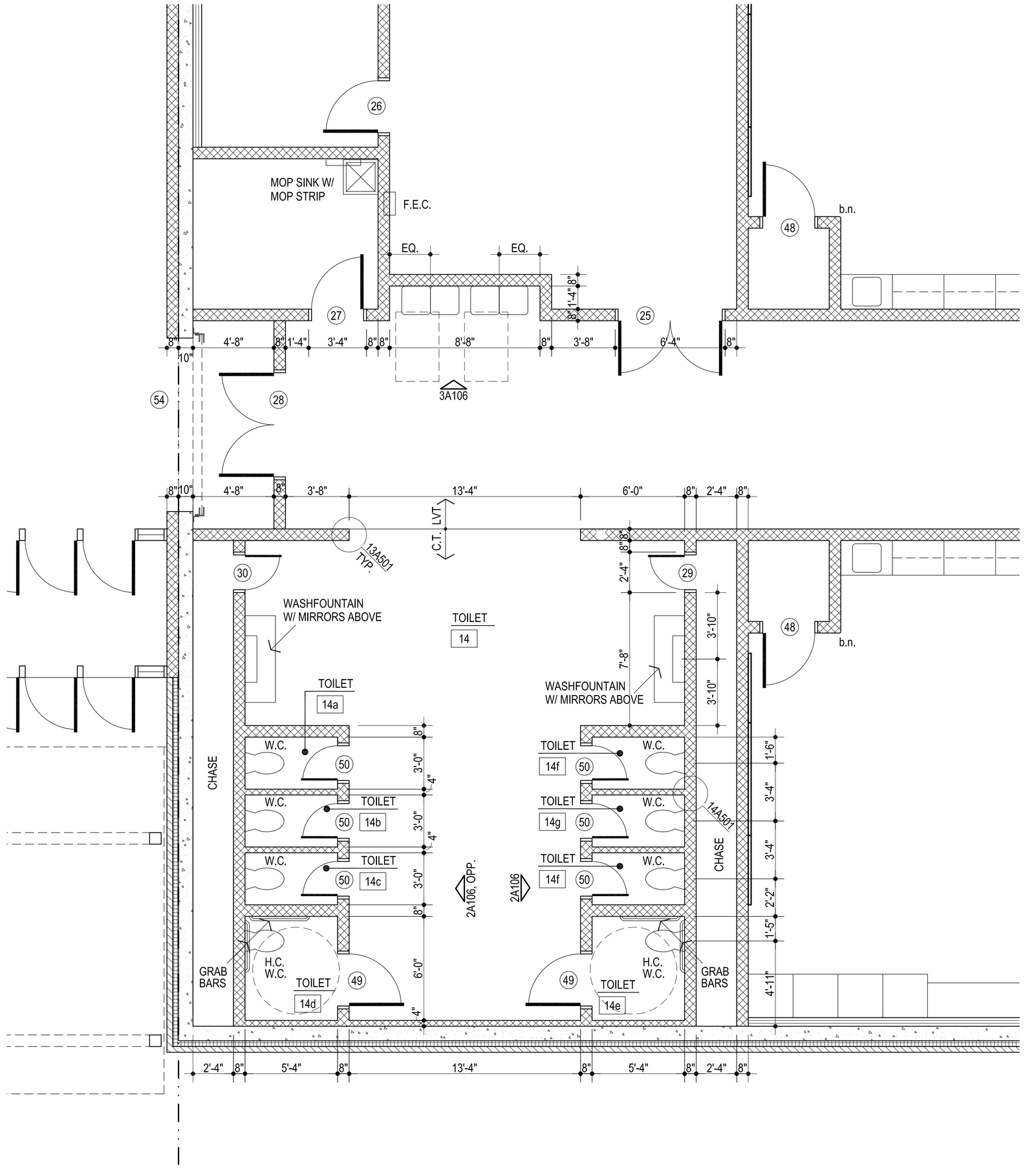
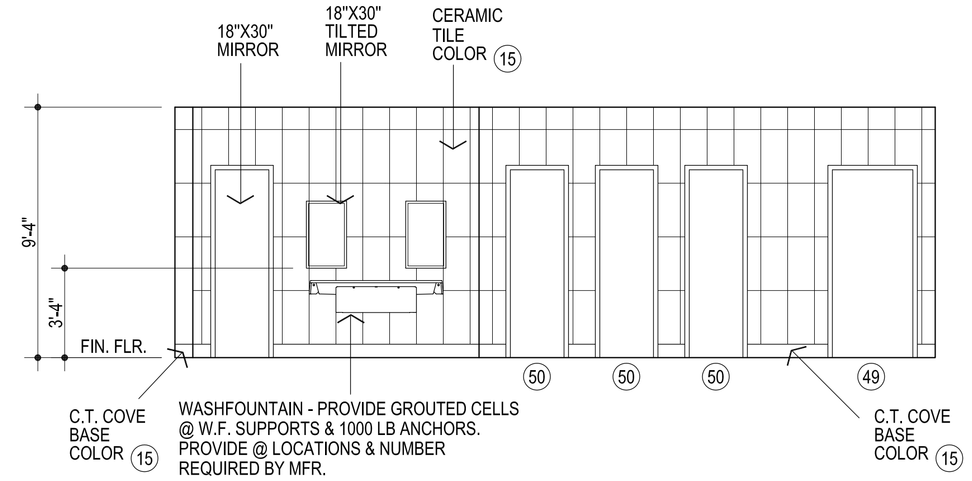
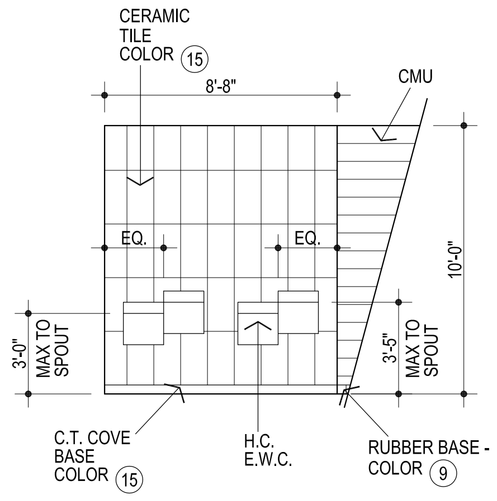


1 ENLARGED FLOOR PLAN ROOM # 14, 14a, 14b, 14c, 14d, 14e, 14f, 14g & 14h
1/4" = 1'-0"

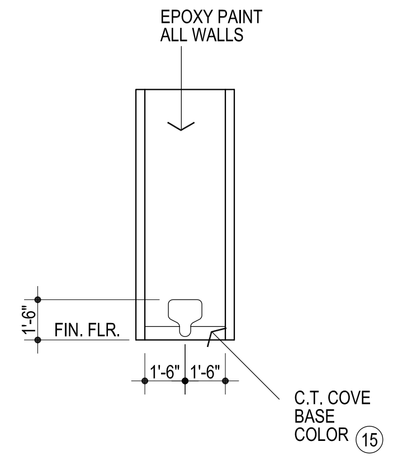
NORTH



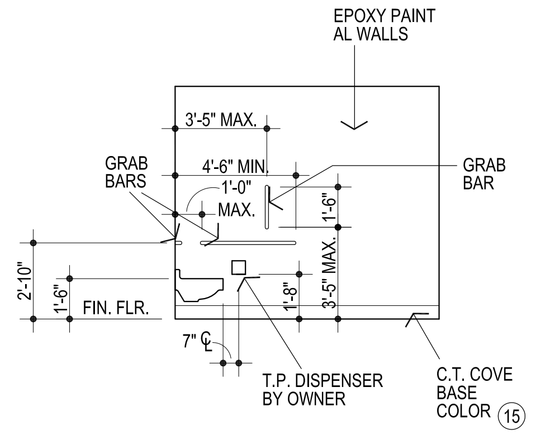
2 N. WALL - RM. #14, S. WALL OPP. - RM. #14
1/4" = 1'-0"



3 TYP. E.W.C. ELEVATION
1/4" = 1'-0"



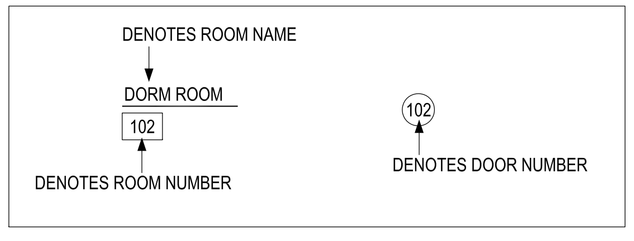
4 TYP. TOILET
1/4" = 1'-0"



5 HANDICAP ACCESSIBLE W.C.
1/4" = 1'-0"

MISCELLANEOUS NOTES:

1. F.E.C. - FIRE EXTINGUISHER AND CABINET
2. REFER A111 & A112 FOR FLOORING FINISH LAYOUT
3. ✱ INDICATES ROOM WALLS & RECESS WALLS PAINTED ACCENT COLOR
4. PROVIDE BULLNOSE @ ALL EXPOSED CMU CORNERS & ENDS (b.n.)
5. DO NOT SCALE DRAWINGS TO OBTAIN MATERIAL QUANTITIES. USE DRAWINGS WHICH ARE DIMENSIONED OR COORDINATE W/ EXISTING CONDITIONS &/OR ARCHITECT & ENGINEERS.



NOTE: CONTRACTOR TO VERIFY THAT THE MOUNTING HEIGHTS OF ALL WALL MOUNTED FIXTURES (I.E. PLUMBING FIXTURES, GRAB BARS, MIRRORS, ETC.) MEET ALL APPLICABLE CODES & STANDARDS PRIOR TO INSTALLATION.

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CLASSROOM ADDITION
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A106

ENLARGED FLOOR PLAN

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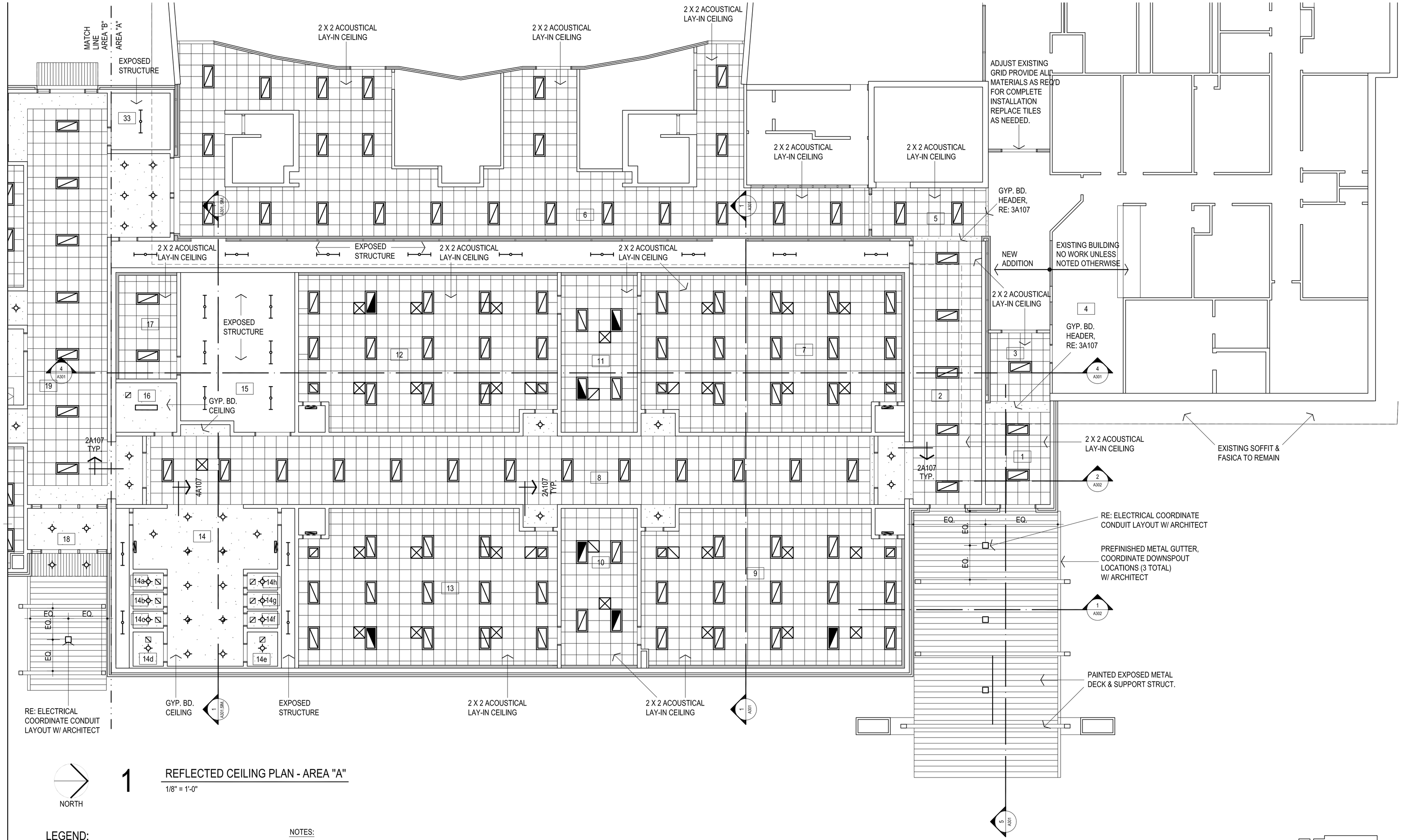


1 REFLECTED CEILING PLAN - AREA "A"

1/8" = 1'-0"

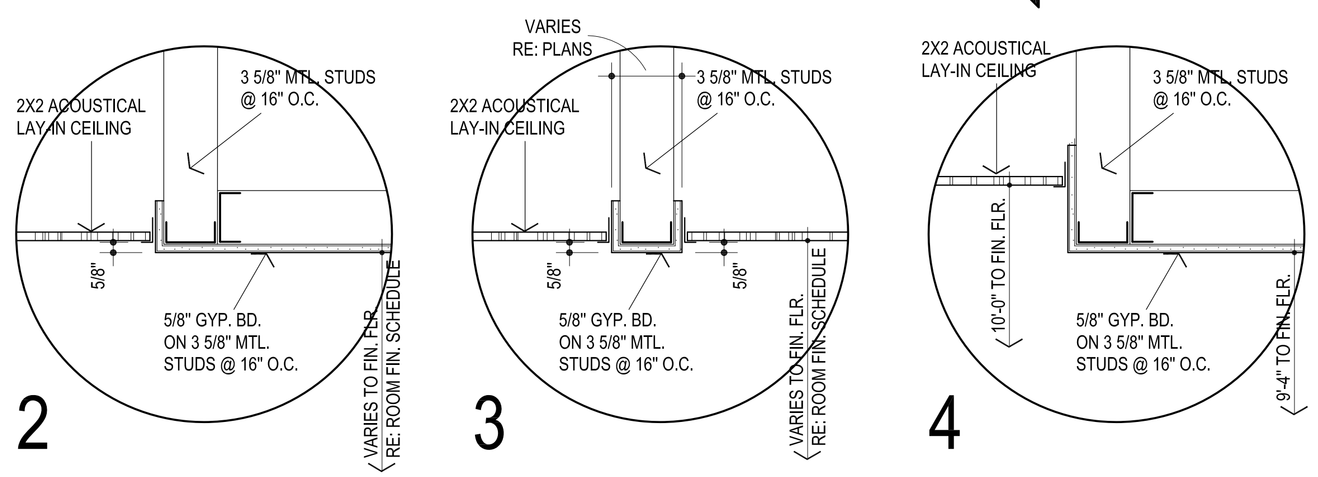
NORTH

LEGEND:

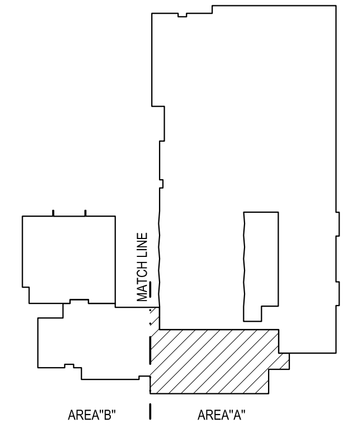
- MECHANICAL OPENINGS
- ELECTRICAL FIXTURES
- CEILING MOUNTED SMOKE DETECTOR, RE: ELEC
- INDICATES AREA / ROOM TO RECEIVE GYP. BD.. CEILING
- INDICATES AREA / ROOM TO RECEIVE 2X2 LAY-IN CEILING

NOTES:

1. REFER MECHANICAL & ELECTRICAL FOR ANY ADDITIONAL CEILING MOUNTED FIXTURES
2. REFER TO SHEET A100 FOR LOCATIONS OF FIRE-RATED WALLS
3. DO NOT SCALE DRAWINGS TO OBTAIN MATERIAL QUANTITIES. USE DRAWINGS WHICH ARE DIMENSIONED OR COORDINATE W/ EXISTING CONDITIONS &/OR ARCHITECT & ENGINEERS.



2 3 4



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REFLECTED CEILING PLAN

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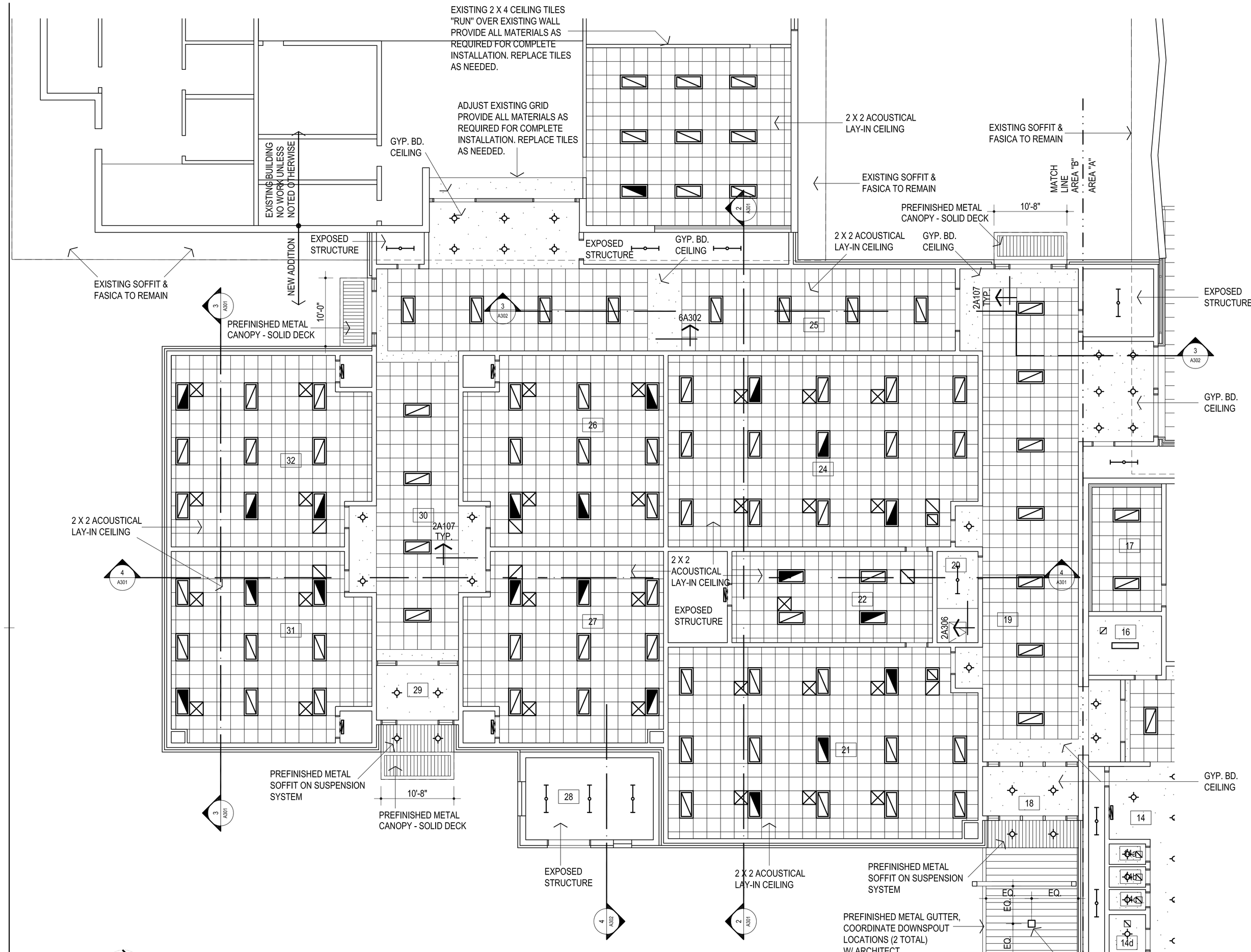


NORTH

1 REFLECTED CEILING PLAN - AREA "B"

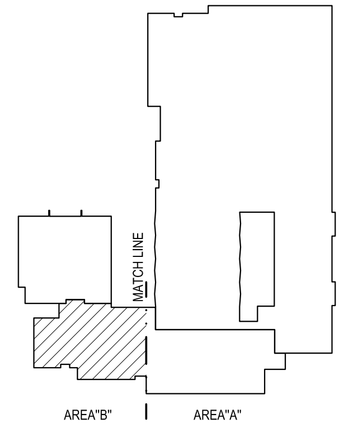
1/8" = 1'-0"

LEGEND:

- MECHANICAL OPENINGS
- ELECTRICAL FIXTURES
- CEILING MOUNTED SMOKE DETECTOR, RE: ELEC
- INDICATES AREA / ROOM TO RECEIVE GYP. BD.. CEILING
- INDICATES AREA / ROOM TO RECEIVE 2X2 LAY-IN CEILING

NOTES:

1. REFER MECHANICAL & ELECTRICAL FOR ANY ADDITIONAL CEILING MOUNTED FIXTURES
2. REFER TO SHEET A100 FOR LOCATIONS OF FIRE-RATED WALLS
3. DO NOT SCALE DRAWINGS TO OBTAIN MATERIAL QUANTITIES. USE DRAWINGS WHICH ARE DIMENSIONED OR COORDINATE W/ EXISTING CONDITIONS &/OR ARCHITECT & ENGINEERS.



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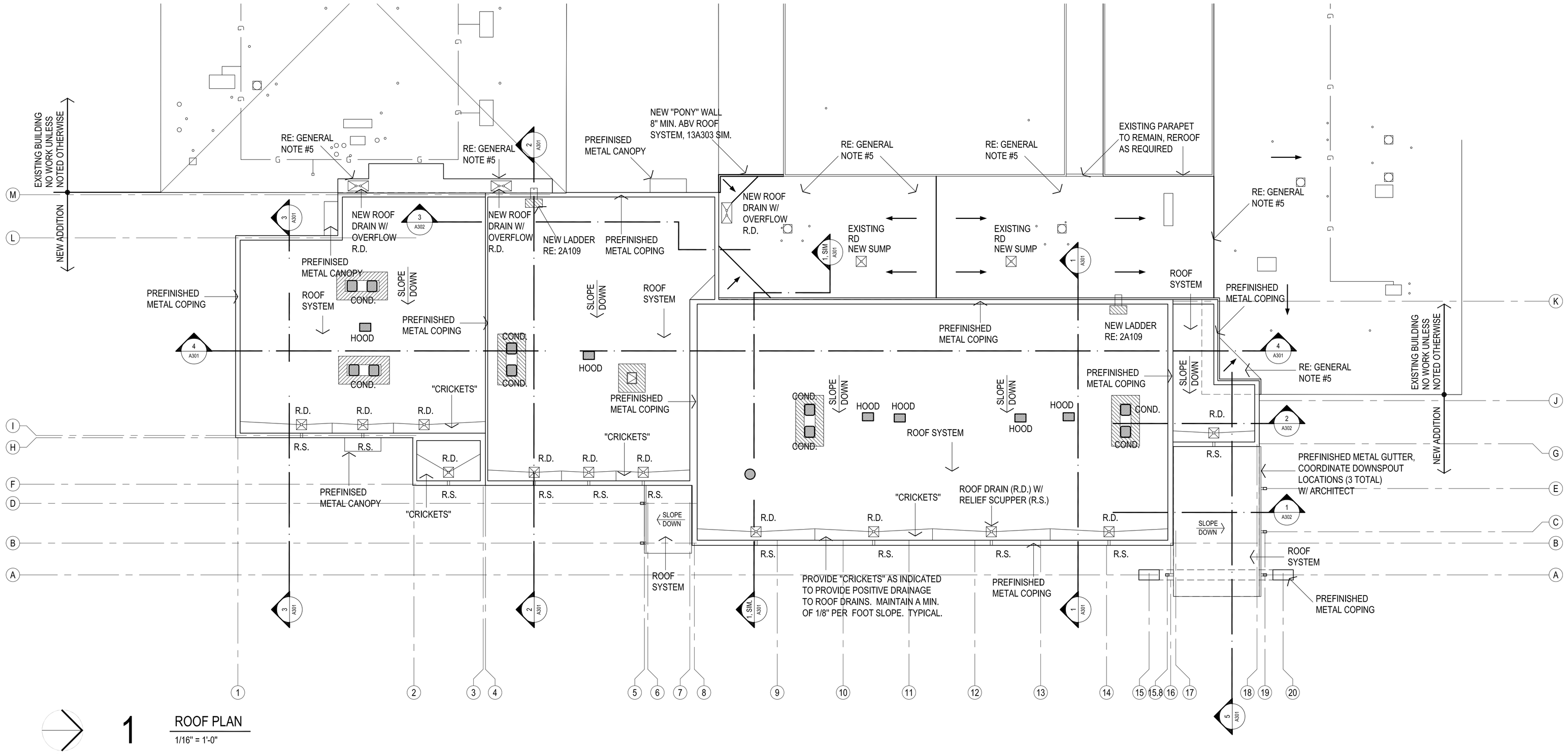


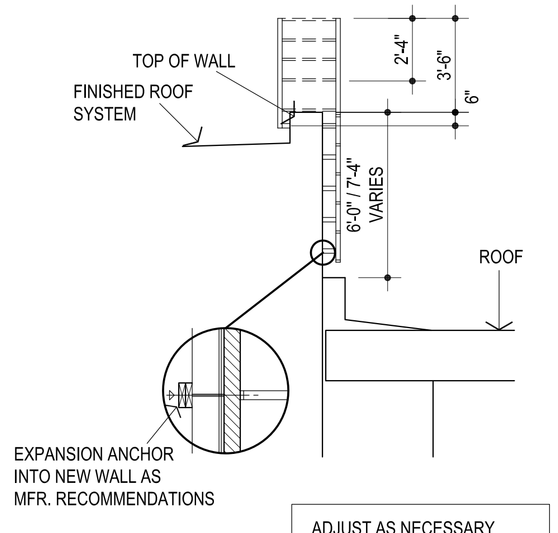
NORTH

1 ROOF PLAN

1/16" = 1'-0"

NOTES:

1. RE: MECH & ELEC. FOR ADDITIONAL ROOF MOUNTED ITEMS. CONTRACTOR TO COORDINATE ALL ROOF MOUNTED ITEMS & PENETRATIONS W/ APPLICABLE TRADES
2. CONTRACTOR TO COORDINATE ROOF VENT PENETRATIONS W/ ARCHITECT.
3. INDICATES NEW WALKWAY PAD LOCATIONS - CUT PADS INTO 5'-0" MAX LENGTHS & PLACE 2" APART TO COVER AREAS INDICATED.
4. PROVIDE @ ALL ROOF PENETRATIONS - PENETRATION DAM / SEALER POCKETS AS PER 6A115
5. PROVIDE NEW "CRICKET" AT EXISTING ROOF SYTEM TO PROVIDE POSITIVE DRAINAGE TO ROOF EDGE / NEW SCUPPER. MAINTAIN A MIN. OF 1/8" PER FOOT SLOPE PROVIDE NEW WOOD BLOCKING, EDGE METAL, ETC. FOR A COMPLETE INSTALLATION . MODIFY EXISTING ROOF SYSTEM AS REQUIRED TO INSTALL NEW OVERLAY AND TAPERED INSULATION TO PROVIDE POSTIVE DRAINAGE TO NEW SCUPPER COORDINATE W/ ARCHITECT
6. DO NOT SCALE DRAWINGS TO OBTAIN MATERIAL QUANTITIES. USE DRAWINGS WHICH ARE DIMENSIONED OR COORDINATE W/ EXISTING CONDITIONS &/OR ARCHITECT & ENGINEERS.



2 ALUMINUM LADDER

1/4" = 1'-0"

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ROOF PLAN

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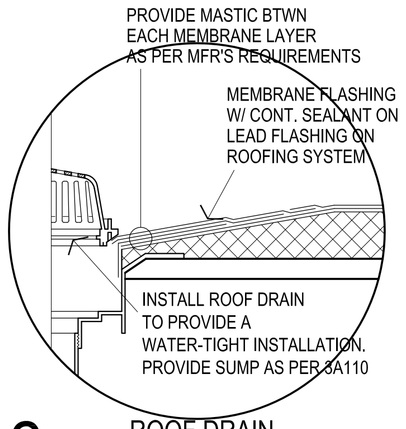
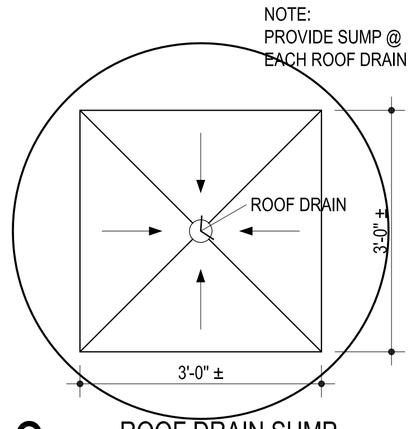
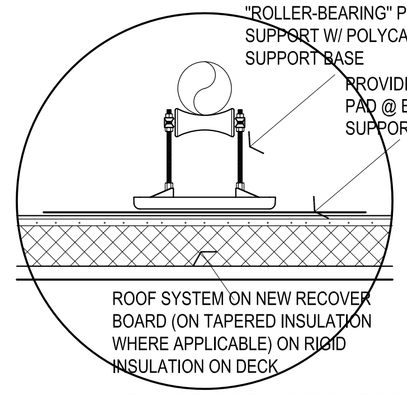


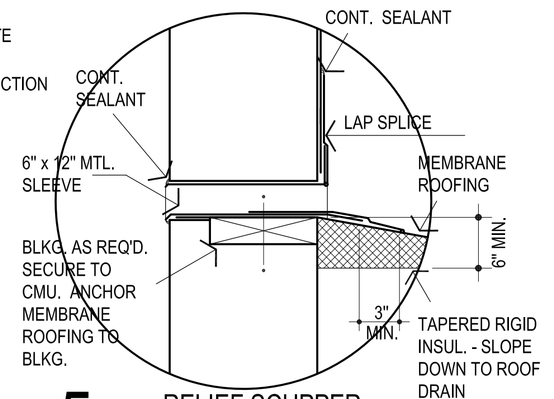
2 ROOF DRAIN
NO SCALE



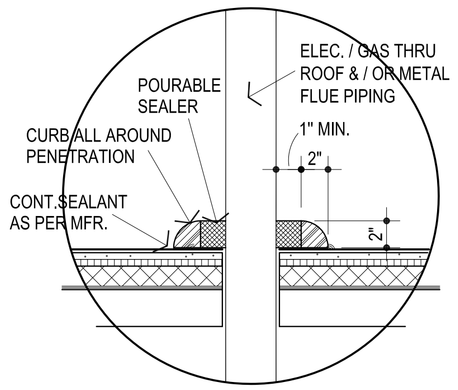
3 ROOF DRAIN SUMP
NO SCALE



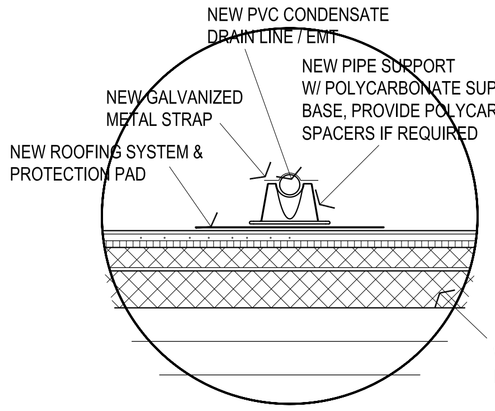
4 ADJUSTABLE PIPE SUPPORTS - FRONT VIEW
NO SCALE



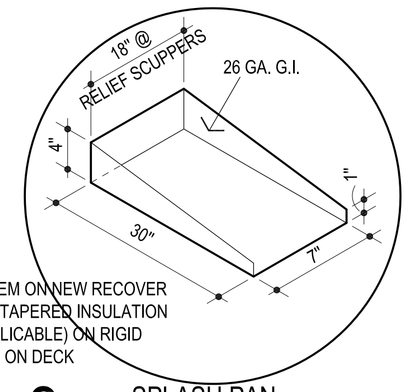
5 RELIEF SCUPPER
NOT TO SCALE



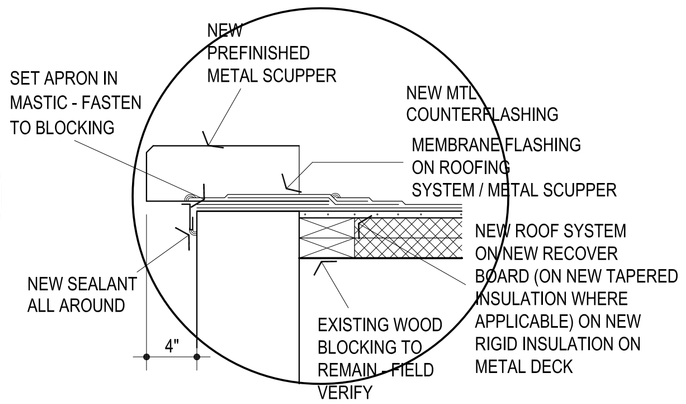
6 PENETRATION DAM / SEALER POCKET @ MAJOR PENETRATIONS



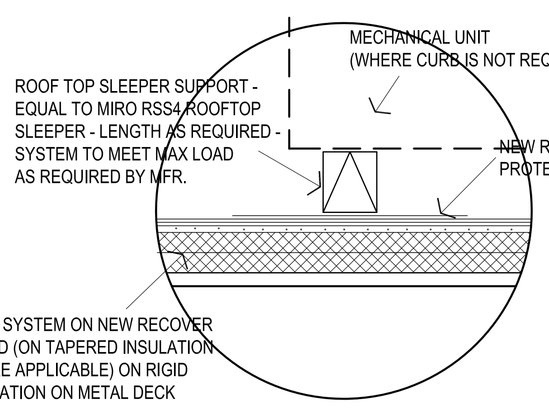
7 DETAIL @ PVC / EMT SUPPORT
NO SCALE



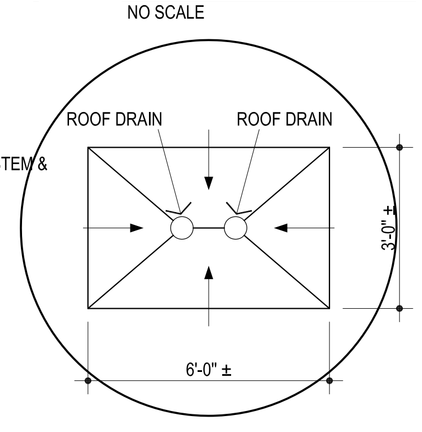
8 SPLASH PAN
NO SCALE



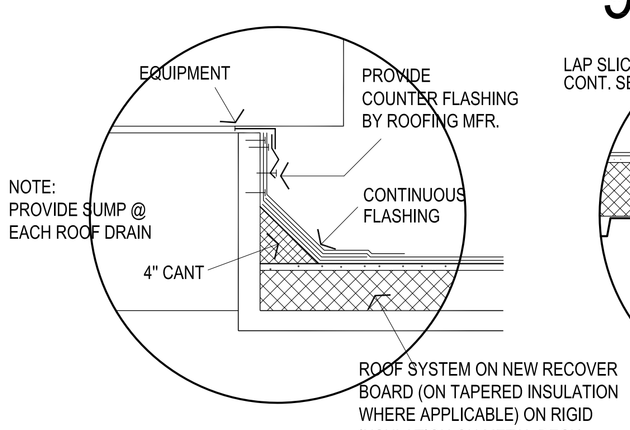
9 RELIEF SCUPPER W/ EXTENSION
NO SCALE



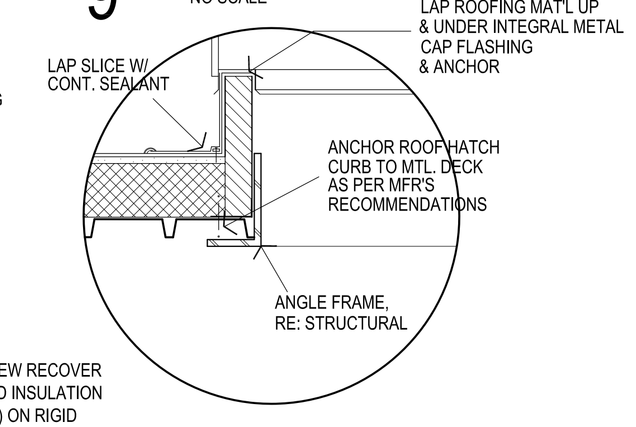
10 MECH. UNIT SUPPORT
NO SCALE



11 ROOF DRAIN SUMP @ OVERFLOW ROOF DRAIN
NO SCALE

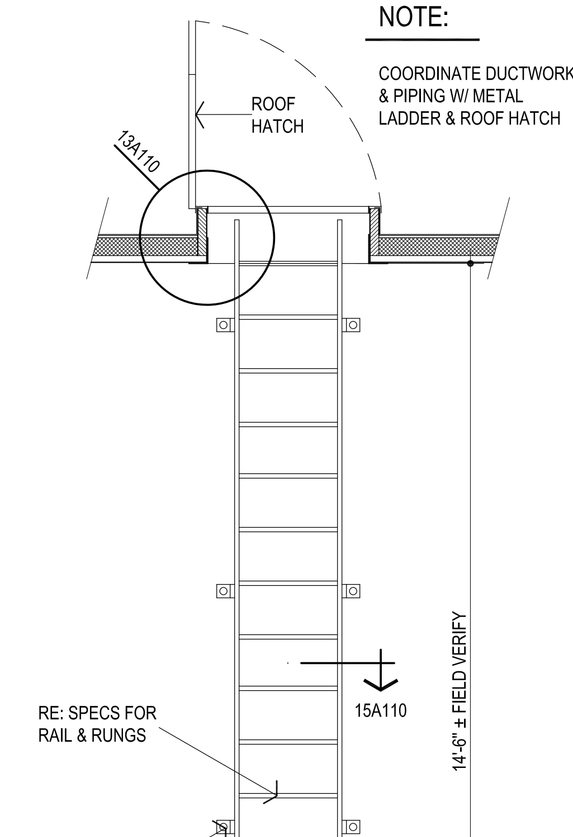


12 MECH. CURB
NO SCALE

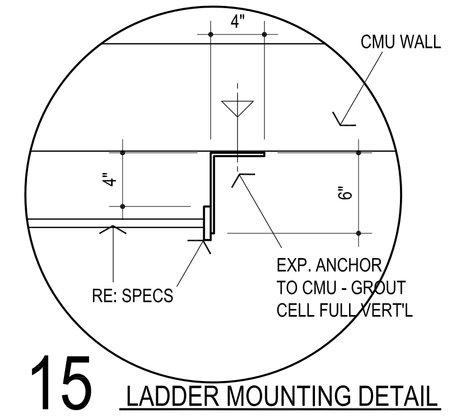


13 ROOF HATCH

NOTE:
COORDINATE DUCTWORK
& PIPING W/ METAL
LADDER & ROOF HATCH



14 INTERIOR ALUMINUM LADDER DETAIL
1/2" = 1'-0"



15 LADDER MOUNTING DETAIL

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CLASSROOM ADDITION
CENTRAL JUNIOR
HIGH SCHOOL

sheet no:
A110
ROOF DETAILS

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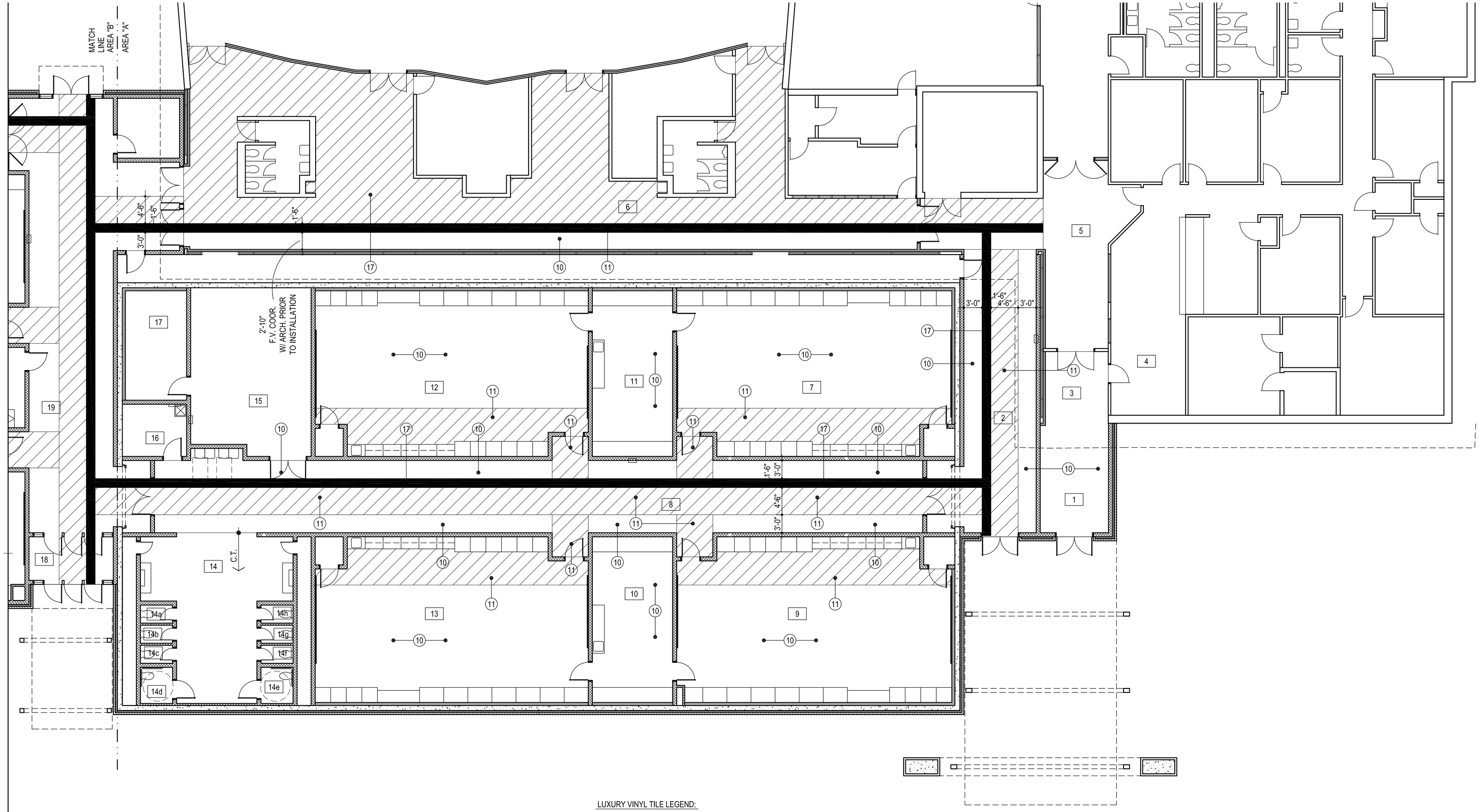


1 LVT & CARPET DESIGN PLAN - AREA "A"

1/8" = 1'-0"

NORTH

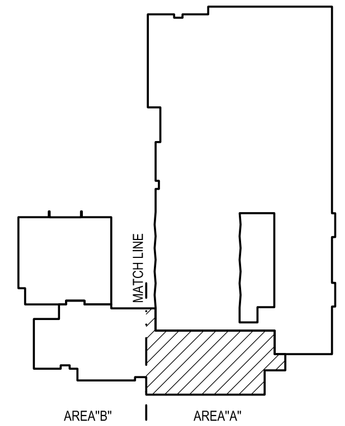
MISCELLANEOUS NOTES:

1. DO NOT SCALE DRAWINGS TO OBTAIN MATERIAL QUANTITIES. USE DRAWINGS WHICH ARE DIMENSIONED OR COORDINATE W/ EXISTING CONDITIONS &/OR ARCHITECT & ENGINEERS.

LUXURY VINYL TILE LEGEND:

- INTERFACE STUDIO SET COLOR - SILVER LIGHT (10)
- INTERFACE STUDIO SET COLOR - PEPPER (11)
- INTERFACE STUDIO SET COLOR - ROYAL BLUE (17)

REFER TO ROOM FINISH SCHEDULE FOR ADDITIONAL LOCATIONS OF LVT



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MOORE, OKLAHOMA

CLASSROOM ADDITION
CENTRAL JUNIOR
HIGH SCHOOL

sheet no:

A111

LVT / CARPET PLAN

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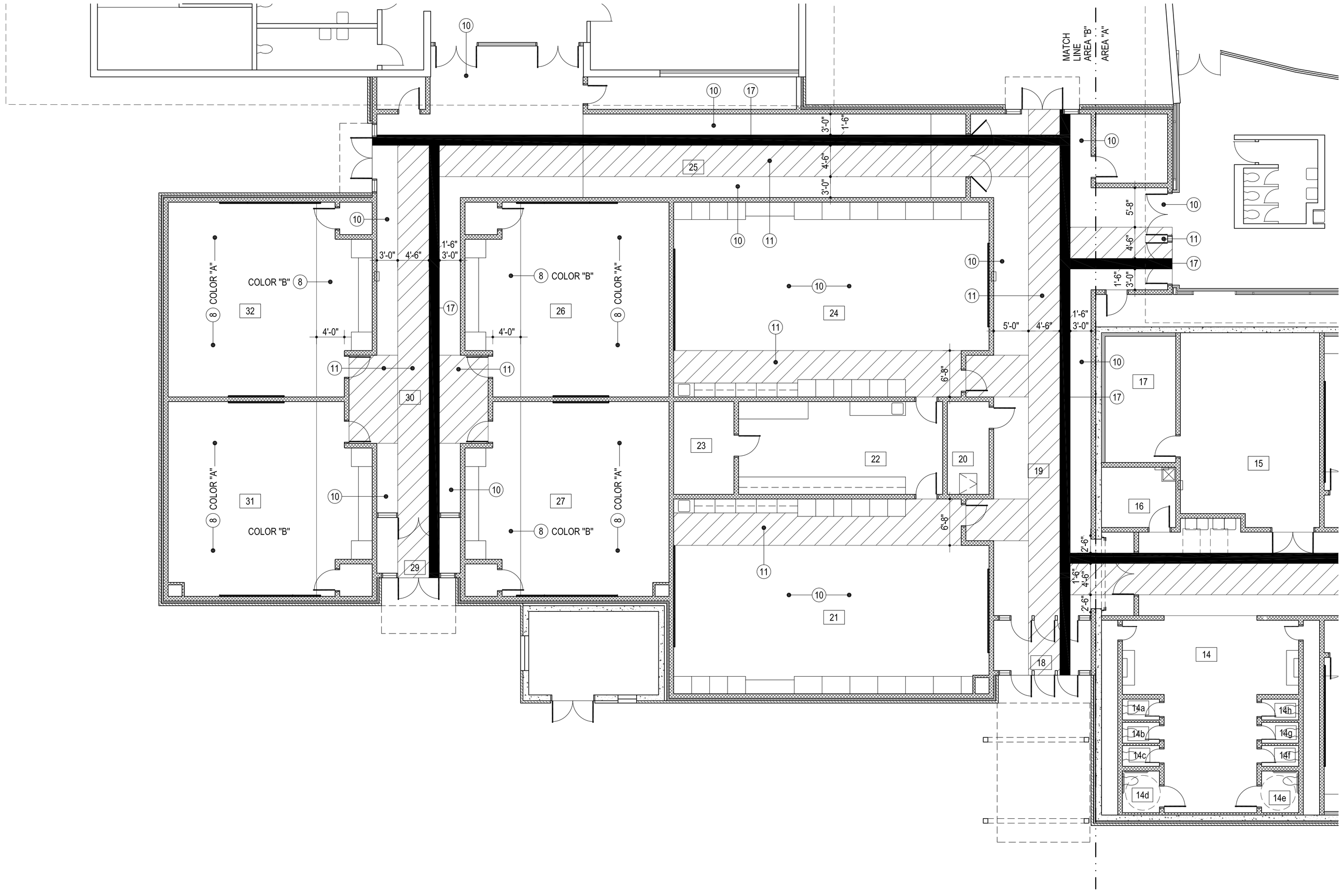

1 LVT & CARPET DESIGN PLAN - AREA "B"

1/8" = 1'-0"

NORTH

LUXURY VINYL TILE LEGEND:

- INTERFACE STUDIO SET COLOR - SILVER LIGHT (10)
- INTERFACE STUDIO SET COLOR - PEPPER (11)
- INTERFACE STUDIO SET COLOR - ROYAL BLUE (17)

REFER TO ROOM FINISH SCHEDULE FOR ADDITIONAL LOCATIONS OF LVT

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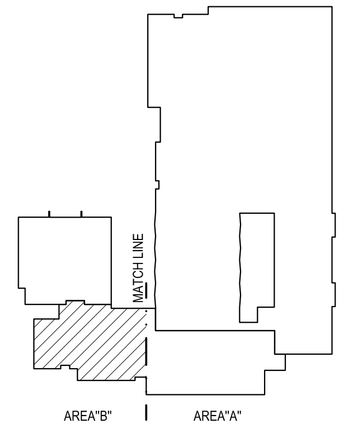

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CLASSROOM ADDITION
CENTRAL JUNIOR
HIGH SCHOOL

sheet no:

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LVT / CARPET PLAN

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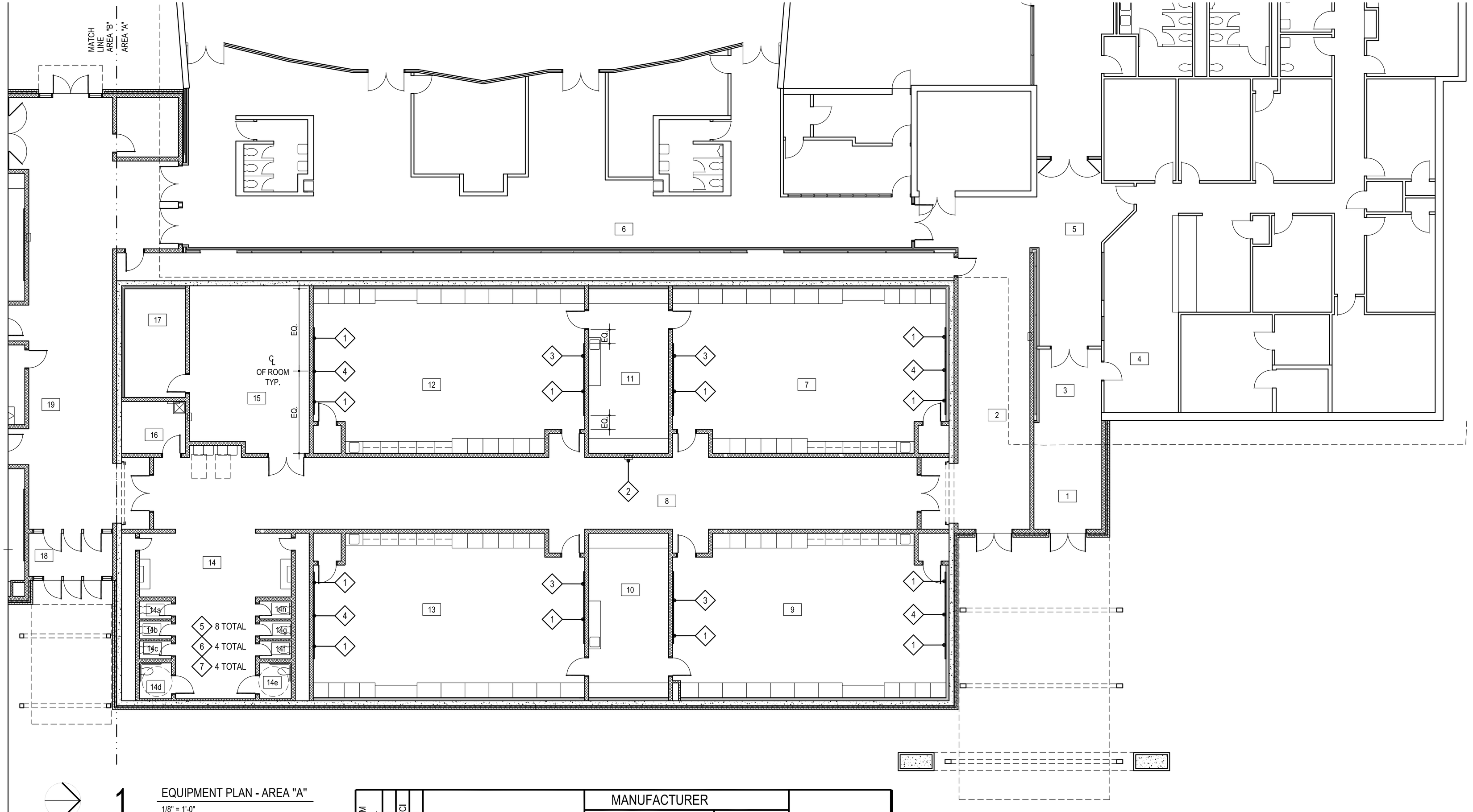


NORTH

1 EQUIPMENT PLAN - AREA "A"

1/8" = 1'-0"

ITEM NO.	CFI	OF/CI	OFI	DESCRIPTION	MANUFACTURER NAME	MANUFACTURER MODEL NO.	REMARKS
1	●			MARKERBOARD - 4'-0"	BEST-RITE CHALKBOARD CO.	RE: SPECS	W/ CHALK RAIL
2	●			FIRE EXTINGUISHER & CABINET	JL INDUSTRIES	RE: SPECS	
3	●			TACKBOARD - 8'-0"	BEST-RITE CHALKBOARD CO.	RE: SPECS	
4			●	SMARTBOARD			BY OWNER
5		●		TOILET PAPER HOLDER			
6		●		PAPER TOWEL DISPENSER			
7		●		SOAP DISPENSER			

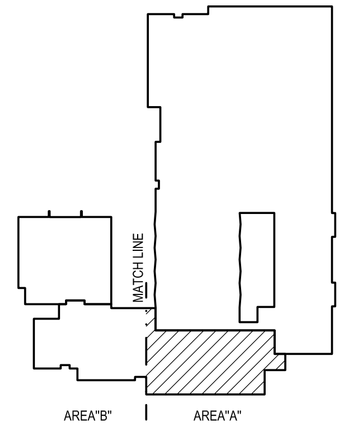
NOTES:

1. ALL CHALKBOARDS & TACKBOARDS MOUNTED @ EXTERIOR WALLS SHALL HAVE "STAND-OFF" MOUNTING BRACKETS TO PREVENT CONDENSATION BEHIND BOARDS.
2. REFER SHEET A115 FOR ADDITIONAL INFORMATION

2 EQUIPMENT SCHEDULE

LEGEND :

- 4 — CONTRACTOR FURNISHED AND INSTALLED (CFI)
- 4 — OWNER FURNISHED AND INSTALLED (OFI)
- 4 — OWNER FURNISHED AND CONTRACTOR INSTALLED (OF / CI)



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MOORE, OKLAHOMA

CLASSROOM ADDITION
CENTRAL JUNIOR
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sheet no:

A113

EQUIPMENT PLAN

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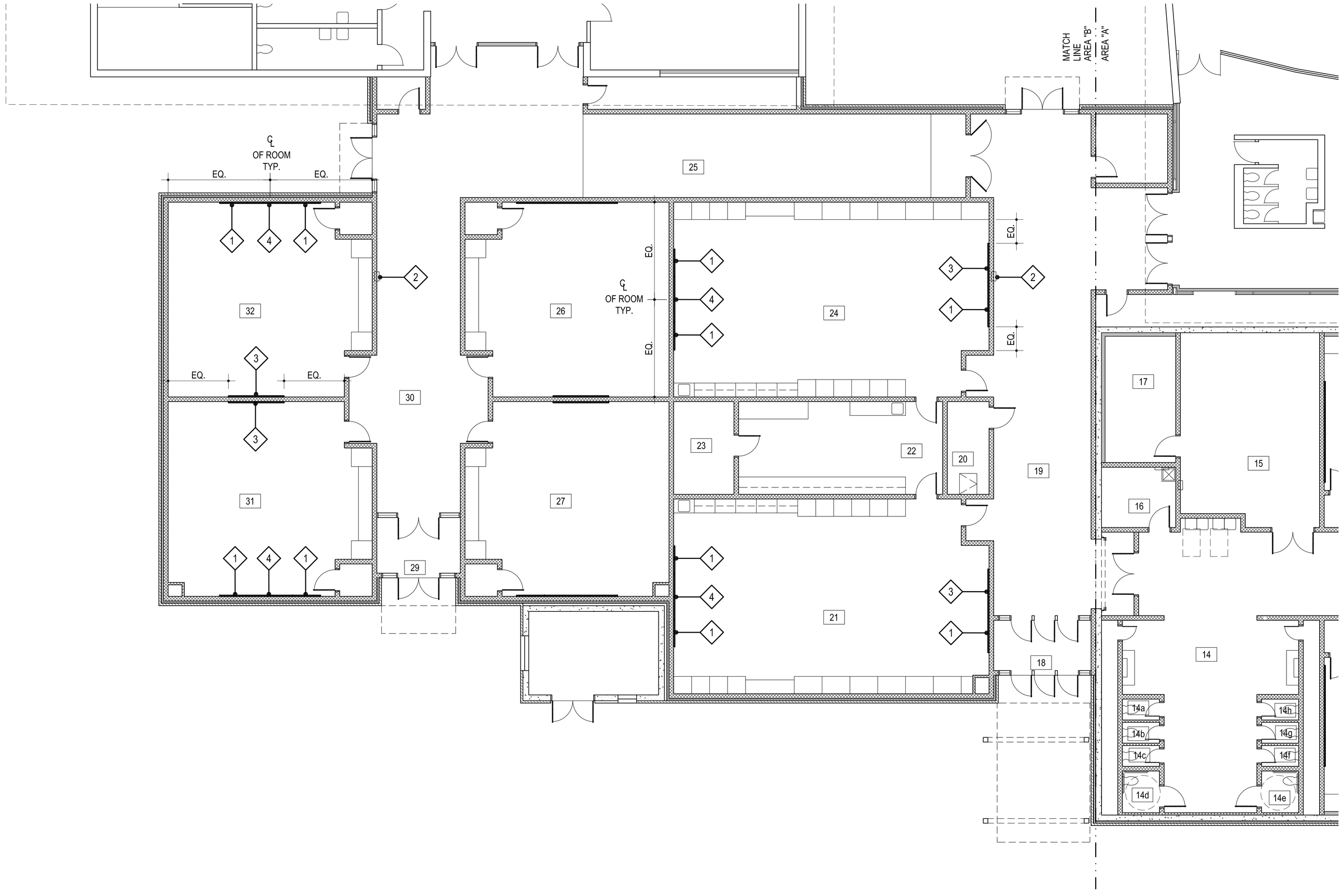
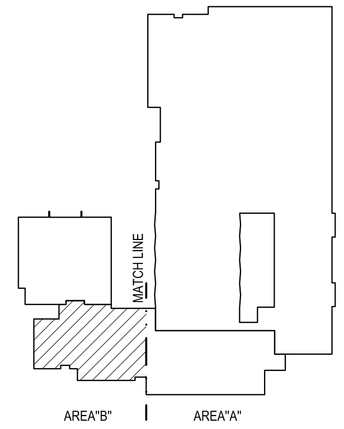


NORTH

1 EQUIPMENT PLAN - AREA "B"

1/8" = 1'-0"



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HIGH SCHOOL

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A114

EQUIPMENT PLAN

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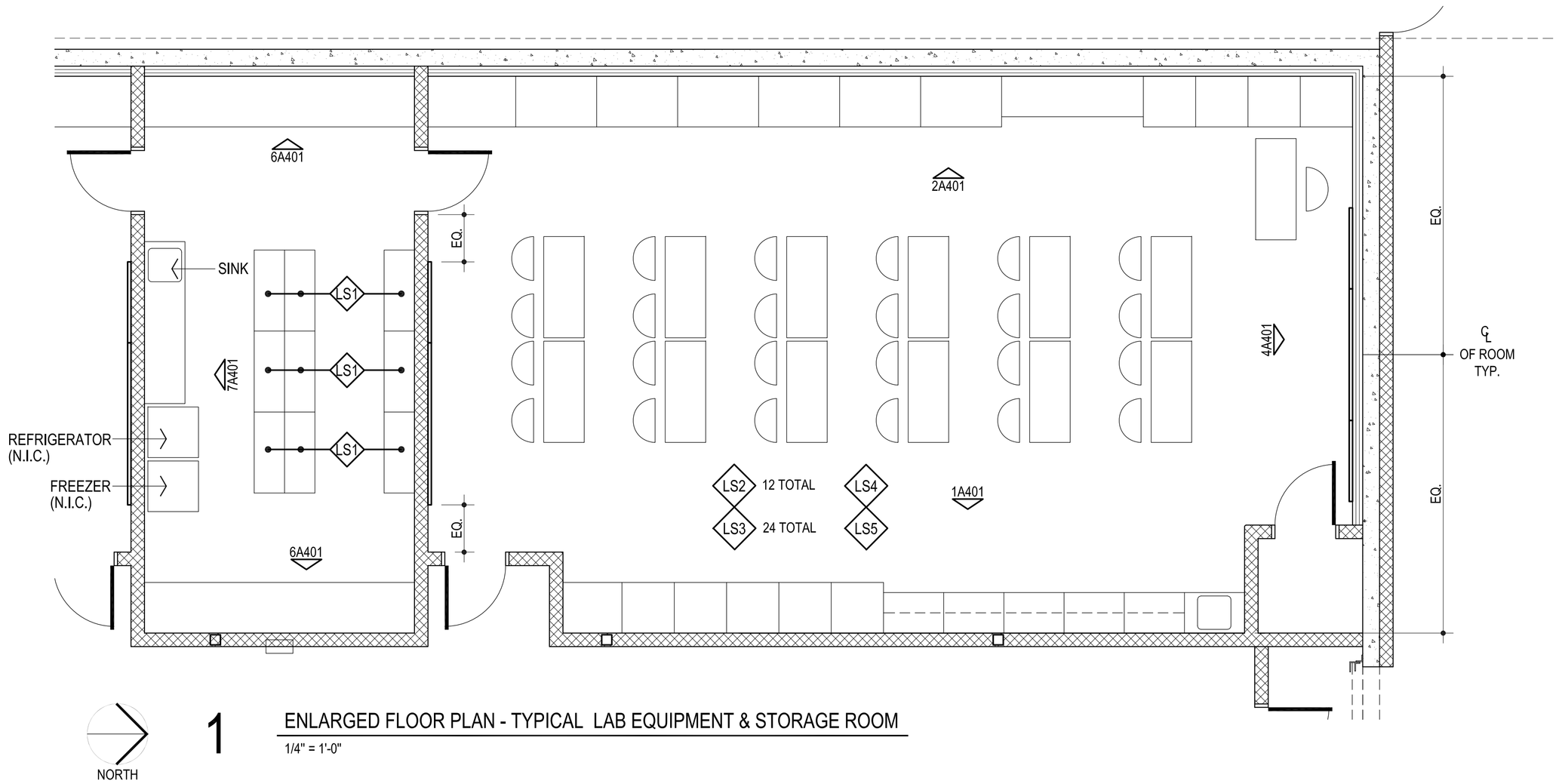
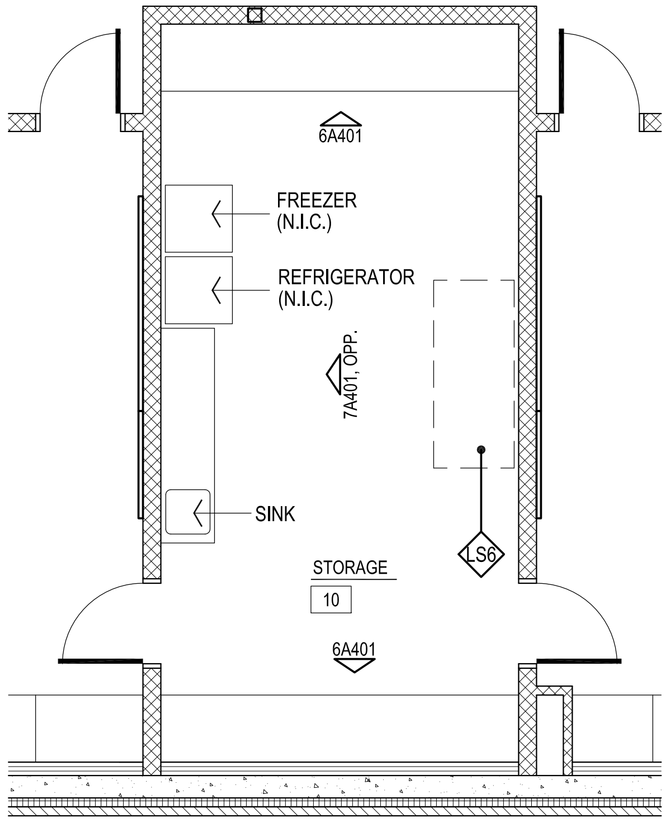


NORTH

1 ENLARGED FLOOR PLAN - TYPICAL LAB EQUIPMENT & STORAGE ROOM

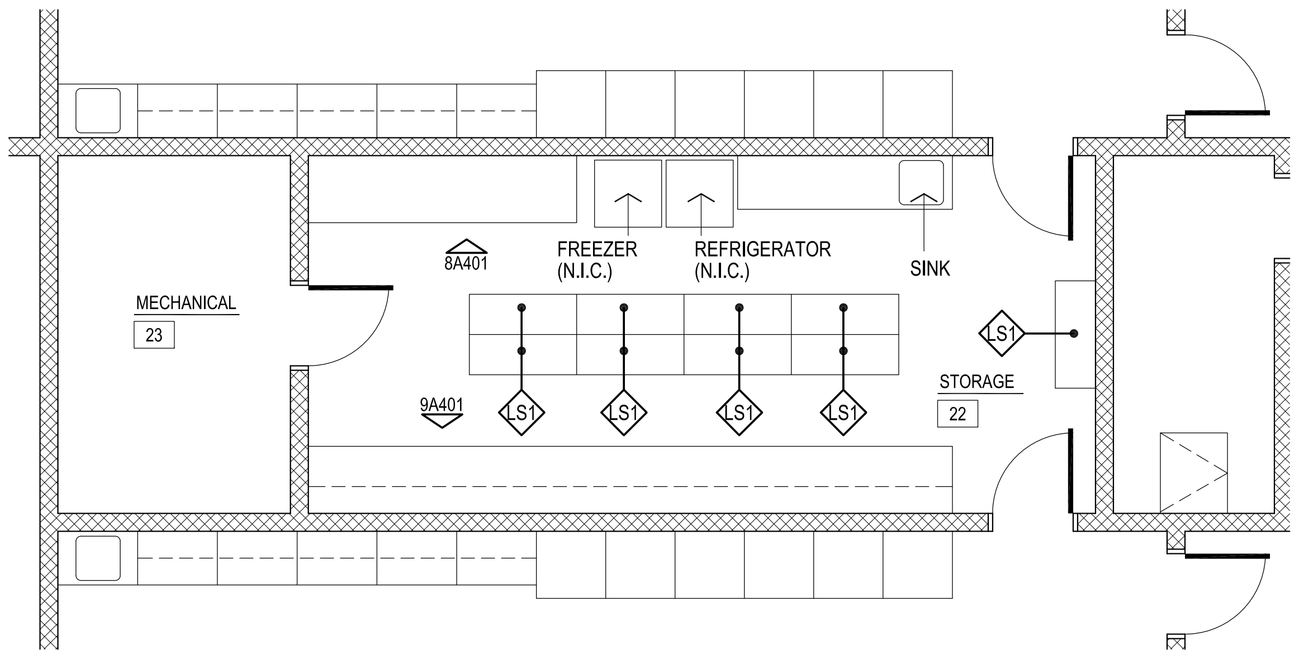
1/4" = 1'-0"



NORTH

3 ENLARGED FLOOR PLAN ROOM #10

1/4" = 1'-0"



NORTH

2 ENLARGED FLOOR PLAN - STORAGE ROOM #22

1/4" = 1'-0"

ITEM NO.	CFI	OF / OI	DESCRIPTION	MANUFACTURER NAME	MANUFACTURER MODEL NO.	COLOR	REMARKS
LS1		●	LAB CABINETS	KEWANEE	S20W841648-5014	RE: SPEC'S	BY OTHERS
LS2		●	LAB TABLE			RE: SPEC'S	BY OTHERS
LS3		●	STOOL			RE: SPEC'S	BY OTHERS
LS4		●	TEACHER'S CHAIR			RE: SPEC'S	BY OTHERS
LS5		●	TEACHER'S DESK			RE: SPEC'S	BY OTHERS
LS6		●	3-D PRINTER			RE: SPEC'S	BY OTHERS

4 LAB EQUIPMENT SCHEDULE - LAB & STORAGE ROOMS

PROVIDED FOR INFORMATION ONLY
OMIT LS1 AT STORAGE ROOM #10
TO MAKE ROOM FOR 3D PRINTER

LEGEND :

4 CONTRACTOR FURNISHED AND INSTALLED (CFI)

4 OWNER FURNISHED AND OWNER INSTALLED (OF / OI)

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ENLARGED FLOOR PLAN

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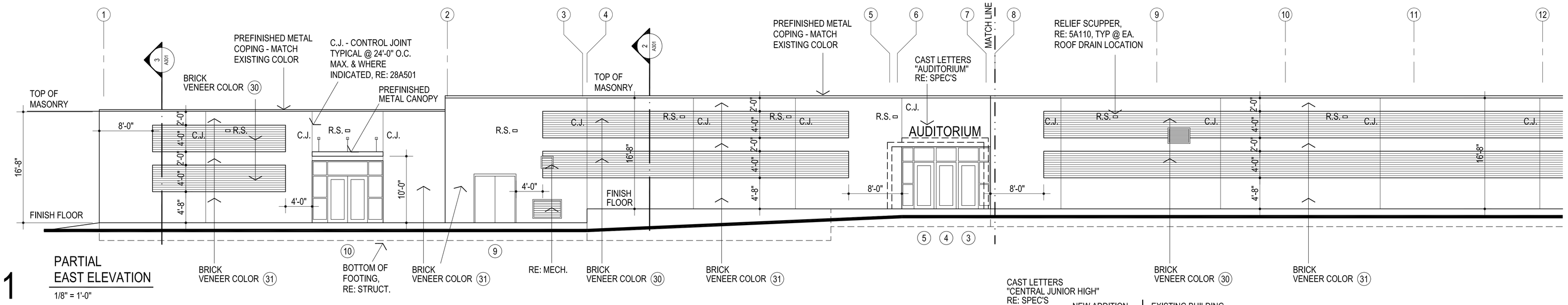

1 PARTIAL EAST ELEVATION
1/8" = 1'-0"

1 PARTIAL EAST ELEVATION
1/8" = 1'-0"

2 SOUTH ELEVATION
1/8" = 1'-0"

3 NORTH ELEVATION
1/8" = 1'-0"

4 PARTIAL EAST ELEVATION
1/8" = 1'-0"

GENERAL NOTES:

1. REFER STRUCTURAL DRAWINGS FOR TOP OF FOOTING ELEVATIONS - PROVIDE ALL MATERIALS REQUIRED FOR WALL SYSTEM TO EXTEND TO TOP OF FOOTING
2. DO NOT SCALE DRAWINGS TO OBTAIN MATERIAL QUANTITIES. USE DRAWINGS WHICH ARE DIMENSIONED OR COORDINATE W/ EXISTING CONDITIONS &/OR ARCHITECT & ENGINEERS.

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CENTRAL JUNIOR
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OVERALL FLOOR PLAN

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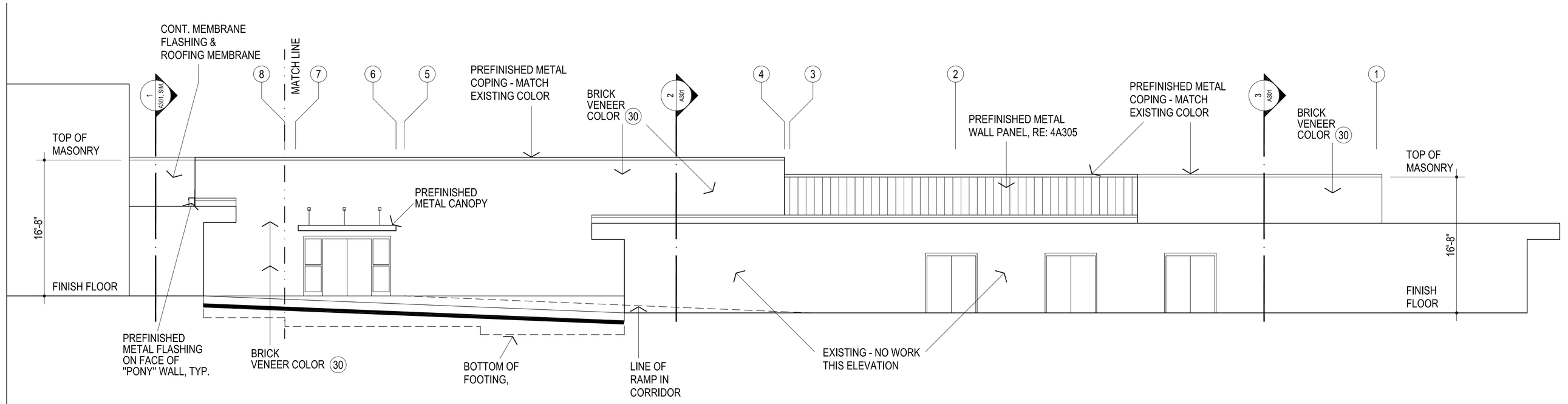

1 WEST ELEVATION

1/8" = 1'-0"

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OVERALL FLOOR PLAN

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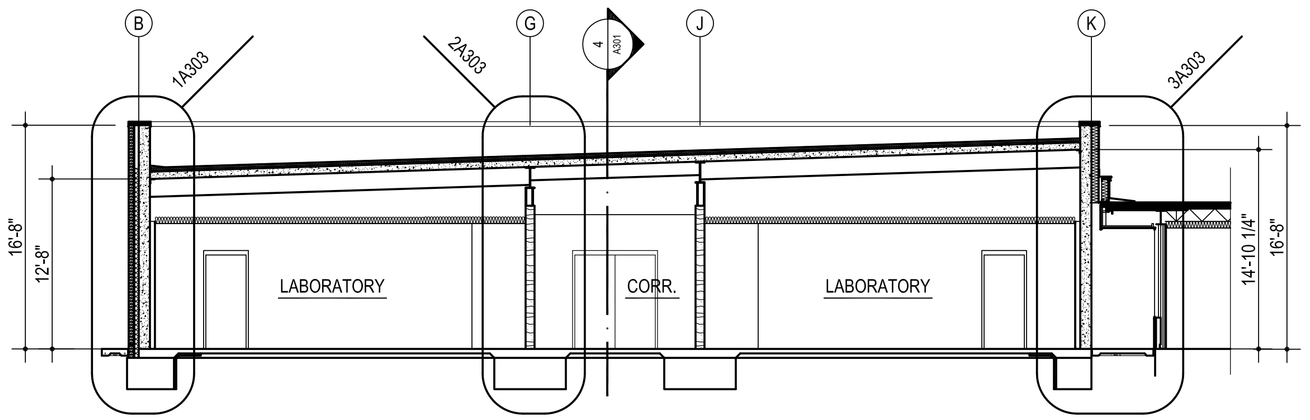
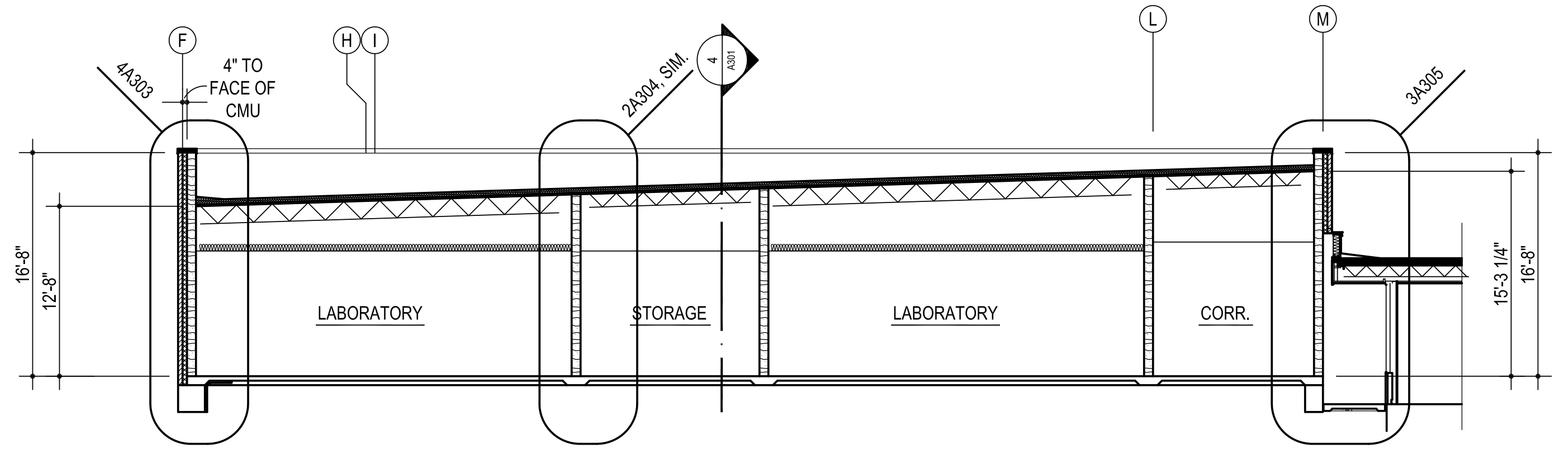
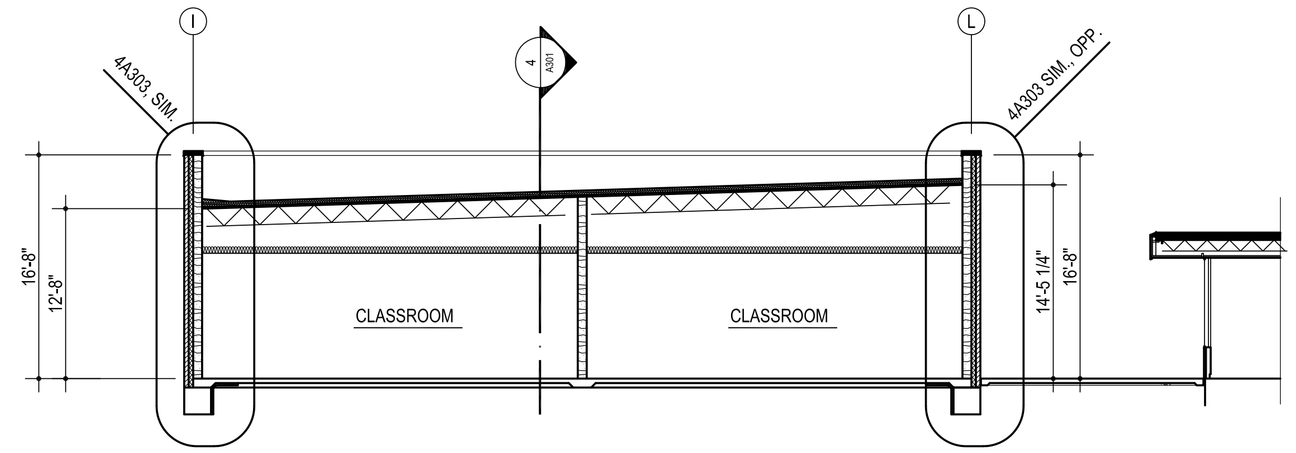


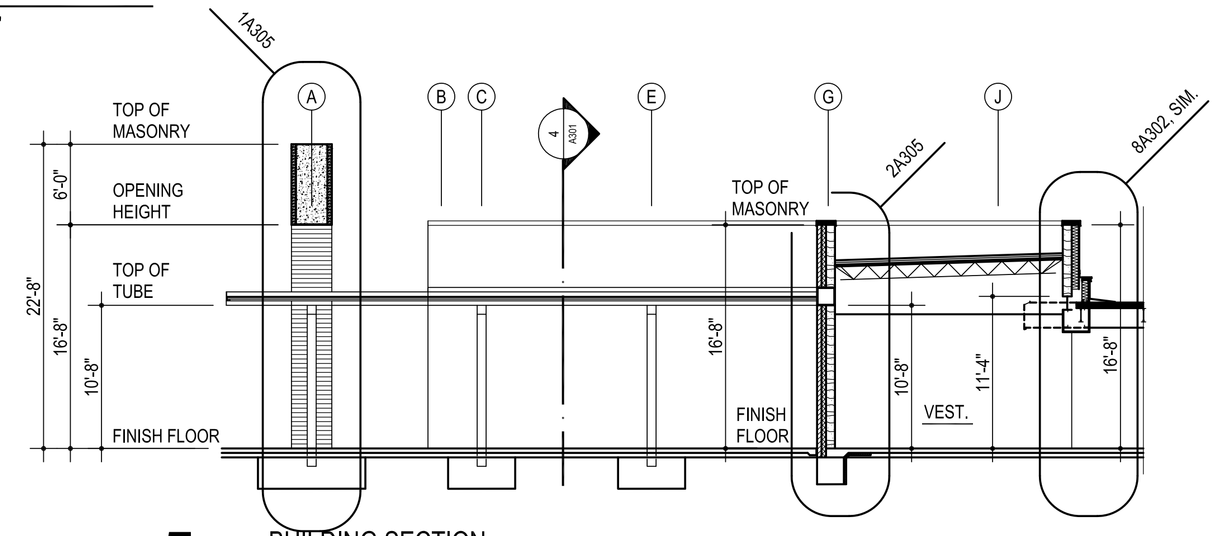
1 BUILDING SECTION
1/8" = 1'-0"



2 BUILDING SECTION
1/8" = 1'-0"

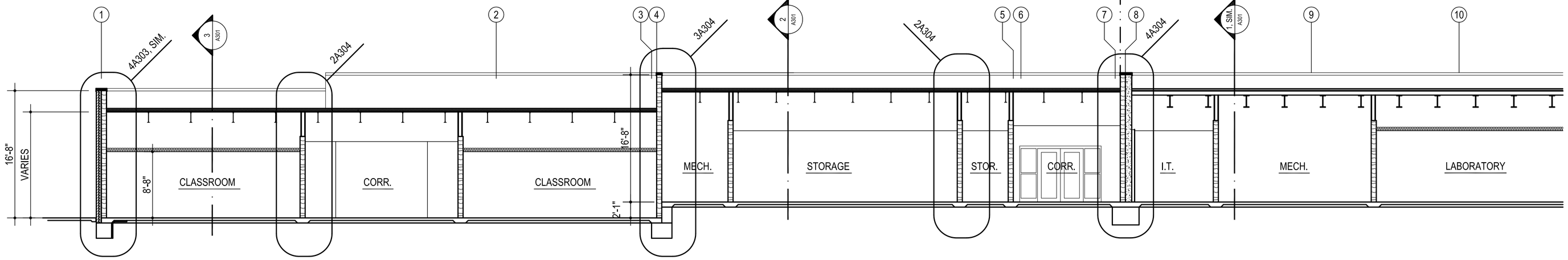


3 BUILDING SECTION
1/8" = 1'-0"

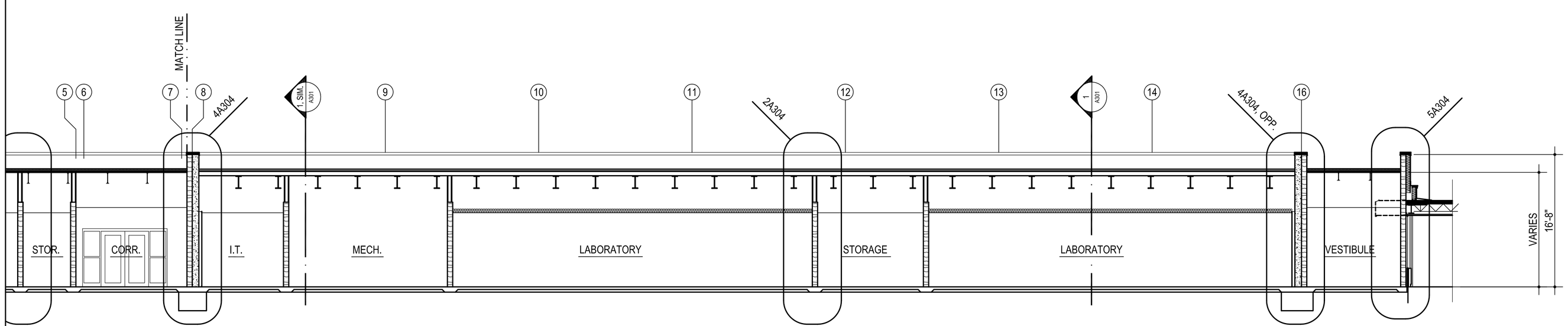


5 BUILDING SECTION
1/8" = 1'-0"

MATCH LINE



4 BUILDING SECTION
1/8" = 1'-0"



4 BUILDING SECTION
1/8" = 1'-0"

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BUILDING SECTIONS

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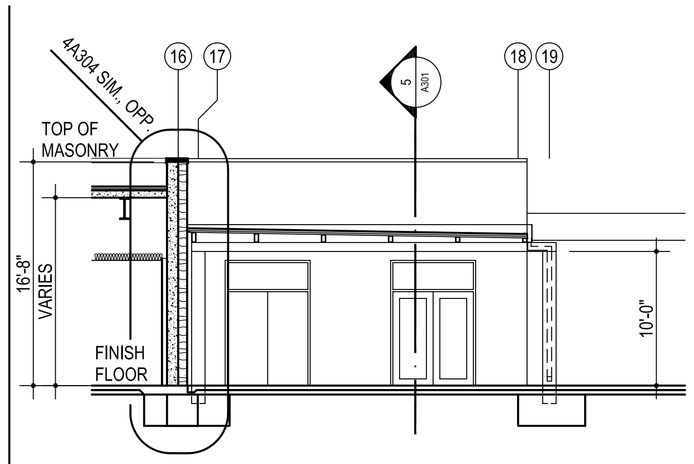

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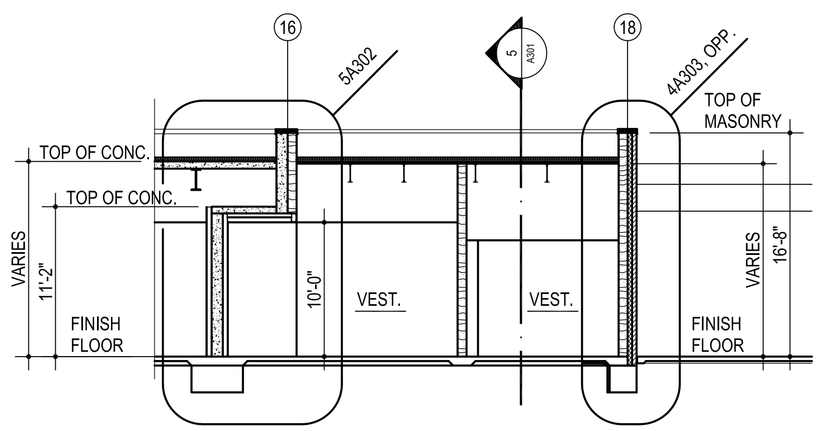
1/8" = 1'-0"



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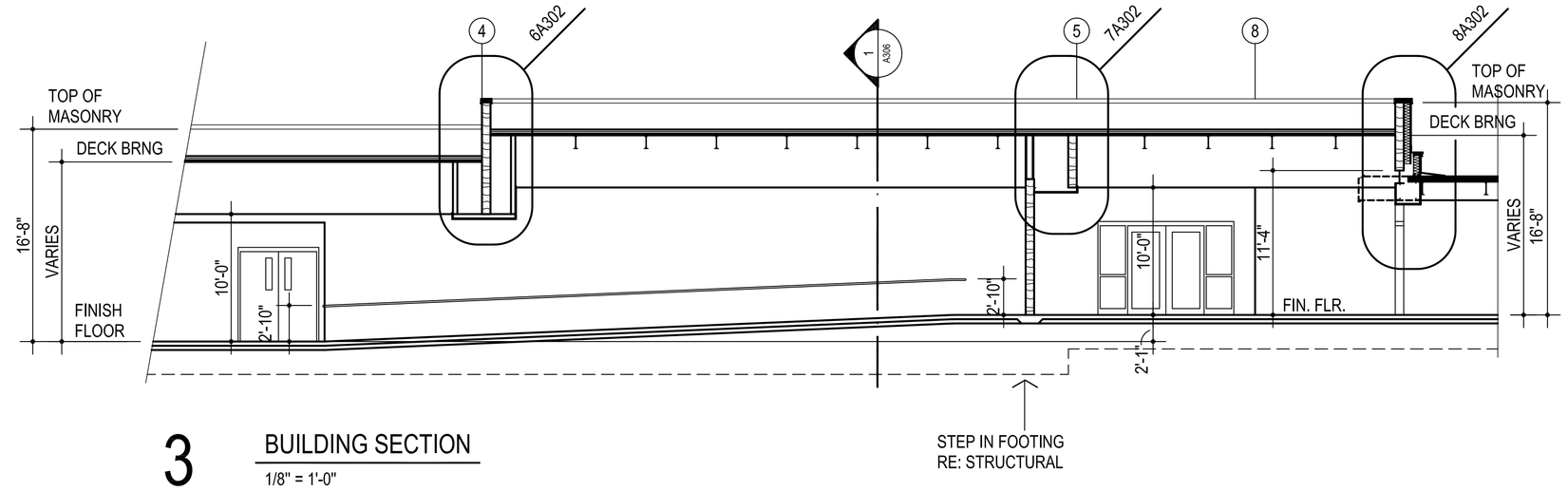
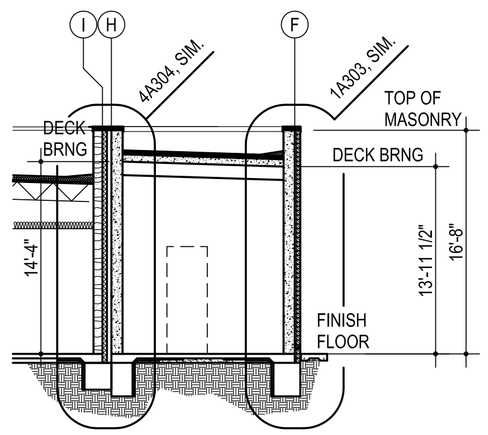


3 BUILDING SECTION
1/8" = 1'-0"



4 BUILDING SECTION
1/8" = 1'-0"

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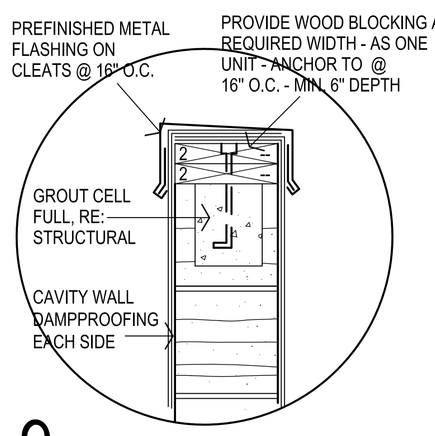

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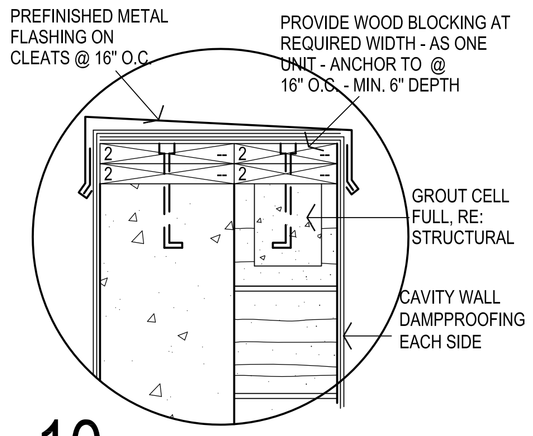

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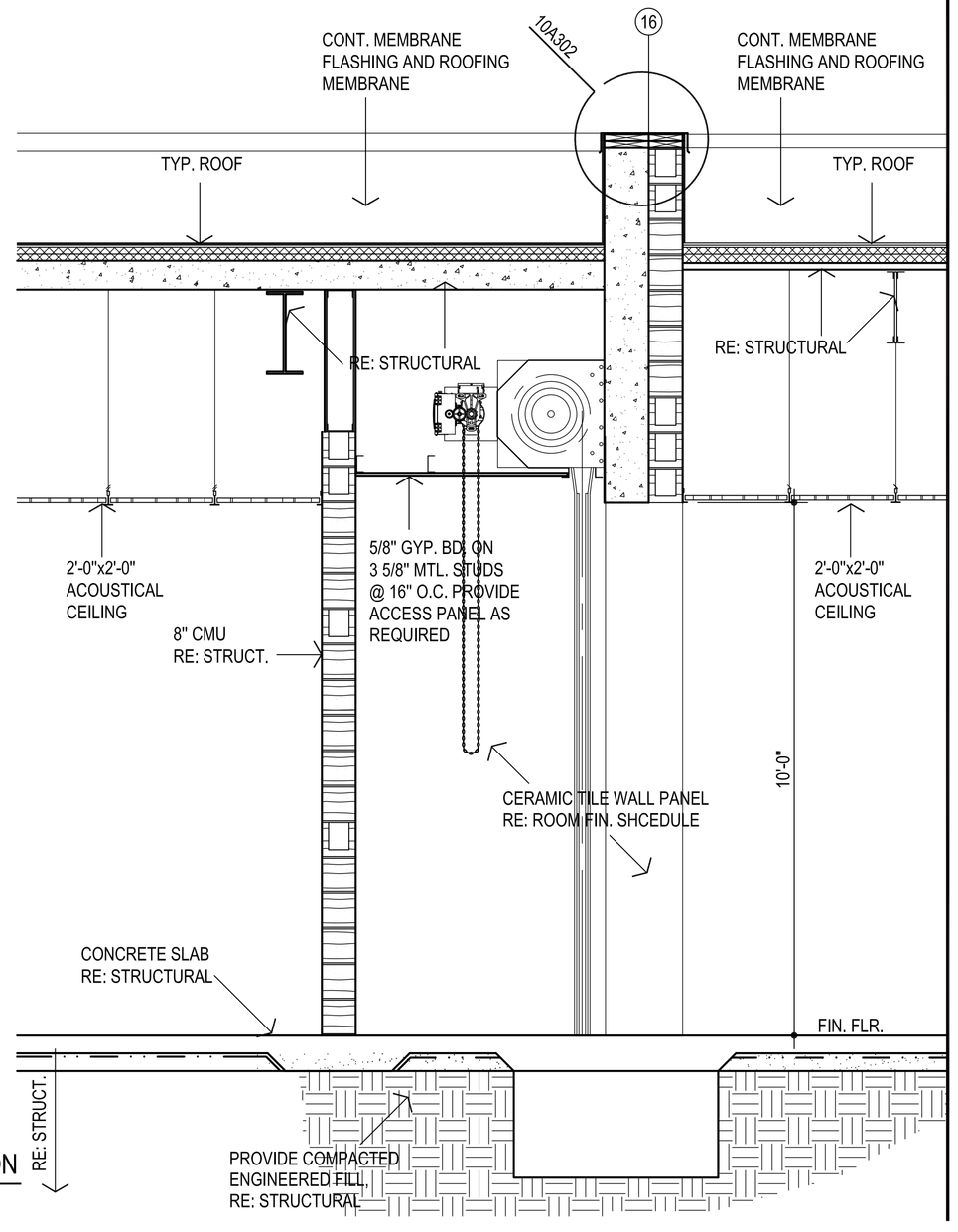
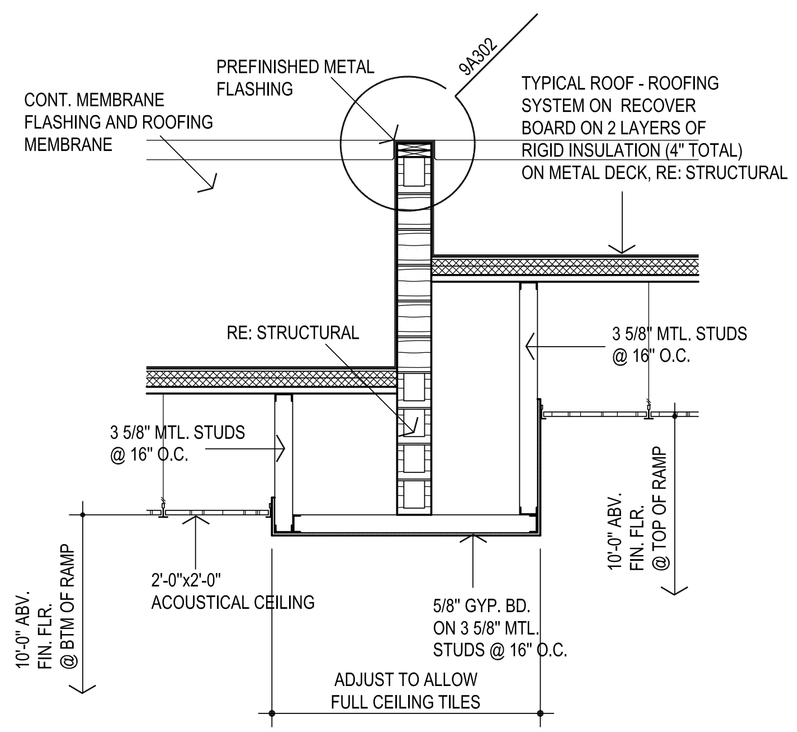
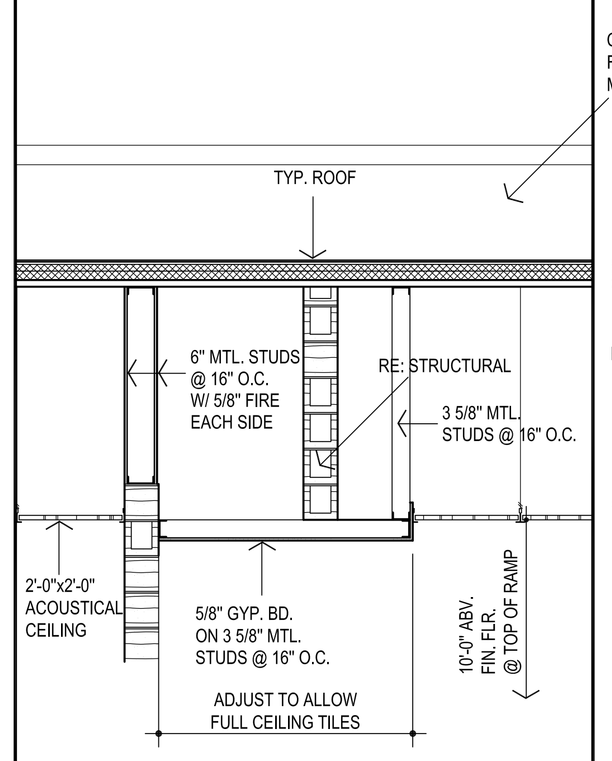


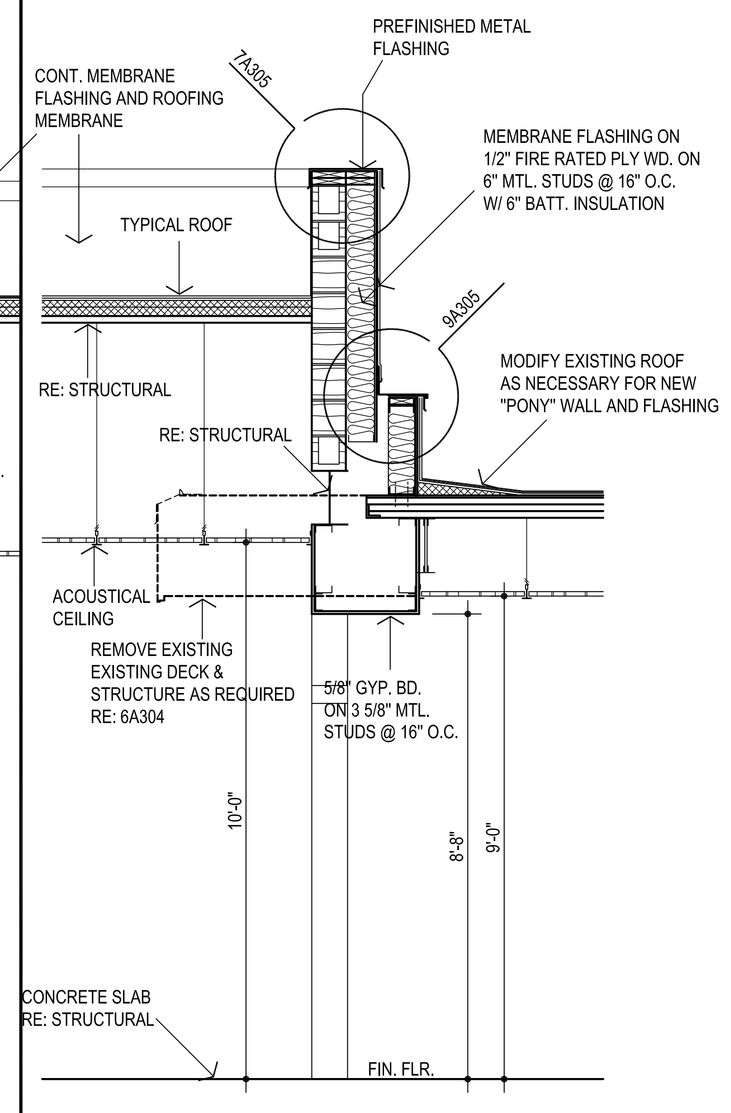
5 WALL SECTION
1/2" = 1'-0"



6 WALL SECTION
1/2" = 1'-0"



7 WALL SECTION
1/2" = 1'-0"



8 WALL SECTION
1/2" = 1'-0"

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MOORE PUBLIC SCHOOLS

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BUILDING SECTIONS

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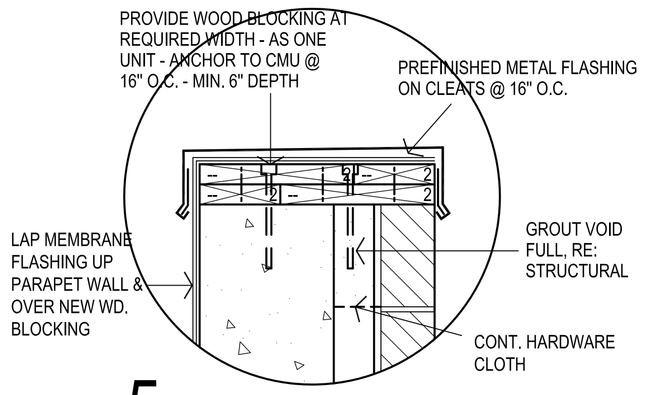

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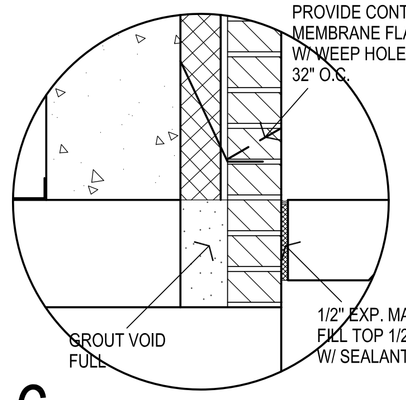

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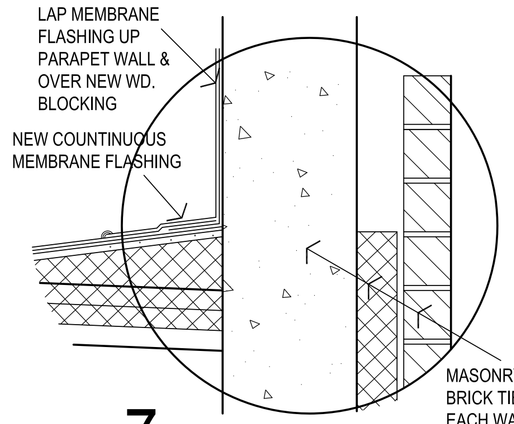

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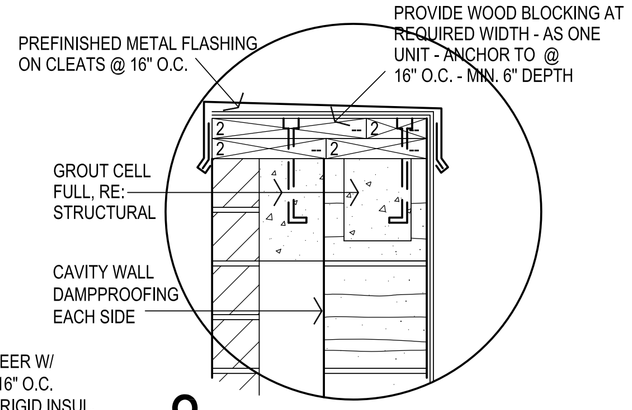

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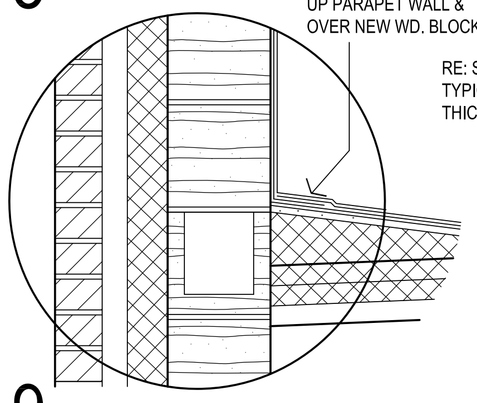

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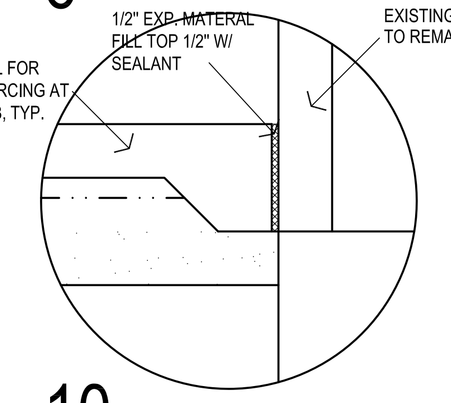

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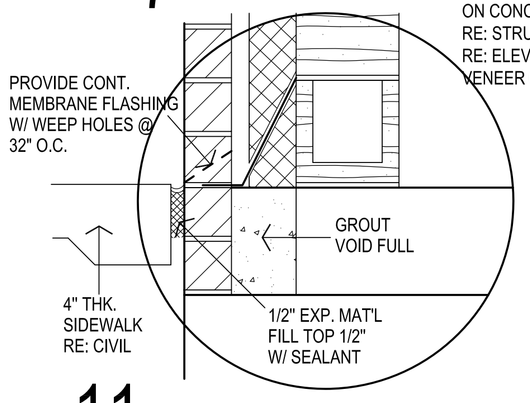

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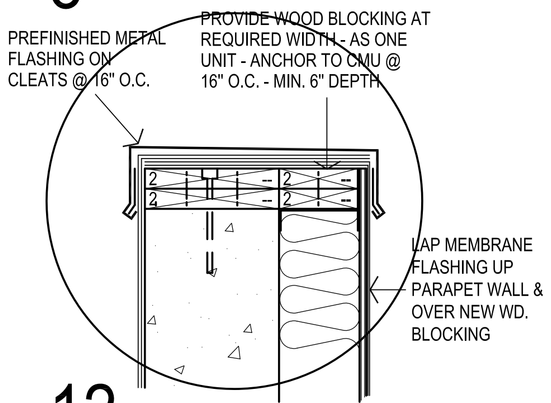

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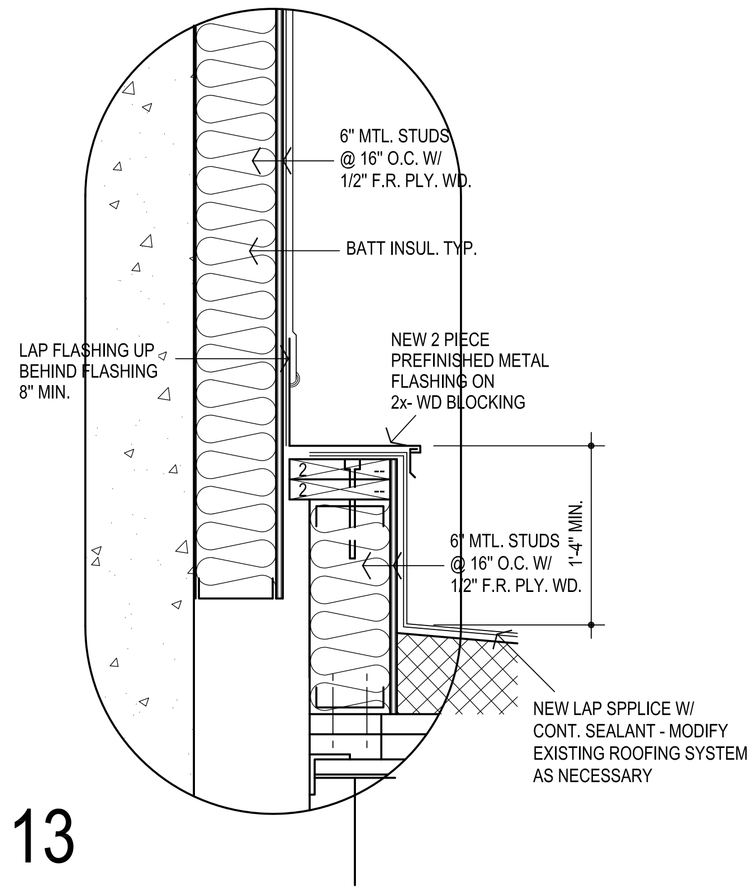

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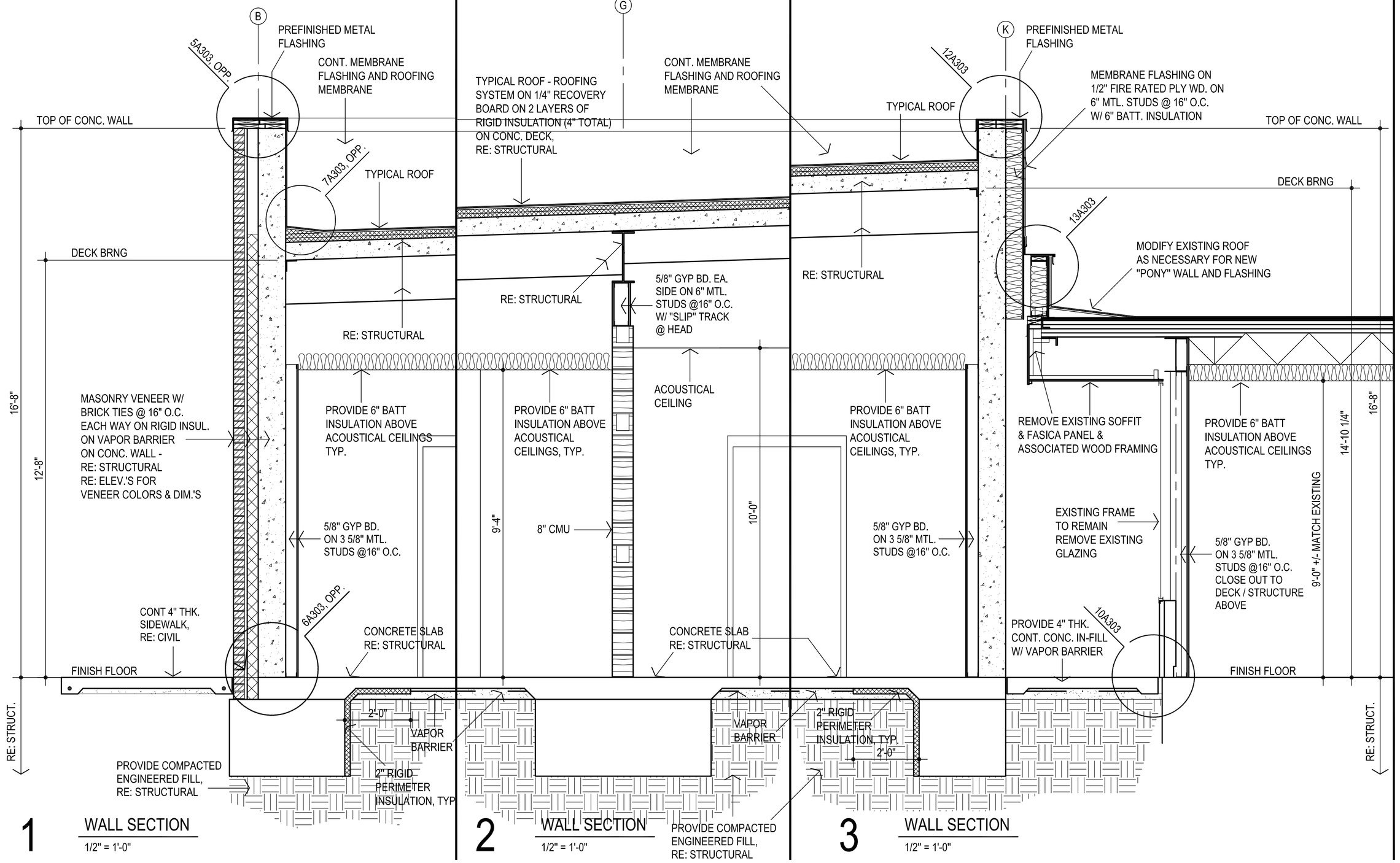
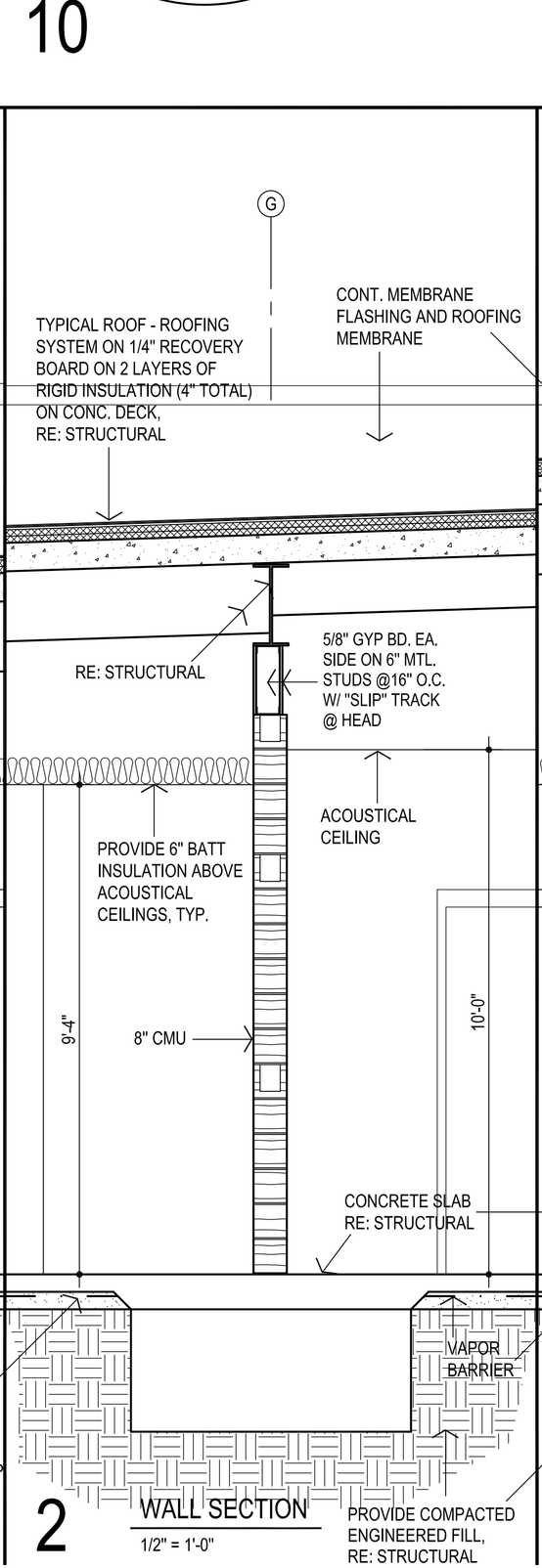
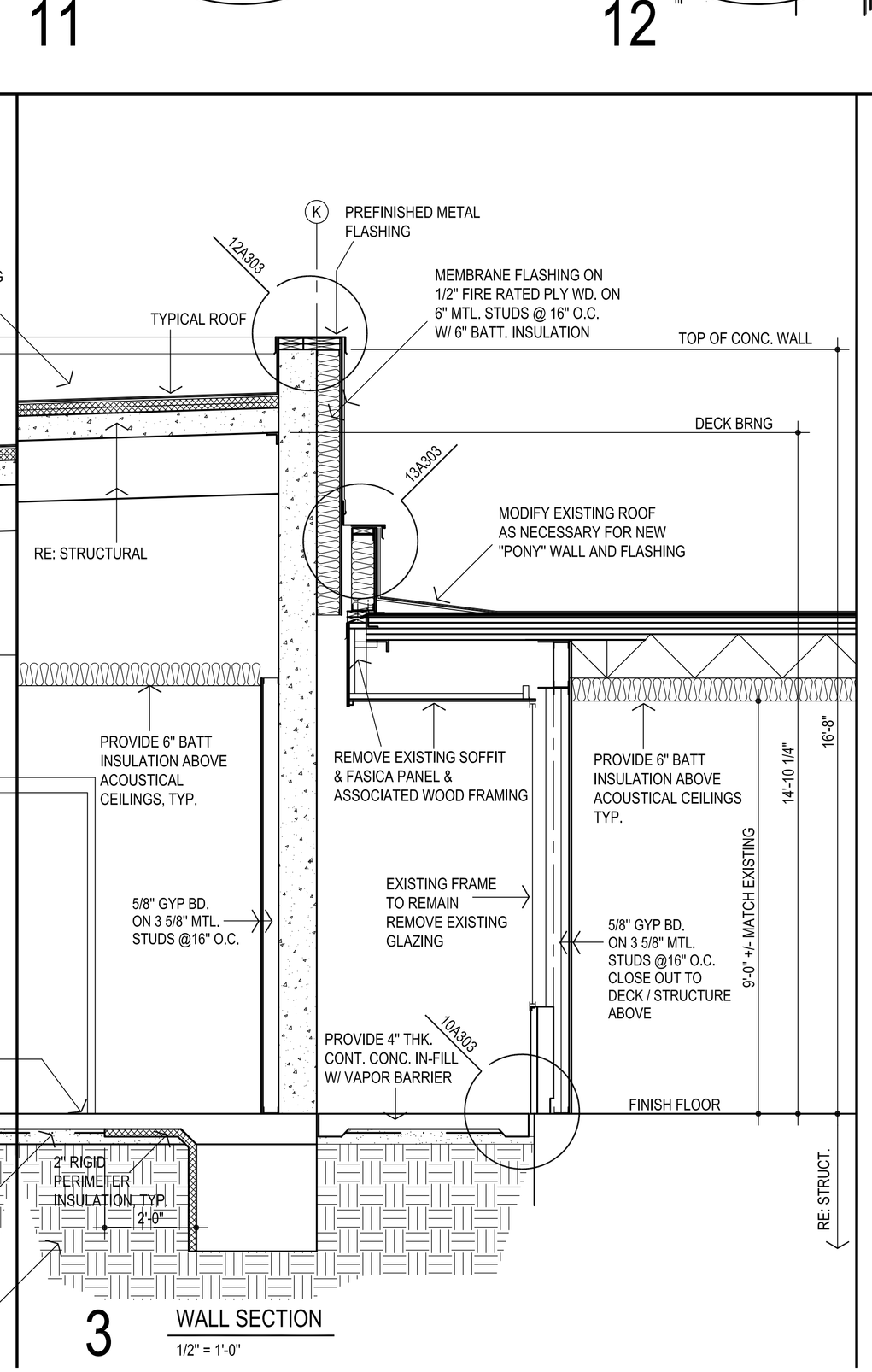


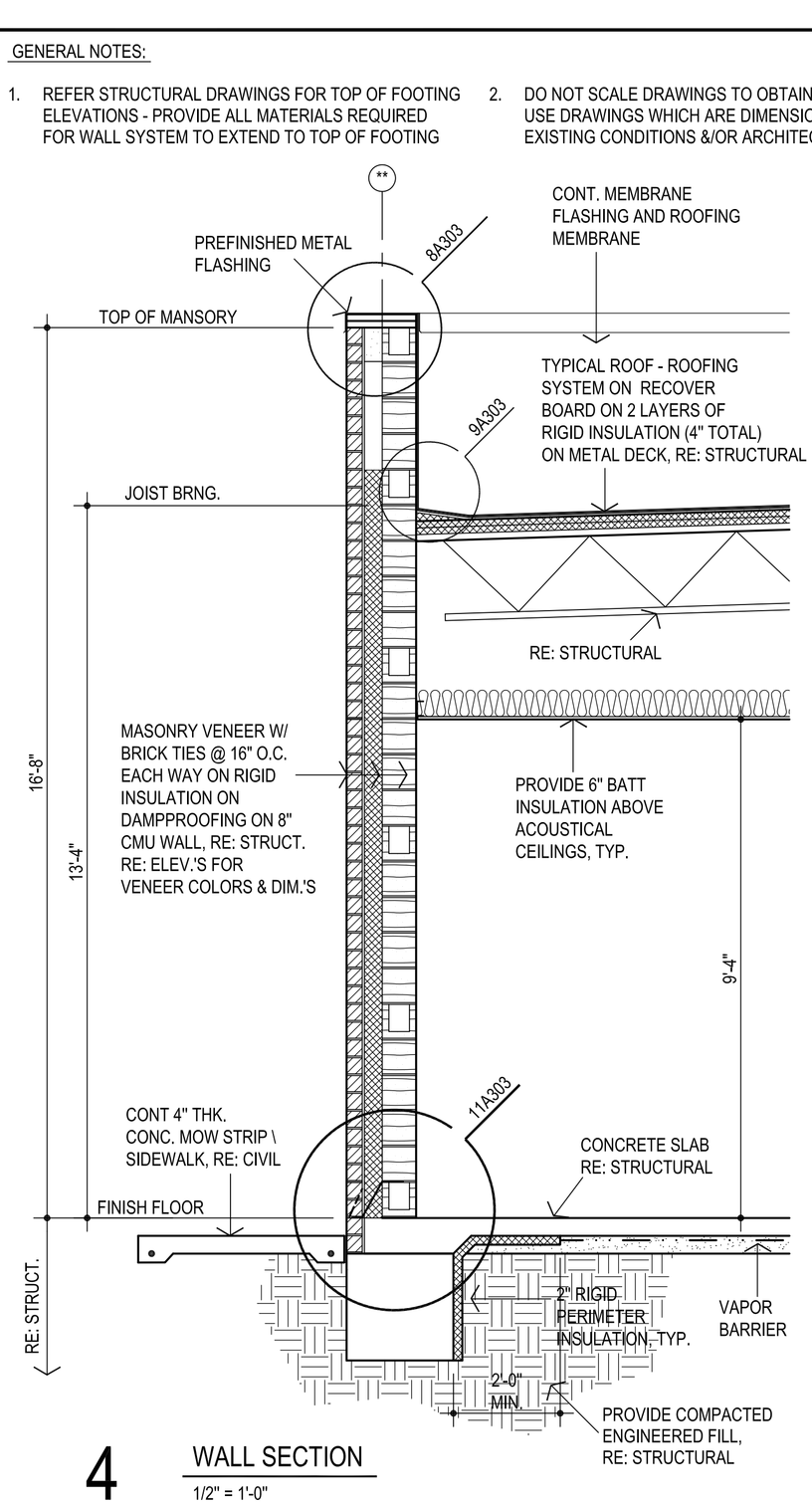
1 WALL SECTION
1/2" = 1'-0"



2 WALL SECTION
1/2" = 1'-0"



3 WALL SECTION
1/2" = 1'-0"



4 WALL SECTION
1/2" = 1'-0"

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CLASSROOM ADDITION
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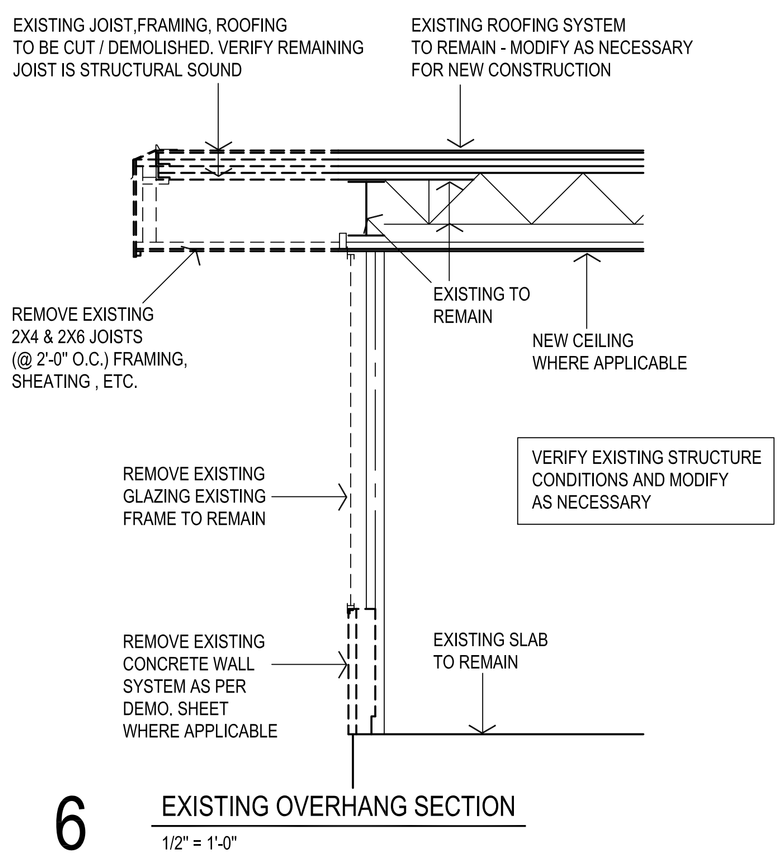
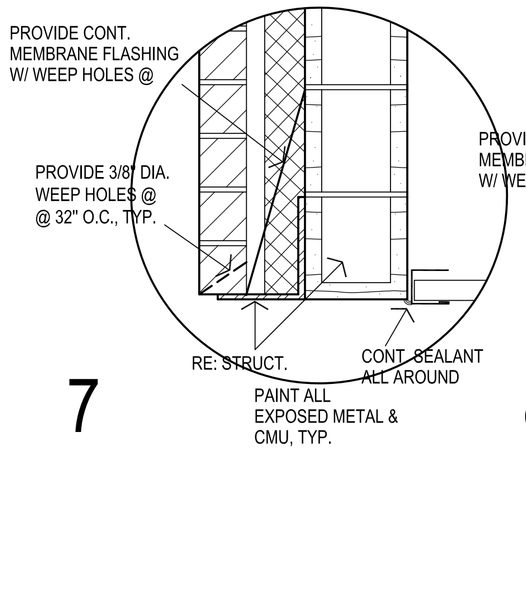


6 EXISTING OVERHANG SECTION

1/2" = 1'-0"



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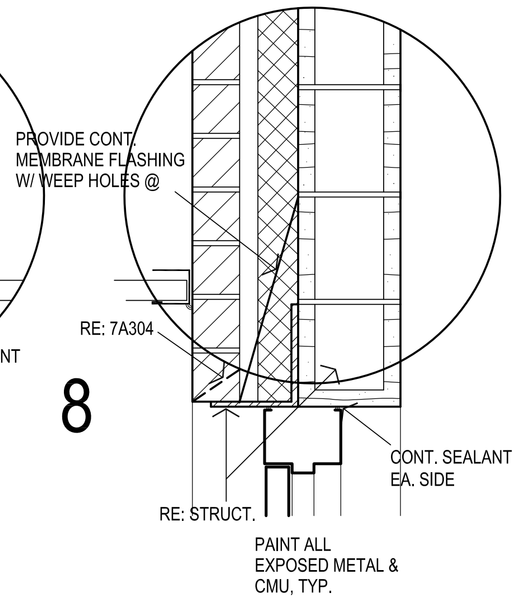

8

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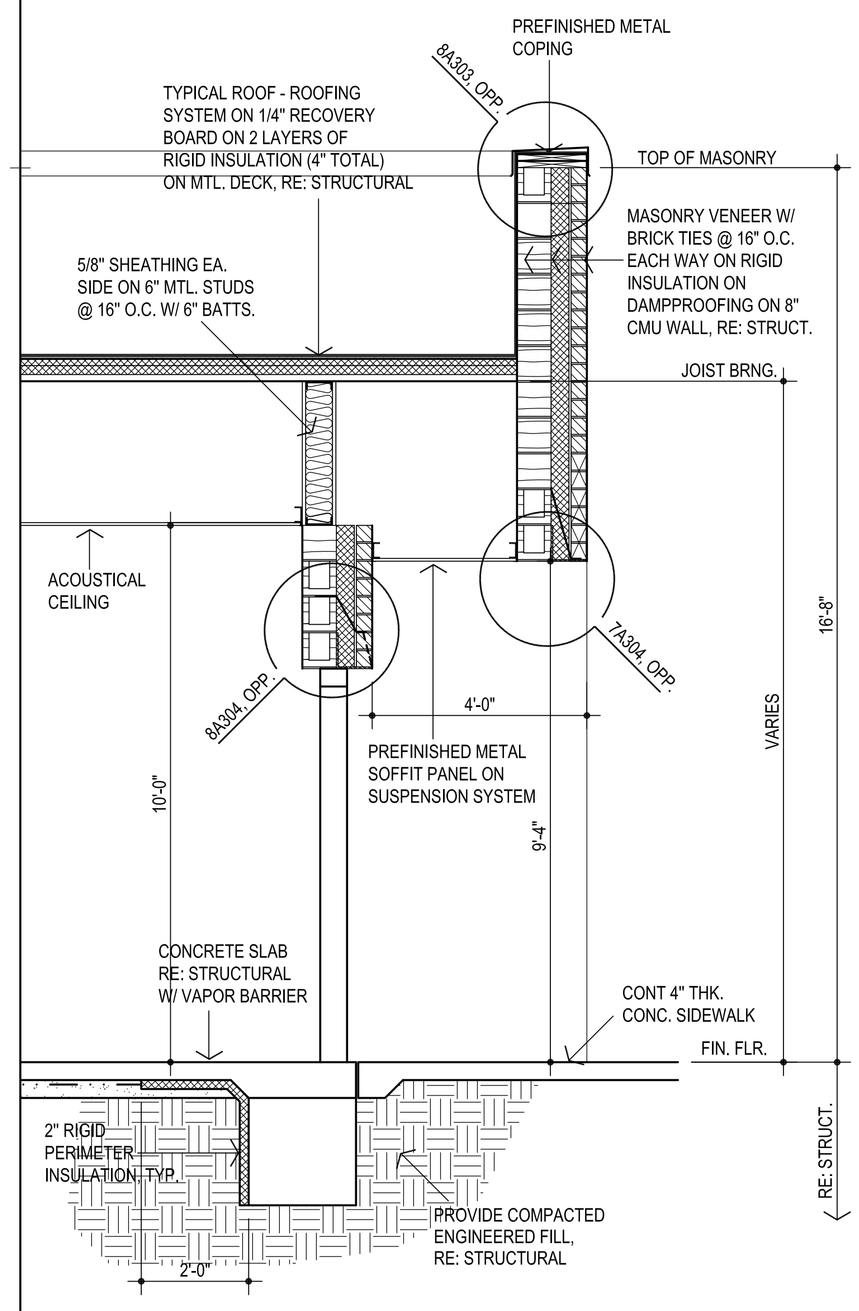
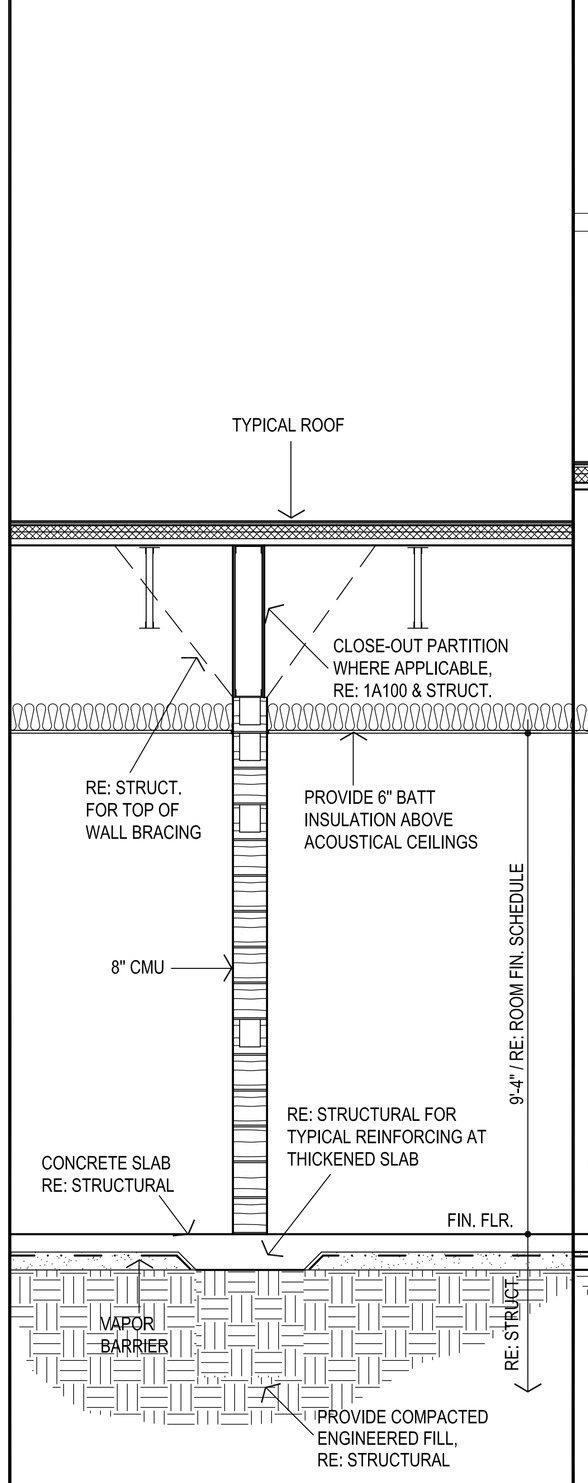


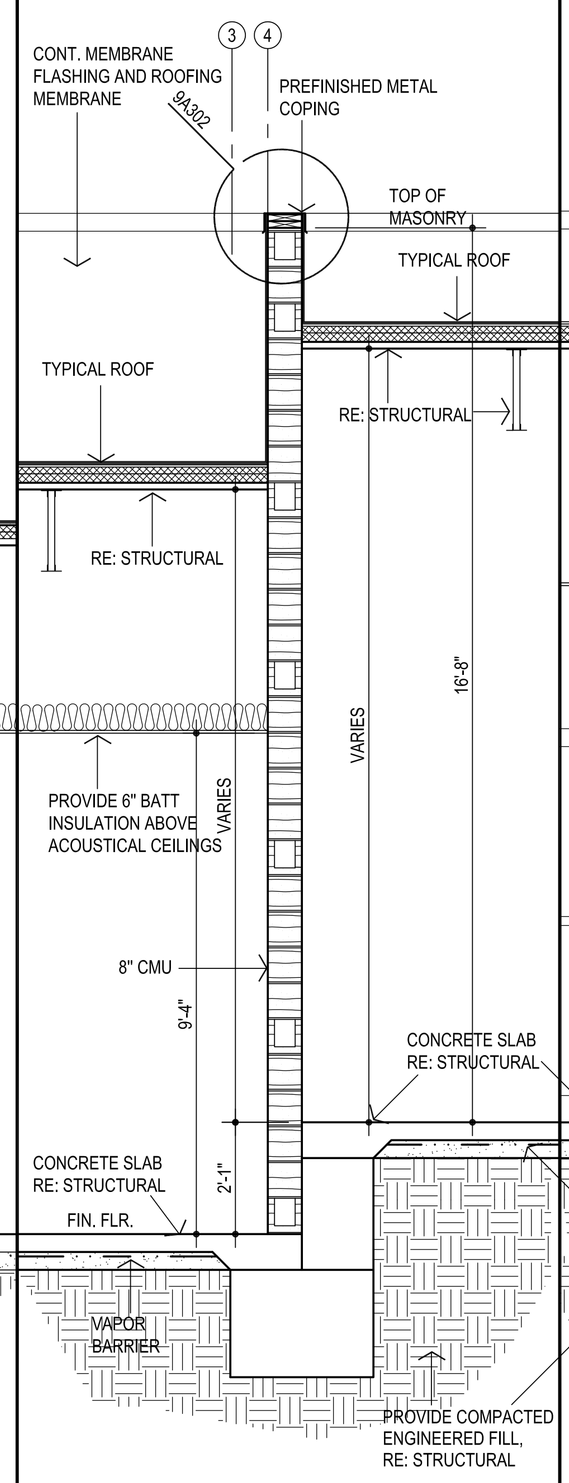
1 WALL SECTION

1/2" = 1'-0"



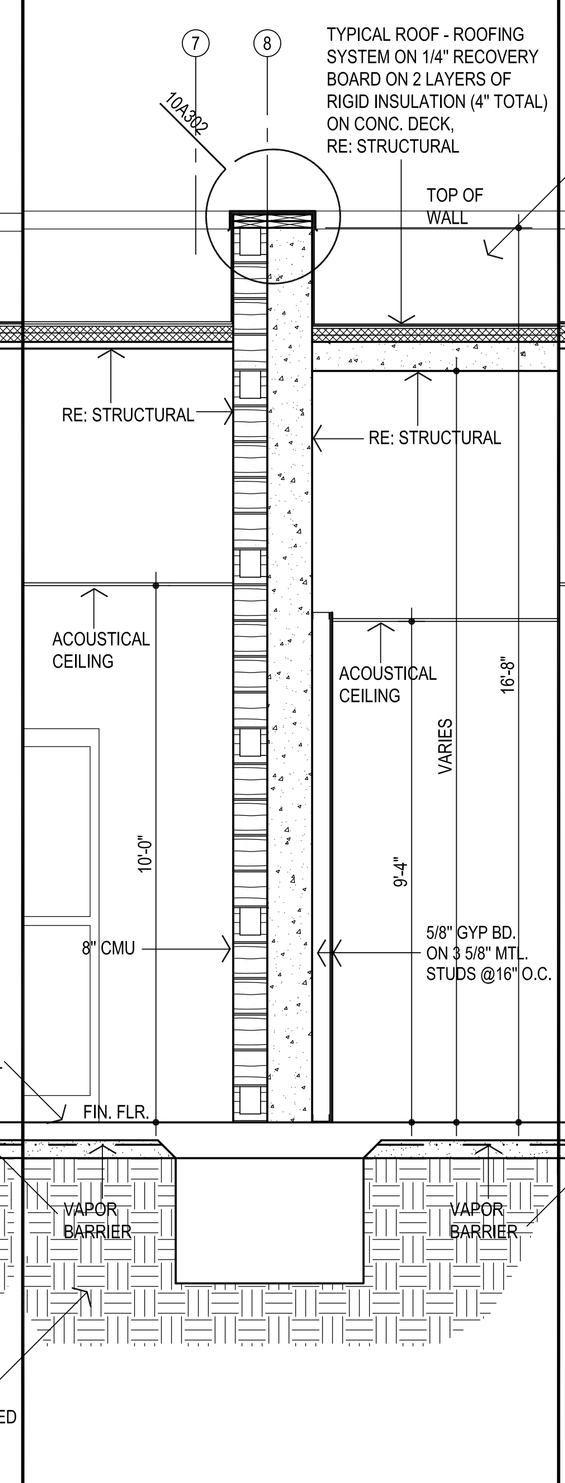
2 WALL SECTION

1/2" = 1'-0"



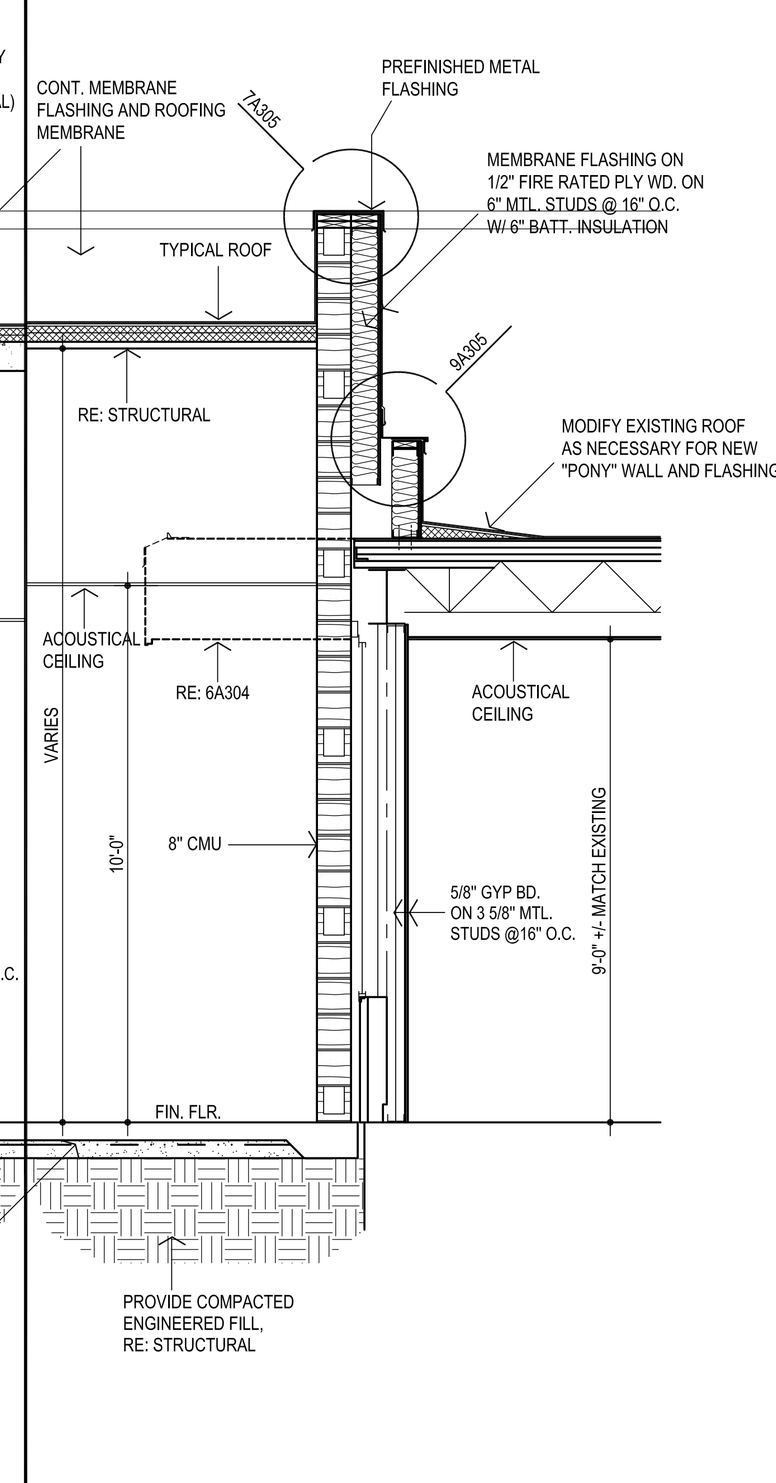
3 WALL SECTION

1/2" = 1'-0"



4 WALL SECTION

1/2" = 1'-0"



5 WALL SECTION

1/2" = 1'-0"

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HIGH SCHOOL

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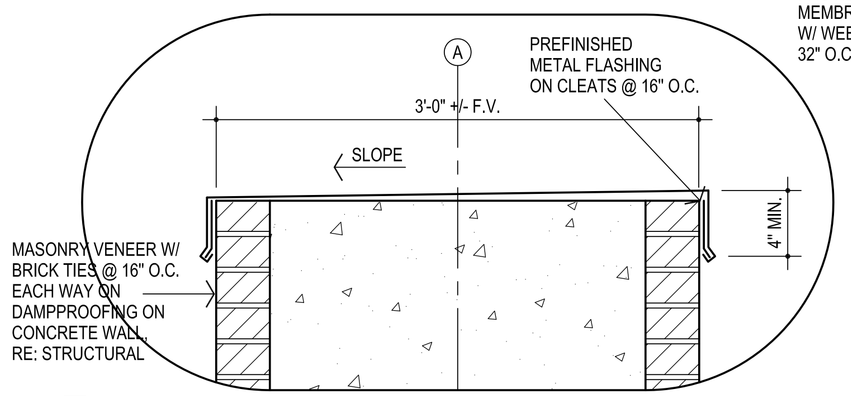

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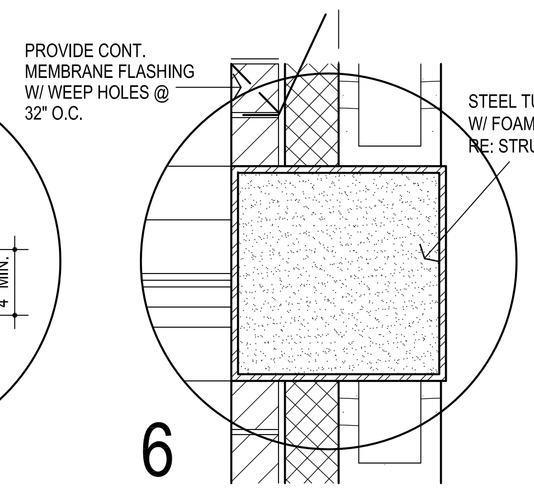

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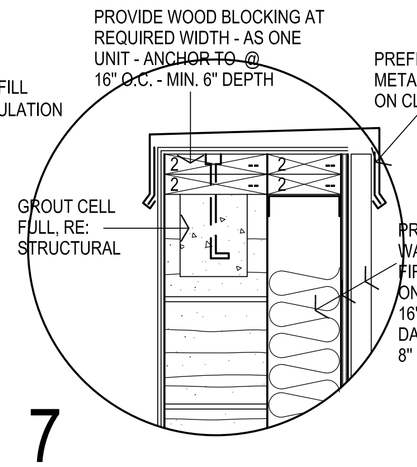

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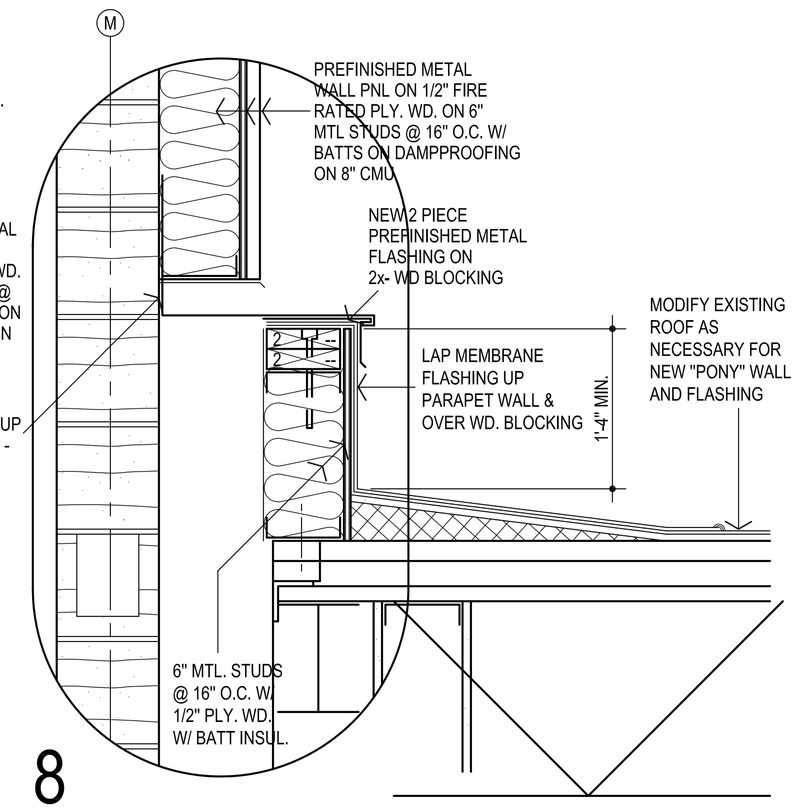

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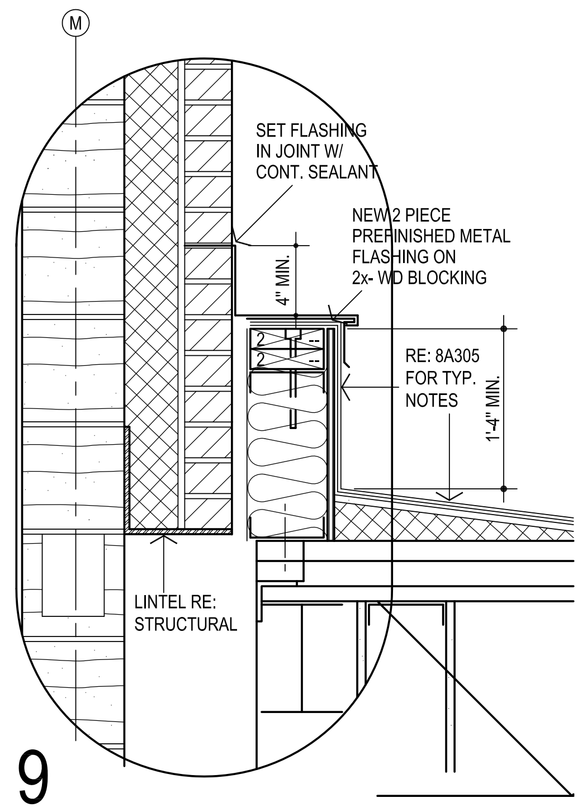

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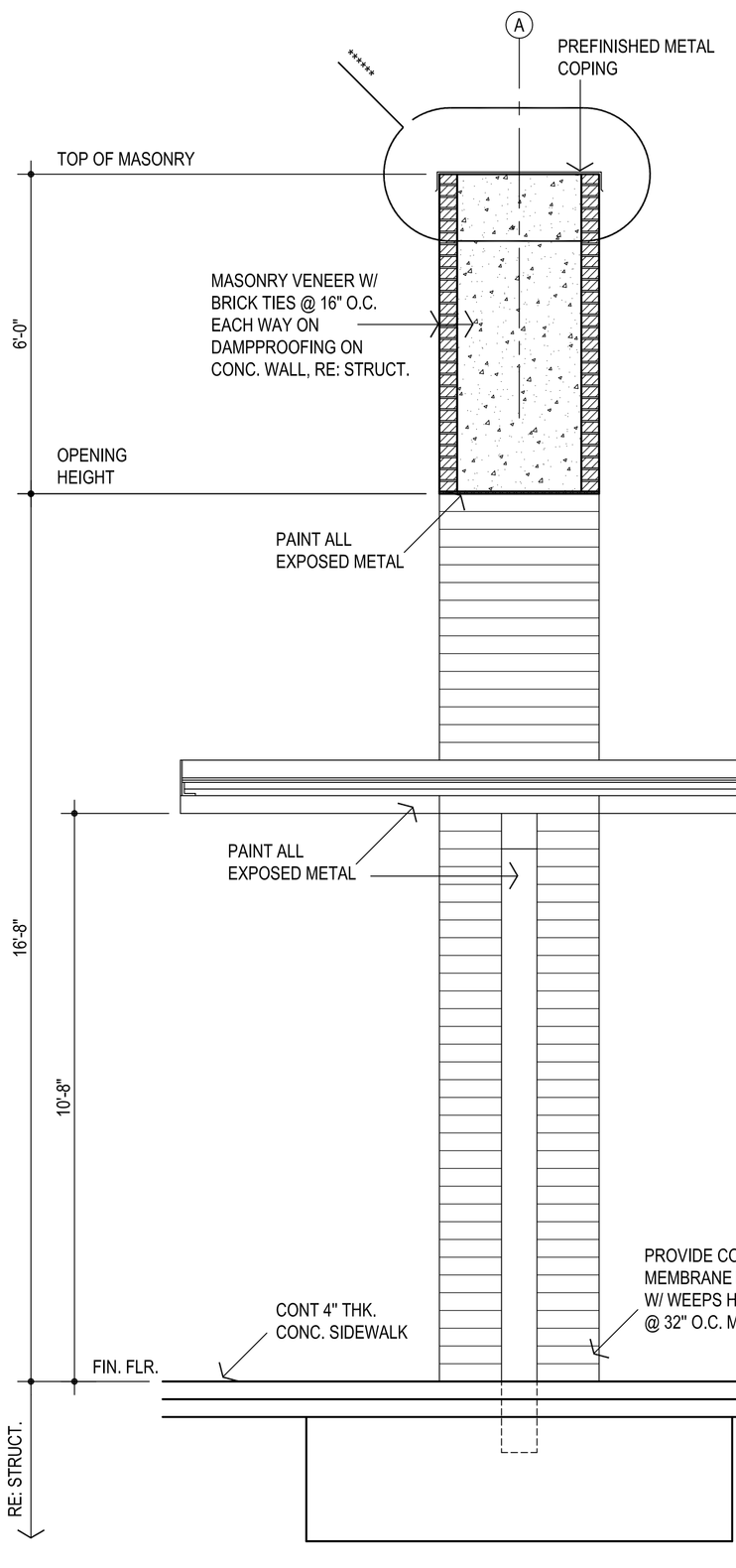

1 WALL SECTION

1/2" = 1'-0"

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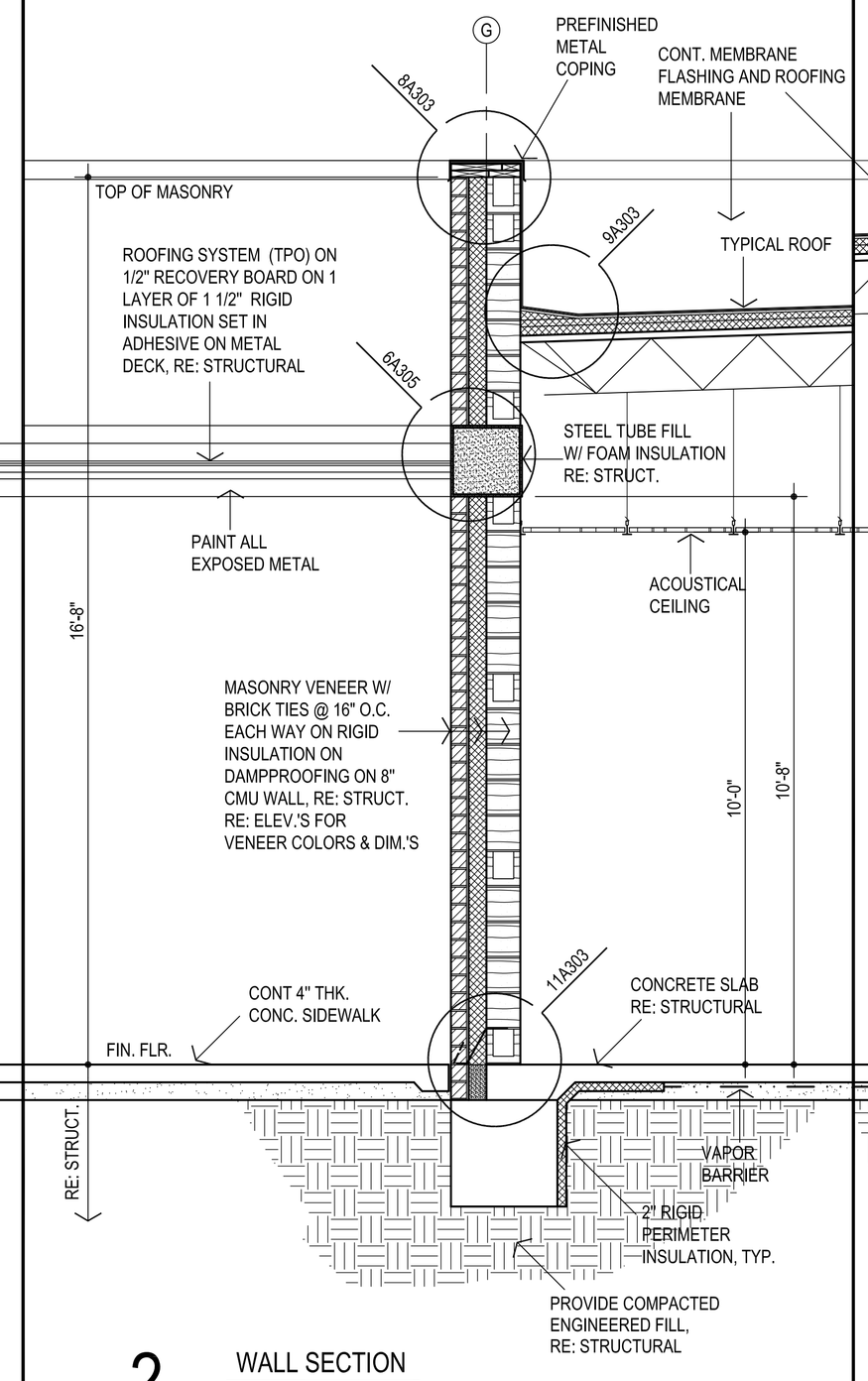
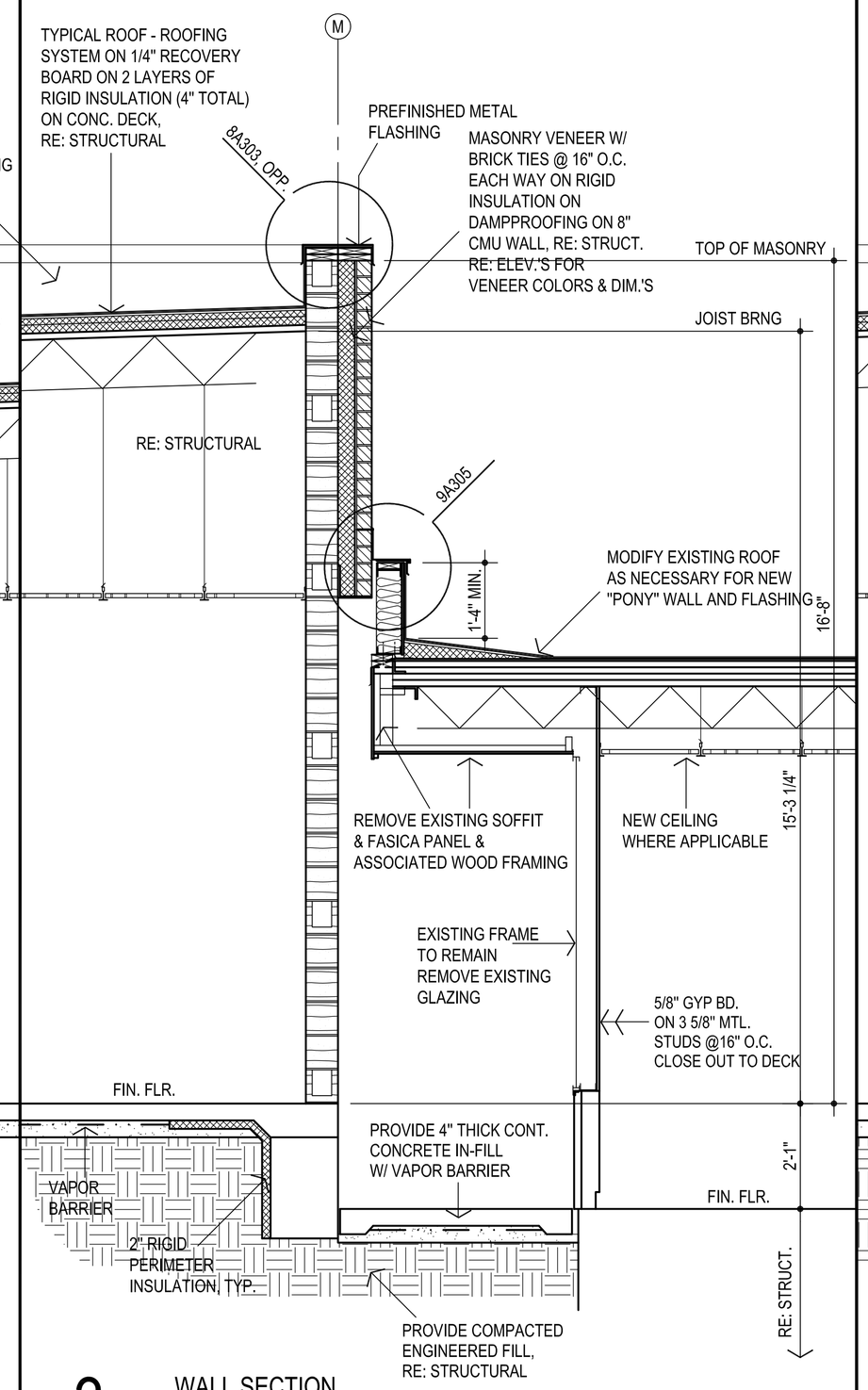


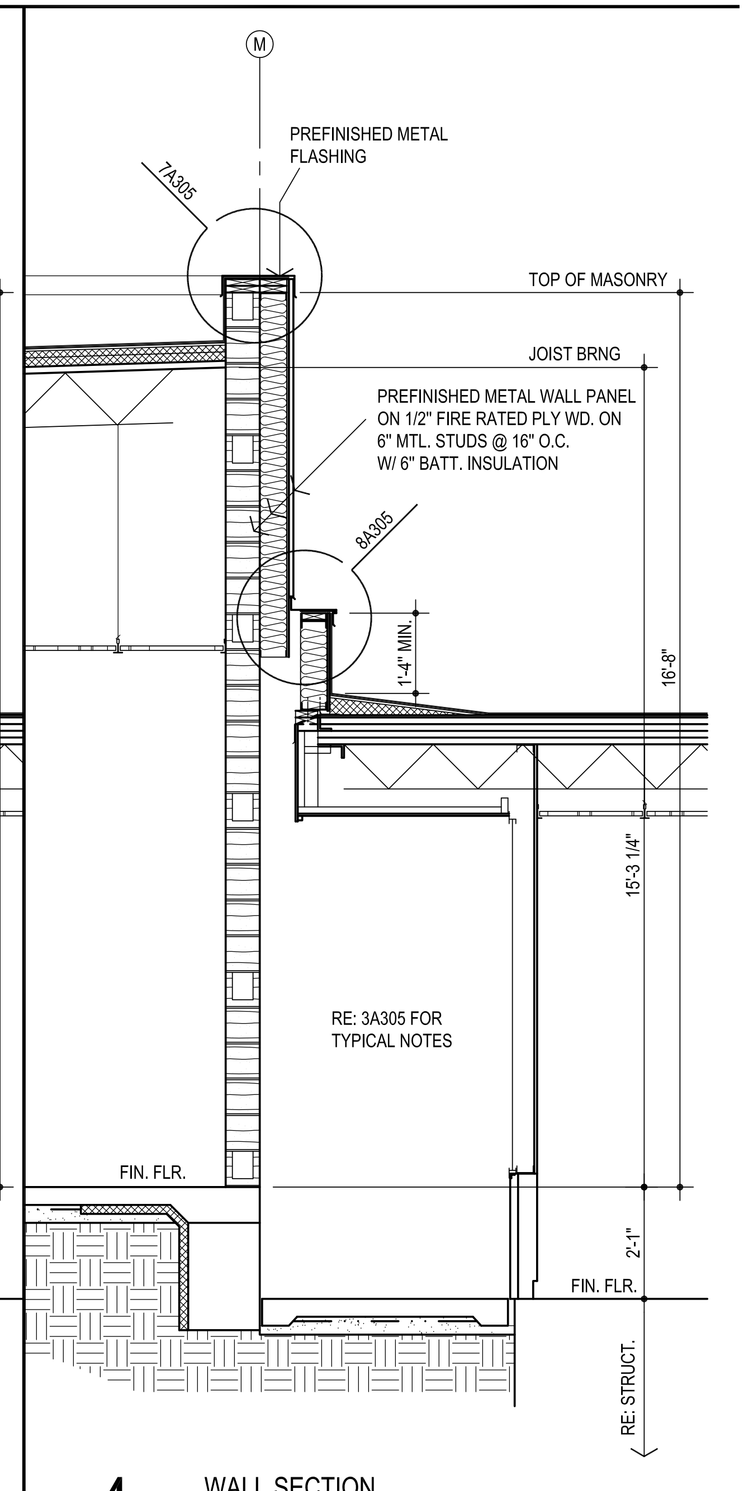
2 WALL SECTION

1/2" = 1'-0"



3 WALL SECTION

1/2" = 1'-0"



4 WALL SECTION

1/2" = 1'-0"

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CLASSROOM ADDITION
CENTRAL JUNIOR HIGH SCHOOL

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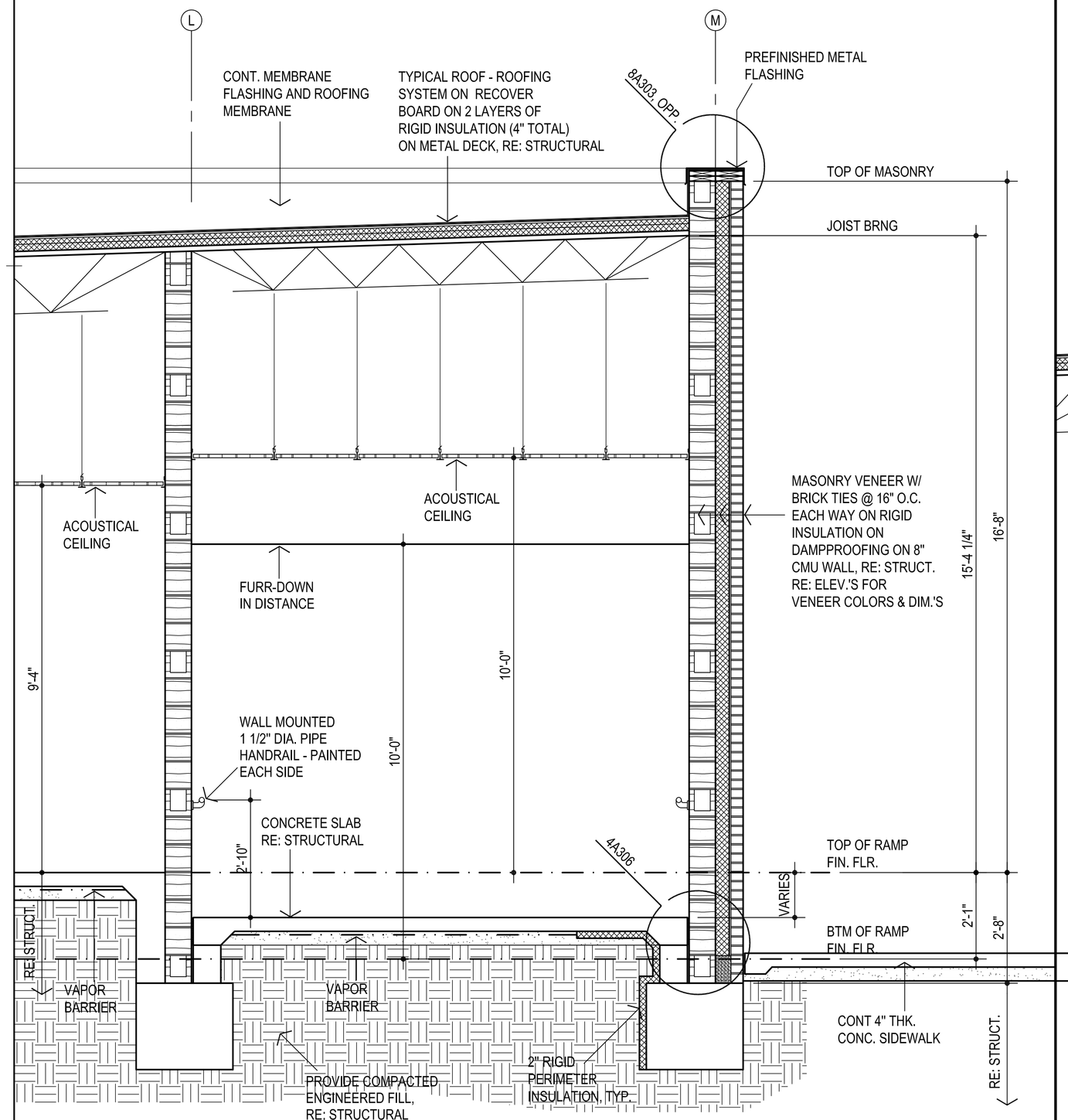
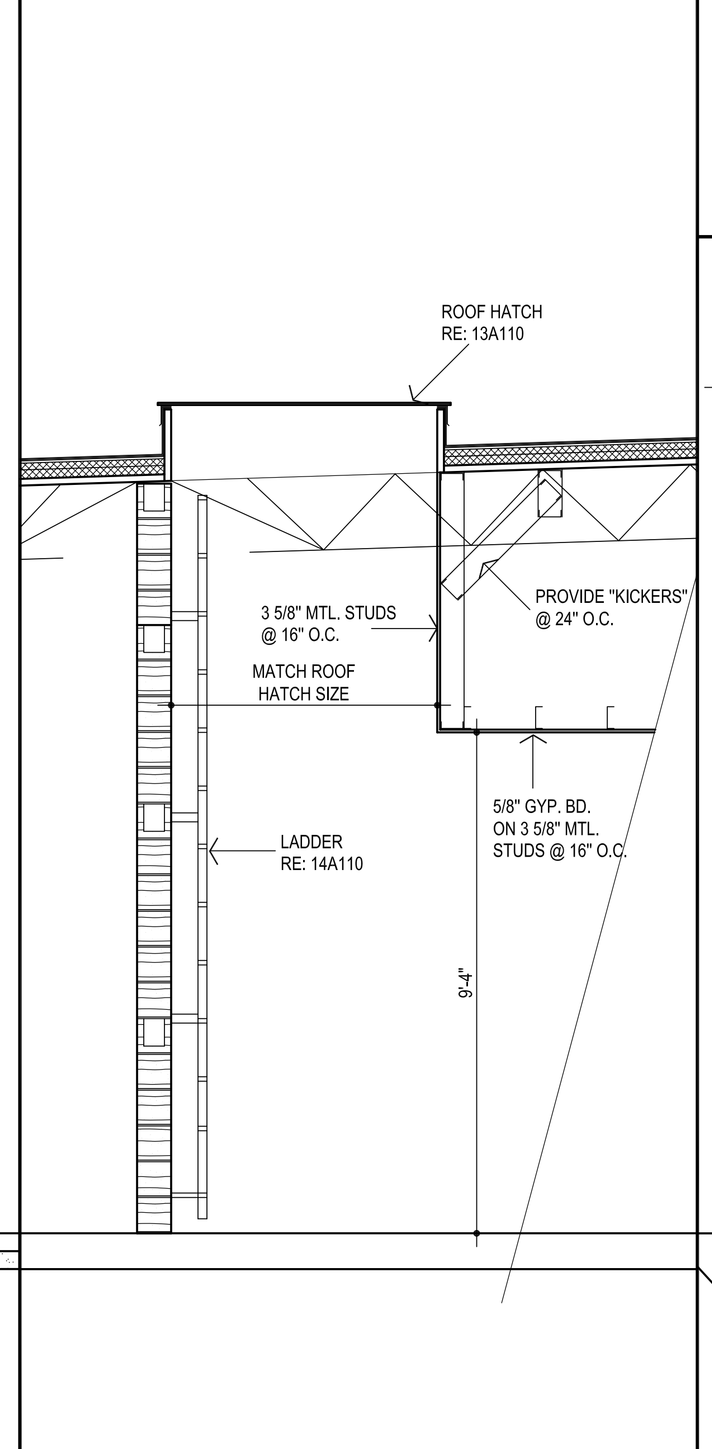


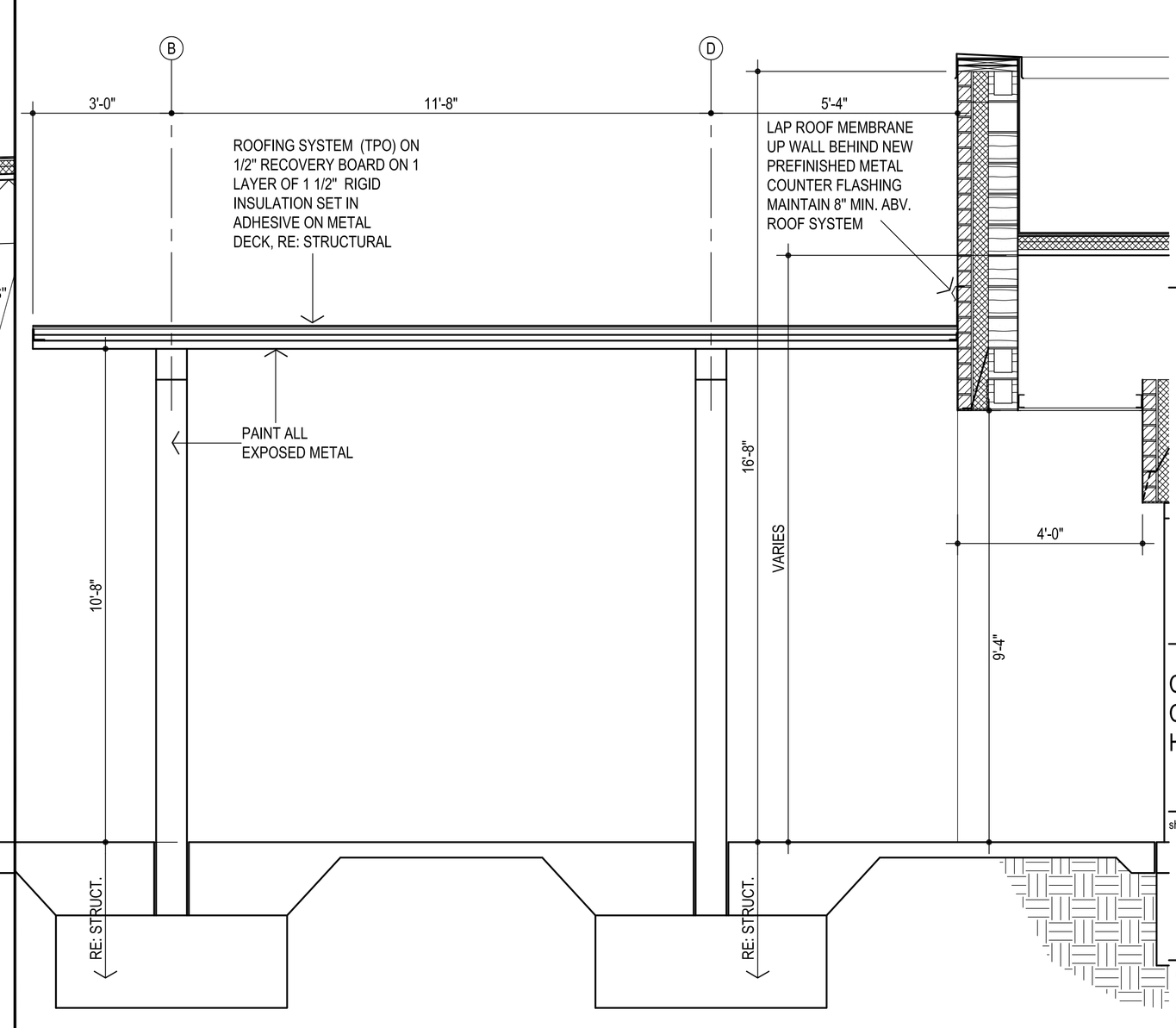
1 WALL SECTION @ RAMP

1/2" = 1'-0"



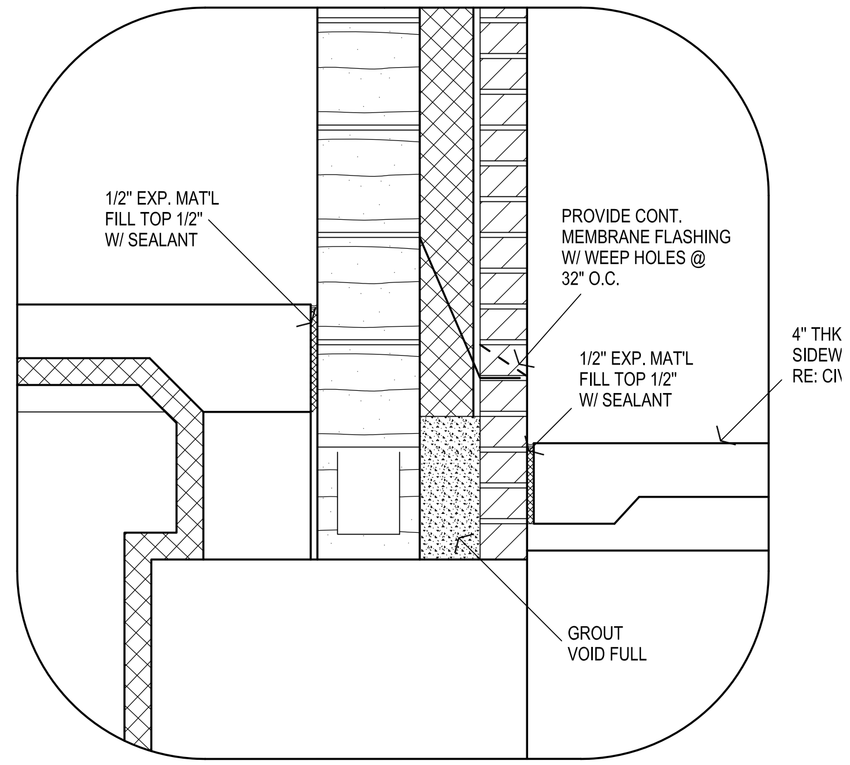
2 OPENING AT ROOF HATCH

1/2" = 1'-0"



3 SECTION

1/2" = 1'-0"



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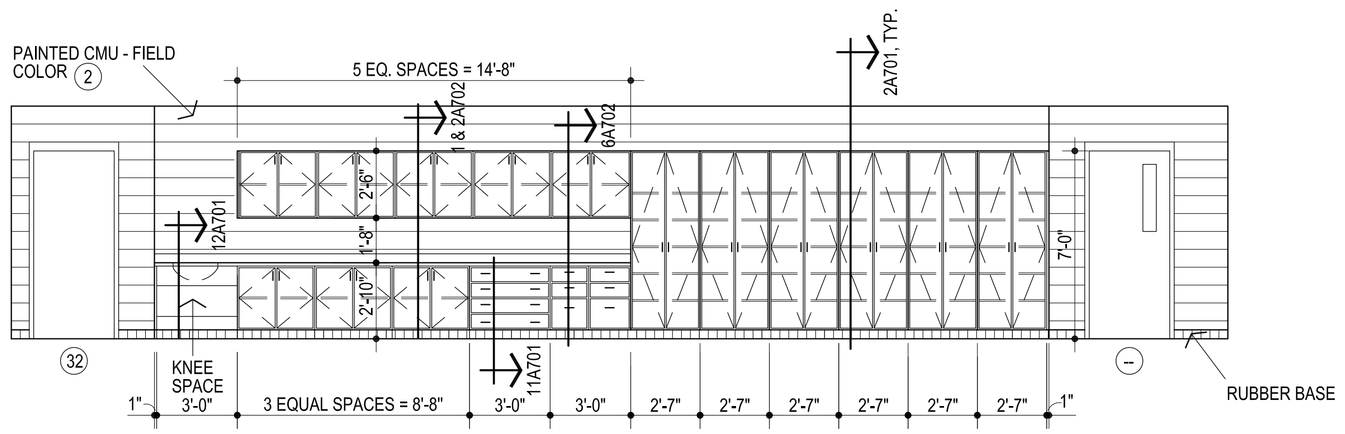
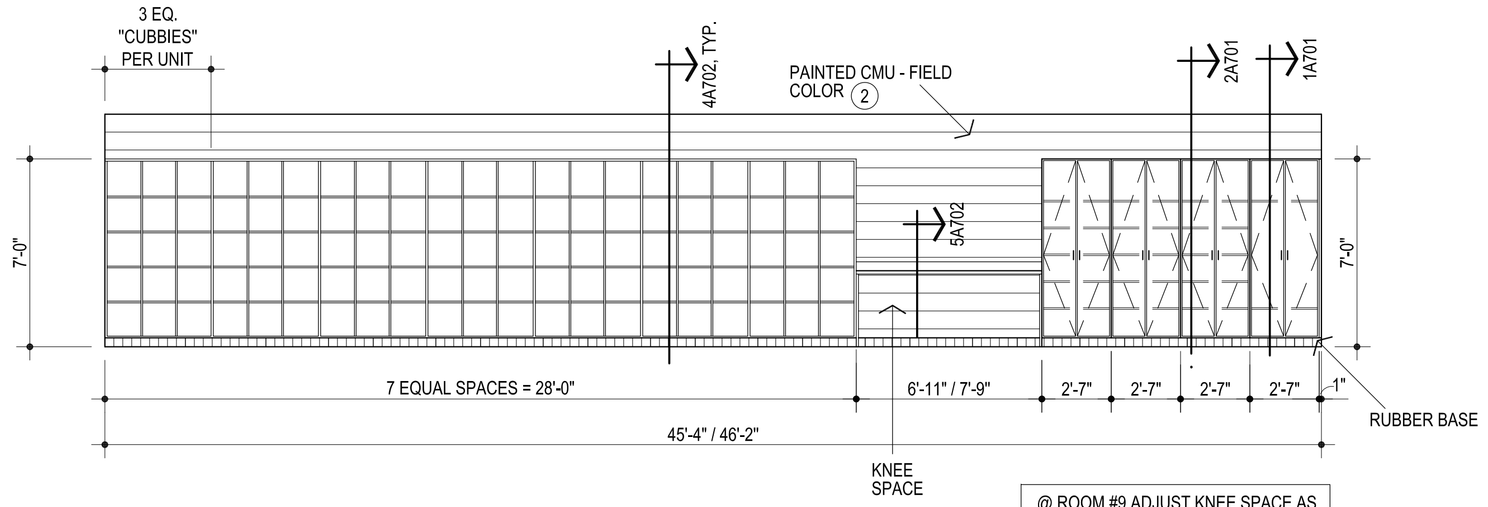


1 ELEVATION @ TYP. LAB

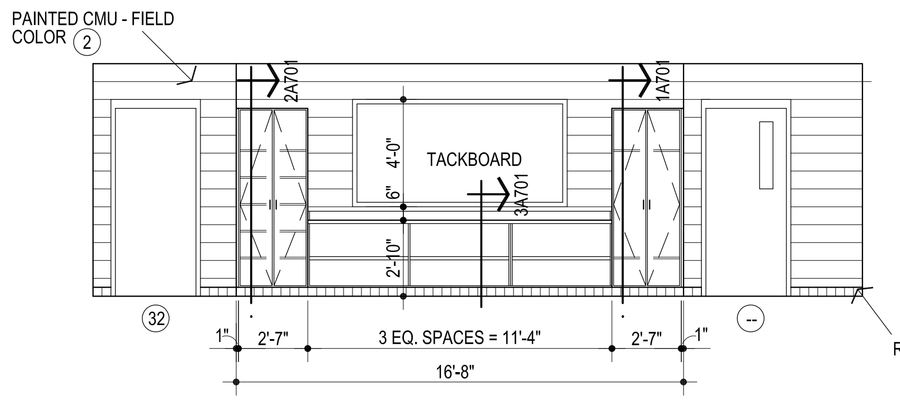
1/4" = 1'-0"



@ ROOM #9 ADJUST KNEE SPACE AS REQUIRED FOR PLUMBING CHASE
44'-4" F.V. OVERALL LENGTH

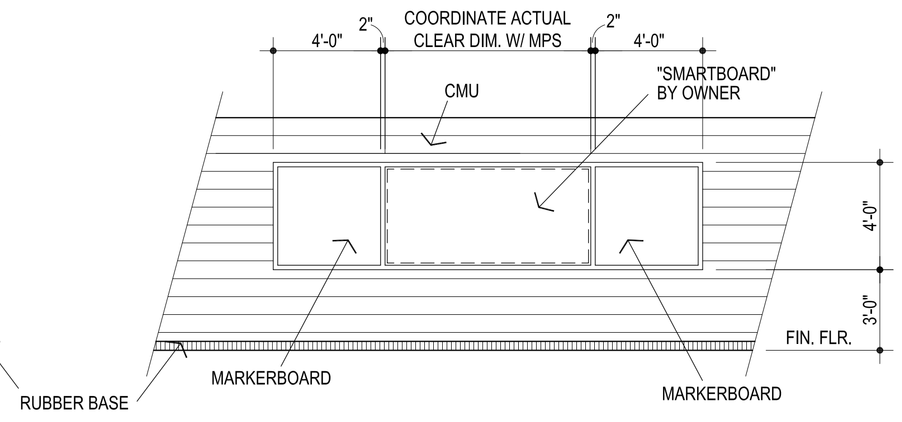
2 ELEVATION @ TYP. LAB

1/4" = 1'-0"



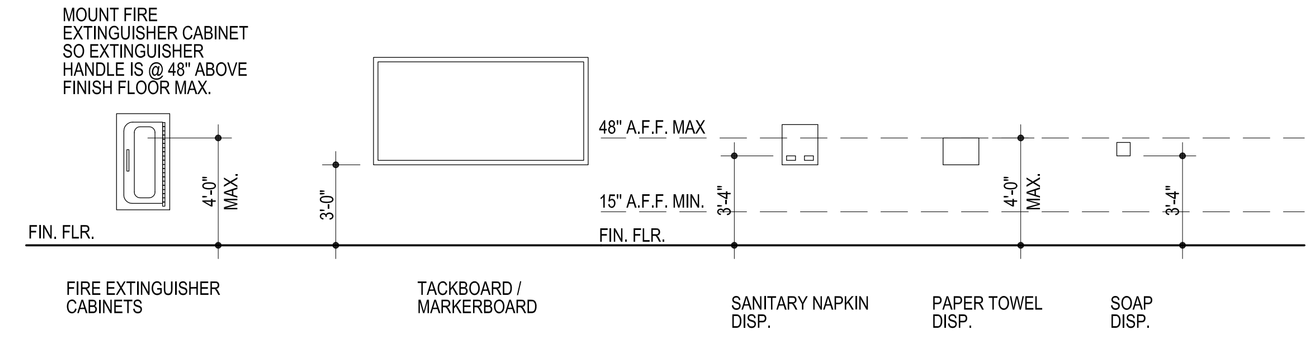
3 ELEVATION @ TYP. CLASSROOM

1/4" = 1'-0"



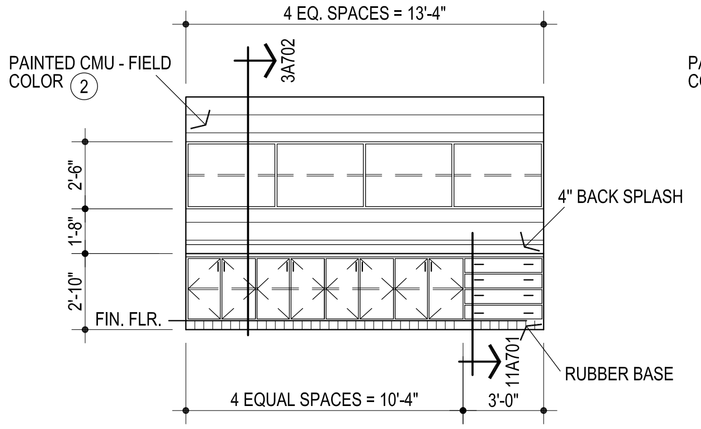
4 ELEV. @ TYP. CLASSROOM "SMARTBOARD"

1/4" = 1'-0"



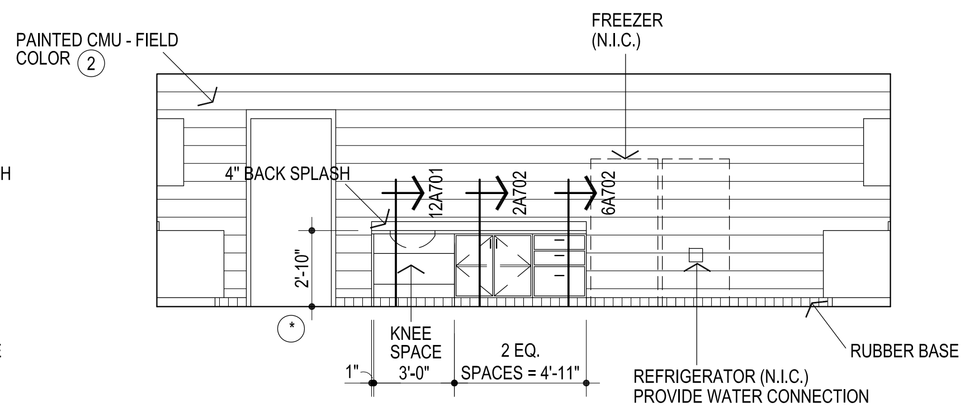
5 TYPICAL MOUNTING HEIGHTS

1/4" = 1'-0"



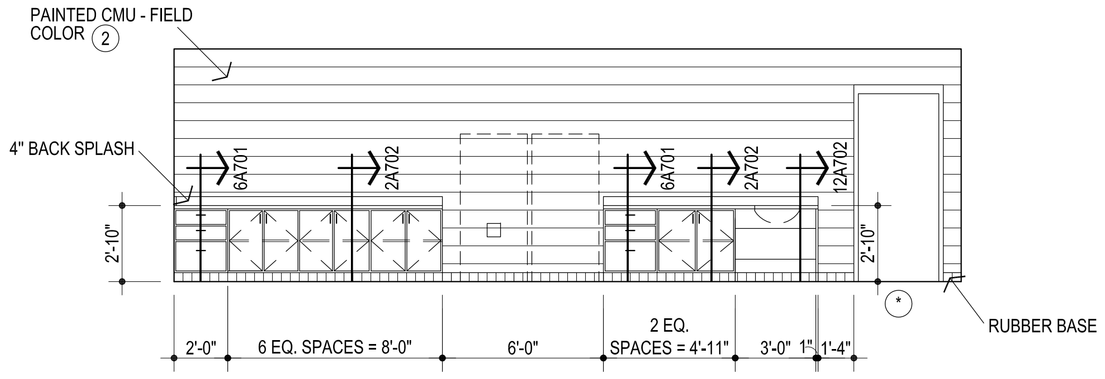
6 ELEVATION @ TYP. STORAGE ROOM

1/4" = 1'-0"



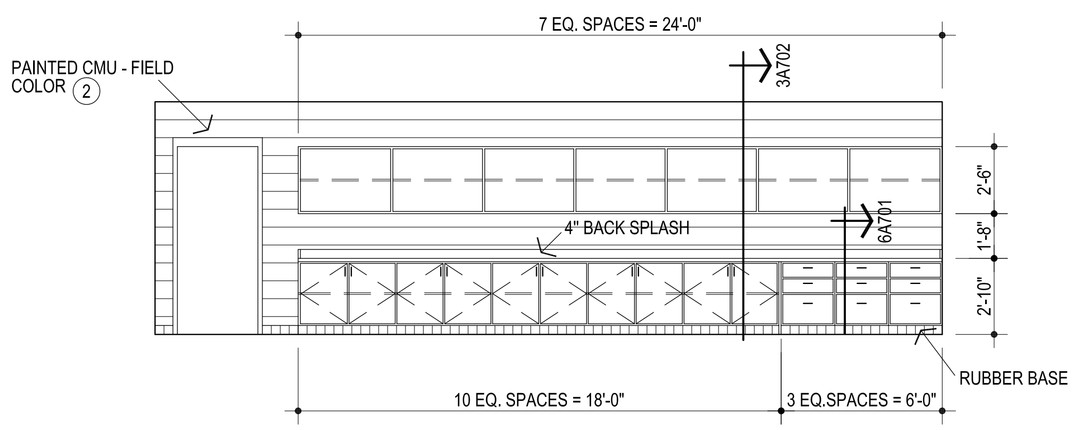
7 ELEVATION @ TYP. BASE CABINET - STORAGE ROOM

1/4" = 1'-0"



8 W. WALL ROOM #22

1/4" = 1'-0"



9 E. WALL ROOM #22

1/4" = 1'-0"

GENERAL NOTES:

1. DO NOT SCALE DRAWINGS TO OBTAIN MATERIAL QUANTITIES. USE DRAWINGS WHICH ARE DIMENSIONED OR COORDINATE W/ EXISTING CONDITIONS &/OR ARCHITECT & ENGINEERS.
2. NOTE: CONTRACTOR TO VERIFY THAT THE MOUNTING HEIGHTS OF ALL WALL MOUNTED FIXTURES (I.E. PLUMBING FIXTURES, GRAB BARS, MIRRORS, ETC.) MEET ALL APPLICABLE CODES & STANDARDS PRIOR TO INSTALLATION.

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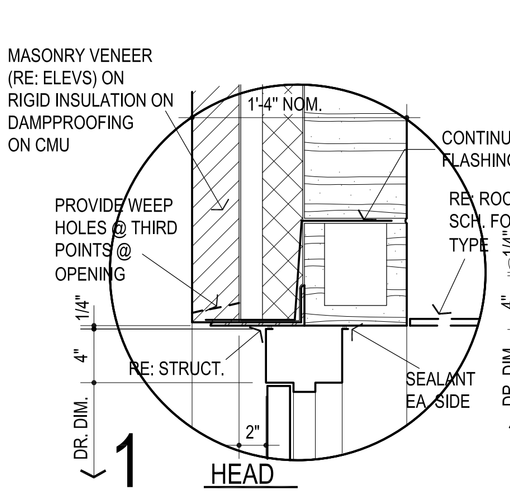

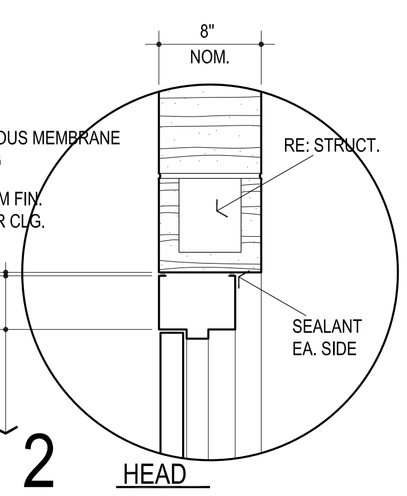

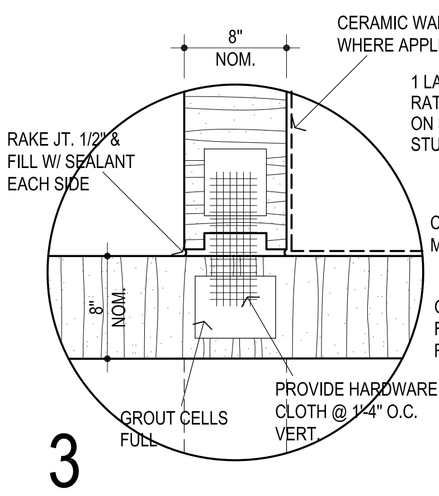

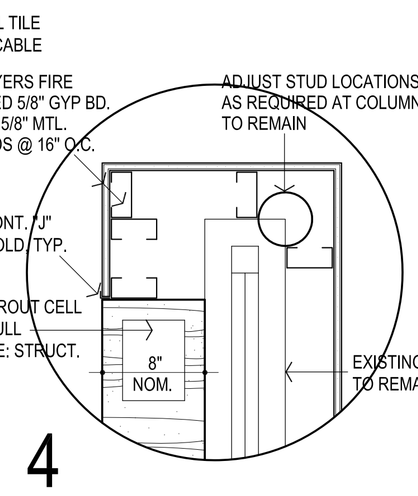

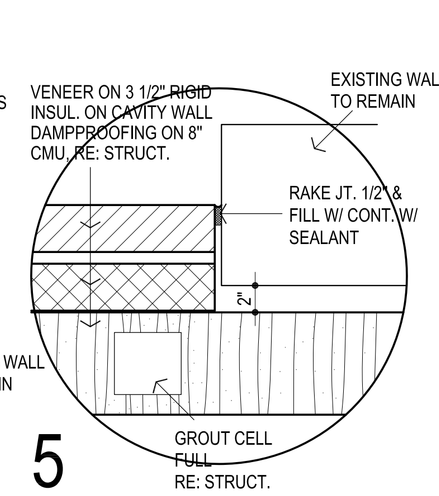

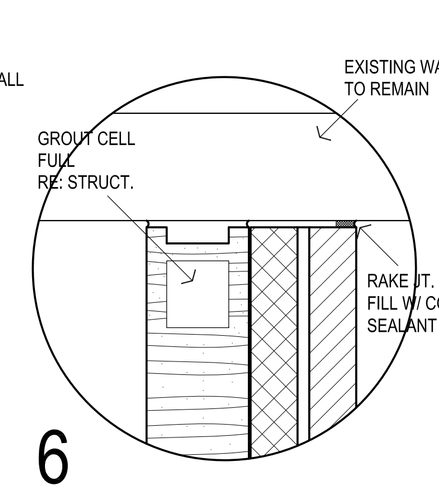

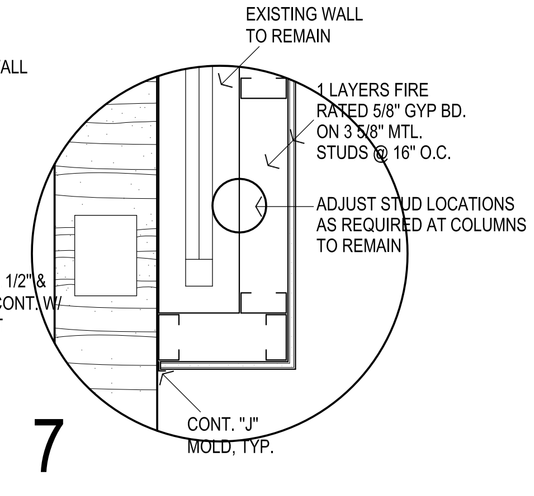

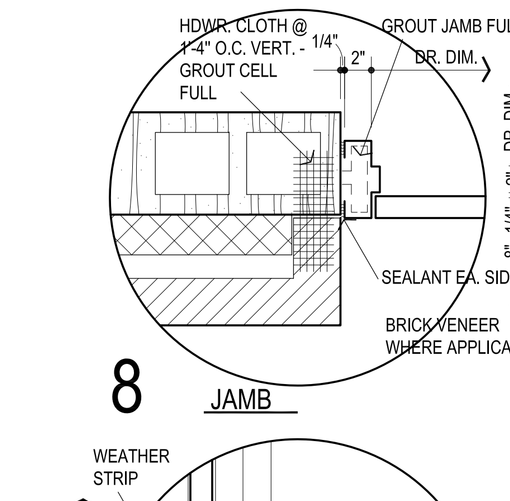

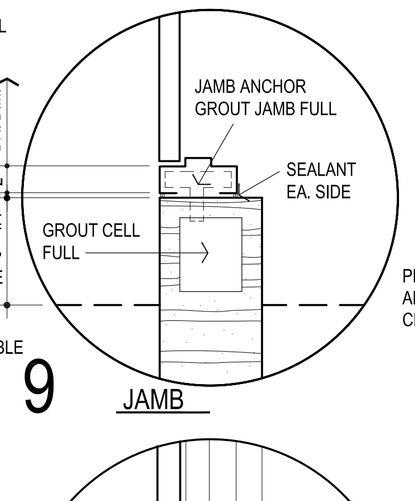

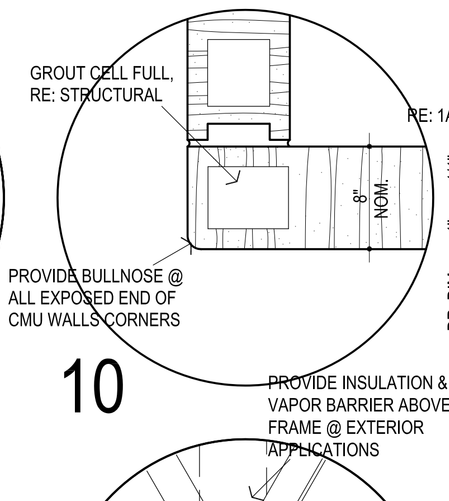

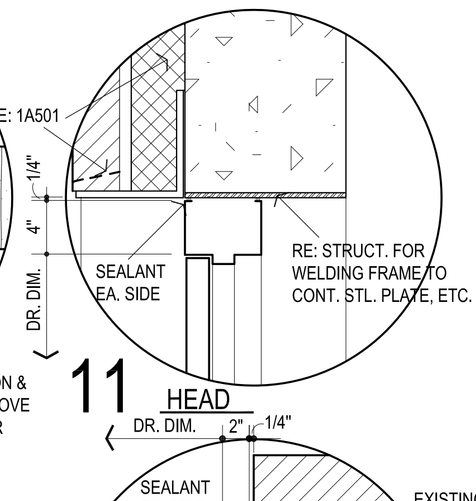

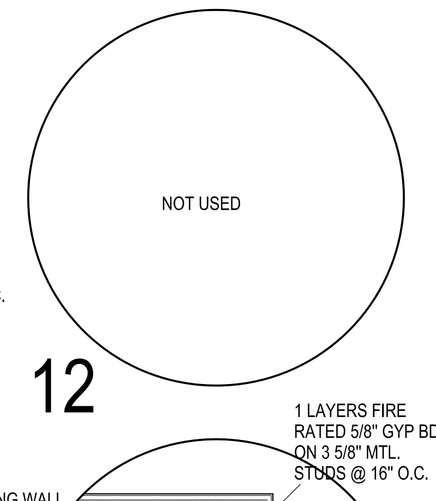

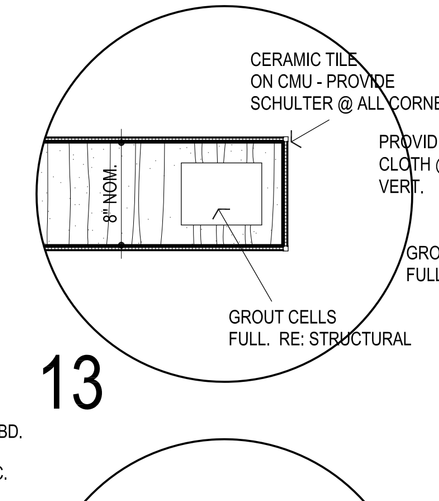

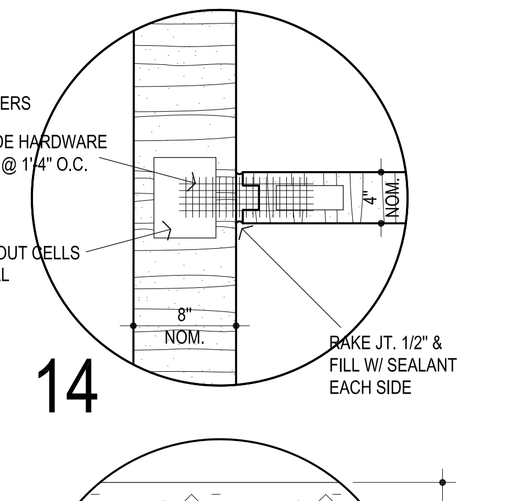

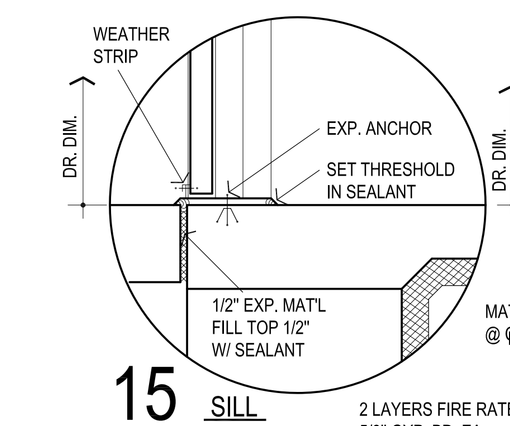

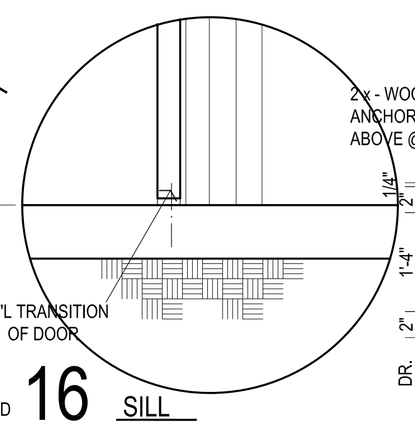

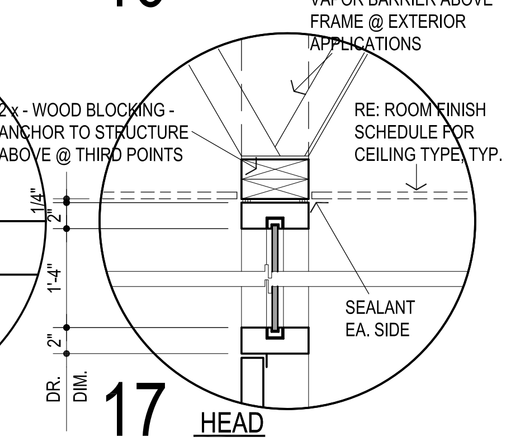

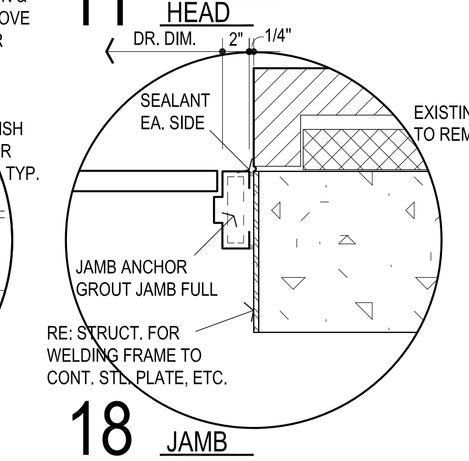

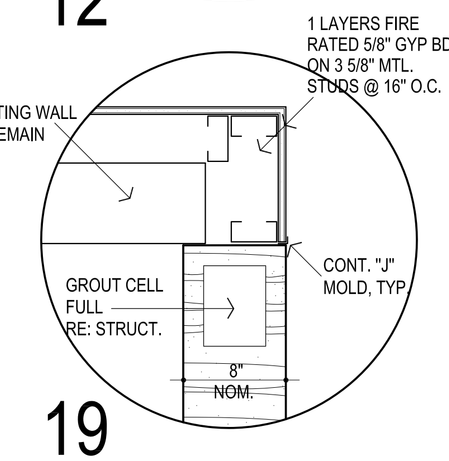

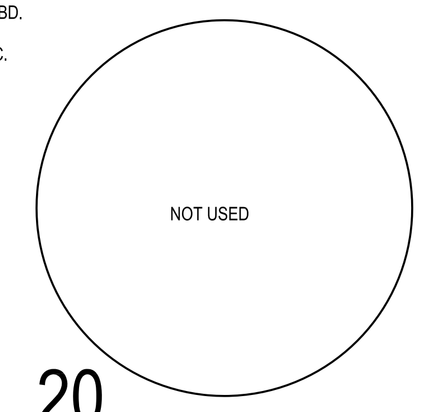

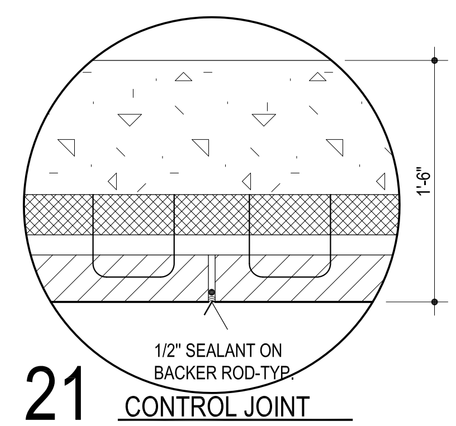

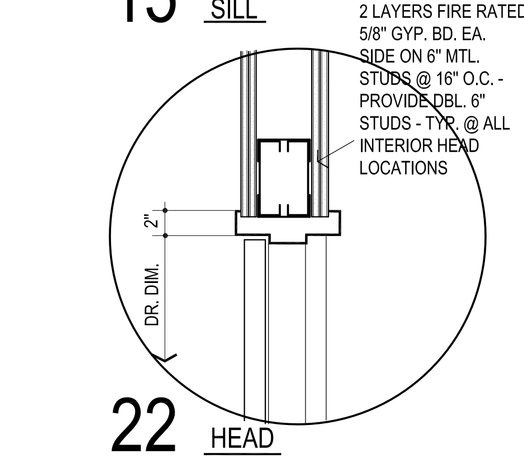

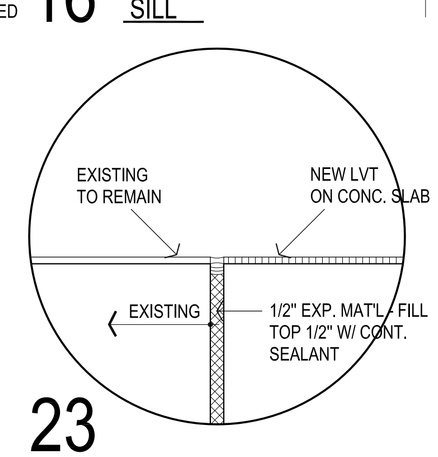

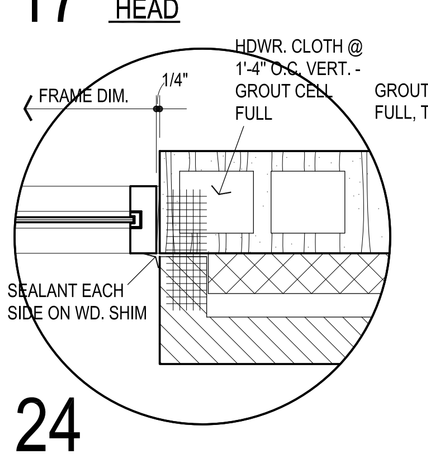

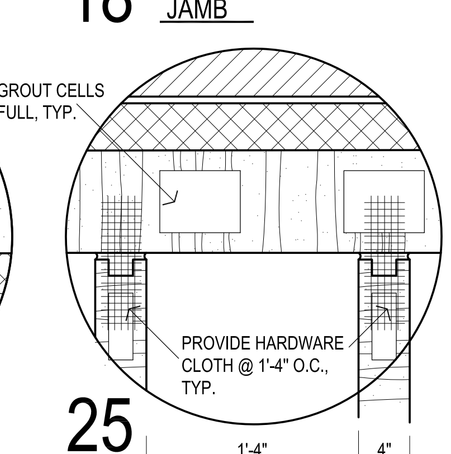

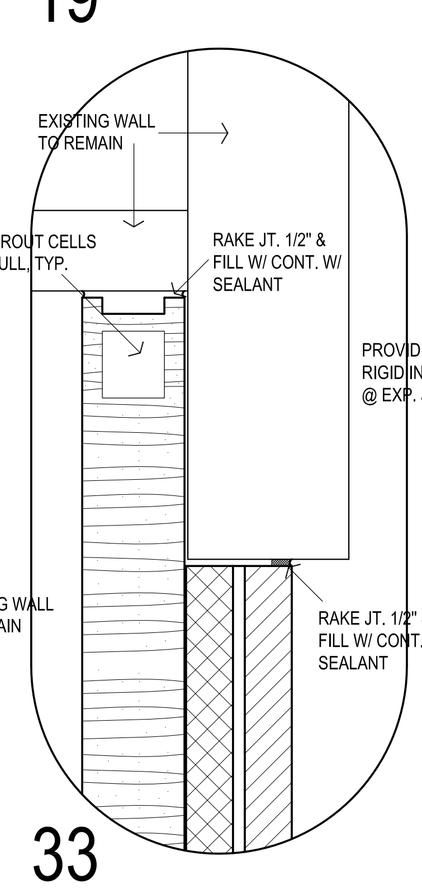

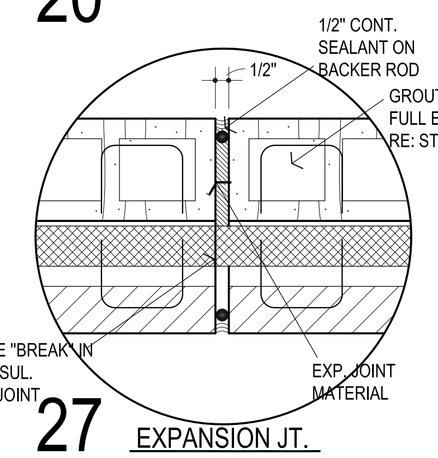

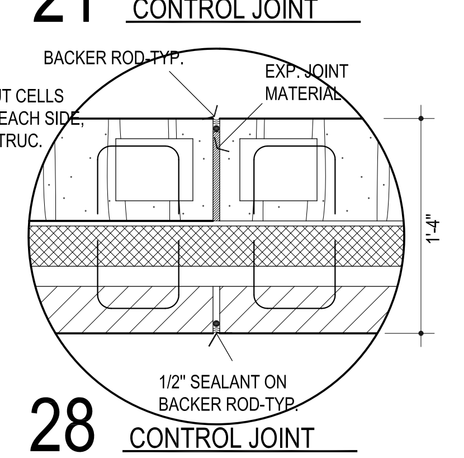

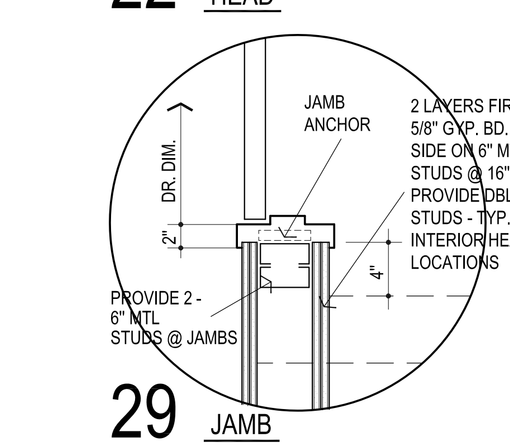

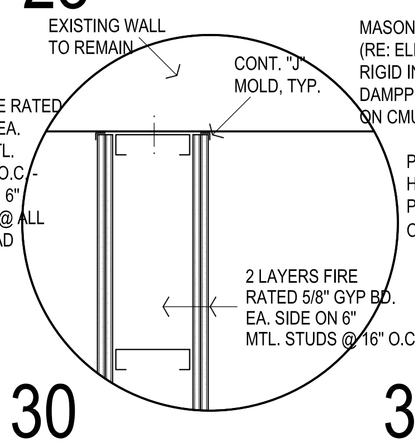

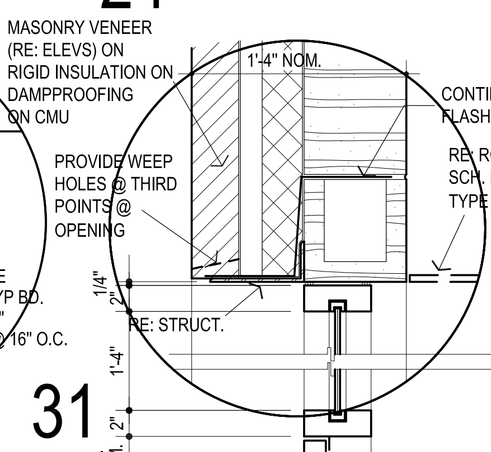

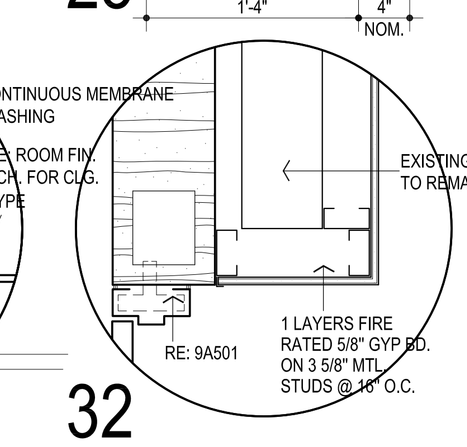

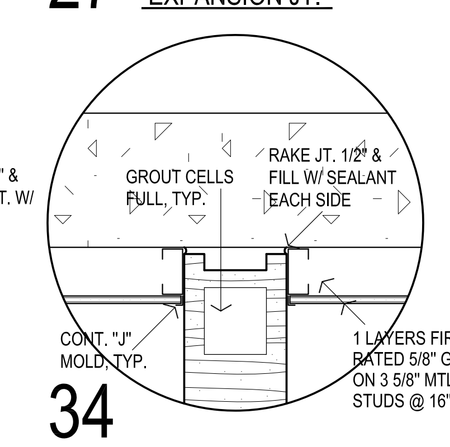

NOTES:

1. ALL DETAILS 1 1/2" = 1'-0" UNLESS NOTED OTHERWISE
2. GROUT FULL ALL H.M. JAMBS AT MASONRY WALLS UNLESS OTHERWISE NOTED
3. RE: ROOM FINISH SCHEDULE FOR FINISHES, FLOOR / WALL MATERIALS, ETC.

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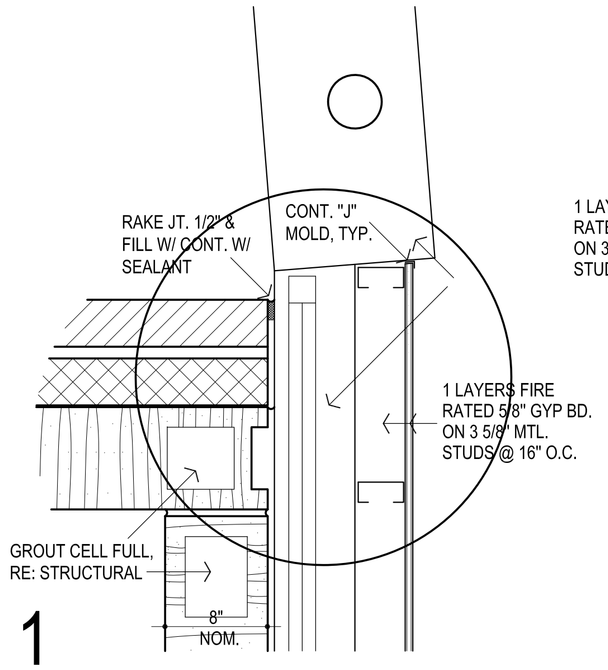

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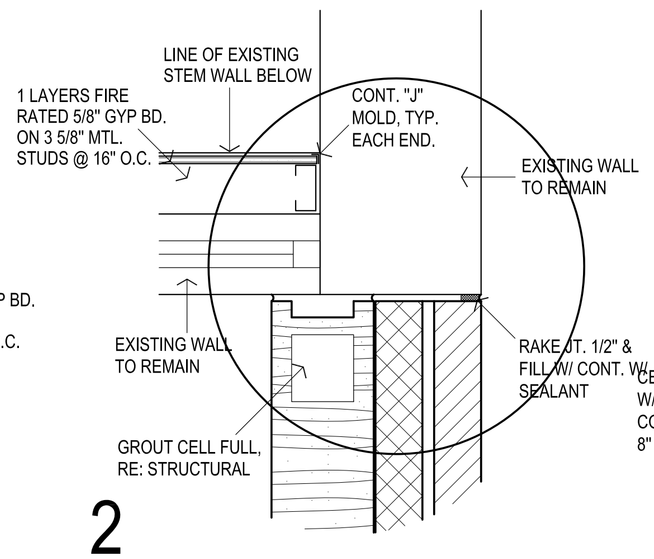

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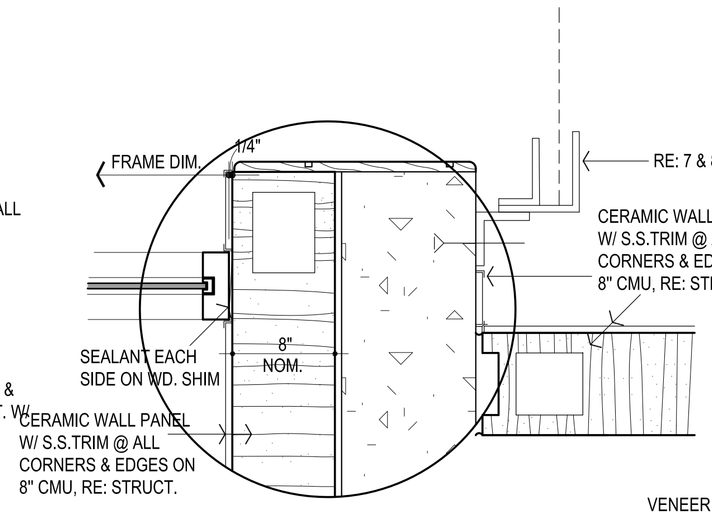

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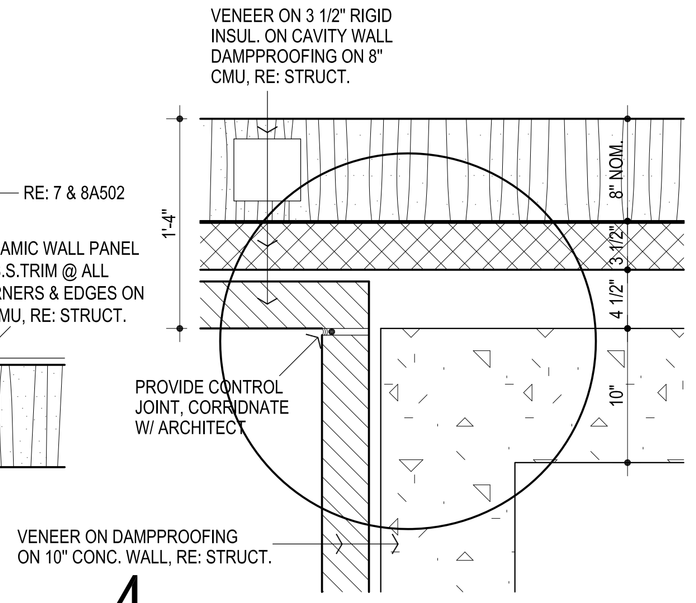

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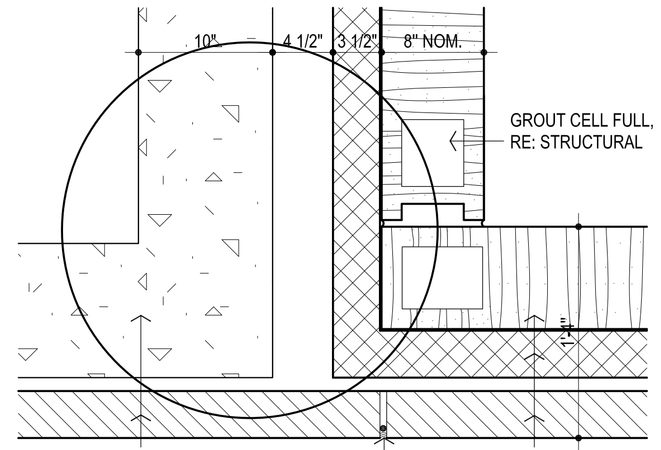

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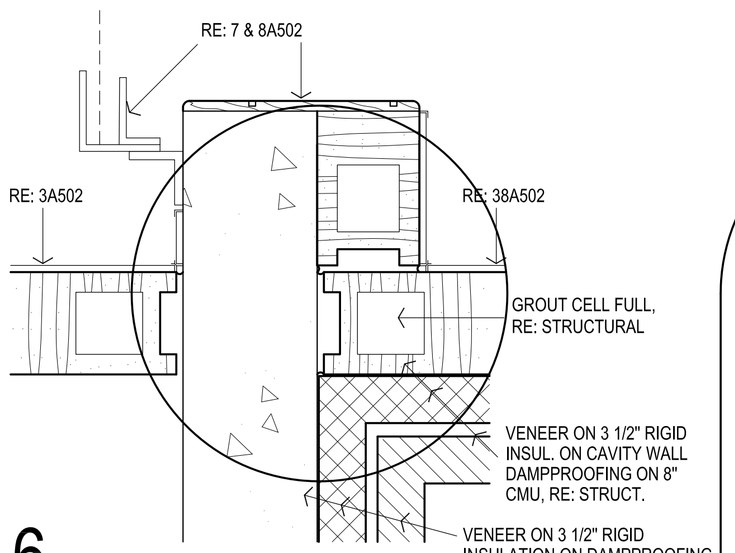

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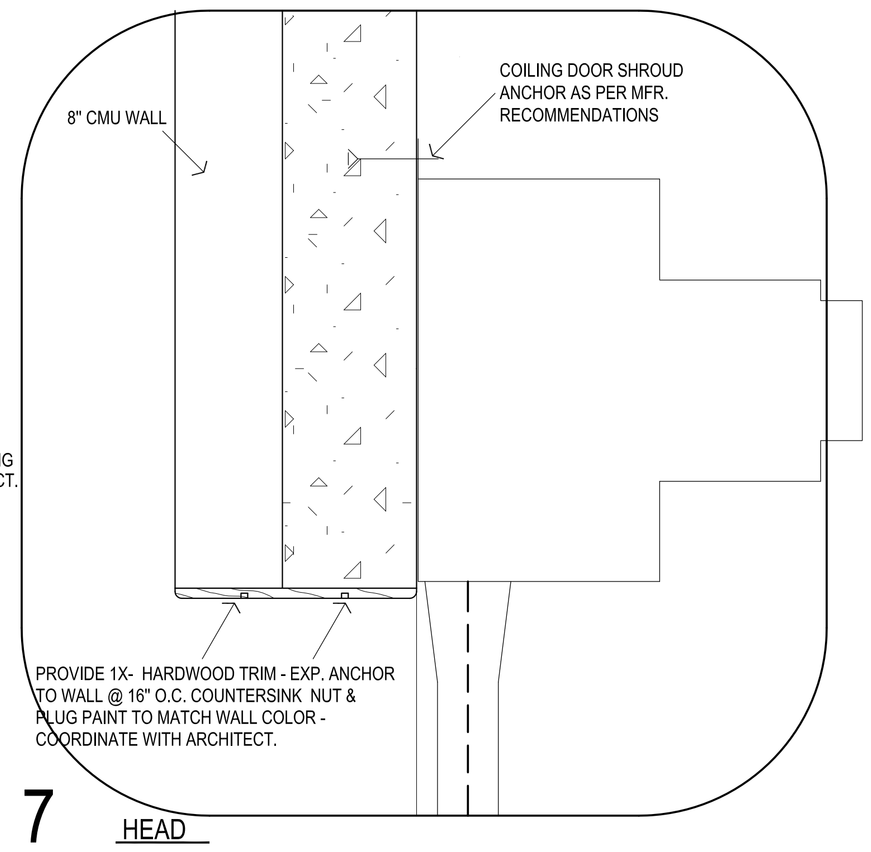
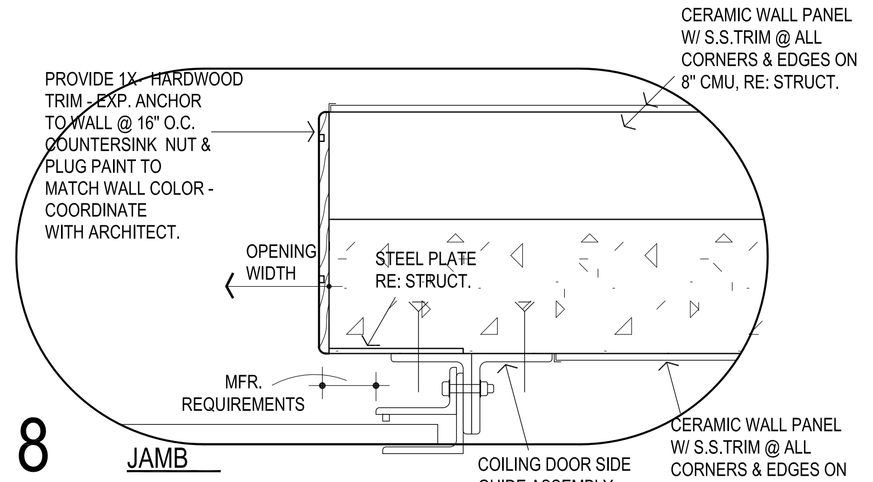


7 HEAD



8 JAMB

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DESCRIPTION	RM. NO.	FLOOR: LUXURY VINYL TILE	FLOOR: CARPET TILE	FLOOR: CERAMIC TILE	FLOOR: EXPOSED CONCRETE W/ HARDENER	FLOOR: LAB FLOORING	BASE: CERAMIC TILE	BASE: RUBBER	BASE: NONE	CEILING: 2 X 2 ACOUT. LAY-IN (TEG)	CEILING: 2 X 2 ACOUT. LAY-IN (SQ)	CEILING: GYP. BOARD	CEILING: EXPOSED STRUCTURE	CLG. HT.	REMARKS	RM. NO.	WALLS: CERAMIC TILE	WALLS: CONCRETE MASONRY UNIT	WALLS: EXISTING WALL	WALLS: GYP. BD.	WALLS: EXPOSED CONCRETE	WALLS: CERAMIC WALL PANELS	PAINT / COLOR SCHEDULE: CLG.	WALLS: N	WALLS: E	WALLS: S	WALLS: W	REMARKS
VESTIBULE	1	○					○					●		9'-4"		1	⊠	●	●				(1)(24)	(2)	(2)	(2)	(2)	(9)(10)
VESTIBULE	2	○					○			○				9'-4"		2	⊠	●	●			⊠	(1)(24)	(16)	(16)	(16)	(2)	(9)(10)(11)(17)
EXISTING VESTIBULE	3	○					○			○				9'-4"		3	⊠	●	●				(24)	(2)	(2)	(2)	(2)	(9)(10)
OFFICE	4															4	⊠	●	●				---	---	---	---	---	
VESTIBULE	5	○					○			○				9'-4"		5	⊠	●	●				(1)(24)	(2)	(2)	(2)	(2)	
LOBBY	6	○					○			○				9'-4"		6	⊠	●	●				(1)(24)	(2)	(2)	(2)	(2)	(9)(10)(11)(17)
LABORATORY	7	○					○				○			9'-4"		7	⊠	●	●				(23)	(2)	(2)	(2)(3)	(2)	(9)(10)(11)(18)(19)(26)(27)
CORRIDOR	8	○					○			○		●		10'-0"		8	⊠	●	●				(24)	(2)	(2)(3)	(2)	(2)(3)	(9)(10)(11)(17)
LABORATORY	9	○					○				○			9'-4"		9	⊠	●	●				(23)	(2)	(2)	(2)(3)	(2)	(9)(10)(11)(18)(19)(26)(27)
STORAGE	10	○					○				○			9'-4"		10	⊠	●	●				(23)	(2)	(2)	(2)	(2)	(9)(10)(18)(19)
STORAGE	11	○					○				○			9'-4"		11	⊠	●	●				(23)	(2)	(2)	(2)	(2)	(9)(10)(18)(19)
LABORATORY	12	○					○				○			9'-4"		12	⊠	●	●				(23)	(2)(3)	(2)	(2)	(2)	(9)(10)(11)(18)(19)(26)(27)
LABORATORY	13	○					○				○			9'-4"		13	⊠	●	●				(23)	(2)(3)	(2)	(2)	(2)	(9)(10)(11)(18)(19)(26)(27)
TOILET	14			○			○					●		9'-4"	EPOXY PAINT	14	⊠						(1)	(2)	(2)	(2)	(2)	(14)(15)
TOILET	14a			○			○					●		9'-4"	EPOXY PAINT	14a	●	●	●				(1)	(2)	(2)	(2)	(2)	(14)(15) BASE
TOILET	14b			○			○					●		9'-4"	EPOXY PAINT	14b	●	●	●				(1)	(2)	(2)	(2)	(2)	(14) EPOXY PAINT (15) BASE
TOILET	14c			○			○					●		9'-4"	EPOXY PAINT	14c	●	●	●				(1)	(2)	(2)	(2)	(2)	(14) EPOXY PAINT (15) BASE
TOILET	14d			○			○					●		9'-4"	EPOXY PAINT	14d	●	●	●				(1)	(2)	(2)	(2)	(2)	(14) EPOXY PAINT (15) BASE
TOILET	14e			○			○					●		9'-4"	EPOXY PAINT	14e	●	●	●				(1)	(2)	(2)	(2)	(2)	(14) EPOXY PAINT (15) BASE
TOILET	14f			○			○					●		9'-4"	EPOXY PAINT	14f	●	●	●				(1)	(2)	(2)	(2)	(2)	(14) EPOXY PAINT (15) BASE
TOILET	14g			○			○					●		9'-4"	EPOXY PAINT	14g	●	●	●				(1)	(2)	(2)	(2)	(2)	(14) EPOXY PAINT (15) BASE
TOILET	14h			○			○					●		9'-4"	EPOXY PAINT	14h	●	●	●				(1)	(2)	(2)	(2)	(2)	(14) EPOXY PAINT (15) BASE
MECH. / ELEC.	15				○			○					●	----	EPOXY PAINT	15	●	●	●		●		(1)	(2)	(2)	(2)	(2)	EPOXY PAINT
CUSTODIAN	16				○			○				●		8'-8"	EPOXY PAINT	16	●	●	●		●		(1)	(2)	(2)	(2)	(2)	(9) EPOXY PAINT
I.T.	17	○						○			○			9'-4"		17	●	●	●		●		(23)	(2)	(2)	(2)	(2)	(9)(10)
VESTIBULE	18	○						○				●		9'-4"		18	●	●	●		●	⊠	(1)	(16)	(16)	(16)	(16)	(9)(10)(11)(17)
CORRIDOR	19	○						○		○				10'-0"		19	●	●	●		●	⊠	(1)(24)	(16)	(16)	(16)	(16)	(9)(10)(11)(17)
STORAGE	20	○						○				●		9'-4"		20	●	●	●		●		(1)	(2)	(2)	(2)	(2)	(9) EPOXY PAINT
LABORATORY	21	○						○			○			9'-4"		21	●	●	●		●		(23)	(2)(3)	(2)	(2)	(2)	(9)(10)(11)(18)(19)(26)(27)
STORAGE	22	○						○			○			9'-4"		22	●	●	●		●		(23)	(2)	(2)	(2)	(2)	(9)(10)(18)(19)
MECHANICAL	23				○			○					●	----	EPOXY PAINT	23	●	●	●		●		(1)	(2)	(2)	(2)	(2)	(9) EPOXY PAINT
LABORATORY	24	○						○			○			9'-4"		24	●	●	●		●		(23)	(2)(3)	(2)	(2)	(2)	(9)(10)(11)(18)(19)(26)(27)
CORRIDOR	25	○						○		○				10'-0"		25	●	●	●		●		(1)(24)	(2)	(2)	(2)	(2)	(9)(10)(11)(17)
CLASSROOM	26		○					○			○			8'-8"		26	●	●	●		●		(23)	(2)	(3)	(2)	(2)	(8)(9)(18)(19)(26)(27)
CLASSROOM	27		○					○			○			8'-8"		27	●	●	●		●		(23)	(2)	(2)	(2)	(3)	(8)(9)(18)(19)(26)(27)
GENERATOR	28				○				○				●	----		28	⊠	●	●			●	---	---	---	---	---	
VESTIBULE	29	○						○				●		10'-0"		29	●	●	●		●		(1)	(2)	(2)	(2)	(2)	(9)(10)(11)(17)
CORRIDOR	30	○						○		○				10'-0"		30	●	●	●		●		(1)(24)	(2)(3)	(2)	(2)(3)	(2)	(9)(10)(11)(17)
CLASSROOM	31		○					○			○			8'-8"		31	●	●	●		●		(23)	(2)	(2)	(2)	(3)	(8)(9)(18)(19)(26)(27)
CLASSROOM	32		○					○			○			8'-8"		32	●	●	●		●		(23)	(2)	(3)	(2)	(2)	(8)(9)(18)(19)(26)(27)
RISER ROOM	33			○					○				●	----		33	●	●	●		●		(1)	(2)	(2)	(2)	(2)	(9)

GENERAL NOTE:

PROVIDE CONCRETE HARDENER AT ALL CHASE LOCATIONS

1 ROOM FINISH SCHEDULE

- ⊠ SCHEDULE ORIENTED SAME AS PLAN
- ◯ INDICATES MATERIAL IN A GIVEN AREA
- ⊠ MATERIAL ON ALL SURFACES
- ⊠ MATERIAL ON EACH INDIVIDUAL SURFACE
- ● IF CIRCLE IS BLACKENED - SURFACE TO RECEIVE PAINTER'S FINISH
- ○ IF CIRCLE IS BLANK - SURFACE OR MATERIAL IS PREFINISHED OR NOT PAINTED

PAINT:

1. GYP. BOARD CEILINGS: SHERWIN-WILLIAMS - SW7006 - EXTRA WHITE
2. WALLS - FIELD: SHERWIN-WILLIAMS - SW7008 - ALABASTER
3. WALL - ACCENT WALL: SHERWIN-WILLIAMS - SW7052 GRAY AREA
4. H.M. DOORS & FRAMES : SHERWIN-WILLIAMS - SW7055 ENDURING BRONZE
5. MISCELLANEOUS METALS: SHERWIN-WILLIAMS - SW7055 ENDURING BRONZE
6. WOOD DOORS & MILLWORK: ARCHITECTURAL WOOD DOORS - CLEAR CL07
7. EXTERIOR H.M. DOORS & FRAMES & WINDOWS & EXISTING METAL WALL PANELS WHERE NOTED: SHERWIN-WILLIAMS - SW7055 ENDURING BRONZE

PREFINISHED COLORS:

8. CARPET TILES: INTERFACE FLOR - COLOR "A" : 410-107025 NATURAL - COLOR "B": AE317-105829 AZURE
9. RUBBER WALL BASE: ROPPE - 100 BLACK
10. LUXURY VINYL TILE COLOR (A) : INTERFACE LVT - STUDIO SET - SILVER LIGHT
11. LUXURY VINYL TILE COLOR (B) : INTERFACE LVT - STUDIO SET - PEPPER
12. GROUT: COLOR 1 TO BE SELECTED FROM MFR'S STANDARD COLORS
13. GROUT: COLOR 2 TO BE SELECTED FROM MFR'S STANDARD COLORS
14. CERAMIC TILE FLOORS: DALTILE - SYNCHRONIC - GREY SY33 OR TILEBAR - COMET - WHITE POLISHED
15. CERAMIC TILE WALLS & BASE: DALTILE - SYNCHRONIC - WHITE SY30 OR TILEBAR - COMET - DARK MATTE W/ MTL. TRIM @ ALL OUTSIDE CORNERS
16. CERAMIC WALL PANELS: COLOR TO BE SELECTED BY ARCHITECT FROM ALL MFR. COLORS
17. LUXURY VINYL TILE COLOR (C) : INTERFACE LVT - STUDIO SET - ROYAL BLUE
18. SOLID SURFACE (COUNTERTOPS) :CORIAN - DEEP CAVIAR
19. PLASTIC LAMINATE (FACING AND EDGING) : WILSONART - 7925-38 - MONTICELLO MAPLE
20. NUMBER NOT USED
21. VINYL "T" EDGING: - TO BE SELECTED FROM MFR'S STANDARD COLORS
22. MELAMINE: TO BE SELECTED FROM MFR'S STANDARD COLORS
23. 2 X 2 ACOUSTICAL LAY - IN TILES - SQUARE EDGE : REFER SPECIFICATIONS
24. 2 X 2 ACOUSTICAL LAY - IN TILES - TEGULAR EDGE : REFER SPECIFICATIONS
25. INTERIOR SIGNAGE: MOHAWK SIGN SYSTEMS - BLACK W/ WHITE LETTERS
26. MARKERBOARD: CLARIDGE - NO. 100 - LCS WHITE
27. TACKBOARD: CLARIDGE - KB662 - GREY
28. NUMBER NOT USED
29. NUMBER NOT USED

EXTERIOR COLORS:

30. MASONRY BRICK VENEER - CLOUD CERAMICS - LIGHT IVORY VELOUR
31. MASONRY BRICK VENEER - KANAS BRICK AND TILE - 530 FLASH
32. PREFINISHED METAL SOFFIT PANEL: COLOR TO BE SELECTED FROM ALL MFR. COLORS - BERRIDGE - MEDIUM BRONZE
33. PREFINISHED METAL COPING: COLOR TO BE SELECTED FROM ALL MFR. COLORS - MATCH PREFINISHED WALL PANELS
34. PREFINISHED METAL WALL PANEL: COLOR TO BE SELECTED FROM ALL MFR. COLORS - LAMINATORS, INC. - MEDIUM BRONZE
35. MASONRY MORTAR - COLOR TO BE SELECTED FROM ALL MFR. COLORS

2 COLOR SCHEDULE

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STATE OF OKLAHOMA
MICHAEL L. ABLA
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4/25/25

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APRIL 2025
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revisions

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CLASSROOM ADDITION
CENTRAL JUNIOR
HIGH SCHOOL

sheet no:
A601

ROOM FIN. SCHEDULE

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DOOR NO.	LOCATION FROM	LOCATION TO	DOOR ELEV.	DOOR MAT'L	DOOR SIZE WIDTH	DOOR SIZE HEIGHT	DOOR SIZE TH' K	FRAME ELEV.	DOOR DETAILS HEAD	DOOR DETAILS SILL	DOOR DETAILS JAMB	DOOR DETAILS JAMB	REMARKS	HDWR. SET NO.
1	1	EXT.	D	ALUM.	PR. 3'-0"	7'-0"	1 3/4"	H	31A501	15A501	24A501	24A501		1
2	2	EXT.	B	H.M.	PR. 3'-0"	〃	〃	J	1A501	〃	8A501	8A501		12
3	18	EXT.	D	ALUM.	3'-0"	〃	〃	B	17A501		24A501	24A501	DOORS 3, 4 & 5 ARE IN ONE FRAME	2
4	18	EXT.	D	〃	〃	〃	〃	B	〃	﹀	24A501	24A501		2
5	18	EXT.	D		〃	〃	〃	B		15A501	24A501	24A501		2
6	19	18	D			〃	〃	B		16A501	9A501	9A501	DOORS 6, 7 & 8 ARE IN ONE FRAME	6
7	19	18	D	﹀	﹀	〃	〃	B	﹀	16A501	9A501	9A501		6
8	19	18	D	ALUM.	3'-0"	〃	〃	B	17A501	16A501	9A501	9A501		6
9	28	EXT.	B	STL.	PR. 3'-0"	〃	〃	A	11A501	15A501	18A501	18A501	STORM SHELTER DR. & FRAME	T1
10	29	EXT.	D	ALUM.	〃	〃	〃	C	17A501	15A501	24A501	24A501		1
11	30	29	D	ALUM.		〃	〃	C	17A501	16A501	24A501 SIM.	24A501 SIM.		4
12	25	EXT.	D	ALUM.		〃	〃	D	31A501	15A501	24A501	24A501		1
13	19	EXT.	D	ALUM.	﹀	〃	〃	E	31A501	15A501	24A501	24A501		1
14	8	2	B	WD.	PR. 3'-0"	〃	〃	A	2A501	16A501	9A501	9A501	90 MIN. DOOR & FRAME	7
15	CHS	2	B	〃	3'-0"	〃	〃	〃	2A501	〃	9A501	9A501	20 MIN. DOOR & FRAME	3
16	6	2	A		PR. 3'-0"	〃	〃		22A501		29A501	29A501	90 MIN. DOOR & FRAME	7
17	9	8	A		3'-0"	〃	〃		2A501		9A501	9A501		8
18	7	8	A		〃	〃	〃		〃		〃	〃		8
19	11	7	A			〃	〃							10
20	11	12	A			〃	〃							10
21	12	8	A			〃	〃							8
22	13	8	A			〃	〃							8
23	10	13	A		﹀	〃	〃							10
24	10	9	A		3'-0"	〃	〃							10
25	15	8	B		PR. 3'-0"	〃	〃						20 MIN. DOOR & FRAME	3
26	15	17	B		3'-0"	〃	〃							3
27	8	16	B		3'-0"	〃	〃						20 MIN. DOOR & FRAME	3
28	8	19	B		PR. 3'-0"	〃	〃							7
29	CHS	14	B		2'-0"	〃	〃							5
30	CHS	14	B		2'-0"	〃	〃							5
31	21	19	A		3'-0"	〃	〃							8
32	21	22	A		〃	〃	〃							10
33	24	22	A			〃	〃							10
34	24	19	A			〃	〃							8
35	20	19	B		﹀	〃	〃	﹀						3
36	19	CHS	B		3'-0"	〃	〃	A					20 MIN. DOOR & FRAME	3
37	6	19	A		PR. 3'-0"	〃	〃	G					DOORS 37 & 38 ARE IN ONE FRAME	7
38	6	19	A		PR. 3'-0"	〃	〃	G					90 MIN. DOOR & FRAME	7
39	19	33	B		3'-0"	〃	〃	A	﹀		﹀	﹀	20 MIN. DOOR & FRAME	3
40	25	CHS	B		3'-0"	〃	〃	A	2A501		9A501	9A501	20 MIN. DOOR & FRAME	3
41	EXIST	19	A		PR. 3'-0"	〃	〃	A	22A501		29A501	29A501	90 MIN. DOOR & FRAME	12
42	EXIST	19	A		PR. 3'-0"	〃	〃	A	22A501		29A501	29A501	90 MIN. DOOR & FRAME	12
43	19	CHS	B		3'-0"	〃	〃	A	2A501		9A501	9A501	20 MIN. DOOR & FRAME	3
44	32	30	A		〃	〃	〃	〃	〃		〃	〃		8
45	31	30	A			〃	〃							8
46	26	30	A			〃	〃							8
47	27	30	A			〃	〃							8
48	---	---	B		﹀	〃	〃						8 LOCATIONS	5
49	---	---	C		3'-0"	〃	〃						2 LOCATIONS	11
50	---	---	C		2'-0"	〃	〃						6 LOCATIONS	11
51	23	22	B		3'-0"	〃	〃							3
52	25	19	A	﹀	3'-0"	﹀	﹀	﹀	﹀	﹀	﹀	﹀		7
53	EXIST	8	A	WD.	3'-0"	7'-0"	1 3/4"	A	2A501	16A501	9A501	9A501		7
54	----	----	E	STL.	10'-0"	10'-0"	----	----	7A502	16A501 SIM.	8A502	8A502	2 LOCATIONS	
55	EXIST	EXIST	B	WD.	PR. 3'-0"	7'-0"	1 3/4"		22A501	16A501	29A501	29A501	90 MIN. DOOR & FRAME	
56	EXIST	EXIST	B	WD.	PR. 3'-0"	7'-0"	1 3/4"		22A501	16A501	29A501	29A501	90 MIN. DOOR & FRAME	
57	EXIST	EXIST	B	WD.	PR. 3'-0"	7'-0"	1 3/4"		22A501	16A501	29A501	29A501	90 MIN. DOOR & FRAME	

1 DOOR SCHEDULE

G1 7/8" NOM. TEMPERED INSULATING GLASS

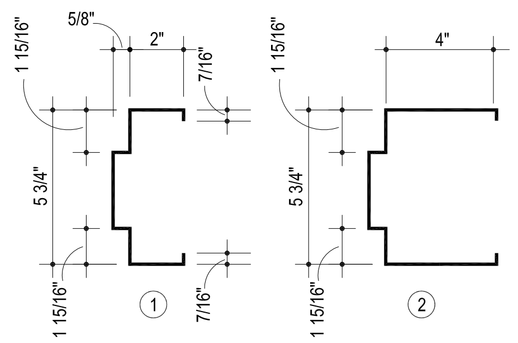
G2 1/4" CLEAR TEMPERED GLASS

G3 1/4" FIRE RATED GLASS

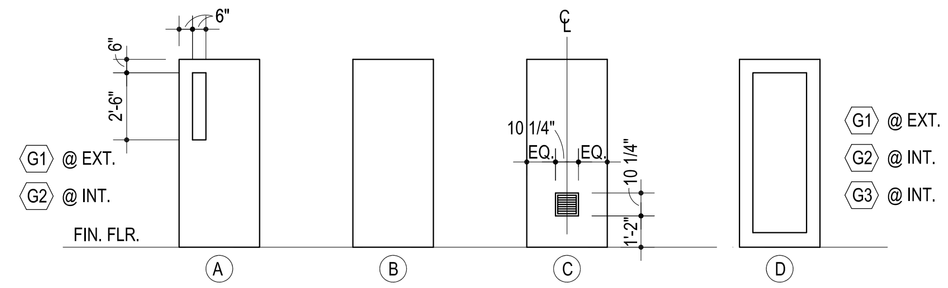
G4 1/4" IMPACT RESISTANT GLASS

G5 7/8" IMPACT RESISTANT INSULATING GLASS

2 GLAZING SCHEDULE

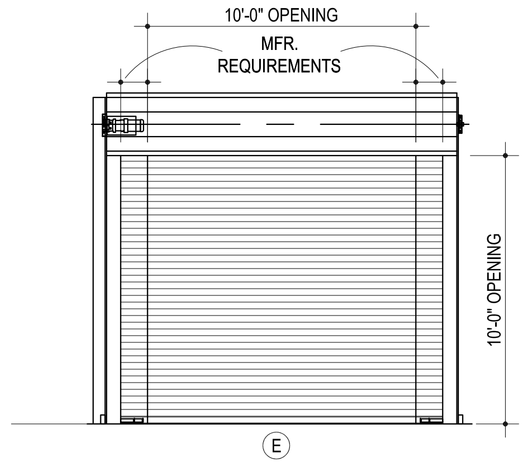


3 FRAME PROFILE



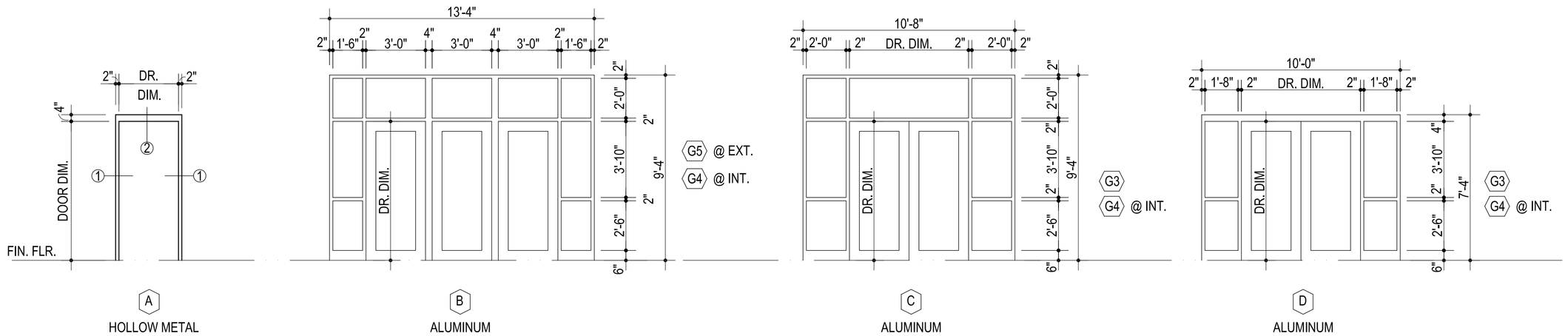
PROVIDE LOUVER "IN DOOR" EQUAL TO ACP MODEL NO. STEEL ADL8X8. DOOR MFR TO PROVIDE "RAILS" ALL AROUND OPENING. ATTACH W/ TAMPERPROOF SCREWS

WIDE STILE



TORNADO COILING DOOR

4 DOOR ELEVATIONS



5 DOOR FRAME ELEVATIONS

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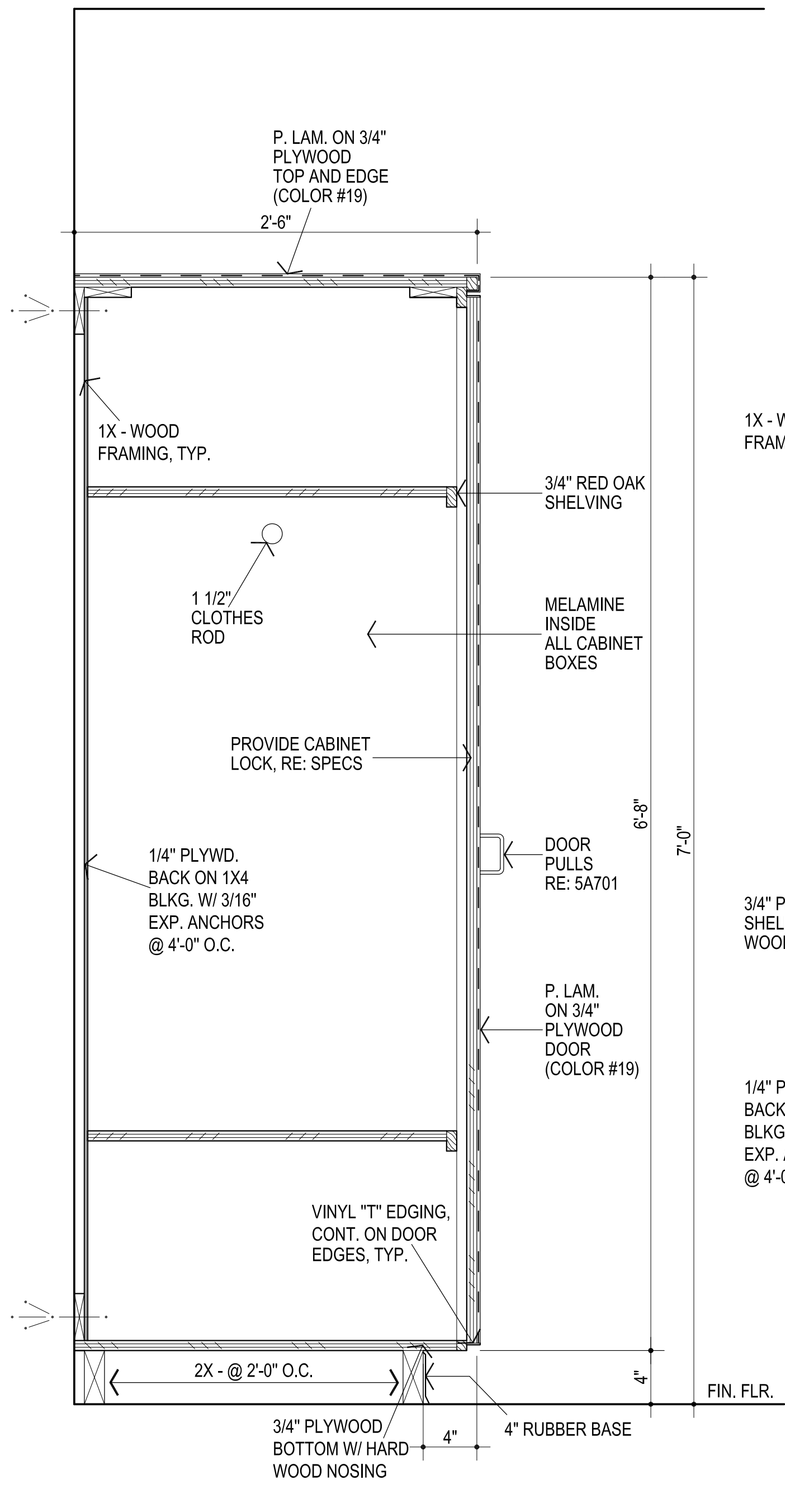
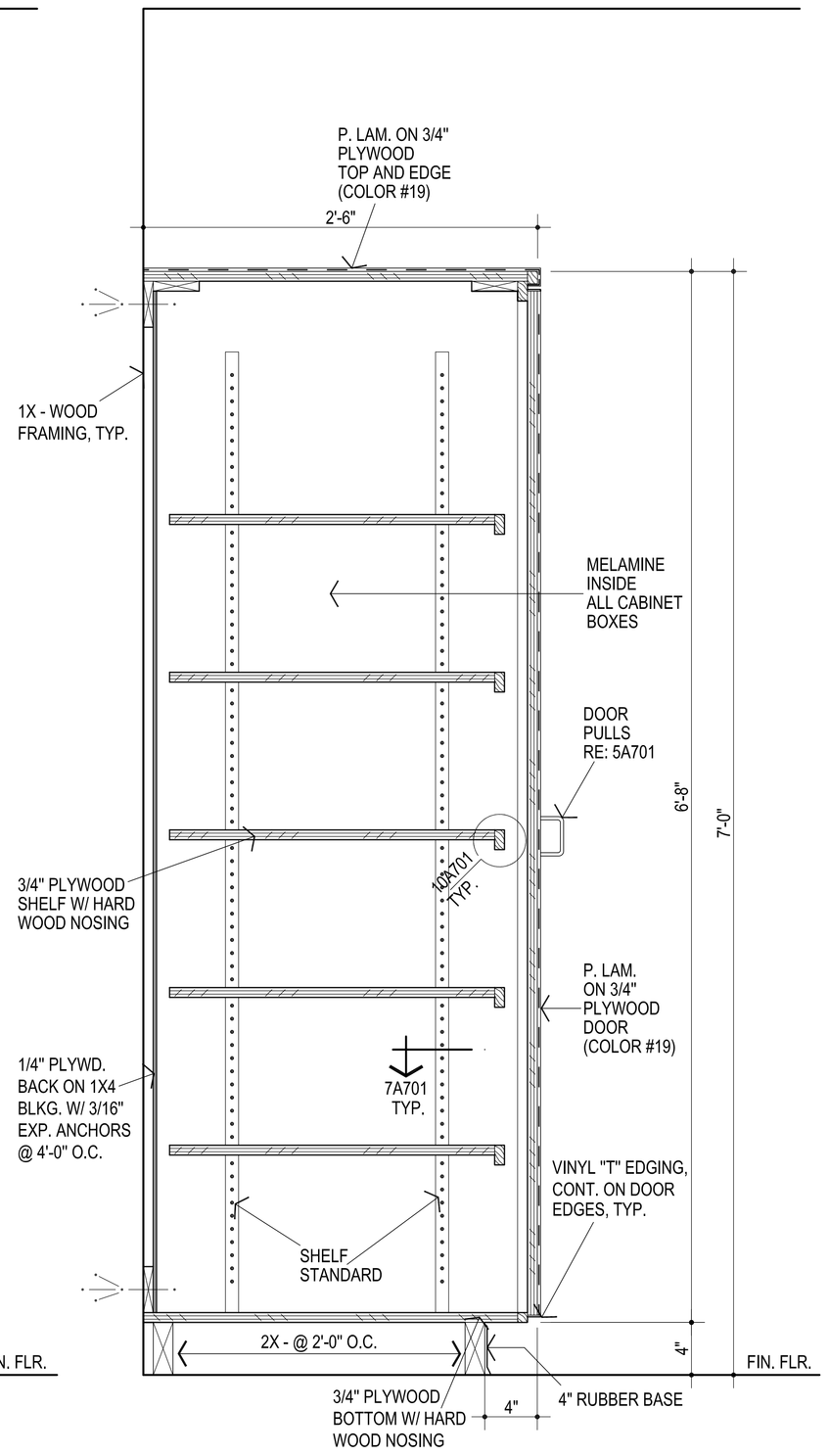


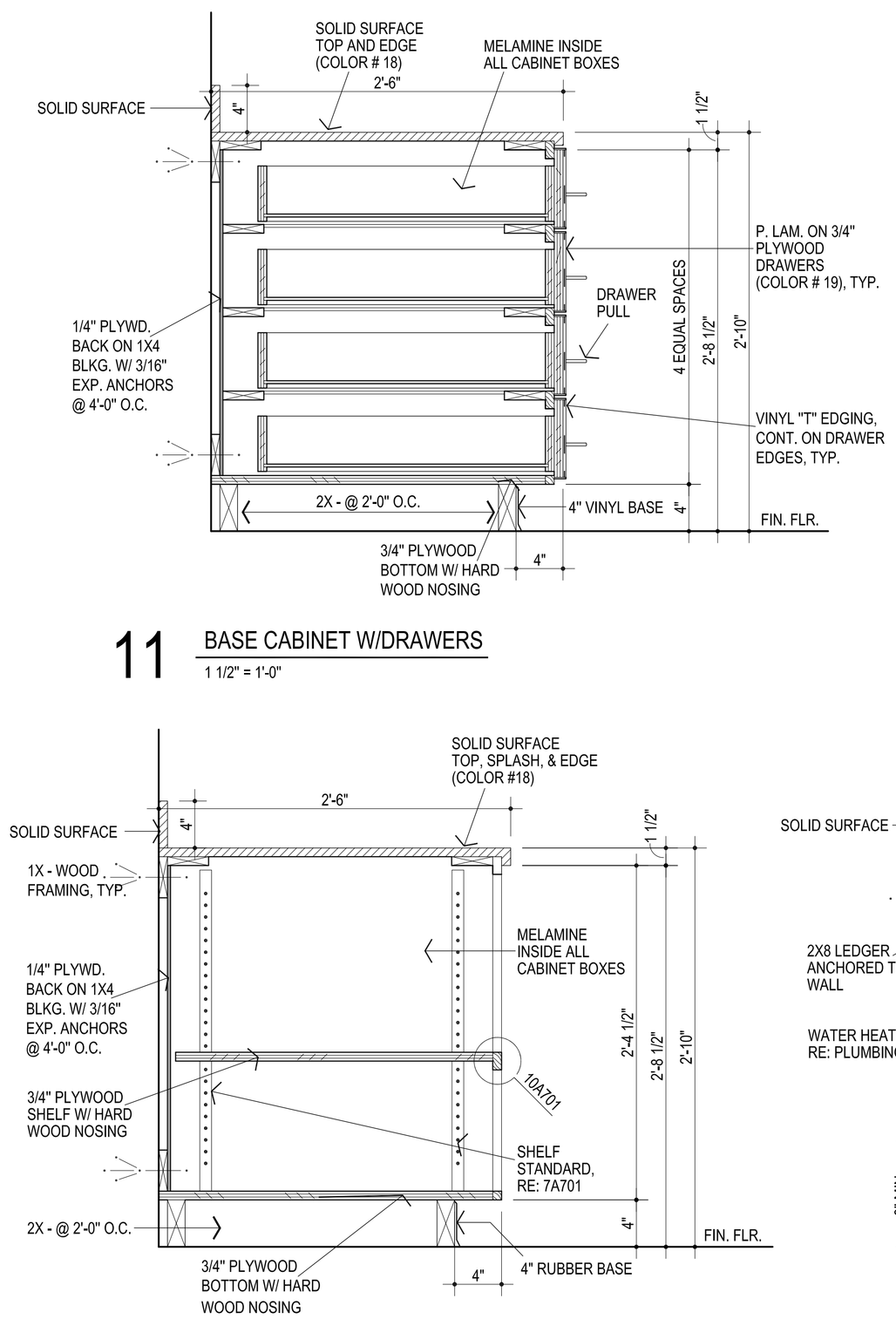
1 TEACHER'S CABINET

1 1/2" = 1'-0"



2 TALL CABINET

1 1/2" = 1'-0"



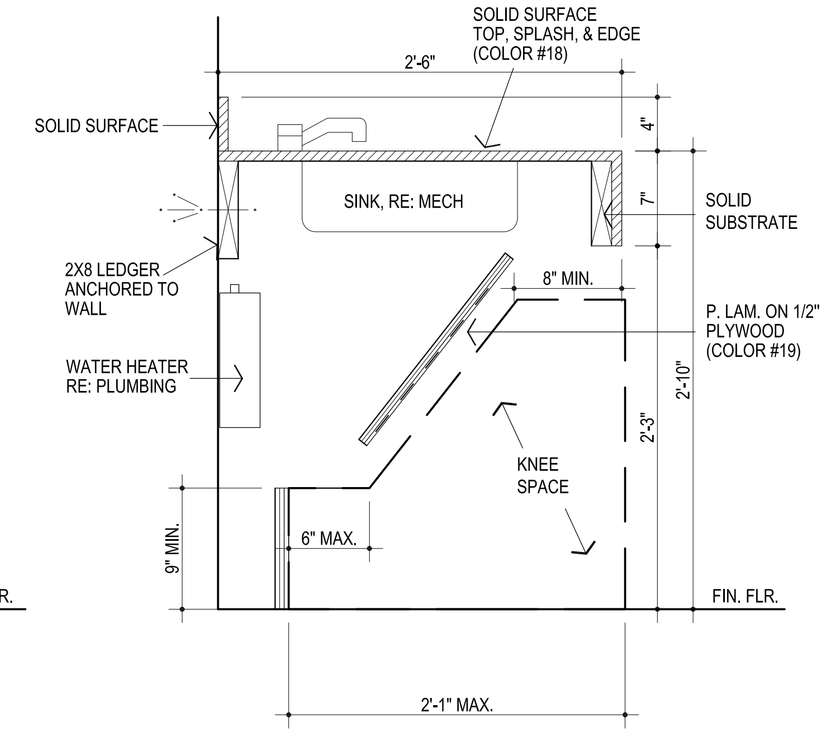
3 BASE CABINET

1 1/2" = 1'-0"

11 BASE CABINET W/DRAWERS

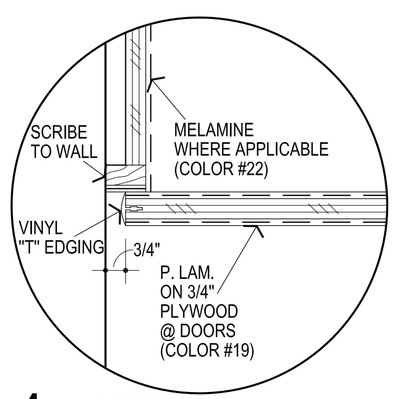
1 1/2" = 1'-0"

FRAMELESS CABINET / EUROPEAN CONSTRUCTION IS IS ACCEPTABLE

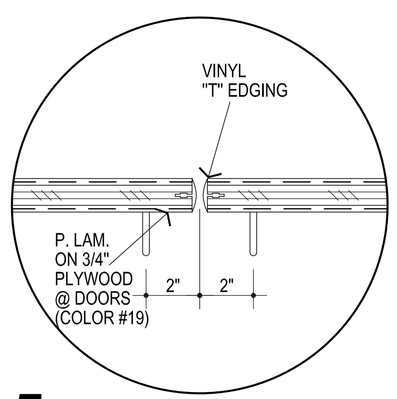


12 SINK SECTION

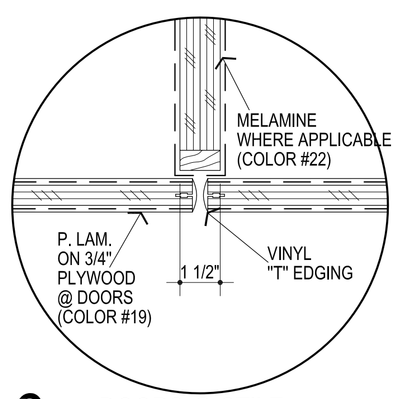
1 1/2" = 1'-0"



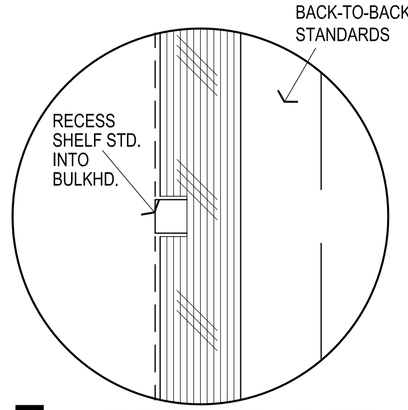
4 DOOR @ WALL



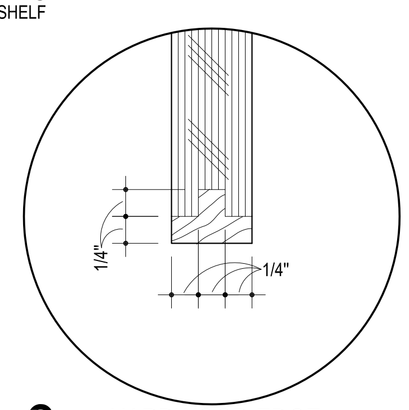
5 PULLS



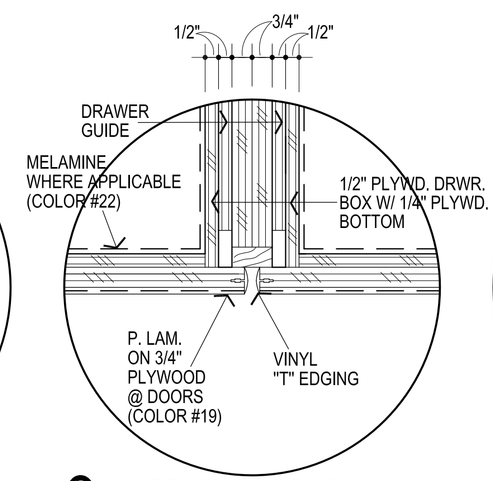
6 DOORS @ STILE



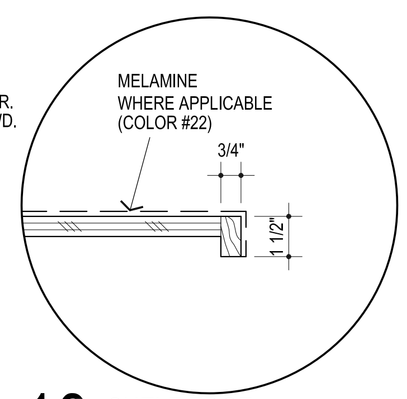
7 RECESSED STANDARDS



8 HARDWOOD EDGE



9 DRWR. TO DRWR.



10 SHELF EDGE

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CLASSROOM ADDITION
CENTRAL JUNIOR
HIGH SCHOOL

sheet no:

A701

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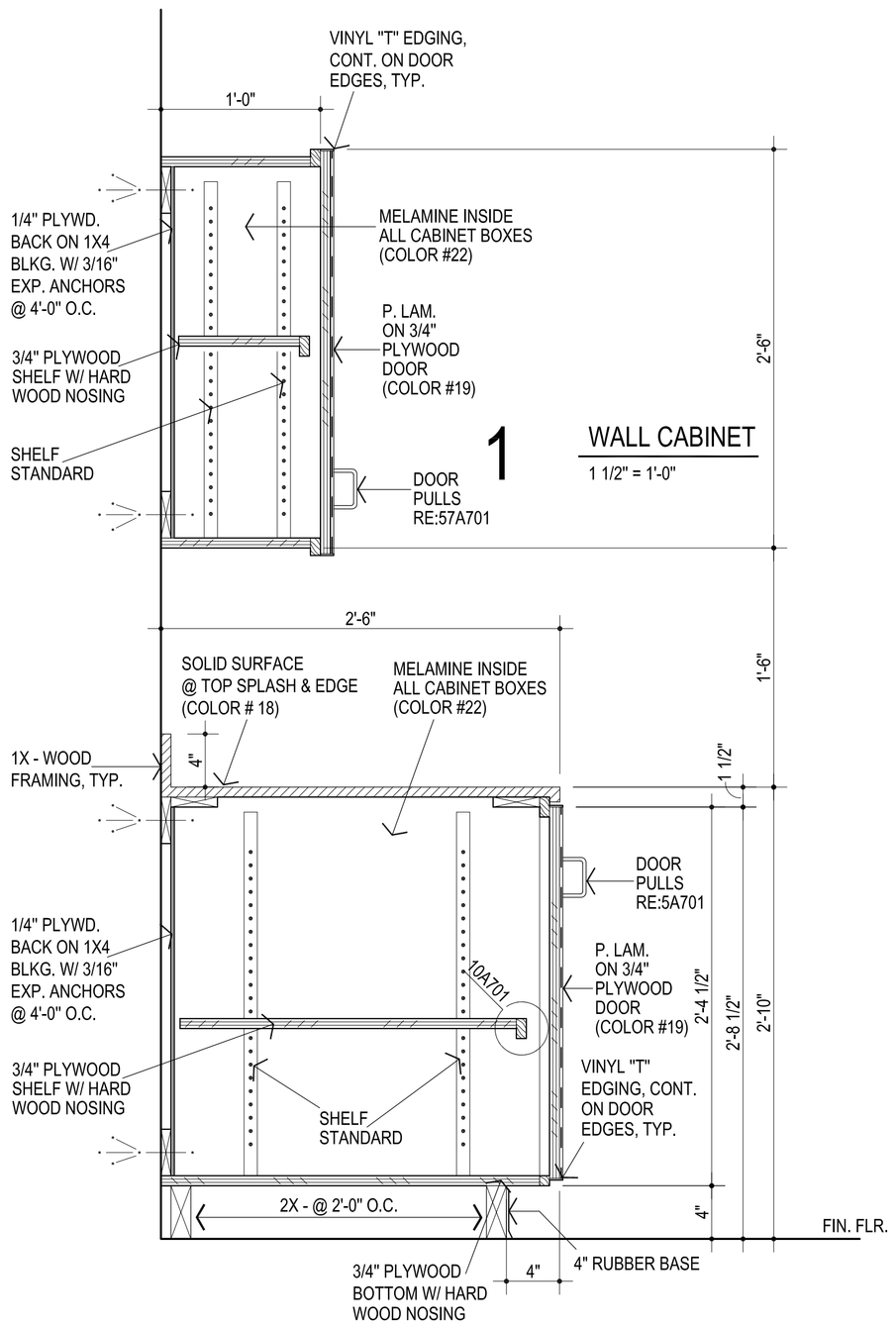
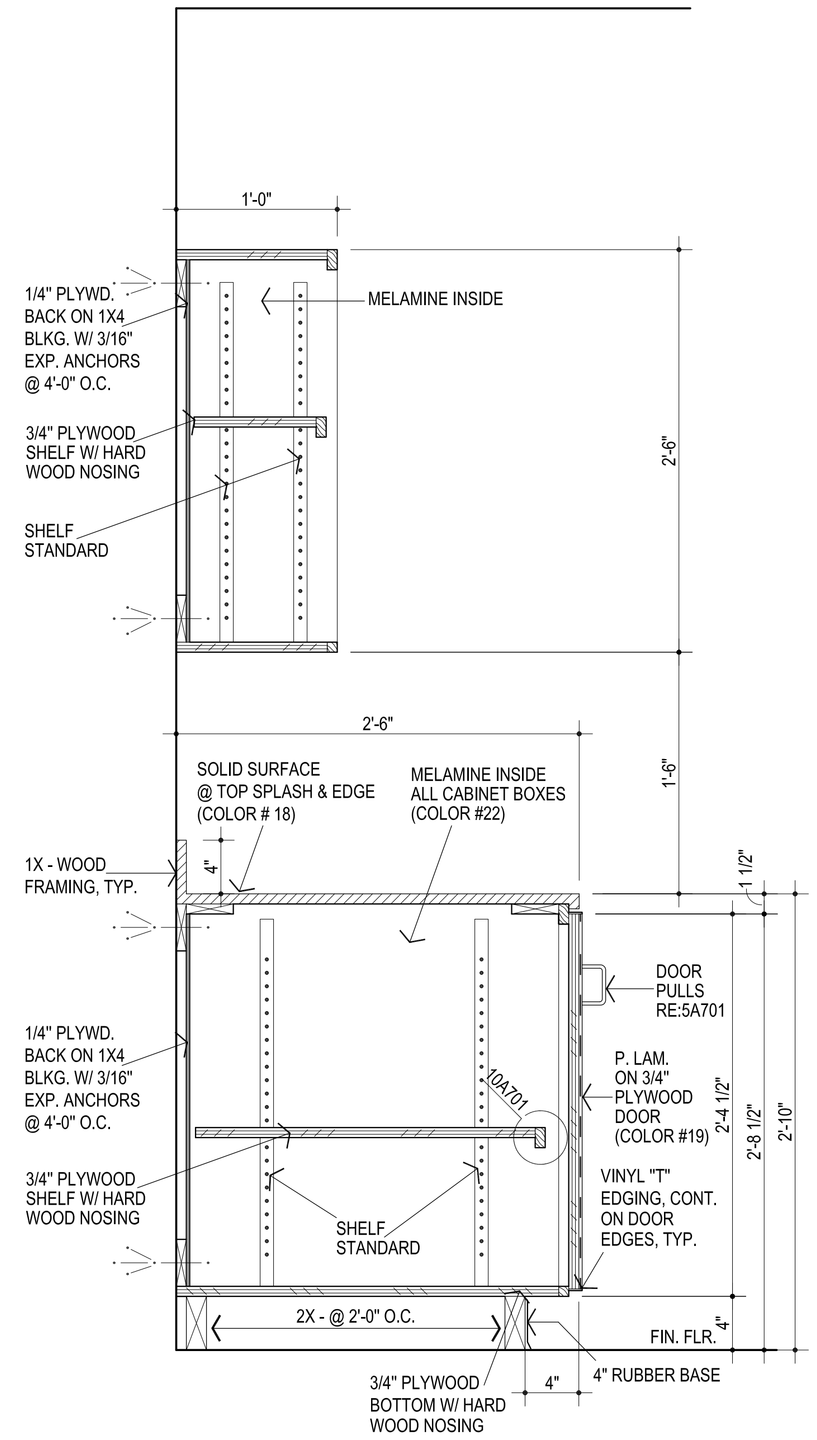


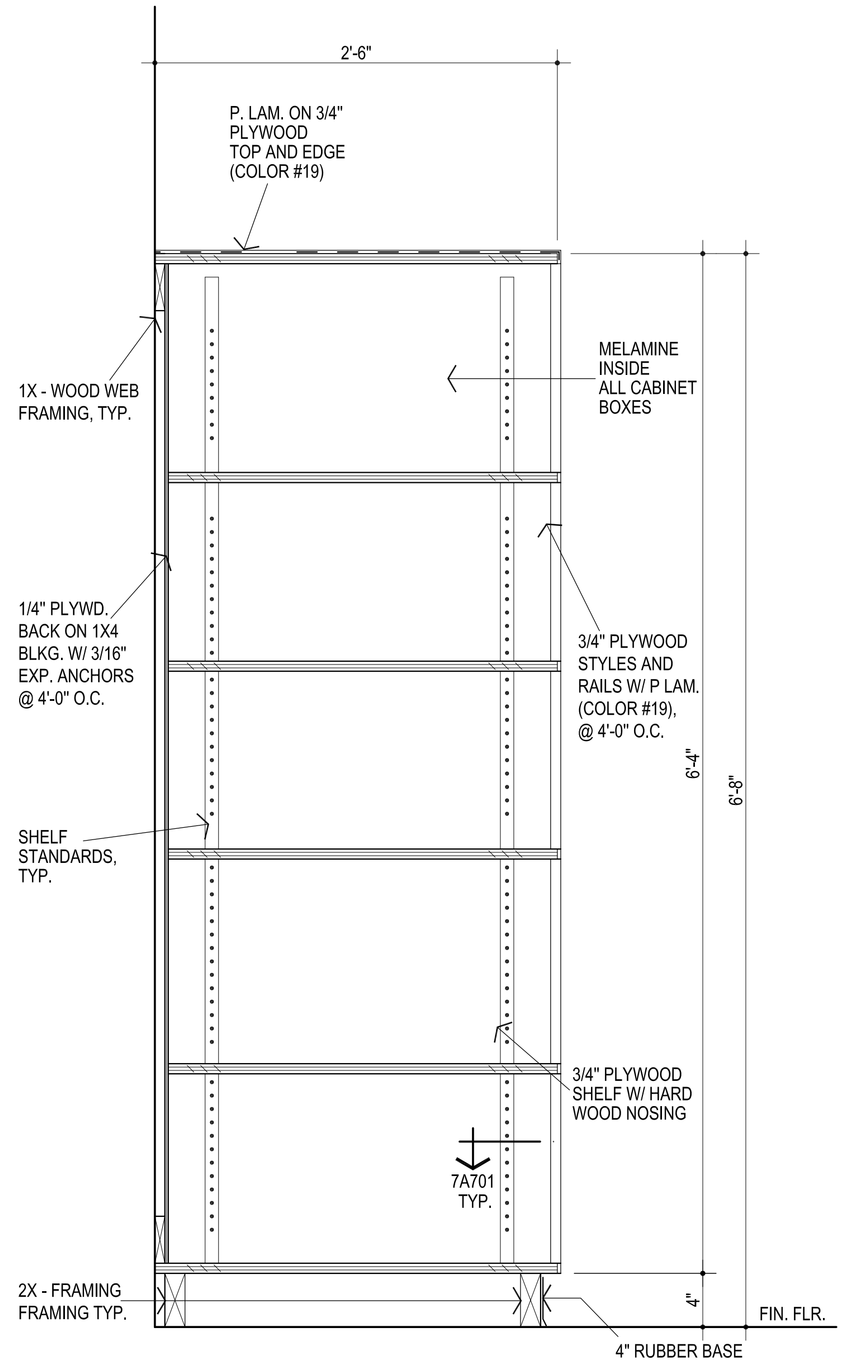
2 BASE CABINET

1 1/2" = 1'-0"



3 BASE & OPEN WALL CABINET

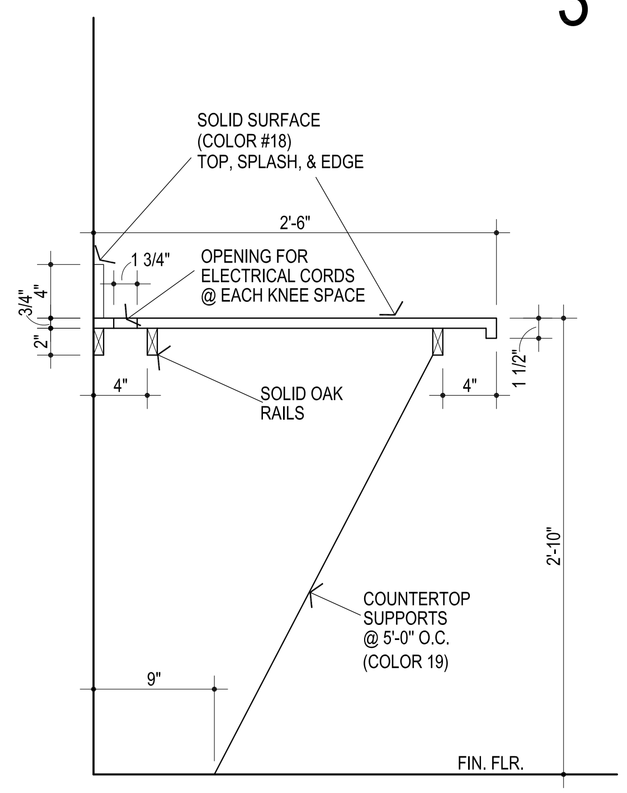
1 1/2" = 1'-0"



4 SHELVING

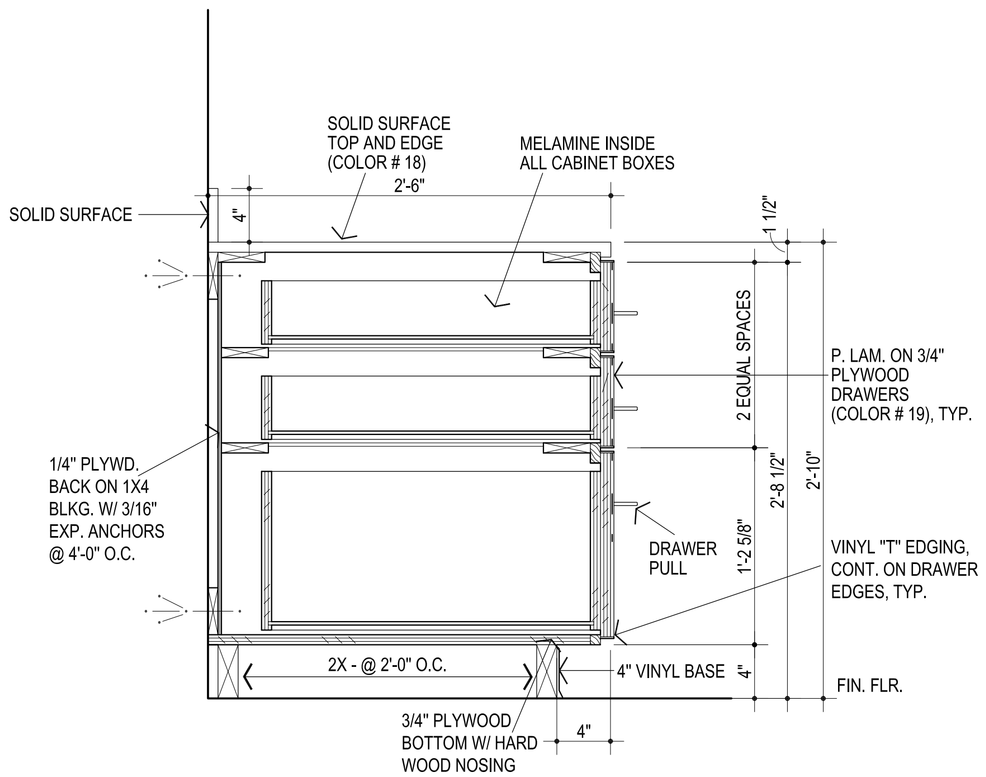
1 1/2" = 1'-0"

FRAMELESS CABINET / EUROPEAN CONSTRUCTION IS IS ACCEPTABLE



5 BASE CABINET W/ KNEE SPACE

1 1/2" = 1'-0"



6 BASE CABINET W/ DRAWERS

1 1/2" = 1'-0"

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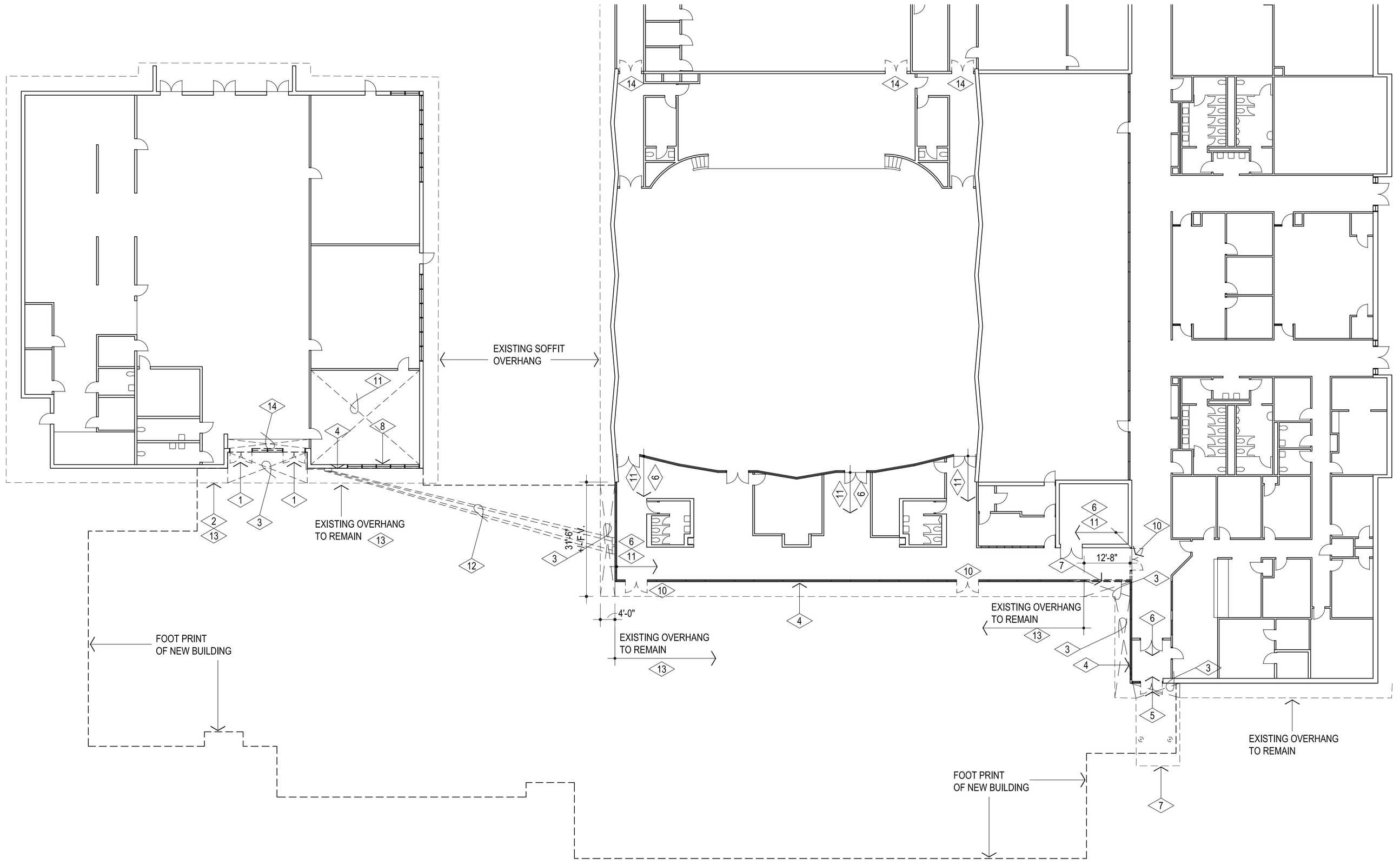

NORTH

1 DEMOLITION PLAN

1/16" = 1'-0"

(RE: CIVIL SHEETS FOR ADDITIONAL DEMOLITION INFORMATION)

GENERAL NOTES:

1. FILL, GRADE, & PREPARE ALL EXCAVATED AREAS TO RECEIVE NEW SITE FEATURES.
2. CONTRACTOR TO VISIT SITE PRIOR TO PREPARING BID, & VERIFY ALL ITEMS TO BE DEMOLISHED. ANY ADDITIONAL ITEMS REQUIRING DEMOLITION THAT ARE NOT INCLUDED IN THESE DOCUMENTS SHOULD BE BROUGHT TO THE IMMEDIATE ATTENTION OF THE ARCHITECT AND INCLUDED IN THE BASE BID.
3. EXISTING UNDERGROUND UTILITY LOCATIONS & CONTOUR INFORMATION HAVE BEEN OBTAINED FROM THE BEST AVAILABLE SOURCES. THE CONTRACTOR SHALL FIELD VERIFY ALL EXISTING CONDITIONS PRIOR TO COMMENCING WORK & COORDINATE W/ ARCHITECT.
4. CONTRACTOR IS TO FIELD VERIFY ALL EXISTING ELEVATIONS PRIOR TO STARTING EARTHWORK - AND ADJUST ACCORDINGLY AS DIRECTED BY THE ARCHITECT.
5. DURING ALL EXISTING UTILITY REVISIONS - TEMPORARY SERVICE IS TO BE PROVIDED @ ALL EFFECTED BUILDINGS.
6. ALL SALVAGEABLE ITEMS TO REMAIN OWNER'S PROPERTY & SHALL BE STORED OR DISPOSED OF AS PER OWNER'S INSTRUCTIONS.
7. CONSTRUCTION SHALL MEET ALL APPLICABLE CODES, ORDINANCES, REGULATIONS & STANDARDS REQUIRED BY THE CITY OF MOORE, OKLAHOMA.
8. CONSTRUCTION SHALL MEET ALL APPLICABLE REQUIREMENTS OF THE AMERICANS W/ DISABILITIES ACT INCLUDING ANY SUPPLEMENTAL REQUIREMENTS BY THE CITY OF MOORE, OKLAHOMA.
9. CONTRACTOR SHALL COORDINATE ACCESS TO SITE W/ OWNER PRIOR TO STARTING WORK. OBTAIN APPROVAL FROM OWNER FOR ON-SITE MATERIAL STORAGE, ETC. CONTRACTOR SHALL PROVIDE PROPER SEPARATION BTWN. WORK & STUDENTS.

DEMOLITION NOTES:

1. REMOVE EXISTING DOORS & FRAME - PREPARE OPENING TO RECEIVE NEW FIRE RATED DOORS & FRAMES & STUD IN-FILL
2. REMOVE EXISTING GUTTERS AND DOWNSPOUTS AS REQUIRED FOR NEW ADDITION. MODIFY GUTTERS TO REMIAN AS REQUIRED FOR PROPER OPERATION
3. REMOVE EXISTING SOFFIT PANEL & EXISTING STRUCTURE AS NECESSARY TO INSTALL NEW CEILING - RE: 1A107 & 1A108
4. REMOVE ALL EXISTING WALL MOUNTED ITEMS TO BE SALVAGED. RE: ELECTRICAL & COORDINATE W/ ARCHITECT & OWNER.
5. REMOVE EXISTING DOORS & FRAME - PREPARE OPENING TO RECEIVE NEW WOOD TRIM. REMOVE EXISTING CEILING AS NECESSARY TO INSTALL NEW CEILING - RE: 1A107 & 1A108
6. REMOVE EXISTING FLOORING & WALL BASE AS REQUIRED FOR NEW FLOORING & WALL BASE - RE: 1A111
7. REMOVE EXISTING ENTRY CANOPY ASSOCIATED COLUMNS & FOOTINGS AS REQUIRED FOR NEW ADDITION.
8. REMOVE EXISTING WINDOW FRAME - PREPARE OPENING TO RECEIVE 6" METAL STUDS @ 16" O.C.W/ BATT INSULATION W/ 5/8" FIRE RATED GYP EACH SIDE. ON EXISTING CLASSROOM SIDE, PAINT ENTIRE WALL
9. REMOVE EXISTING WALL & WINDOW FRAME SYSTEM - REMOVE WINDOW SYSTEM TO NEAREST VERTICAL FRAME PAST NEW OPENING IN EXISTING WALL. RE: SHEET A104
10. REMOVE EXISTING DOORS & FRAME AND SIDE LIGHT AS REQUIRED. RE: SHEET A104
11. REMOVE EXISTING CEILING SYSTEM AS REQUIRED FOR NEW CEILING SYSTEM. RE: MECHANICAL & ELECTRICAL FOR ADDITIONAL WORK.
12. IDENTIFY EXISTING CONDUIT WIRING AND COORDINATE TEMPORARY SERVICE TO REMAIN ACTIVE. REMOVE EXISTING CONDUITS & JUNCTION BOXES RE: ELECTRICAL & TECHNOLOGY FOR NEW WORK. COORDINATE WORK WITH MPS PERSONAL.
13. REMOVE EXISTING SOFFIT PANEL & EXISTING WOOD FRAMING AS NECESSARY TO INSTALL NEW STUD FRAMING W/ GYP. BD. EACH SIDE ABOVE EXISTING WALL SYSTEM TO CLOSE OUT TO DECK ABOVE - REFER WALL SECTIONS.
14. REMOVE EXISTING DOORS & FRAME - PREPARE OPENING TO RECEIVE NEW FIRE RATED DOORS & FRAMES.

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DEMOLITION PLAN

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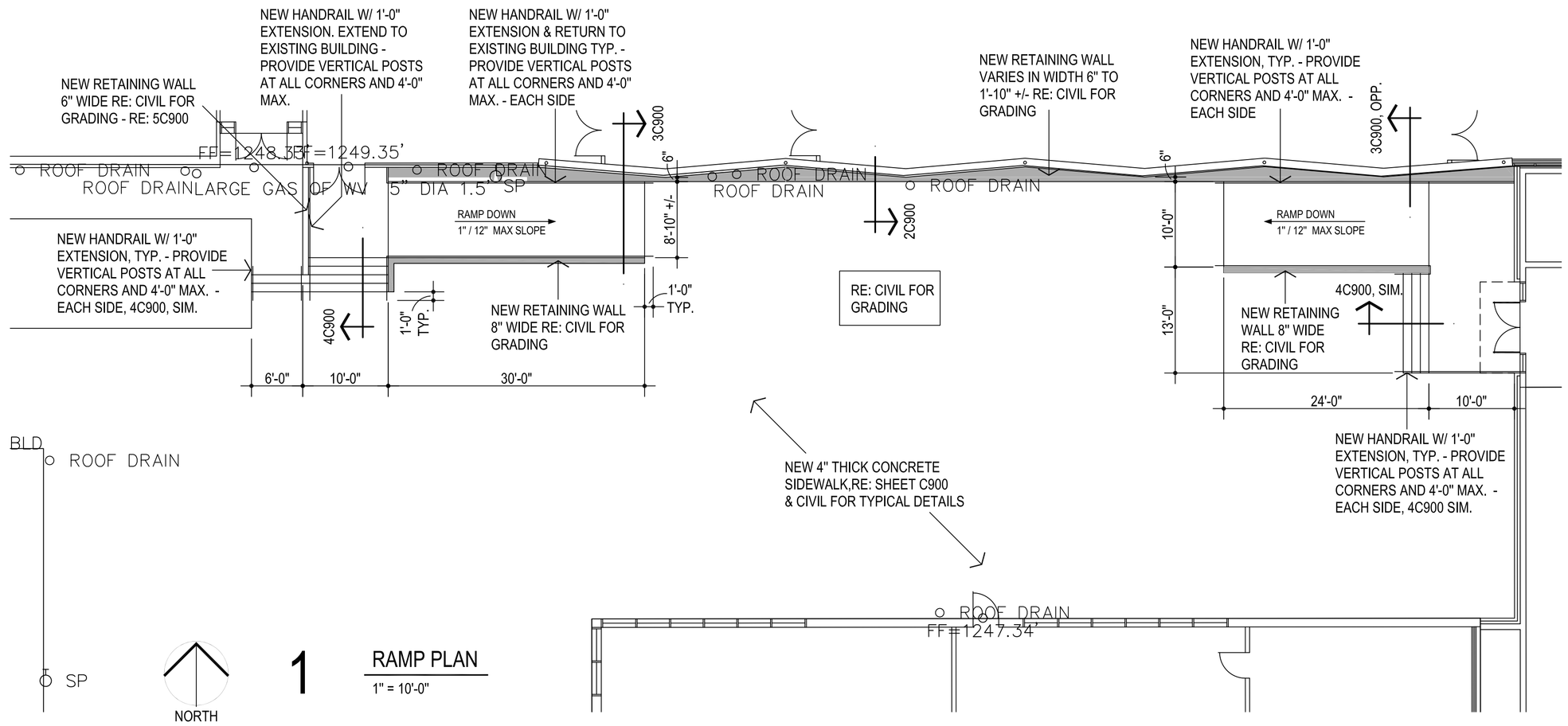
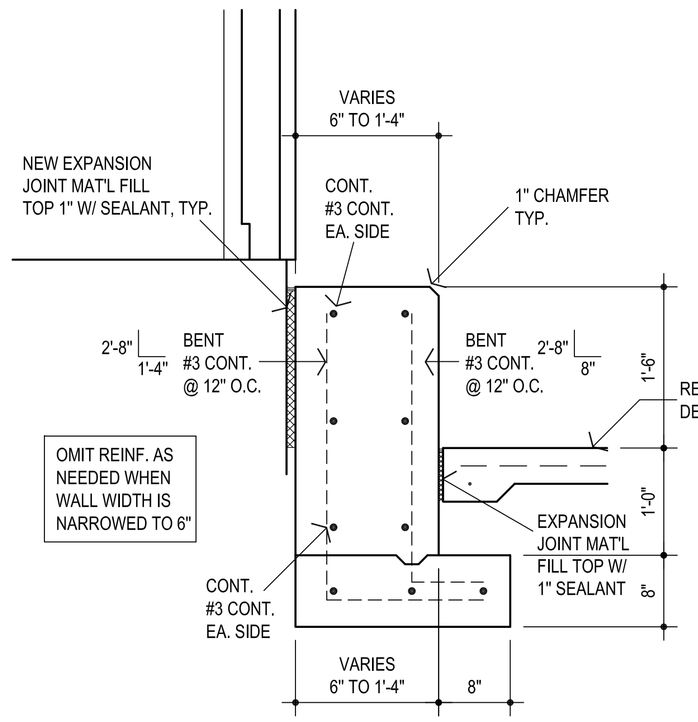


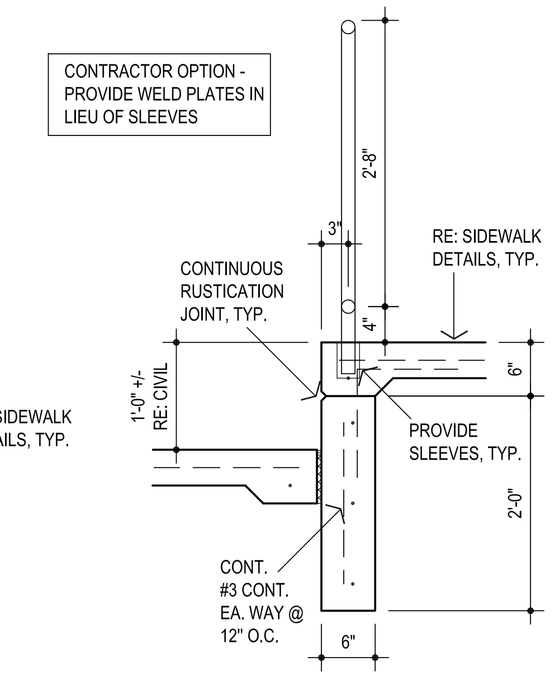
1 RAMP PLAN

1" = 10'-0"



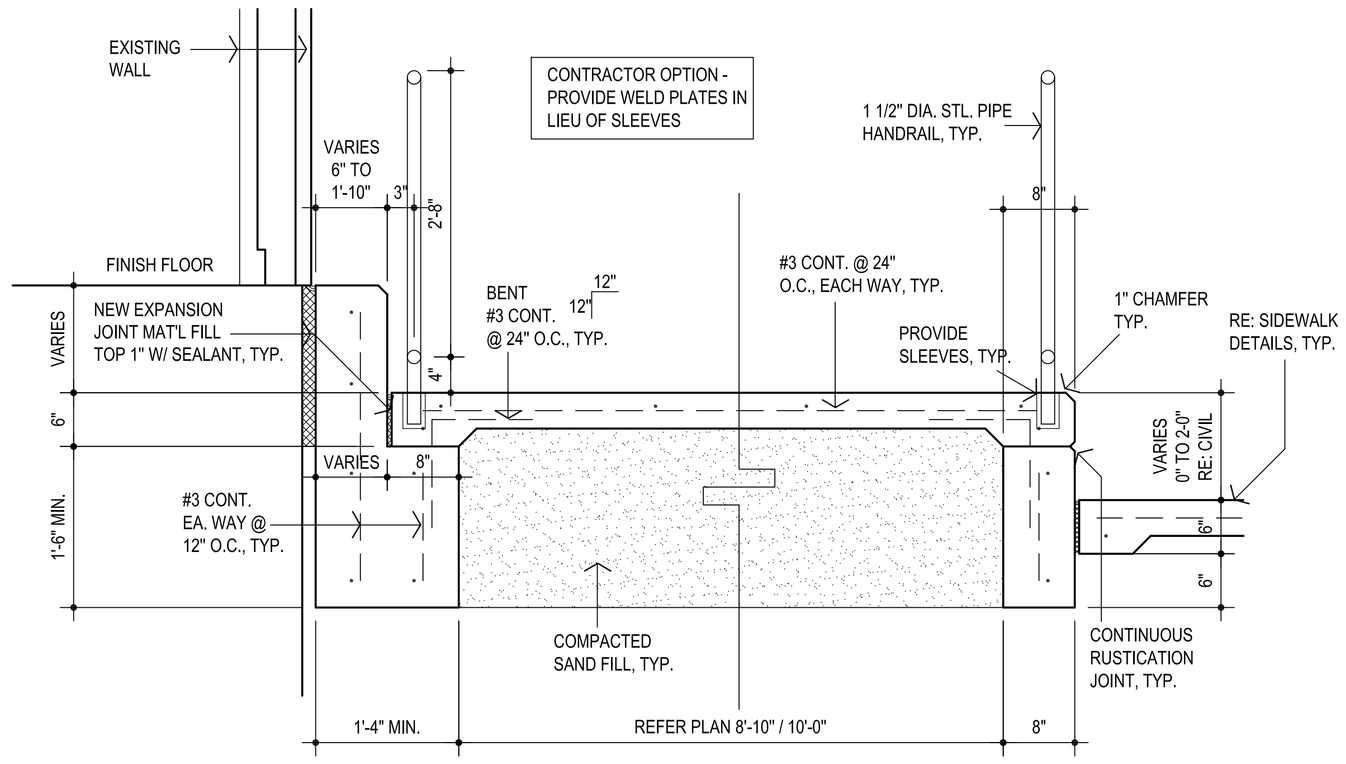
2 RETAINING WALL SECTION

1"= 1'-0"



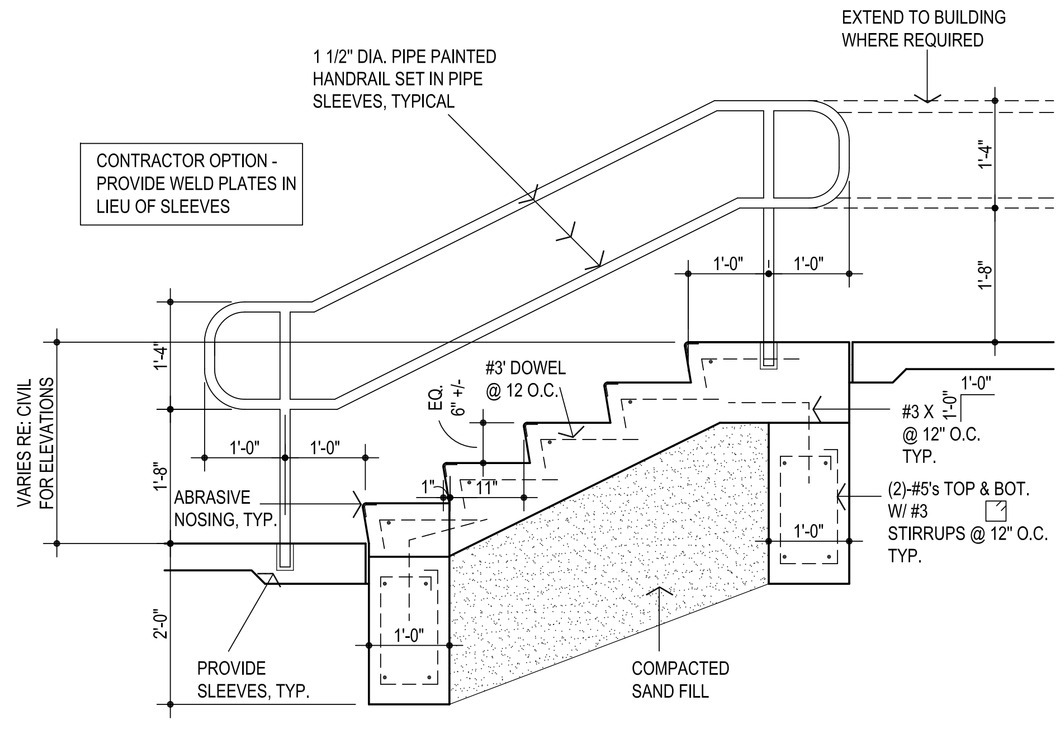
5 SECTION

1"= 1'-0"



3 RAMP SECTION

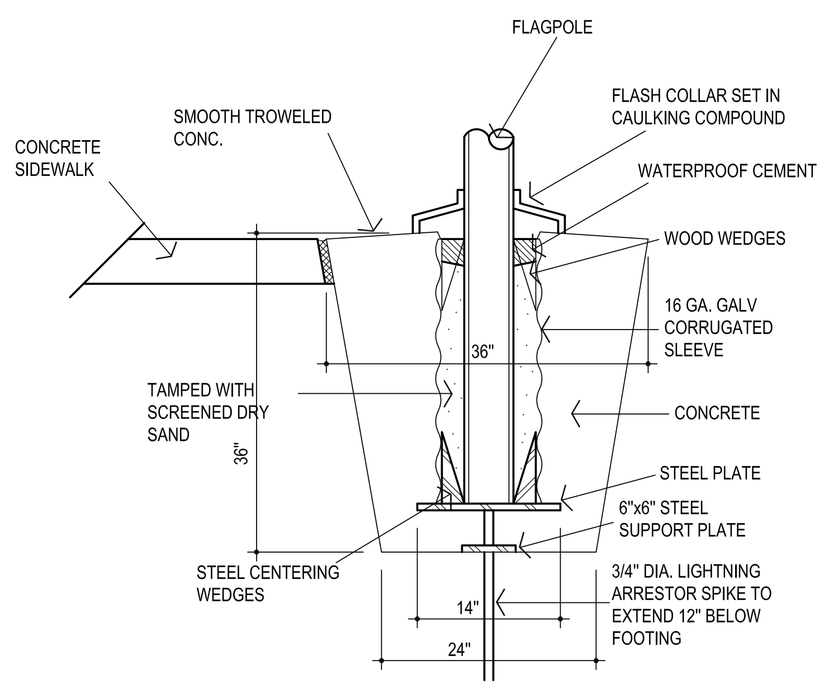
1"= 1'-0"



4 STEP SECTION

3/4"= 1'-0"

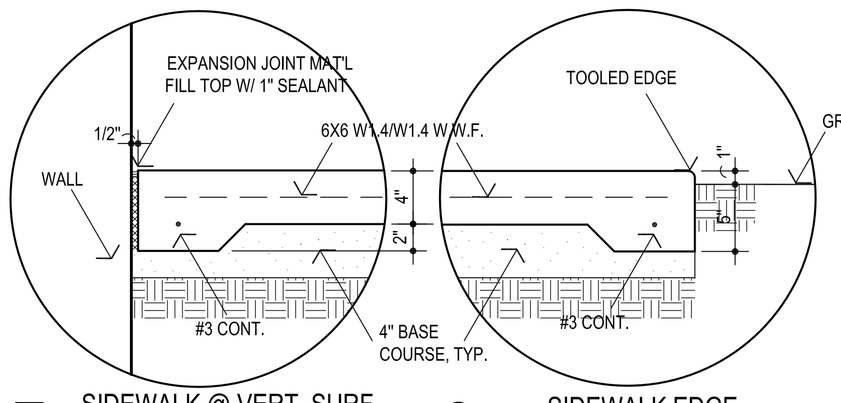
NOTE :
CONTRACTOR SHALL COORDINATE ALL FINAL ELEVATIONS W/ ARCHITECT - RE: SHEET 1C900 FOR STAIR PLANS



6 FLAG POLE

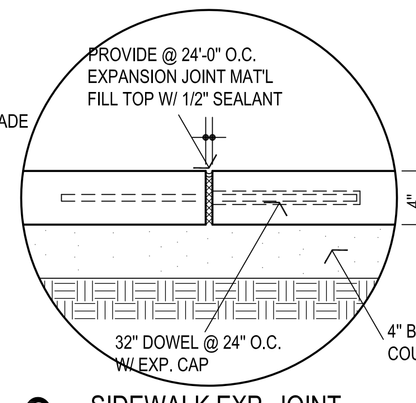
NOT TO SCALE

COORDINATE LOCATION WITH ARCHITECT

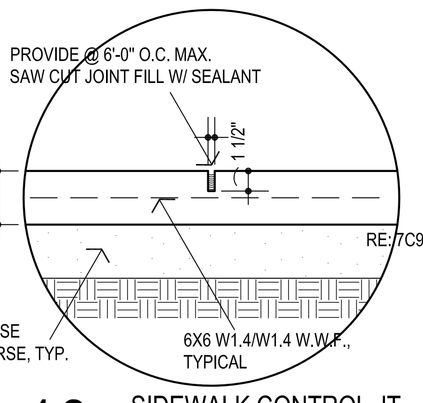


7 SIDEWALK @ VERT. SURF.

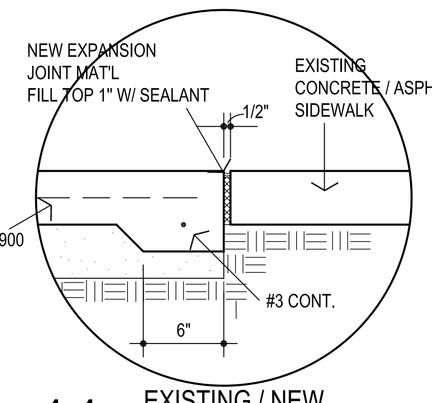
8 SIDEWALK EDGE



9 SIDEWALK EXP. JOINT



10 SIDEWALK CONTROL JT.



11 EXISTING / NEW CONCRETE SIDEWALK

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RAMP PLAN

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1) GENERAL INFORMATION

A. GOVERNING BUILDING CODE: IBC-2018 "INTERNATIONAL BUILDING CODE" WITH CITY OF OKLAHOMA CITY AMENDMENTS.

B. BUILDING RISK CATEGORY: THE BUILDING RISK CATEGORY ACCORDING TO IBC-2018 TABLE 1604.5 AND ASCE 7-16 TABLE 1.5-1 IS CATEGORY II.

C. ELEVATIONS: REFERENCE FINISHED FLOOR ELEVATIONS OF 100'-0" EQUALS ACTUAL EXISTING FINISH FLOOR ELEVATION OF 1249.33'.

D. CONTRACT DOCUMENTS:

1) THE CONTRACT DOCUMENTS CONSIST OF THE AGREEMENT BETWEEN THE OWNER AND CONTRACTOR, CONDITIONS OF THE CONTRACT, DRAWINGS, SPECIFICATIONS, ADDENDA ISSUED PRIOR TO EXECUTION OF THE CONTRACT, OTHER DOCUMENTS LISTED IN THE AGREEMENT AND MODIFICATIONS ISSUED AFTER EXECUTION OF THE CONTRACT.

2) THE GENERAL CONTRACTOR IS RESPONSIBLE FOR OBTAINING AND DISSEMINATING ALL CONTRACT DOCUMENTS AND LATEST ADDENDA TO ALL SUB-CONTRACTORS PRIOR TO DETAILING, FABRICATION, OR INSTALLATION OF WORK.

3) CORRELATION OF THE CONTRACT DOCUMENTS: THE CONTRACT DOCUMENTS ARE COMPLEMENTARY, AND WHAT IS REQUIRED BY ONE SHALL BE AS BINDING AS IF REQUIRED BY ALL. IF CONFLICTING REQUIREMENTS ARE FOUND BETWEEN THE DRAWINGS, SPECIFICATIONS AND/OR THESE GENERAL NOTES, THE MORE STRINGENT AND HIGHEST COST REQUIREMENT SHALL CONTROL UNLESS DIRECTED OTHERWISE IN WRITING BY THE OWNER'S REPRESENTATIVE.

4) THE GENERAL CONTRACTOR SHALL COMPARE THE ARCHITECTURAL AND STRUCTURAL DRAWINGS FOR DISCREPANCIES BETWEEN EACH SET, AND WITHIN EACH SET OF DRAWINGS, AND REPORT DISCREPANCIES, IF ANY, TO THE OWNER'S REPRESENTATIVE PRIOR TO THE DETAILING, FABRICATION, AND INSTALLATION OF AFFECTED WORK.

5) GENERAL CONTRACTOR SHALL COORDINATE SIZES AND LOCATIONS OF OPENINGS THROUGH FLOORS, ROOF, AND WALLS SHOWN ON ELECTRICAL, PLUMBING, AND FIRE SUPPRESSION SYSTEM DESIGN DOCUMENTS WITH ASSOCIATED SUBCONTRACTORS.

6) ALTHOUGH NOT NECESSARILY SPECIFICALLY REFERENCED IN THE CONTRACT DOCUMENTS, TYPICAL DETAILS AND GENERAL NOTES APPLY TO THE ENTIRE PROJECT WHEREVER CONDITIONS SIMILAR TO THOSE DETAILED OR NOTED EXIST.

7) THE USE OF ELECTRONIC FILES OR REPRODUCTION OF CONTRACT DOCUMENTS BY ANY TRADE OR MATERIAL SUPPLIER IN LIEU OF COMPLETELY INDEPENDENT PREPARATION OF SHOP DRAWINGS SIGNIFIES THE SUPPLIER'S CERTIFICATION THAT ALL INFORMATION SHOWN IN THE SHOP DRAWINGS IS CORRECT, AND ASSIGNS THEMSELVES TO RESPONSIBILITY FOR ANY JOB EXPENSE ARISING DUE TO ANY ERRORS OCCURRING THEREIN.

E. FIELD MODIFICATIONS: CONTRACTOR OR SUBCONTRACTOR FIELD MODIFICATIONS TO THE STRUCTURE WITHOUT THE PRIOR WRITTEN CONSENT OF THE STRUCTURAL ENGINEER ARE EXPRESSLY PROHIBITED AND MAY REQUIRE SUBSEQUENT REMEDIATION DIRECTED BY THE STRUCTURAL ENGINEER AT CONTRACTOR'S EXPENSE.

2) DESIGN LOADS

A. GOVERNING STANDARD FOR DESIGN LOADS: ASCE 7-16 "MINIMUM DESIGN LOADS FOR BUILDINGS AND OTHER STRUCTURES"

B. DEAD LOAD: SELF WEIGHT OF MATERIALS, UNLESS NOTED OTHERWISE

C. ROOF DEAD LOAD:
1) BUILT-UP ROOFING SYSTEM.....6 PSF
2) RIGID INSULATION.....2 PSF
3) METAL ROOF DECK.....3 PSF
4) JOIST SELF-WEIGHT.....2 PSF
5) CEILING SYSTEM.....2 PSF
6) ROOF COLLATERAL (MEP, BRIDGING & MISC. FRAMING).....5 PSF
7) TOTAL.....20 PSF

D. UNIFORM LIVE LOADS:
1) ROOF LIVE LOAD (UNREDUCIBLE).....20 PSF
2) SLAB-ON-GRADE.....250 PSF

E. CONCENTRATED LIVE LOADS:
1) ROOFS (ON AN AREA 2.5 FT. X 2.5 FT.).....300 LBS

F. WIND LOADS:
1) RISK CATEGORY: II
2) EXPOSURE CATEGORY:.....C
3) ENCLOSURE CLASSIFICATION.....ENCLOSED
4) INTERNAL PRESSURE COEFFICIENT, GCPI:.....+/- 0.18
5) TOPOGRAPHIC FACTOR, KZT:.....1.0
6) DIRECTIONALITY FACTOR, KD:.....0.85
7) ULTIMATE DESIGN WIND SPEED, Vult:.....109 MPH
8) NOMINAL DESIGN WIND SPEED, Vasd:.....90 MPH

G. SNOW LOADS:
1) SNOW IMPORTANCE FACTOR, Is:.....1.0
2) GROUND SNOW LOAD, Pg:.....10 PSF
3) EXPOSURE OF ROOF: .....PARTIALLY EXPOSED
4) SURFACE ROUGHNESS CATEGORY:.....C
5) EXPOSURE FACTOR, Ce:.....1.0
6) THERMAL FACTOR, Ct:.....1.0
7) ROOF SLOPE FACTOR, Cs:.....1.0
8) CALCULATED FLAT ROOF SNOW LOAD, Pf:.....7.0 PSF
9) MINIMUM FLAT ROOF SNOW LOAD, I*Pg:.....10 PSF
10)RAIN ON SNOW SURCHARGE LOAD:.....5 PSF

H. RAIN LOADS:
1) 15-MINUTE RAIN INTENSITY.....8.72 INCHES/HOUR
2) 60-MINUTE RAIN INTENSITY.....4.44 INCHES/HOUR
3) DEPTH OF WATER ON THE UNDEFLECTED ROOF UP TO THE INLET OF THE SECONDARY DRAINAGE SYSTEM WHEN THE PRIMARY DRAINAGE SYSTEM IS BLOCKED (I.E., THE STATIC HEAD), ds.....4.0 INCHES
4) ADDITIONAL DEPTH OF WATER ON THE UNDEFLECTED ROOF ABOVE THE INLET OF THE SECONDARY DRAINAGE SYSTEM AT ITS DESIGN FLOW (I.E., THE HYDRAULIC HEAD), dh.....2.0 INCHES

I. SEISMIC DESIGN CRITERIA:
1) RISK CATEGORY:.....II
2) SEISMIC IMPORTANCE FACTOR, Ie:.....1.00
3) SOIL SITE CLASSIFICATION:.....C
4) 0.2 SEC. MAPPED SPECTRAL ACCELERATION, Ss:.....0.271
5) 1.0 SEC. MAPPED SPECTRAL ACCELERATION, S1:.....0.079
6) SITE COEFFICIENT, 0.2 SEC. PERIOD, Fa:.....1.20
7) SITE COEFFICIENT, 1.0 SEC. PERIOD, Fv:.....1.70
8) 0.2 SEC. DESIGN SPECTRAL ACCELERATION, Sds:.....0.217
9) 1.0 SEC. DESIGN SPECTRAL ACCELERATION, Sd1:.....0.089
10)SEISMIC DESIGN CATEGORY:.....B
11)SEISMIC PARAMETERS FOR BUILDING:
A) SEISMIC FORCE RESISTING SYSTEM: ORDINARY REINFORCED MASONRY SHEAR WALLS
B) RESPONSE MODIFICATION COEFFICIENT, R:.....2.00
C) SYSTEM OVERSTRENGTH FACTOR, O:.....2.00
D) DEFLECTION AMPLIFICATION FACTOR, Cd:.....1.75
E) ANALYSIS PROCEDURE: EQUIVALENT LATERAL FORCE METHOD.
F) SEISMIC RESPONSE COEFFICIENT, Cs:.....0.110
G) TOTAL LATERAL BASE SHEAR, V:.....95 KIPS

3) MATERIAL DESIGN VALUES

A. CONCRETE (MIN. COMPRESSIVE STRENGTH AT 28 DAYS, NORMAL WEIGHT U.N.O.)
1) FOUNDATIONS:.....3,500 PSI
2) WALLS:.....4,000 PSI
3) SLABS-ON-GRADE:.....4,000 PSI
4) ELEVATED SLABS ON METAL DECK.....4,000 PSI
5) ALL OTHER STRUCTURAL CONCRETE, U.N.O:.....4,000 PSI

B. REINFORCED CONCRETE MASONRY
1) DETERMINATION OF COMPRESSIVE STRENGTH:.....UNIT STRENGTH METHOD
2) DESIGN COMPRESSIVE STRENGTH OF CONCRETE MASONRY, f'm:...2,000 PSI
3) NET AREA COMPRESSIVE STRENGTH OF CONCRETE MASONRY UNITS (ASTM C90).....2,000 PSI
4) MORTAR (ASTM C270, PROPORTION SPECIFICATION, TYPE S)....1,800 PSI
5) GROUT (ASTM C476, PROPORTION SPECIFICATION).....2,000 PSI

C. CONCRETE AND MASONRY REINFORCEMENT (MINIMUM YIELD STRENGTH)
1) ALL PLAIN AND DEFORMED BARS (ASTM A615, GRADE 60).....FY = 60 KSI
2) WELDED PLAIN WIRE REINFORCEMENT (ASTM A1064).....FY = 65 KSI
3) WELDED DEFORMED WIRE REINFORCEMENT (ASTM A1064).....FY = 70 KSI
4) WELDABLE REINFORCING BARS (ASTM A706) .....FY = 60 KSI

D. STRUCTURAL STEEL (MINIMUM YIELD STRENGTH)
1) ALL WIDE FLANGE SHAPES (ASTM A992).....FY = 50 KSI
2) SQUARE AND RECTANGULAR HSS (ASTM A500, GRADE C).....FY = 50 KSI
3) ROUND HSS (ASTM A500, GRADE C).....FY = 46 KSI
4) PIPES (ASTM A53, GRADE B).....FY = 35 KSI
5) ANCHOR RODS (ASTM F1554, GRADE 55, SUPPLEMENTARY REQUIREMENT S1, WELDABLE).....FY = 55 KSI
6) DEFORMED BAR ANCHORS (AWS D1.1 TYPE C, ASTM A1064)....FY = 70 KSI
7) HEADED STUD ANCHORS (AWS D1.1 TYPE B, ASTM A29, GRADES 1010 THROUGH 1020).....FY = 51 KSI
8) ALL OTHER SHAPES AND PLATES UNLESS NOTED (ASTM A36)...FY = 36 KSI (FABRICATOR MAY OPTIONALLY USE ASTM A572-50 PLATE MATERIAL)

E. COLD FORMED STEEL (MINIMUM YIELD STRENGTH)
1) ROOF DECK (ASTM A653, SS GRADE 33, G-60 GALVANIZED)...FY = 33 KSI
2) COMPOSITE FLOOR DECK (ASTM A653, SS GRADE 40, G-60 GALVANIZED).....FY = 40 KSI
3) COLD FORMED METAL STUDS, 43 MIL AND LIGHTER (ASTM A1003/A, GRADE ST33H, G-60 GALVANIZED).....FY = 33 KSI
4) COLD FORMED METAL STUDS, 54 MIL AND HEAVIER (ASTM A1003/A, GRADE ST50H, G-60 GALVANIZED).....FY = 50 KSI
5) COLD FORMED METAL CLIPS (ASTM A653, SS GRADE 50,G-90 GALVANIZED).....FY = 50 KSI

4) CONSTRUCTION LOADS AND STABILITY

A. THE CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFYING ALL TEMPORARY CONSTRUCTION LOADS CAN BE SAFELY SUPPORTED BY THE STRUCTURE DURING CONSTRUCTION.

B. THE STRUCTURAL FRAMING SYSTEM AND FOUNDATIONS HAVE BEEN DESIGNED AS A COMPLETE STRUCTURAL SYSTEM FOR SUPPORT OF THE LOADS INDICATED IN THE CONSTRUCTION DOCUMENTS. THE STRUCTURE HAS NOT BEEN DESIGNED OR CHECKED FOR TEMPORARY CONSTRUCTION LOADS NOR HAS IT BEEN DESIGNED OR CHECKED FOR ADEQUACY OR STABILITY AS A PARTIALLY ERECTED STRUCTURE.

C. THE CONTRACTOR SHALL BE RESPONSIBLE FOR CONFIRMING THE ABILITY OF THE PARTIALLY COMPLETED OR FULLY COMPLETED STRUCTURE TO RESIST ALL CONSTRUCTION LOADS INCLUDING BUT ARE NOT NECESSARILY LIMITED TO MATERIAL STAGING, PERSONNEL, AND EQUIPMENT.

D. THE CONTRACTOR SHALL PROVIDE TEMPORARY SHORES, GUYS, BRACES, AND OTHER SUPPORTS DURING CONSTRUCTION TO KEEP STRUCTURAL FRAMING COMPONENTS SECURE, PLUMB, AND IN ALIGNMENT AGAINST TEMPORARY CONSTRUCTION LOADS AND LOADS EQUAL IN INTENSITY TO DESIGN LOADS. THE TEMPORARY SUPPORTS SHALL BE SUFFICIENT TO SECURE THE PARTIALLY ERECTED STRUCTURE OR ANY PORTION THEREOF AGAINST LOADS THAT ARE LIKELY TO BE ENCOUNTERED DURING CONSTRUCTION, INCLUDING THOSE DUE TO WIND AND THOSE THAT RESULT FROM CONSTRUCTION OPERATIONS.

E. THE CONTRACTOR SHALL NOT REMOVE TEMPORARY SUPPORTS UNTIL THE INSTALLATION OF ALL STRUCTURAL ELEMENTS IS COMPLETE AND HAS BEEN ACCEPTED AS COMPLETE BY THE ENGINEER. FOR THE PURPOSES OF THIS PARAGRAPH, "ALL STRUCTURAL ELEMENTS" INCLUDES, BUT IS NOT NECESSARILY LIMITED TO, THE FOLLOWING STRUCTURAL ELEMENTS:
1) FOUNDATIONS
2) CAST-IN-PLACE CONCRETE COLUMNS, BEAMS WALLS AND ELEVATED SLABS
3) LOAD-BEARING MASONRY WALLS
4) MASONRY SHEAR WALLS
5) STRUCTURAL STEEL FRAMING WITH COMPLETED STEEL CONNECTIONS, INCLUDING PERMANENT VERTICAL AND/OR HORIZONTAL BRACING
6) STEEL JOISTS INCLUDING JOIST BRIDGING
7) ROOF DECK
8) FLOOR DECK
9) CONCRETE SLABS ON METAL DECK

5) EXISTING CONSTRUCTION

A. ALL VERTICAL AND HORIZONTAL DIMENSIONS, FINISHED FLOOR AND ROOF ELEVATIONS, PLUMBNESS, AND DETAILS FOR THE EXISTING STRUCTURE SHALL BE VERIFIED IN THE FIELD PRIOR TO PROCEEDING WITH ANY DEMOLITION OR INSTALLATION OF NEW WORK.

B. PRIOR TO DEMOLITION OR INSTALLATION OF NEW WORK, THE CONTRACTOR SHALL MAKE WRITTEN DOCUMENTATION IF UNFORESEEN CONDITIONS OCCUR IN THE EXISTING CONSTRUCTION. THESE UNFORESEEN CONDITIONS SHALL BE SUBMITTED TO THE OWNER'S REPRESENTATIVE FOR REVIEW AND A WRITTEN RESPONSE BEFORE PROCEEDING WITH THE WORK.

C. THE CONTRACTOR SHALL PROVIDE AND INSTALL ALL SHORING, PROPS, AND GUYS REQUIRED FOR THE TEMPORARY SUPPORT OF THE EXISTING STRUCTURE, UTILITIES, ETC. AS MAY BE NECESSARY TO SAFELY COMPLETE DEMOLITION OR NEW WORK.

D. THE CONTRACTOR SHALL BE RESPONSIBLE FOR LOCATING EXISTING UTILITIES, BOTH CHARTED AND UNCHARTED BEFORE COMMENCING WITH ANY EXCAVATION OR DEMOLITION WORK. DEPTH OF CONCRETE SAW SHALL BE SET SO AS NOT TO CUT ANY LOCAL EMBEDDED OR UNDER-FLOOR PIPING OR WIRING WHICH IS TO REMAIN.

E. ALL DRILLING, CUTTING, DEMOLITION OR OTHER MODIFICATIONS TO EXISTING CONSTRUCTION SHALL BE PERFORMED IN A MANNER THAT WILL NOT REDUCE THE STABILITY OR STRUCTURAL INTEGRITY OF THE EXISTING CONSTRUCTION. WHEN SAW CUTTING, SPECIAL CARE SHALL BE TAKEN TO NOT OVER CUT INTO AN EXISTING AREA OF STRUCTURE THAT WILL REMAIN.

F. CORING FOR PIPING OR CONDUIT THROUGH EXISTING STRUCTURAL MEMBERS IS NOT ALLOWED UNLESS SPECIFICALLY SHOWN IN THE CONTRACT DOCUMENTS OR SPECIFICALLY ALLOWED BY THE STRUCTURAL ENGINEER IN WRITING.

G. DAMAGE TO PORTIONS OF THE EXISTING STRUCTURE OR OTHER EXISTING BUILDING COMPONENTS CAUSED BY DEMOLITION OPERATIONS SHALL BE REPAIRED BY THE CONTRACTOR AT THE CONTRACTOR'S EXPENSE AND TO A LEVEL ACCEPTABLE TO THE OWNER'S REPRESENTATIVE.

H. WHEN EXISTING FOUNDATIONS ARE TO BE DEMOLISHED, EXCAVATION DEPTHS EXCEEDING 4 FEET SHALL BE BACKFILLED WITH PROPERLY COMPACTED CRUSHED STONE OR FLOWABLE FILL TO WITHIN 4 FEET OF THE REQUIRED FINISHED BACKFILL ELEVATION. THE REMAINING DEPTH OF BACKFILL SHALL BE COMPLETED WITH PROPERLY COMPACTED STRUCTURAL FILL AS OUTLINED IN THE FOUNDATION NOTES.

I. THE PROJECT AREA SHALL BE MAINTAINED AS CLEAN AS POSSIBLE WITH DUST BEING LIMITED AS MUCH AS PRACTICAL.

6) DEFERRED SUBMITTALS

A. SOME STRUCTURAL AND/OR OTHER BUILDING ELEMENTS ARE DESIGNATED AS VENDOR-DESIGNED IN THE CONSTRUCTION DOCUMENTS. THESE ELEMENTS HAVE NOT BEEN INCLUDED IN THE BUILDING PERMIT ISSUED BY THE BUILDING OFFICIAL AND REQUIRE THEIR DESIGN BE SUBSTANTIATED BY DEFERRED SUBMITTALS.

B. DEFERRED DESIGN SUBMITTALS ARE TO BE SUBMITTED TO THE OWNER'S REPRESENTATIVE AND SHALL INCLUDE BOTH SHOP DRAWINGS AND SIGNED AND SEALED CALCULATIONS PERFORMED BY AN ENGINEER LICENSED IN THE STATE WHERE THE PROJECT IS LOCATED AND EXPERIENCED IN THE DESIGN OF THE SPECIFIC BUILDING ELEMENT BEING SUBMITTED. THE FOLLOWING ITEMS ARE CONSIDERED DEFERRED SUBMITTALS:
1) FORMWORK SHORING AND RESHORING
2) STEEL JOISTS
3) COLD-FORMED METAL FRAMING SYSTEMS
4) TEMPORARY BRACING OF CONCRETE WALLS
5) ROOF MOUNTED EQUIPMENT AND ASSOCIATED ANCHORAGES
6) ANALYSIS OF CONCRETE SLABS FOR SUPPORT OF PROPOSED LIFT EQUIPMENT (FOR KFC FILE ONLY, WILL NOT BE REVIEWED AND RETURNED)
7) EXTERIOR WINDOW AND/OR CURTAIN WALL SYSTEMS
8) WINDOW WASHING AND FALL ARREST SYSTEMS

C. DOCUMENTS FOR DEFERRED SUBMITTAL ITEMS SHALL BE SUBMITTED TO THE OWNER'S REPRESENTATIVE WHO SHALL REVIEW THEM AND FORWARD THEM TO THE BUILDING OFFICIAL WITH A NOTATION INDICATING THAT THE DEFERRED SUBMITTAL DOCUMENTS HAVE BEEN REVIEWED AND FOUND TO BE IN GENERAL CONFORMANCE TO THE DESIGN OF THE BUILDING.

D. THE DEFERRED SUBMITTAL ITEMS SHALL NOT BE INSTALLED UNTIL THE DEFERRED SUBMITTAL DOCUMENTS HAVE BEEN APPROVED BY BOTH THE OWNER'S REPRESENTATIVE AND THE BUILDING OFFICIAL.

E. ADDITIONAL ITEMS IMPACTING STRUCTURAL DESIGN, INCLUDING BUT NOT LIMITED TO, ELEVATORS AND MECHANICAL EQUIPMENT WEIGHTS, SHALL BE SUBMITTED TO OWNER'S REPRESENTATIVE FOR EVALUATION

7) FOUNDATION NOTES

A. GEOTECHNICAL REPORT: A GEOTECHNICAL ENGINEERING SERVICES REPORT FOR THE CENTRAL JUNIOR HIGH SCHOOL ADDITION, IN MOORE, OKLAHOMA WAS PERFORMED BY PROFESSIONAL SERVICES INDUSTRIES, INC (PSI), DATED APRIL 22, 2020 (PSI PROJECT NUMBER: 05462142-2).

B. SITE SUB-GRADE PREPARATION:

1) STRIPPING: SITE PREPARATION FOR THE BUILDING PAD SHALL INCLUDE REMOVING ANY SOFT OR UNSUITABLE MATERIALS ENCOUNTERED DURING CONSTRUCTION. VEGETATION ROOTS, PAVEMENTS, UTILITIES, GRAVEL, EXISTING FOOTINGS, EXISTING SLABS AND ANY TOPSOIL WILL REQUIRE REMOVAL DURING INITIAL SITE STRIPPING. REMOVAL DEPTHS SHALL BE DETERMINED BY A GEOTECHNICAL ENGINEER.

2) PROOF-ROLLING: AFTER MAKING ANY REQUIRED CUTS, THE BUILDING PAD SHALL BE PROOF-ROLLED (UNDER OBSERVATION OF A GEOTECHNICAL ENGINEER) WITH A TWENTY FIVE (25) TON LOADED, TANDEM AXLE DUMP TRUCK TO LOCATE ANY SOFT OR UNSTABLE AREAS. THE PROOF-ROLLING SHALL BE PERFORMED WITH OVERLAPPING PASSES IN MUTUALLY PERPENDICULAR DIRECTIONS. SOILS IN AREAS WHERE RUTTING (DEFLECTIONS GREATER THAN 1 INCH) OR PUMPING OCCURS DURING PROOF-ROLLING SHALL BE OVER-EXCAVATED, MOISTURE CONDITIONED AND REPLACED WITH PROPERLY COMPACTED LOW VOLUME CHANGE SOILS AS DIRECTED BY A GEOTECHNICAL ENGINEER.

3) SCARIFICATION: AFTER STRIPPING, EXCAVATING AND PROOF-ROLLING, THE EXPOSED SOILS SHALL BE SCARIFIED TO A DEPTH OF 12 INCHES AND THEN ADJUSTED TO WITHIN 2% POINTS OF THE SOILS OPTIMUM VALUE PRIOR TO BEING COMPACTED TO AT LEAST 95 PERCENT OF THE SOILS MAXIMUM DRY DENSITY AS DETERMINED BY THE STANDARD PROCTOR TEST METHOD (ASTM D-698).

4) ACCEPTABLE FILL: STRUCTURAL FILL MATERIALS SHALL BE FREE OF ORGANIC OR OTHER DELETERIOUS MATTER AND BE A LOW VOLUME CHANGE SOIL OF COHESIVE MATERIALS HAVING A LIQUID LIMIT OF LESS THAN 35 AND A PLASTICITY INDEX BETWEEN 5 AND 15 WITH AT LEAST 60% PASSING THE #200 U.S. STANDARD SIEVE.

5) FILL PLACEMENT: AFTER IN-SITU SOIL PREPARATION AND INSPECTION IS COMPLETE, FILL PLACEMENT TO ESTABLISH SITE DESIGN GRADES MAY BEGIN. THE ZONE OF FILL COMPACTED TO MEET THESE CRITERIA SHALL EXTEND BEYOND THE BUILDING FOOTPRINT AT LEAST 1 FOOT LATERALLY FOR EACH FOOT OF FILL REQUIRED TO DEVELOP DESIGN GRADE, BUT UNDER NO CIRCUMSTANCE SHALL IT BE LESS THAN 5 FEET. THE FILL SHALL BE PLACED IN MAXIMUM LOOSE LIFTS OF 8 INCHES, ADJUSTED TO 1% POINT BELOW TO 2% POINTS ABOVE OF ITS OPTIMUM MOISTURE CONTENT AND COMPACTED TO 95 PERCENT OF THE SOIL'S STANDARD PROCTOR MAXIMUM DRY DENSITY AS DETERMINED BY ASTM D-698.

6) DEPTH OF FILL: THE FLOOR SLAB SHALL BE GRADE SUPPORTED ON A MINIMUM DEPTH OF 2'-6" OF MOISTURE CONDITIONED LOW-PLASTICITY STRUCTURAL FILL.

7) FILL PLACEMENT TESTING: EACH LIFT OF COMPACTED FILL SHALL BE TESTED BY A GEOTECHNICAL ENGINEER PRIOR TO PLACEMENT OF SUBSEQUENT LIFTS. FIELD DENSITY TESTS SHALL BE TAKEN AT A MINIMUM OF ONE PER EVERY 2500 SF, BUT AT LEAST TWO SETS OF DENSITY TESTS SHALL BE TAKEN FOR EACH LIFT.

8) SITE DRAINAGE: THE CONTRACTOR SHALL PROVIDE POSITIVE DRAINAGE AWAY FROM THE AREAS OF EXCAVATION DURING CONSTRUCTION TO PREVENT PONDING UNDER FUTURE FLOOR SLABS AND FOOTINGS. THE CONTRACTOR SHALL PROVIDE POSITIVE CUTOFF IN UTILITY TRENCHES AS REQUIRED TO PREVENT WATER MIGRATION INTO AREAS OF EXCAVATIONS AND FUTURE FLOOR SLABS AND FOOTINGS.

9) MAINTENANCE OF SOIL MOISTURE: SOIL MOISTURE SHALL BE MAINTAINED UP UNTIL CONCRETE PLACEMENT TO PREVENT SHRINKAGE AND SUBSEQUENT POST-CONSTRUCTION SWELL OF SUBGRADE SOILS.

C. SHALLOW FOUNDATIONS:

1) FOOTING DESIGN PARAMETERS: THE PROPOSED BUILDING SHALL BE SUPPORTED ON CONVENTIONAL SHALLOW SPREAD FOOTINGS BASED ON THE FOLLOWING DESIGN PARAMETERS:
A) BEARING MATERIAL: EXISTING NON-EXPANSIVE SOIL OR PROPERLY COMPACTED ENGINEERED FILL AS OUTLINED ABOVE
B) ALLOWABLE BEARING PRESSURE FOR SPOT FOOTINGS: 2500 PSF
C) ALLOWABLE BEARING PRESSURE FOR CONTINUOUS FOOTINGS: 2000 PSF

2) OBSERVATION OF BEARING CONDITIONS: A REPRESENTATIVE OF THE GEOTECHNICAL ENGINEER SHALL OBSERVE THE FOUNDATION EXCAVATIONS PRIOR TO STEEL OR CONCRETE PLACEMENT TO DETERMINE IF THE FOUNDATION MATERIALS ARE CAPABLE OF SUPPORTING THE DESIGN LOADS AND ARE CONSISTENT WITH THE MATERIALS DISCUSSED ABOVE.

3) IMPROVEMENT OF BEARING CONDITIONS: SOFT OR LOOSE SOIL ZONES ENCOUNTERED AT THE BOTTOM OF THE FOOTING EXCAVATIONS SHALL BE REMOVED TO THE LEVEL OF STIFF OR DENSE SOIL AS DIRECTED BY THE GEOTECHNICAL ENGINEER. CAVITIES FORMED AS A RESULT OF EXCAVATION OF SOFT OR LOOSE SOIL ZONES SHALL BE BACKFILLED WITH ENGINEERED FILL, LEAN CONCRETE OR FLOWABLE FILL, AS DETERMINED BY THE GEOTECHNICAL ENGINEER. CARE SHALL BE TAKEN TO PREVENT WETTING OR DRYING OF THE BEARING MATERIALS DURING CONSTRUCTION. ANY EXTREMELY WET OR DRY MATERIAL, OR ANY LOOSE OR DISTURBED MATERIAL IN THE BOTTOM OF THE FOOTING EXCAVATIONS SHALL BE REMOVED PRIOR TO PLACING CONCRETE.

4) ANTICIPATED SETTLEMENT: IT IS ESTIMATED THAT FOUNDATIONS CONSTRUCTED IN ACCORDANCE WITH THE ABOVE RECOMMENDATIONS WILL EXPERIENCE TOTAL SETTLEMENTS GENERALLY LESS THAN 1-INCH WITH DIFFERENTIAL SETTLEMENTS GENERALLY LESS THAN ¾ INCHES WITHIN THE BUILDING AREA. ADDITIONAL SETTLEMENT OF APPROXIMATELY 1 TO 2 PERCENT OF PLACED FILL HEIGHT IS ALSO ANTICIPATED.

5) TRENCHED FOOTINGS: EARTH-FORMED TRENCHED FOOTINGS ARE PERMITTED, EXCEPT WHERE BRICK LEDGES OR EXPOSED SURFACES REQUIRE FORMING AND/OR WHERE SOIL SIDE WALLS SLOUGH INTO THE TRENCH. IN ORDER TO ACHIEVE 3" MINIMUM CONCRETE COVER OVER STEEL REINFORCING ON SIDEWALLS, EARTH FORMED TRENCHES SHALL BE A MINIMUM OF 2" WIDER THAN THE FORMED DIMENSIONS SHOWN IN ALL SECTIONS AND DETAILS.

6) PIPE PENETRATIONS: ALL HORIZONTAL PIPE OR SIMILAR PENETRATIONS OR SLEEVES THROUGH FOOTINGS SHALL PREFERABLY OCCUR WITHIN THE MIDDLE 1/3 OF THE FOOTING DEPTH AND SHALL HAVE A MAXIMUM OPENING DIAMETER OF ONE-FOURTH THE FOOTING DEPTH. AT PENETRATIONS, PROVIDE (4) #5 DIAGONAL BARS AT EACH FOOTING FACE (3" CLEAR BETWEEN BAR AND PENETRATION AND 3" CLEAR FROM FOOTING BEARING). IF PENETRATION MUST OCCUR NEAR THE BOTTOM OF FOOTING, REFER TYPICAL DETAILS FOR STANDARD DETAIL TO TRANSITION & THICKEN FOOTING TO ACCOMMODATE PENETRATION.

D. SLAB-ON-GRADE CONSTRUCTION

1) SLAB THICKNESS AND REINFORCING: SLABS-ON-GRADE SHALL BE 4" THICK CONCRETE REINFORCED WITH #3 BARS AT 15" ON CENTER EACH WAY. REINFORCING BARS SHALL BE PLACED 1½" CLEAR FROM TOP OF SLAB USING CHAIRS OR SLAB BOLSTERS COMPLYING WITH CRSI'S "MANUAL OF STANDARD PRACTICE".

2) SLAB SUBGRADE: THE FLOOR SLAB SHALL BE GRADE-SUPPORTED AS OUTLINED IN THE SITE SUB-GRADE PREPARATION NOTES SHOWN ABOVE.

3) CONSTRUCTION MONITORING: CONSTRUCTION ACTIVITY MAY CAUSE DAMAGE AND DETERIORATION TO THE PREPARED SUBGRADE. A FIELD REPRESENTATIVE OF THE GEOTECHNICAL ENGINEER SHALL OBSERVE THE FINAL SUBGRADE PRIOR TO PLACEMENT OF THE SLAB ON GRADE, PERFORM FURTHER TESTING AS NECESSARY, AND DETERMINE IF ANY REMEDIAL MEASURES ARE NECESSARY PRIOR TO SLAB PLACEMENT.

4) AGGREGATE BASE COURSE: A 4-INCH THICK, FREE-DRAINING AGGREGATE BASE COURSE SHALL BE PLACED BENEATH THE FLOOR SLAB TO ENHANCE DRAINAGE AND PROVIDE INCREASED SUBGRADE STRENGTH. AT THE TIME OF THE SLAB PLACEMENT, THE GRANULAR BASE SHALL BE MOIST, BUT FREE OF ANY STANDING OR SELF-DRAINING WATER. THE AGGREGATE BASE COURSE MATERIAL SHALL MEET THE FOLLOWING CRITERIA:
A)100 PERCENT SHALL PASS THE 1½" SIEVE
B) LESS THAN 5 PERCENT SHALL PASS THE #8 SIEVE
C)PLASTICITY INDEX, PI, SHALL BE LESS THAN OR EQUAL TO 6
D) COMPACTED TO 98% STANDARD PROCTOR MAXIMUM DRY DENSITY.

5) VAPOR RETARDER: A 15 MIL VAPOR RETARDER SHALL BE PLACED IMMEDIATELY BELOW THE CONCRETE SLAB. VAPOR RETARDER SHALL BE SEALED AT ALL LAPS AND SEALED TO PREVIOUSLY PLACED CONCRETE AS RECOMMENDED BY VAPOR RETARDER MANUFACTURER. BEFORE PLACING CONCRETE, PATCH AND SEAL ANY RIPS, TEARS OR HOLES IN VAPOR RETARDER INCURRED DURING CONSTRUCTION.

6) EVAPORATION RETARDER: UNIFORMLY APPLY EVAPORATION RETARDER TO CONCRETE SURFACES IF HOT, DRY, OR WINDY CONDITIONS CAUSE MOISTURE LOSS DUE TO EVAPORATION APPROACHING 0.2 LB/SQ.FT./H BEFORE AND DURING FINISHING OPERATIONS. APPLY ACCORDING TO MANUFACTURER'S WRITTEN INSTRUCTIONS AFTER PLACING, SCREEDING, AND BULL FLOATING OR DARBYING CONCRETE, BUT BEFORE FLOAT FINISHING. A METHODOLOGY FOR CALCULATING THE MOISTURE LOSS DUE TO EVAPORATION IS PROVIDED IN ACI 305.1-14 "SPECIFICATION FOR HOT WEATHER CONCRETING."

7) MOIST CURING OF SLAB: SLABS-ON-GRADE SHALL BE WATER CURED FOR A MINIMUM OF 7 DAYS BY PONDING, SPRAYING, SPRINKLING OR BY USE OF SATURATED COVERINGS. CURING COMPOUNDS ARE EXPRESSLY PROHIBITED.

8) ISOLATION JOINTS: PROVIDE SLAB ISOLATION AROUND COLUMNS PENETRATING THE SLAB-ON-GRADE. PROVIDE 1/2 INCH PREMOLDED EXPANSION JOINT MATERIAL AROUND PERIMETER OF ISOLATION JOINTS. REFER TO TYPICAL DETAILS AND ADDITIONAL INFORMATION.

9) SLAB JOINTS: SLAB JOINTS SHALL BE PROVIDED AS SHOWN ON THE PLANS AND TYPICAL DETAILS AND AS DESCRIBED FURTHER IN THE SLAB-ON-GRADE SCHEDULE. THE FOLLOWING JOINT TYPES ARE SHOWN ON THE DRAWINGS:
A) CJ = CONSTRUCTION JOINT
B) SJ = SAWED CONTRACTION JOINT

E. FOUNDATION MISCELLANEOUS

1) GROUNDWATER CONDITIONS: GROUNDWATER WAS ENCOUNTERED IN SOME OF THE BORINGS AT THE TIME OF DRILLING. IT IS POSSIBLE THAT TRANSIENT OVER-SATURATED GROUND CONDITIONS COULD DEVELOP AT SHALLOWER DEPTHS AT A LATER TIME DUE TO PERIODS OF HEAVY PRECIPITATION, LANDSCAPE WATERING, LEAKING WATER LINES, OR OTHER UNFORESEEN CAUSES. THE CONTRACTOR SHALL DETERMINE THE ACTUAL GROUNDWATER LEVELS AT TIME OF CONSTRUCTION. IF GROUNDWATER ISSUES ARE ENCOUNTERED DURING CONSTRUCTION, THE GEOTECHNICAL ENGINEER SHALL BE CONTACTED AND REQUESTED TO ASSESS THE POSSIBLE NEED FOR REMEDIAL MEASURES.

2) DRAINAGE CONSIDERATIONS DURING CONSTRUCTION: DUE TO ADVERSE EFFECT ON STRUCTURES, WATER SHALL NOT BE ALLOWED TO COLLECT IN THE FOUNDATION EXCAVATION OR ON PREPARED SUBGRADE OF THE CONSTRUCTION AREA EITHER DURING OR AFTER CONSTRUCTION. UNDERCUT OR EXCAVATED AREAS SHALL BE SLOPED TOWARD ONE CORNER TO FACILITATE REMOVAL OF ANY COLLECTED RAINWATER, OR POSITIVE RUNOFF SHALL BE PROVIDED. THE CONTRACTOR SHALL EXERCISE CARE IN CREATING DRAINA

6) CONSTRUCTION MONITORING: A GEOTECHNICAL ENGINEER SHALL BE RETAINED TO PROVIDE OBSERVATIONS AND TESTING OF SOILS EXPOSED DURING PROJECT CONSTRUCTION IN ORDER TO VERIFY THAT SOIL CONDITIONS ARE AS ANTICIPATED. CONSTRUCTION ACTIVITIES PERTAINING TO EARTHWORK AND OTHER RELATED ACTIVITIES SHALL ALSO BE OBSERVED BY THE GEOTECHNICAL ENGINEER AS OUTLINED ABOVE.

8) CONCRETE CONSTRUCTION NOTES

A. GOVERNING CODES AND STANDARDS: IN ADDITION TO THE REQUIREMENTS OF THE GOVERNING INTERNATIONAL BUILDING CODE, ALL CONCRETE SHALL BE DETAILED, FABRICATED, AND ERECTED IN ACCORDANCE WITH THE FOLLOWING CODES AND STANDARDS AND AS SUPPLEMENTED BY THESE GENERAL NOTES AND THE PROJECT DRAWINGS AND SPECIFICATIONS.
1) ACI 117-10 "SPECIFICATION FOR TOLERANCES FOR CONCRETE CONSTRUCTION AND MATERIALS"
2) ACI 301-10 "SPECIFICATIONS FOR STRUCTURAL CONCRETE"
3) ACI 318-14 "BUILDING CODE REQUIREMENTS FOR STRUCTURAL CONCRETE"
4) ACI 347-04 "GUIDE TO FORMWORK FOR CONCRETE"
5) ACI SP-66(04) "ACI DETAILING MANUAL"
6) AWS D1.4-2011 "STRUCTURAL WELDING CODE - REINFORCING STEEL".
7) CRSI MSP-2018 "CRSI MANUAL OF STANDARD PRACTICE"

B. CONCRETE MIXTURES:

1) CEMENTITIOUS MATERIALS
A)OPTION 1 – ORDINARY PORTLAND CEMENT (OPC): ASTM C150 TYPE I OR II UNLESS SPECIFICALLY NOTED OTHERWISE.
B) OPTION 2 - PORTLAND LIMESTONE CEMENT (PLC): ASTM C595 TYPE IL UNLESS SPECIFICALLY NOTED OTHERWISE.
C) FLY ASH: ASTM C618 CLASS C OR F. THE MAXIMUM PERCENTAGE OF FLY ASH SHALL NOT EXCEED 25 PERCENT OF THE TOTAL CEMENTITIOUS MATERIAL.

2) ALL CONCRETE MIXES SHALL BE COMPRISED OF NORMAL WEIGHT AGGREGATES CONFORMING TO ASTM C33, EXCEPT WHERE SPECIFICALLY INDICATED AS LIGHTWEIGHT, IN WHICH CASE AGGREGATES SHALL CONFORM TO ASTM C330.

3) MIXING WATER SHALL CONFORM TO ASTM C1062. MIXING WATER, INCLUDING THAT PORTION OF MIXING WATER CONTRIBUTED IN THE FORM OF FREE MOISTURE ON AGGREGATES, SHALL NOT CONTAIN DELETERIOUS AMOUNTS OF CHLORIDE IONS.

4) ADMIXTURES, IF USED, SHALL CONFORM TO THE FOLLOWING:
A) WATER REDUCTION AND SETTING TIME MODIFICATION: ASTM C494.
B) PRODUCING FLOWING CONCRETE: ASTM C1017.
C) AIR ENTRAINMENT: ASTM C260.
D) INHIBITING CHLORIDE INDUCED CORROSION: ASTM C1582.
E) MOISTURE VAPOR REDUCTION ADMIXTURE, MVRA: ASTM C494.

5) MIX DESIGNS SHALL BE PROPORTIONED BASED ON THE FOLLOWING MIX CHARACTERISTICS;

A) FOUNDATIONS
1) FREEZING AND THAWING EXPOSURE CATEGORY (F): CLASS F1
2) SULFATE EXPOSURE CATEGORY (S): CLASS S0
3) WATER EXPOSURE CATEGORY (W): CLASS W0
4) CORROSION PROTECTION CATEGORY (C): CLASS C1
5) 28-DAY COMPRESSIVE STRENGTH: 3,500 PSI
6) MAXIMUM WATER/CEMENT RATIO: 0.55
7) MAXIMUM AGGREGATE SIZE: 1 1/2 INCHES
8) TARGET AIR CONTENT: 4.5 PERCENT PLUS OR MINUS 1.5 PERCENT
9) MAXIMUM WATER-SOLUBLE CHLORIDE ION CONTENT IN CONCRETE, PERCENT BY WEIGHT OF CEMENTITIOUS MATERIALS: 0.30

B) WALLS
1) FREEZING AND THAWING EXPOSURE CATEGORY (F): CLASS F2
2) SULFATE EXPOSURE CATEGORY (S): CLASS S0
3) WATER EXPOSURE CATEGORY (W): CLASS W0
4) CORROSION PROTECTION CATEGORY (C): CLASS C1
5) 28-DAY COMPRESSIVE STRENGTH: 4,500 PSI
6) MAXIMUM WATER/CEMENT RATIO: 0.45
7) MAXIMUM AGGREGATE SIZE: 1 1/2 INCHES
8) TARGET AIR CONTENT: 5.5 PERCENT PLUS OR MINUS 1.5 PERCENT
9) MAXIMUM WATER-SOLUBLE CHLORIDE ION CONTENT IN CONCRETE, PERCENT BY WEIGHT OF CEMENTITIOUS MATERIALS: 0.30

C) SLABS-ON-GRADE
1) FREEZING AND THAWING EXPOSURE CATEGORY (F): CLASS F0
2) SULFATE EXPOSURE CATEGORY (S): CLASS S0
3) WATER EXPOSURE CATEGORY (W): CLASS W0
4) CORROSION PROTECTION CATEGORY (C): CLASS C0
5) 28-DAY COMPRESSIVE STRENGTH: 4,000 PSI
6) MAXIMUM WATER/CEMENT RATIO: 0.45
7) MAXIMUM AGGREGATE SIZE: 1 1/2-INCHES
8) TARGET AIR CONTENT: DO NOT ALLOW AIR CONTENT OF TROWEL-FINISHED FLOORS TO EXCEED 3 PERCENT
9) MVRA REQUIRED IN ALL SLABS-ON-GRADE.
10)MAXIMUM WATER-SOLUBLE CHLORIDE ION CONTENT IN CONCRETE, PERCENT BY WEIGHT OF CEMENTITIOUS MATERIALS: 1.OO

D) SLABS ON METAL DECK
1) FREEZING AND THAWING EXPOSURE CATEGORY (F): CLASS F0
2) SULFATE EXPOSURE CATEGORY (S): CLASS S0
3) WATER EXPOSURE CATEGORY (W): CLASS W0
4) CORROSION PROTECTION CATEGORY (C): CLASS C0
5) 28-DAY COMPRESSIVE STRENGTH: 4,000 PSI
6) MAXIMUM WATER/CEMENT RATIO: 0.45
7) MAXIMUM AGGREGATE SIZE: 3/4-INCHES
8) TARGET AIR CONTENT: DO NOT ALLOW AIR CONTENT OF TROWEL-FINISHED FLOORS TO EXCEED 3 PERCENT
9) MAXIMUM WATER-SOLUBLE CHLORIDE ION CONTENT IN CONCRETE, PERCENT BY WEIGHT OF CEMENTITIOUS MATERIALS: 1.OO

6) CONCRETE MIX PROPORTIONS SHALL BE ESTABLISHED IN ACCORDANCE WITH ARTICLE 4.2.3 OF ACI 301 SO THAT THE CONCRETE SATISFIES THE FOLLOWING THREE REQUIREMENTS:
A) THE CONCRETE CAN BE PLACED READILY WITHOUT SEGREGATION INTO FORMS AND AROUND REINFORCEMENT UNDER ANTICIPATED PLACEMENT CONDITIONS. THE CONCRETE PRODUCER SHALL DETERMINE WHETHER ADMIXTURES ARE NECESSARY FOR WATER REDUCTION, SET TIME, OR SLUMP REQUIREMENTS.
B) THE CONCRETE SHALL MEET REQUIREMENTS FOR THE ASSIGNED EXPOSURE CLASSES OUTLINED HEREIN.
C) THE CONCRETE SHALL CONFORM TO STRENGTH TEST REQUIREMENTS FOR STANDARD-CURED SPECIMENS.

7) DOCUMENTATION OF CONCRETE MIXTURE CHARACTERISTICS SHALL BE SUBMITTED FOR REVIEW BEFORE THE MIXTURE IS USED. EVIDENCE OF THE ABILITY OF THE PROPOSED MIXTURE TO COMPLY WITH THE CONCRETE MIXTURE REQUIREMENTS IN THE CONSTRUCTION DOCUMENTS SHALL BE INCLUDED IN THE SUBMITTAL. THE EVIDENCE SHALL BE BASED ON FIELD TEST RECORDS OR LABORATORY TRIAL BATCHES.

C. CONCRETE REINFORCING:

1) ALL DETAILING, FABRICATION, AND PLACING OF REINFORCING STEEL, UNLESS OTHERWISE NOTED, SHALL FOLLOW ALL SECTIONS OF ACI MNL-66, ACI 318, AND THE CRSI MSP.

2) UNLESS OTHERWISE NOTED, LAP SPLICES OF DEFORMED REINFORCING BARS SHALL CONFORM TO ACI REQUIREMENTS FOR CLASS B TENSION SPLICES. REFER TO LAP LENGTH SCHEDULES FOR TYPICAL LAP REQUIREMENTS.

3) PROVIDE CORNER BARS IN BOTH FACES OF ALL CONTINUOUS GRADE BEAMS, FOOTINGS AND WALLS. NUMBER, SIZE, AND SPACING OF CORNER BARS SHALL BE EQUAL TO NUMBER, SIZE AND SPACING OF HORIZONTAL REINFORCING WITH WHICH THEY LAP AND SHALL HAVE CLASS B TENSION LAP SPLICES IN EACH DIRECTION. REFER TO TYPICAL DETAILS FOR ADDITIONAL INFORMATION.

4) AT INTERSECTING FOUNDATIONS, EXTEND ALL HORIZONTAL REINFORCING OF THE INTERSECTING MEMBERS BEYOND THE POINT OF INTERSECTION TO THE OPPOSITE FACE. BEND TO A STANDARD 90 DEGREE HOOK OR PROVIDE BENT DOWELS OF EQUAL SIZE AND SPACING AND LAP AS REQUIRED FOR A CLASS B TENSION SPLICE (BUT NOT LESS THAN 12") IN EACH DIRECTION. REFER TO TYPICAL DETAILS FOR ADDITIONAL INFORMATION.

5) PROVIDE TIES COMPLYING WITH ACI 318 IN ALL CONCRETE COLUMNS AND PILASTERS. EVERY CORNER AND ALTERNATING LONGITUDINAL BAR SHALL HAVE A LATERAL SUPPORT PROVIDED BY THE CORNER OF A TIE WITH AN INCLUDED ANGLE ON NOT MORE THAN 135-DEGREES. NO UNSUPPORTED LONGITUDINAL BAR SHALL BE FARTHER THAN 6-IN. CLEAR ON EACH SIDE ALONG THE TIE FROM A LATERALLY SUPPORTED BAR.

6) CONCRETE COVER OVER STEEL REINFORCING FOR NON-PRESTRESSED CAST-IN-PLACE CONSTRUCTION SHALL CONFORM TO THE TABLE PROVIDED BELOW.

MINIMUM CONCRETE COVER FOR CAST-IN-PLACE NON-PRESTRESSED CONCRETE MEMBERS			
CONCRETE EXPOSURE	MEMBER	REINFORCEMENT	MINIMUM COVER, IN.
CAST AGAINST AND PERMANENTLY IN CONTACT WITH GROUND	ALL	ALL	3
EXPOSED TO WEATHER OR IN CONTACT WITH GROUND	ALL	NO. 6 THROUGH NO. 18 BARS	2
		NO. 5 BAR, W31 OR D31 WIRE, AND SMALLER	1-1/2
NOT EXPOSED TO WEATHER OR IN CONTACT WITH GROUND	SLABS, JOIST AND WALLS	NO. 14 AND NO. 18 BARS	1-1/2
		NO. 11 BAR AND SMALLER	3/4
	BEAMS, COLUMNS, PEDESTALS AND TENSION TIES	PRIMARY REINFORCEMENT, STIRRUPS, TIES, SPIRALS AND HOOPS	1-1/2

D. OPENINGS IN CONCRETE STRUCTURES:

1) ALL OPENINGS IN CONCRETE WALLS LARGER THAN 1'-0" IN SIZE SHALL HAVE A MINIMUM OF (2)#5 BARS PLACED AT ALL SIDES OF OPENING AND EXTENDED 2'-6" BEYOND EDGE OF OPENING. IN ADDITION, DIAGONAL CORNER BARS SHALL EXTEND 2'-6" EACH WAY BEYOND CORNER OF OPENING. REFER TYPICAL DETAILS FOR MORE INFORMATION.

2) THE SIZE AND LOCATION OF ALL FLOOR PITS, TRENCH DRAINS, AND OPENINGS FOR ALL DUCTS AND PIPES THROUGH WALLS, FLOORS, AND FOUNDATION WORK SHALL BE VERIFIED WITH THE MECHANICAL, PLUMBING, FIRE PROTECTION AND ELECTRICAL CONTRACTOR'S REQUIREMENTS PRIOR TO THE START OF ANY CONCRETE WORK.

E. JOINTS IN CONCRETE CONSTRUCTION:

1) ELEVATED STRUCTURAL SLABS: CONSTRUCTION JOINTS IN ELEVATED STRUCTURAL SLABS SHALL BE LOCATED NEAR THE 1/3 POINTS OF THE CLEAR-SPAN AND SHALL HAVE A HORIZONTAL KEY. WHERE CONSTRUCTION JOINTS OCCUR, THE TOP SCHEDULED TOP REINFORCING STEEL SHALL EXTEND FOR THE FULL SPAN OF THAT BAY.

2) CONCRETE WALLS:

A) VERTICAL CONTRACTION OR CONSTRUCTION JOINTS SHALL BE INSTALLED IN WALLS AND RETAINING WALLS AT THE MAXIMUM JOINT SPACINGS SHOWN IN THE TABLE BELOW. IN ADDITION, A CONTRACTION OR CONSTRUCTION JOINT SHALL BE INSTALLED WITHIN 10 TO 15 FT. OF A WALL CORNER.

WALL CLASSIFICATION	WALL HEIGHT, H	MAXIMUM JOINT SPACING
SHORT	H < 8'-0"	3 X H
INTERMEDIATE	8'-0" < H < 12'-0"	2 X H
HIGH	H > 12'-0"	1 X H

B) VERTICAL EXPANSION JOINTS SHALL BE INSTALLED IN STRAIGHT WALLS AND RETAINING WALLS AT A MAXIMUM SPACING OF 200 FT UNLESS SHOWN OTHERWISE IN CONSTRUCTION DOCUMENTS.

3) CURING AT CONSTRUCTION JOINTS: CONCRETE POURS EITHER SIDE OF CONSTRUCTION JOINTS SHALL NOT BE CONCURRENT. CONCRETE SHALL BE ALLOWED TO CURE A MINIMUM OF 7 DAYS PRIOR TO PLACEMENT OF ADJACENT CONCRETE.

F. FORMWORK FOR CAST-IN-PLACE CONCRETE:

1) THE DESIGN AND REMOVAL OF FORMWORK SHALL COMPLY WITH THE RECOMMENDATIONS OF ACI 347.

2) THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE DESIGN, FABRICATION, INSTALLATION, AND REMOVAL OF FORMWORK. FORMWORK DESIGN SHALL CONSIDER THE FOLLOWING:
A) METHOD OF CONCRETE PLACEMENT.
B) RATE OF CONCRETE PLACEMENT.
C) CONSTRUCTION LOADS, INCLUDING VERTICAL, HORIZONTAL AND IMPACT.
D) AVOIDANCE OF DAMAGE TO PREVIOUSLY CONSTRUCTED MEMBERS.
E) FOR POST-TENSIONED MEMBERS, ALLOWANCE FOR MOVEMENT OF THE MEMBER DURING APPLICATION OF THE PRESTRESSING FORCE WITHOUT DAMAGE TO THE MEMBER.

3) FORMWORK FABRICATION AND INSTALLATION SHALL RESULT IN A FINAL STRUCTURE THAT CONFORMS TO SHAPES, LINES, AND DIMENSIONS OF THE MEMBERS AS REQUIRED BY THE CONSTRUCTION DOCUMENTS.

4) FORMWORK SHALL BE SUFFICIENTLY TIGHT TO INHIBIT LEAKAGE OF PASTE AND MORTAR.

5) FORMWORK SHALL BE BRACED OR TIED TOGETHER TO MAINTAIN SAFETY, POSITION AND SHAPE.

6) REMOVAL OF FORMWORK

A) BEFORE STARTING CONSTRUCTION, THE CONTRACTOR SHALL DEVELOP A PROCEDURE AND SCHEDULE FOR REMOVAL OF FORMWORK AND INSTALLATION OF RESHORES, AND SHALL CALCULATE THE LOADS TRANSFERRED TO THE STRUCTURE DURING THIS PROCESS.

B) STRUCTURAL ANALYSIS AND CONCRETE STRENGTH REQUIREMENTS USED IN PLANNING AND IMPLEMENTING THE FORMWORK REMOVAL AND RESHORE INSTALLATION SHALL BE FURNISHED BY THE CONTRACTOR TO THE LICENSED DESIGN PROFESSIONAL AND TO THE BUILDING OFFICIAL.

C) NO CONSTRUCTION LOADS SHALL BE PLACED ON, NOR ANY FORMWORK REMOVED FROM, ANY PART OF THE STRUCTURE UNDER CONSTRUCTION EXCEPT WHEN THAT PORTION OF THE STRUCTURE IN COMBINATION WITH REMAINING FORMWORK HAS SUFFICIENT STRENGTH TO SUPPORT SAFELY ITS WEIGHT AND LOADS PLACED THEREON AND WITHOUT IMPAIRING SERVICEABILITY.

D) SUFFICIENT STRENGTH SHALL BE DEMONSTRATED BY STRUCTURAL ANALYSIS CONSIDERING ANTICIPATED LOADS, STRENGTH OF FORMWORK, AND AN ESTIMATE OF IN-PLACE CONCRETE STRENGTH.

E) THE ESTIMATE OF IN-PLACE CONCRETE STRENGTH SHALL BE BASED ON TESTS OF FIELD-CURED CYLINDERS OR ON OTHER PROCEDURES TO EVALUATE CONCRETE STRENGTH APPROVED BY THE LICENSED DESIGN PROFESSIONAL AND, WHEN REQUESTED, APPROVED BY THE BUILDING OFFICIAL.

F) FORMWORK SHALL BE REMOVED IN SUCH A MANNER NOT TO IMPAIR SAFETY AND SERVICEABILITY OF THE STRUCTURE.

G) CONCRETE EXPOSED BY FORMWORK REMOVAL SHALL HAVE SUFFICIENT STRENGTH NOT TO BE DAMAGED BY THE REMOVAL.

H) FORMWORK SUPPORTS FOR POST-TENSIONED MEMBERS SHALL NOT BE REMOVED UNTIL SUFFICIENT POST-TENSIONING HAS BEEN APPLIED TO ENABLE POST-TENSIONED MEMBERS TO SUPPORT THEIR DEAD LOAD AND ANTICIPATED CONSTRUCTION LOADS.

I) NO CONSTRUCTION LOADS EXCEEDING THE COMBINATION OF SUPERIMPOSED DEAD LOAD PLUS LIVE LOAD INCLUDING REDUCTION SHALL BE PLACED ON ANY UNSHORED PORTION OF THE STRUCTURE UNDER CONSTRUCTION, UNLESS ANALYSIS INDICATES ADEQUATE STRENGTH TO SUPPORT SUCH ADDITIONAL LOADS AND WITHOUT IMPAIRING SERVICEABILITY.

G. CONCRETE MISCELLANEOUS:

1) WATERSTOPS AND WATERPROOFING: ALL CONSTRUCTION JOINTS (VERTICAL AND HORIZONTAL) IN BELOW-GRADE CONCRETE WALLS, TRENCHES AND PITS SHALL BE KEYED AND HAVE BENTONITE WATERSTOPS INSTALLED UNLESS NOTED OTHERWISE. ALL BELOW-GRADE CONCRETE WALLS, PITS AND TRENCHES SHALL BE WATERPROOFED AS SHOWN IN ARCHITECTURAL DRAWINGS, UNLESS NOTED OTHERWISE.

2) EQUIPMENT PADS: PROVIDE CONCRETE EQUIPMENT PADS OF SIZE REQUIRED FOR EQUIPMENT FURNISHED. SEE MECHANICAL, PLUMBING, FIRE PROTECTION AND ELECTRICAL DRAWINGS FOR NUMBER, SIZE, AND LOCATION OF SUCH PADS. UNLESS OTHERWISE SHOWN, MINIMUM PAD THICKNESS SHALL BE 4" AND SHALL EXTEND A MINIMUM OF 6" BEYOND THE FACE OF THE EQUIPMENT. MINIMUM REINFORCING SHALL BE #4 BARS AT 12" O.C. EACH WAY. TOOLED OR CHAMFERED EDGES SHALL BE PROVIDED AT ALL EQUIPMENT PADS. ANCHORAGE TO SUPPORTING SLAB SHALL BE MADE. REFER TO TYPICAL DETAILS.

3) CHAMFERED EDGES: UNLESS NOTED OTHERWISE ON ARCHITECTURAL DRAWINGS, PROVIDE 3/4" CHAMFER ON ALL EXPOSED CONCRETE EDGES.

4) SURFACE FINISH: ALL HORIZONTAL CONCRETE SURFACES SHALL HAVE A TROWELED FINISH UNLESS NOTED OTHERWISE IN ARCHITECTURAL DRAWINGS OR FLOORING SPECIFICATIONS. AT STAIR TREAD PLACEMENTS PROVIDE A FINE BROOM FINISH TRANSVERSE TO THE RISERS UNLESS NOTED OTHERWISE.

5) MOIST CURING OF SLABS: SLABS-ON-GRADE AND SLABS-ON-DECK SHALL BE WATER CURED FOR A MINIMUM OF 7 DAYS BY PONDING, SPRAYING, SPRINKLING OR BY USE OF SATURATED COVERINGS. CURING COMPOUNDS ARE EXPRESSLY PROHIBITED.

6) VAPOR EMISSION LIMITS: IT IS THE CONTRACTOR'S RESPONSIBILITY TO PLAN AND DETERMINE THE MEANS AND METHODS NECESSARY FOR LIMITING VAPOR EMISSIONS TO AN ACCEPTABLE RANGE AS REQUIRED BY FLOOR FINISH MANUFACTURERS.

9) REINFORCED HOLLOW CONCRETE MASONRY NOTES

A. GOVERNING CODES AND STANDARDS: IN ADDITION TO THE REQUIREMENTS OF THE GOVERNING INTERNATIONAL BUILDING CODE, ALL MASONRY SHALL BE DETAILED, FABRICATED, AND ERECTED IN ACCORDANCE WITH THE FOLLOWING STANDARDS AND AS SUPPLEMENTED BY THESE GENERAL NOTES AND THE PROJECT DRAWINGS AND SPECIFICATIONS.
1) TMS 402-2016, "BUILDING CODE FOR MASONRY STRUCTURES"
2) TMS 602-2016, "SPECIFICATION FOR MASONRY STRUCTURES"

B. MASONRY DIMENSIONS: REFER TO ARCHITECTURAL DRAWINGS FOR ALL DIMENSIONS RELEVANT TO ALL CONCRETE MASONRY CONSTRUCTION.

C. CONCRETE MASONRY UNITS:

1) ALL CONCRETE MASONRY UNITS SHALL BE 1 OR 2-CELL LIGHTWEIGHT CONCRETE BLOCK WITH AN OVEN DRY WEIGHT OF LESS THAN 105 LBS PER CUBIC FOOT.

2) ALL CONCRETE MASONRY UNITS SHALL HAVE A MINIMUM COMPRESSIVE STRENGTH OF 2000 PSI ON THE NET AREA (INDIVIDUAL STRENGTH PER ASTM C 90).

D. MORTAR:

1) MORTAR MATERIALS: CONCRETE MASONRY SHALL BE CONSTRUCTED WITH PORTLAND CEMENT/LIME, TYPE S MORTAR CONFORMING TO THE PROPORTION SPECIFICATION OF ASTM C270.

2) MORTAR SUBMITTAL REQUIREMENTS: BECAUSE THE PROPORTION SPECIFICATION FOR MORTAR IS PRESCRIPTIVE, THERE ARE NO MORTAR TESTS REQUIRED. SUBMITTAL INFORMATION SHALL INCLUDE THE PROPORTIONS OF MORTAR MATERIALS AND CERTIFICATES OF COMPLIANCE FOR EACH RAW MATERIAL USED.

3) MORTAR MIX PROPORTIONS: MORTAR MATERIAL PROPORTIONS BY VOLUME SHALL BE AS FOLLOWS:
A)PORTLAND CEMENT: 1
B) HYDRATED LIME OR LIME PUTTY: OVER 0.25 TO 0.50
C) AGGREGATE RATIO (MEASURED IN DAMP LOOSE CONDITIONS): NOT LESS THAN 2.25 AND NOT MORE THAN 3.0 TIMES THE SUM OF THE VOLUMES OF CEMENT AND LIME MATERIALS.

4) MORTAR MIXING: MIX CEMENTITIOUS MATERIALS AND AGGREGATES BETWEEN 3 AND 5 MINUTES IN A MECHANICAL BATCH MIXER WITH A SUFFICIENT AMOUNT OF WATER TO PRODUCE A WORKABLE CONSISTENCY. UNLESS SPECIFICALLY ALLOWED BY THE OWNER'S REPRESENTATIVE, DO NOT HAND MIX MORTAR. MAINTAIN WORKABILITY OF MORTAR BY REMIXING OR RETEMPERING. DISCARD MORTAR WHICH HAS BEGUN TO STIFFEN OR IS NOT USED WITHIN 2.5 HOURS AFTER INITIAL MIXING.

5) MORTAR PROTRUSIONS: REMOVE MORTAR PROTRUSIONS EXTENDING ¼-INCH OR MORE INTO CELLS OR CAVITIES TO BE GROUTED.

6) ADMIXTURES: DO NOT USE ADMIXTURES CONTAINING MORE THAN 0.2 PERCENT CHLORIDE IONS.

7) MORTAR QUALITY ASSURANCE: TESTING AGENCY SHALL PERIODICALLY OBSERVE AND CONFIRM THAT THE PROPORTIONS OF SITE-PREPARED MORTAR COMPLY WITH THE PROPORTIONS OUTLINED ABOVE.

E. GROUT:

1) GROUT MATERIALS: GROUT USED IN THE CONSTRUCTION OF MASONRY SHALL CONFORM TO THE PROPORTION SPECIFICATION OF ASTM C476. GROUT AGGREGATES SHALL COMPLY WITH ASTM C404.

2) GROUT SUBMITTAL REQUIREMENTS: BECAUSE THE PROPORTION SPECIFICATION FOR GROUT IS PRESCRIPTIVE, THERE ARE NO GROUT TESTS REQUIRED. SUBMITTAL INFORMATION SHALL INCLUDE THE PROPORTIONS OF GROUT MATERIALS AND CERTIFICATES OF COMPLIANCE FOR EACH RAW MATERIAL USED.

3) GROUT MIX PROPORTIONS: GROUT MATERIAL PROPORTIONS BY VOLUME SHALL BE AS FOLLOWS:

GROUT TYPE	CEMENT	LIME	AGGREGATE (DAMP, LOOSE)*	
			FINE	COARSE
FINE	1	0 TO 1/10	2.25 TO 3	-
COARSE	1	0 TO 1/10	2.25 TO 3	1 TO 2

*TIMES THE SUM OF THE VOLUMES OF THE CEMENT & LIME MATERIALS

4) GROUT SLUMP: SITE-MIX GROUT TO A CONSISTENCY THAT HAS A SLUMP BETWEEN 8 AND 11 INCHES. DISCARD GROUT THAT DOES NOT MEET THE SPECIFIED SLUMP WITHOUT ADDING WATER AFTER INITIAL MIXING.

5) GROUT QUALITY ASSURANCE: TESTING AGENCY SHALL PERIODICALLY OBSERVE AND CONFIRM THAT THE PROPORTIONS AND SLUMP OF SITE-PREPARED GROUT COMPLY WITH THE REQUIREMENTS OUTLINED ABOVE.

F. INSPECTION: PRIOR TO THE START OF MASONRY CONSTRUCTION, THE CONTRACTOR SHALL VERIFY THE FOLLOWING:

1) VERIFY FOUNDATIONS ARE CONSTRUCTED WITHIN A LEVEL ALIGNMENT TOLERANCE OF PLUS OR MINUS 1/2 IN.

2) VERIFY REINFORCING DOWELS ARE POSITIONED IN ACCORDANCE WITH THE PROJECT DRAWINGS.

3) IF STATED CONDITIONS ARE NOT MET, NOTIFY THE OWNER'S REPRESENTATIVE PRIOR TO PROCEEDING.

G. PREPARATION:

1) CLEANING:
A) CLEAN REINFORCEMENT AND SHANKS OF ANCHOR BOLTS BY REMOVING MUD, OIL, OR OTHER MATERIALS THAT WILL ADVERSELY AFFECT OR REDUCE BOND AT THE TIME MORTAR OUR GROUT IS PLACED.
B) PRIOR TO PLACING MASONRY, REMOVE LAITANCE, LOOSE AGGREGATE, AND ANYTHING ELSE THAT WOULD PREVENT MORTAR FROM BONDING TO THE FOUNDATION.

2) WETTING: DO NOT WET CONCRETE MASONRY UNITS BEFORE LAYING. WET CUTTING IS PERMITTED.

3) DEBRIS: CONSTRUCT GROUT SPACES FREE OF MORTAR DROPPING, DEBRIS, LOOSE AGGREGATES, AND ANY MATERIAL DELETERIOUS TO MASONRY GROUT.

4) REINFORCEMENT: PLACE REINFORCEMENT AND TIES IN GROUT SPACES PRIOR TO GROUTING.

5) CLEANOUTS: PROVIDE CLEANOUTS IN THE BOTTOM COURSE OF MASONRY FOR EACH GROUT POUR WHEN THE GROUT POUR HEIGHT EXCEEDS 5 FT 4 IN.
A) CONSTRUCT CLEANOUTS SO THAT THE SPACE TO BE GROUTED CAN BE CLEANED AND INSPECTED. IN SOLID GROUTED MASONRY, SPACE CLEANOUTS HORIZONTALLY A MAXIMUM OF 32 IN. ON CENTER.
B) CONSTRUCT CLEANOUTS WITH AN OPENING OF SUFFICIENT SIZE TO PERMIT REMOVAL OF DEBRIS. THE MINIMUM OPENING DIMENSION SHALL BE 3 IN.
C) AFTER CLEANING, CLOSE CLEANOUTS WITH CLOSURES BRACED TO RESIST GROUT PRESSURE.

H. MASONRY ERECTION:

1) BOND PATTERN: UNLESS OTHERWISE INDICATED, LAY MASONRY IN RUNNING BOND.

2) PLACING MORTAR UNITS: COMPLY WITH ARTICLE 3.3 B OF TMS 602, INCLUDING BUT NOT LIMITED TO THE FOLLOWING:
A) BED JOINTS AT FOUNDATIONS: IN THE STARTING COURSE ON FOUNDATIONS AND OTHER SUPPORTING MEMBERS, CONSTRUCT BED JOINTS SO THAT THE BED JOINT THICKNESS IS AT LEAST 1/4 IN. AND NOT MORE THAN:
(i) 3/4 IN. WHEN THE MASONRY IS UNGROUTED OR PARTIALLY GROUTED
(ii) 1-1/4 IN. WHEN THE FIRST COURSE OF MASONRY IS SOLID GROUTED AND SUPPORTED BY A CONCRETE FOUNDATION.
B) OPENINGS IN TROUGH BLOCKS: AT ALL VERTICAL REINFORCING LOCATIONS, THE BOTTOM OF TROUGH BLOCKS SHALL BE CUT TO PROVIDE A MINIMUM 2-INCH DIAMETER HOLE TO ALLOW PLACEMENT OF VERTICAL REINFORCING AND PLACEMENT OF GROUT THROUGH THE HOLE.

3) EMBEDDED ITEMS AND ACCESSORIES: COMPLY WITH ARTICLE 3.3 D OF TMS 602.

4) TEMPORARY BRACING OF MASONRY: DESIGN, PROVIDE, AND INSTALL TEMPORARY BRACING THAT WILL ASSURE STABILITY OF MASONRY DURING CONSTRUCTION.

5) SITE TOLERANCES: ERECT MASONRY WITHIN THE TOLERANCES DEFINED IN ARTICLE 3.3 F OF TMS 602.

6) PLACING REINFORCING: COMPLY WITH ALL PROVISIONS OF ARTICLE 3.4 OF TMS 602. MAINTAIN CLEAR DISTANCE BETWEEN REINFORCING BARS AND ANY FACE OF MASONRY UNIT OR FORMED SURFACE, BUT NOT LESS THAN 1/4-IN FOR FINE GROUT OR 1/2-IN. FOR COARSE GROUT.

7) CONTROL JOINTS: LOCATION AND DETAILS OF CONTROL JOINTS SHALL BE AS DEFINED ON ARCHITECTURAL DRAWINGS. IF NOT SHOWN ON THE ARCHITECTURAL DRAWINGS, THE LOCATION OF CONTROL JOINTS SHALL BE DETAILED BY THE MASONRY CONTRACTOR AND SUBMITTED FOR REVIEW AND APPROVAL BY THE ARCHITECT AND ENGINEER. THE DISTANCE BETWEEN CONTROL JOINTS SHOULD NOT EXCEED THE LESSER OF 1.5 TIMES THE WALL HEIGHT OR 25 FT. IN ADDITION, CONTROL JOINTS SHOULD TYPICALLY BE PROVIDED AT THE FOLLOWING LOCATIONS:
A) AT CHANGES IN WALL HEIGHT.
B) AT PILASTERS AND CHANGES IN WALL THICKNESS.
C) DIRECTLY OVER EXPANSION JOINTS IN SUPPORTING FOUNDATIONS.
D) AT EXPANSION JOINTS IN ROOFS AND FLOORS THAT BEAR ON THE WALL.
E) NEAR ONE SIDE OF OPENINGS LESS THAN 6 FT. WIDE. REFER TYPICAL MASONRY OPENING DETAILS.
F) NEAR BOTH SIDES OF OPENINGS GREATER THAN 6 FT. WIDE. REFER TYPICAL MASONRY OPENING DETAILS.
G) AT INTERSECTING WALLS.
H) AT MAXIMUM OF ONE-HALF THE TYPICAL CONTROL JOINTS SPACING FROM CORNERS.

8) PENETRATIONS: OPENINGS FOR ALL DUCTS AND PIPES PENETRATING MASONRY WALLS SHALL BE VERIFIED AND COORDINATED WITH MECHANICAL AND ELECTRICAL CONTRACTORS' REQUIREMENTS. PENETRATIONS THROUGH WALLS SHALL HAVE ADDITIONAL REINFORCING AS SHOWN ON IN THE TYPICAL DETAILS.

9) LINTELS: LINTELS SHALL BE PROVIDED WHERE REQUIRED ACCORDING TO TYPICAL LINTEL DETAILS AND SCHEDULE OR AS INDICATED ON PLAN SHEETS. SOLID BOTTOM TROUGH BLOCKS SHALL BE USED AT THE HEADS OF ALL OPENINGS.

10)PERMANENT BRACING: UNLESS BRACED BY ATTACHMENT TO A STRUCTURAL SLAB OR METAL DECK, THE TOP OF MASONRY WALLS SHALL BE BRACED IN ACCORDANCE WITH THE TYPICAL DETAILS SHOWN IN THE DRAWINGS.

I. CONCRETE MASONRY REINFORCING:

1) MINIMUM HORIZONTAL AND VERTICAL REINFORCING IN CMU WALLS SHALL BE PROVIDED AS FOLLOWS:

AGP
the Abla Griffin Partnership L.L.C.
201 N. BROADWAY
SUITE 210
MOORE, OK. 73160
405.735.3477
AGP@theAGP.net
www.theAGP.net

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MECHANICAL / ELECTRICAL

CJC
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BWB
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FEBRUARY 2025
date

revisions

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MINIMUM REINFORCING IN CMU WALLS					
WALL TYPE	CMU TYPE	GROUTED VERTICAL CELL REINFORCING		HORIZONTAL BOND BEAM REINFORCING	
		BARS	SPACING OF GROUTED CELLS	BARS	SPACING OF BOND BEAMS
EXTERIOR	8"	(1)#5	48" O.C.	(2)#4	48" O.C.
INTERIOR LOAD-BEARING	8"	(1)#5	48" O.C.	(2)#4	48" O.C.
INTERIOR PARTITION	8"	(1)#5	48" O.C.	(2)#4	48" O.C.

NOTES:
1. ALL SINGLE BAR REINFORCING IN VERTICAL CELLS SHALL BE CENTERED IN CELL UNLESS NOTED OTHERWISE.
2. FOR DOUBLE BAR REINFORCING IN VERTICAL CELLS:
   a. THE CLEAR DISTANCE BETWEEN PARALLEL BARS SHALL NOT BE LESS THAT THE NOMINAL DIAMETER OF THE BAR, NOR LESS THAN 1 IN.
   b. REINFORCING BARS SHALL HAVE A THICKNESS OF GROUT BETWEEN THE BARS AND MASONRY UNITS NOT LESS THAN 1/4 IN. FOR FINE GROUT OR 1/2 IN. FOR COARSE GROUT.
3. AN ADDITIONAL VERTICAL BAR OF THE SAME SIZE AND LENGTH AS THE NORMAL REINFORCING BAR SHALL BE PLACED IN GROUTED CELLS:
   a. IN FIRST TWO JAMB CELLS ON EACH SIDE OF WALL OPENINGS.
   b. IN CELLS ON EACH SIDE OF CONTROL JOINTS OR EXPANSION JOINTS.
   c. IN CELL AT ALL WALL INTERSECTIONS AND FIRST ADJACENT CELL IN EACH DIRECTION.
4. ADDITIONAL BOND BEAMS SHALL BE PROVIDED FOR ALL MASONRY LINTELS AND WALL OPENINGS AS SHOWN IN TYPICAL DETAILS.

2) THE MINIMUM LENGTH OF LAP SPLICES OF REINFORCING STEEL IN MASONRY SHALL BE AS SHOWN IN THE CMU REINFORCING LAP SCHEDULE.

3) FOUNDATION DOWELS:
   A) THERE SHALL BE A FOUNDATION DOWEL FOR EACH VERTICAL WALL REINFORCING BAR.
   B) THE MINIMUM REQUIRED EMBEDMENT OF DOWELS IN CONCRETE FOUNDATIONS SHALL BE AS REQUIRED FOR A CLASS B SPLICE FOR THE SPECIFIED COMPRESSIVE STRENGTH FOR THE FOUNDATION. REFER TO CONCRETE LAP LENGTH SCHEDULES FOR TYPICAL LAP REQUIREMENTS. ALTERNATIVELY, THE FOUNDATION DOWELS MAY BE DEVELOPED WITH A STANDARD ACI 90 DEGREE HOOK INTO THE FOUNDATION.
   C) MASONRY DOWELS SHOWN CAST-IN-PLACE IN DOCUMENTS SHALL BE TIED IN PLACE TO FOUNDATION REINFORCING. WET STICKING OF MASONRY DOWELS IS NOT PERMITTED. MASONRY CONTRACTOR SHALL VERIFY PLACEMENT AND LOCATION OF DOWELS PRIOR TO CONCRETE PLACEMENT. EPOXY EMBEDDING DOWELS SHALL NOT BE PERMITTED WITHOUT APPROVAL BY THE OWNER'S REPRESENTATIVE.
   D) AT CONTRACTOR'S OPTION, FOUNDATION DOWELS MAY BE DRILLED AND GROUTED WITH EPOXY MATERIAL TO DEVELOP THE TENSILE CAPACITY OF THE BAR IN ACCORDANCE WITH POST-INSTALLED ANCHORS AND DOWEL NOTES BELOW. EPOXY MANUFACTURER INFORMATION AND EMBEDMENT DEPTH SHALL BE SUBMITTED FOR REVIEW AND APPROVAL BY THE OWNER'S REPRESENTATIVE PRIOR TO PLACEMENT OF WALL FOUNDATIONS.
   E) FOUNDATION DOWELS SHALL EXTEND UP INTO THE GROUTED CELLS TO PROVIDE THE MINIMUM LAP SPLICE LENGTH SHOWN IN THE CMU REINFORCING LAP SCHEDULE.
   F) FOUNDATION DOWELS THAT INTERFERE WITH UNIT WEBS ARE PERMITTED TO BE BENT A MAXIMUM OF 1 IN. HORIZONTALLY FOR EVERY 6 IN. OF VERTICAL HEIGHT. REFER TYPICAL DETAIL FOR PERMITTED BENDING OF FOUNDATION DOWELS.

4) NORMAL VERTICAL WALL REINFORCING SHALL EXTEND CONTINUOUSLY FROM THE TOP OF FOUNDATION TO EMBED WITH A STANDARD HOOK INTO THE TOP BOND BEAM.

5) BOND BEAM REINFORCING STEEL FOR INTERIOR AND EXTERIOR WALLS SHALL BE CONTINUOUS THROUGHOUT, EXCEPT AT CONTROL JOINTS. AT CONTROL JOINTS, INTERMEDIATE BOND BEAM REINFORCEMENT SHALL BE CUT, BUT SHALL BE CONTINUOUS AT DIAPHRAGM BOND BEAMS. EXTEND REINFORCING BARS NOT LESS THAN THAT SPECIFIED ON LAP SCHEDULE. REFER TO TYPICAL DETAILS AND LAP SCHEDULE FOR ADDITIONAL INFORMATION.

J. GROUT PLACEMENT:

1) GROUT PLACING TIME: PLACE GROUT WITHIN 1-1/2 HOURS FROM INTRODUCING WATER IN THE MIXTURE AND PRIOR TO INITIAL SET.

2) GROUT POUR HEIGHT: DO NOT EXCEED THE MAXIMUM GROUT POUR HEIGHT GIVEN IN THE TABLE BELOW. THE GROUT POUR HEIGHT IS DEFINED AS THE TOTAL HEIGHT OF MASONRY TO BE GROUTED PRIOR TO ERECTION OF ADDITIONAL MASONRY. A GROUT POUR CONSISTS OF ONE OR MORE GROUT LIFTS.

GROUT SPACE REQUIREMENTS PER TMS 602-16 BUILDING CODE REQUIREMENTS FOR MASONRY STRUCTURES, TABLE 3.2.1			
GROUT TYPE1	MAXIMUM GROUT POUR HEIGHT, FT.	MINIMUM CLEAR WIDTH OF GROUT SPACE,2,3 IN.	MINIMUM CLEAR GROUT SPACE DIMENSIONS FOR GROUTING CELLS OF HOLLOW UNITS,3,4 IN. X IN.
FINE	1	3/4	1-1/2 X 2
FINE	5.33	2	2 X 3
FINE	12.67	2-1/2	2-1/2 X 3
FINE	24	3	3 X 3
COARSE	1	1-1/2	1-1/2 X 3
COARSE	5.33	2	2-1/2 X 3
COARSE	12.67	2-1/2	3 X 3
COARSE	24	3	3 X 4

FOOTNOTES:
1. FINE AND COARSE GROUTS ARE DEFINED IN ASTM C476.
2. FOR GROUTING BETWEEN MASONRY WYTHES.
3. MINIMUM CLEAR WIDTH OF GROUT SPACE AND MINIMUM CLEAR GROUT SPACE DIMENSION ARE THE NET DIMENSION OF THE SPACE DETERMINED BY SUBTRACTING MASONRY PROTRUSIONS AND THE DIAMETERS OF HORIZONTAL BARS FROM THE AS-BUILT CROSS-SECTION OF THE GROUT SPACE. SELECT THE GROUT TYPE AND MAXIMUM GROUT POUR HEIGHT BASED ON THE MINIMUM CLEAR SPACE.

3) GROUT LIFT HEIGHT: PLACE GROUT IN LIFTS NOT EXCEEDING 5 FT. 4 IN. A GROUT LIFT IS DEFINED AS AN INCREMENT OF GROUT HEIGHT WITHIN A TOTAL GROUT POUR.

4) GROUT CONSOLIDATION: CONSOLIDATE GROUT POURS BY MECHANICAL VIBRATION, AND RECONSOLIDATE BY MECHANICAL VIBRATION AFTER INITIAL WATER LOSS AND SETTLEMENT HAS OCCURRED.

5) GROUT KEY: WHEN GROUTING, FORM GROUT KEYS BETWEEN GROUT POURS. FORM GROUT KEYS BETWEEN GROUT LIFTS WHEN THE FIRST LIFT IS PERMITTED TO SET PRIOR TO PLACEMENT OF THE SUBSEQUENT LIFT.
   A) FORM A GROUT KEY BY TERMINATING THE GROUT A MINIMUM OF 1-1/2 IN. BELOW A MORTAR JOINT.
   B) DO NOT FORM GROUT KEYS WITHIN BOND BEAMS.
   C) AT BOND BEAMS OR LINTELS LAID WITH CLOSED BOTTOM UNITS, TERMINATE THE GROUT POUR AT THE BOTTOM OF THE BEAM OR LINTEL WITHOUT FORMING A GROUT KEY.

10) POST-INSTALLED ANCHORS AND DOWELS

A. GOVERNING CODES AND STANDARDS: IN ADDITION TO THE REQUIREMENTS OF THE GOVERNING INTERNATIONAL BUILDING CODE, ALL POST-INSTALLED ANCHORS AND DOWELS SHALL BE DETAILED, FABRICATED, AND INSTALLED IN ACCORDANCE WITH THE FOLLOWING CODES AND STANDARDS AND AS SUPPLEMENTED BY THESE GENERAL NOTES AND THE PROJECT DRAWINGS AND SPECIFICATIONS.
   1) ACI 318-14 "BUILDING CODE REQUIREMENTS FOR STRUCTURAL CONCRETE."
   2) ACI 355.2-07 "QUALIFICATION OF POST-INSTALLED MECHANICAL ANCHORS IN CONCRETE."
   3) ACI 355.4-11 "QUALIFICATION OF POST-INSTALLED ADHESIVE ANCHORS IN CONCRETE."

B. QUALIFICATION REQUIREMENTS FOR INSTALLERS

   1) CONTRACTOR SHALL REQUEST, SCHEDULE AND FACILITATE THE ANCHOR AND/OR ADHESIVE MANUFACTURER'S REPRESENTATIVE TO PROVIDE ONSITE INSTALLATION TRAINING FOR ALL THE MANUFACTURER'S SPECIFIED ANCHORING PRODUCTS. THE ENGINEER MUST RECEIVE DOCUMENTED CONFIRMATION THAT ALL OF THE CONTRACTOR'S ANCHOR INSTALLATION PERSONNEL ARE TRAINED PRIOR TO COMMENCEMENT OF ANCHOR INSTALLATION OPERATIONS.

   2) INSTALLATION OF ADHESIVE ANCHORS HORIZONTALLY OR UPWARDLY INCLINED SHALL BE PERFORMED BY PERSONNEL CERTIFIED BY AN APPLICABLE CERTIFICATION PROGRAM. CERTIFICATION SHALL INCLUDE WRITTEN AND PERFORMANCE TESTS IN ACCORDANCE WITH THE ACI/CRSI ADHESIVE ANCHOR INSTALLER (AAI) CERTIFICATION PROGRAM, OR EQUIVALENT. WHEN APPLICABLE, SOME DOWN-HOLE INSTALLATIONS SHOWN ON DRAWINGS SUPPORTING SUSTAINED TENSION LOADS ARE DESIGNATED WITH A (CERT) AFTER THE ANCHOR CALLOUT AND SHALL ALSO REQUIRE INSTALLER CERTIFICATION AS OUTLINED ABOVE.

C. QUALIFICATION REQUIREMENTS FOR PRODUCTS

   1) POST-INSTALLED EXPANSION AND UNDERCUT ANCHORS SHALL MEET THE ASSESSMENT CRITERIA OF ACI 355.2.

   2) POST-INSTALLED ADHESIVE ANCHORS SHALL MEET THE ASSESSMENT CRITERIA OF ACI 355.4.

D. APPROVED ANCHORING PRODUCTS: THE ANCHORING SYSTEMS SHOWN BELOW HAVE BEEN USED IN THE ANCHOR DESIGNS SHOWN IN THE CONSTRUCTION DOCUMENTS. SUBSTITUTION REQUESTS FOR ALTERNATE PRODUCTS MUST BE APPROVED IN WRITING BY THE ENGINEER OF RECORD PRIOR TO USE. CONTRACTOR SHALL PROVIDE CALCULATIONS DEMONSTRATING THAT THE SUBSTITUTED PRODUCT IS CAPABLE OF ACHIEVING THE PERFORMANCE VALUES OF THE SPECIFIED PRODUCT. SUBSTITUTIONS WILL BE EVALUATED BY THEIR HAVING AN ICC ESR SHOWING COMPLIANCE WITH THE RELEVANT BUILDING CODE FOR SEISMIC USES, LOAD RESISTANCE, INSTALLATION CATEGORY, AND AVAILABILITY OF COMPREHENSIVE INSTALLATION INSTRUCTIONS. ADHESIVE ANCHOR EVALUATION WILL ALSO CONSIDER CREEP, IN-SERVICE TEMPERATURE, AND INSTALLATION TEMPERATURE.

   1) ANCHORAGE TO CONCRETE

      A) ADHESIVE ANCHORS:
         (1) HILTI HIT-HY 200 SYSTEM WITH HILTI HIT-Z ROD OR HAS-E THREADED ROD [ICC ESR-3187].
         (2) HILTI HIT-RE 500 V3 SYSTEM WITH HILTI HAS-E THREADED ROD [ICC ESR-3814].

      B) MEDIUM DUTY MECHANICAL ANCHORS:
         (1) HILTI KWIK HUS-EZ AND KWIK HUS-EZ I SCREW ANCHORS [ICC ESR-3027]
         (2) HILTI KWIK BOLT-TZ EXPANSION ANCHORS [ICC ESR-1917].
         (3) HILTI KWIK BOLT 3 EXPANSION ANCHORS (UNCRACKED CONCRETE ONLY) [ICC ESR-2302]

      C) HEAVY DUTY MECHANICAL ANCHORS:
         (1) HILTI HDA UNDERCUT ANCHORS [ICC ESR-1546]
         (2) HILTI HSL-3 EXPANSION ANCHORS [ICC ESR-1545]

   2) REBAR DOWELING INTO CONCRETE

      A) ADHESIVE ANCHORS:
         (1) HILTI HIT-HY 200 SYSTEM WITH CONTINUOUSLY DEFORMED REBAR [ICC ESR-3187].
         (2) HILTI HIT-RE 500 V3 SYSTEM WITH CONTINUOUSLY DEFORMED REBAR [ICC ESR-3814].

   3) ANCHORAGE TO SOLID GROUTED MASONRY

      A) ADHESIVE ANCHORS:
         (1) HILTI HIT-HY 270 MASONRY ADHESIVE ANCHORING SYSTEM WITH HILTI HAS-E CONTINUOUSLY THREADED ROD OR CONTINUOUSLY DEFORMED STEEL REBAR [ICC ESR-4143].

      B) MECHANICAL ANCHORS:
         (1) HILTI KWIK BOLT-3 EXPANSION ANCHORS [ICC ESR-1385].

   4) ANCHORAGE TO HOLLOW / MULTI-WYTHE MASONRY

      A) ADHESIVE ANCHORS:
         (1) HILTI HIT-HY 270 MASONRY ADHESIVE ANCHORING SYSTEM WITH HILTI HAS-E CONTINUOUSLY THREADED ROD OR CONTINUOUSLY DEFORMED STEEL REBAR [ICC ESR-4143].
         (2) THE APPROPRIATE SIZE SCREEN TUBE SHALL BE USED PER ADHESIVE MANUFACTURER'S RECOMMENDATION.

E. PREPARATION PRIOR TO INSTALLATION

   1) CURING OF BASE MATERIAL: DO NOT DRILL OR CORE HOLES INTO SUPPORTING CONCRETE OR MASONRY MATERIALS UNTIL THE CONCRETE, MORTAR AND/OR GROUT HAVE BEEN ADEQUATELY CURED TO ACHIEVE FULL DESIGN STRENGTH. IN NO CASE SHALL ANCHORS BE INSTALLED PRIOR TO THE CONCRETE HAVING AN AGE OF LESS THAN 21 DAYS.

   2) TEMPERATURE OF BASE MATERIAL: THE CONCRETE TEMPERATURE AT THE TIME OF ADHESIVE ANCHOR INSTALLATION SHALL BE AT LEAST 50°F (10°C) UNLESS TESTING HAS BEEN CONDUCTED IN ACCORDANCE WITH RECOGNIZED CRITERIA TO VERIFY PERFORMANCE IN CONCRETE AT LOWER TEMPERATURES.

   3) AVOIDANCE OF EMBEDDED ITEMS: PRIOR TO DRILLING OR CORING OPERATIONS, THE CONTRACTOR SHALL LOCATE AND MARK ALL POTENTIALLY CONFLICTING REINFORCING BARS, UTILITIES AND OTHER EMBEDDED ITEMS BY INDUCTION SCANNING, GROUND PENETRATING RADAR, X-RAY, OR OTHER APPROVED NON-DESTRUCTIVE METHOD. CONTRACTOR SHALL AVOID DRILLING OR CORING HOLES THAT MAY DAMAGE THESE EMBEDDED ITEMS. NOTIFY THE ENGINEER IF CONFLICTING EMBEDDED ITEMS DO NOT ALLOW INSTALLATION OF POST-INSTALLED ANCHORS IN ACCORDANCE WITH THE CONSTRUCTION DOCUMENTS AND/OR APPROVED SHOP DRAWINGS.

   4) CARTRIDGE STORAGE: ADHESIVE CARTRIDGES SHALL BE STORED UNDER CONDITIONS IN COMPLIANCE WITH MANUFACTURER RECOMMENDATIONS REGARDING TEMPERATURE, EXPOSURE TO SUNLIGHT, ETC. AND EVIDENCE OF COMPLIANCE SHALL BE MADE AVAILABLE UPON REQUEST. THE USE OF EXPIRED ADHESIVE, AS INDICATED BY THE EXPIRATION DATE ON THE CARTRIDGE, IS PROHIBITED.

   5) INSTALLATION EQUIPMENT: THE CONTRACTOR SHALL PROVIDE ALL EQUIPMENT REQUIRED TO INSTALL THE EXPANSION AND/OR ADHESIVE ANCHOR INCLUDING, BUT NOT LIMITED TO, DRILLS, SETTING TOOLS, CLEAN-OUT BRUSHES, BLOWOUT BULBS, OIL-FREE COMPRESSED AIR, VACUUMS, WRENCHES, ETC.

F. INSTALLATION

   1) ALL DRILLING AND CORING EQUIPMENT AND ALL METHODS FOR INSTALLATION OF POST-INSTALLED ANCHORS AND DOWELS SHALL BE IN ACCORDANCE WITH THE MANUFACTURER'S PRINTED INSTALLATION INSTRUCTIONS (MPII).

   2) UNLESS OTHERWISE SPECIFIED, ANCHORS SHALL BE INSTALLED IN HOLES DRILLED WITH A ROTARY IMPACT HAMMER DRILL OR, WHERE NOT OTHERWISE PROSCRIBED, A ROCK DRILL. IN ALL CASES, THE BIT DIAMETER SHALL BE IN ACCORDANCE WITH THE MPII.

   3) EMBEDMENT DEPTH AND MINIMUM ANCHOR PROJECTION OF THE ANCHOR ELEMENT FROM THE CONCRETE SURFACE SHALL BE AS SHOWN ON THE DRAWING OR DETAIL FOR THE PARTICULAR ANCHOR OR GROUP OF ANCHORS BEING INSTALLED.

   4) ANCHOR CAPACITY IS DEPENDENT UPON SPACING BETWEEN ADJACENT ANCHORS AND PROXIMITY OF ANCHORS TO EDGES OF CONCRETE. INSTALL ANCHORS IN ACCORDANCE WITH SPACING AND EDGE CLEARANCES INDICATED ON THE DRAWINGS. ANCHOR SPACING AND EDGE DISTANCE VALUES SHALL NOT BE LESS THAN RECOMMENDED BY THE ANCHOR MANUFACTURER.

   5) HOLES FOR POST-INSTALLED ANCHORS:

      A) UNLESS SPECIFICALLY SHOWN OTHERWISE, ALL HOLES SHALL BE INSTALLED PERPENDICULAR TO THE CONCRETE OR MASONRY SURFACE.

      B) ANCHOR HOLES SHALL BE THOROUGHLY CLEANED IN ACCORDANCE WITH THE PROCEDURES SPECIFIED IN THE MPII PRIOR TO ADHESIVE INJECTION. AT A MINIMUM, THIS SHALL CONSIST OF CLEANING WITH OIL-FREE AND MOISTURE-FREE COMPRESSED AIR, USING A NOZZLE EXTENDED TO THE BOTTOM HOLE; SUPPLEMENTED WITH A BRUSH OR OTHER TOOL CLEANING TO REMOVE ALL CONCRETE DUST AND LOOSE MATERIAL; AND FOLLOWED BY A SECOND COMPRESSED AIR CLEANING. THIS IS COMMONLY KNOWN AS BLOW-BRUSH-BLOW OR BBB. SOME ANCHOR MANUFACTURERS HAVE DEVELOPED VACUUM SYSTEMS THAT REPLACE THE TRADITIONAL BBB APPROACH.

      C) DRILLED AND CLEANED ANCHOR HOLES SHALL BE PROTECTED FROM CONTAMINATION AND WATER (E.G. RAIN) UNTIL THE ADHESIVE IS INSTALLED.

      D) A DRILLED ANCHOR HOLE SHALL BE RE-CLEANED JUST PRIOR TO ADHESIVE INJECTION IF, IN THE OPINION OF THE ENGINEER, INSPECTOR, OR OWNER'S REPRESENTATIVE, THE HOLE HAS BECOME CONTAMINATED AFTER INITIAL CLEANING.

   6) INSTALLATION OF ADHESIVE ANCHORS:

      A) ADHESIVE ANCHORS WITH DIAMETER GREATER THAN 3/8-INCH INSTALLED IN ORIENTATIONS FROM HORIZONTAL TO VERTICAL SHALL EMPLOY A PISTON PLUG FOR THE ADHESIVE INJECTION.

      B) ADHESIVE SHALL BE INJECTED IN ACCORDANCE WITH THE MPII USING EQUIPMENT AND PROCEDURES AS SPECIFIED THEREIN FOR THE SPECIFIC CONDITIONS ASSOCIATED WITH THE INJECTION. THIS SHALL BE CLEARLY SPECIFIED IN THE MPII, IF NOT, ANOTHER PRODUCT SHALL BE PROPOSED FOR USE.

      C) ANCHOR ELEMENTS TO BE INSTALLED IN THE ADHESIVE SHALL BE CLEAN, OIL-FREE, AND FREE OF LOOSE RUST, PAINT, OR OTHER COATINGS.

      D) THREADS ON THE PROJECTING PORTION OF THE ANCHOR ELEMENT SHALL BE PROTECTED FROM ADHESIVE CONTAMINATION.

      E) UNLESS SPECIFICALLY SHOWN OTHERWISE ON THE DRAWINGS, ANCHORS SHALL BE INSTALLED PERPENDICULAR TO THE CONCRETE SURFACE.

      F) INSTALLED ADHESIVE ANCHORS SHALL BE SECURELY FIXED IN-PLACE TO PREVENT DISPLACEMENT WHILE THE ADHESIVE CURES. ANCHORS DISPLACED BEFORE FULL ADHESIVE CURE SHALL BE CONSIDERED DAMAGED AND REPLACED AT THE CONTRACTOR'S EXPENSE.

   7) POST-INSTALLED ANCHORS AND DOWELS SHALL NOT BE BENT AFTER BEING INSTALLED UNLESS PERMITTED BY THE ENGINEER IN WRITING.

G. SPECIAL INSPECTION REQUIREMENTS

   1) CONTINUOUS INSPECTIONS: ADHESIVE ANCHORS INSTALLED IN HORIZONTALLY OR UPWARDLY INCLINED ORIENTATIONS SHALL BE CONTINUOUSLY INSPECTED DURING INSTALLATION BY A CERTIFIED INSPECTOR SPECIFICALLY APPROVED FOR THAT PURPOSE BY THE BUILDING OFFICIAL.

   2) PERIODIC INSPECTIONS: PERIODIC SPECIAL INSPECTIONS SHALL BE PROVIDED FOR ALL OTHER POST-INSTALLED ANCHORS NOT INCLUDED IN THE CONTINUOUS INSPECTIONS REQUIRED ABOVE.

   3) REPORTING REQUIREMENTS: THE SPECIAL INSPECTOR SHALL FURNISH A REPORT TO THE ENGINEER AND BUILDING OFFICIAL THAT THE WORK COVERED BY THE REPORT HAS BEEN PERFORMED AND THAT THE MATERIALS AND INSTALLATION PROCEDURES USED CONFORM WITH THE APPROVED CONSTRUCTION DOCUMENTS AND THE MANUFACTURER'S PRINTED INSTALLATION INSTRUCTIONS (MPII).

11) STEEL CONSTRUCTION NOTES

A. GOVERNING CODES AND STANDARDS: IN ADDITION TO THE REQUIREMENTS OF THE GOVERNING INTERNATIONAL BUILDING CODE, ALL STRUCTURAL STEEL SHALL BE DETAILED, FABRICATED, AND ERECTED IN ACCORDANCE WITH THE FOLLOWING STANDARDS AND AS SUPPLEMENTED BY THESE GENERAL NOTES AND THE PROJECT DRAWINGS AND SPECIFICATIONS.
   1) AISC 303-16 "CODE OF STANDARD PRACTICE FOR STEEL BUILDINGS AND BRIDGES"
   2) AISC 341-16 "SEISMIC PROVISIONS FOR STRUCTURAL STEEL BUILDINGS"
   3) AISC 360-16 "SPECIFICATION FOR STRUCTURAL STEEL BUILDINGS"
   4) AWS D1.1-2015 "STRUCTURAL WELDING CODE - STEEL"
   5) RCSC-2014 "SPECIFICATION FOR STRUCTURAL JOINTS USING HIGH-STRENGTH BOLTS"

B. STRUCTURAL BOLTS, ANCHOR RODS & BASE PLATES:

   1) STEEL CONTRACTOR SHALL FURNISH ERECTION BOLTS AS REQUIRED FOR FIELD CONNECTIONS.

   2) ALL BOLTS SHALL BE 3/4 IN. DIAMETER ASTM A325 WITH SUITABLE WASHERS AND NUTS UNLESS OTHERWISE SHOWN IN THE CONSTRUCTION DOCUMENTS OR APPROVED IN WRITING BY THE OWNER'S REPRESENTATIVE.

   3) ALL BOLTS SHALL BE TIGHTENED TO THE SNUG-TIGHTENED JOINT REQUIREMENTS OF RCSC-10 EXCEPT AT SLIP-CRITICAL JOINTS OR WHERE NOTED OTHERWISE IN CONSTRUCTION DOCUMENTS OR IN FABRICATOR'S CONNECTION DESIGN.

   4) UNLESS OTHERWISE INDICATED IN THE DRAWINGS, ALL ANCHOR RODS SHALL CONFORM TO THE SPECIFIED MATERIAL GRADE SHALL BE A MINIMUM 3/4 INCH DIAMETER WITH A MINIMUM FOUNDATION EMBEDMENT AS INDICATED IN STRUCTURAL DETAILS. THE EMBEDDED END SHALL HAVE EITHER A STANDARD BOLT HEAD, A HEAVY HEX NUT WITH THE THREADS SPOILED ABOVE AND BELOW THE NUT, OR JAMMED DOUBLE NUTS.

   5) PRIOR TO PLACING CONCRETE, STEEL PLATE TEMPLATES SHALL BE PROVIDED TO FACILITATE PLACEMENT OF ANCHOR RODS IN DETAILED PLAN POSITIONS AND ELEVATIONS.

   6) BASE PLATES SHALL BE LEVELED WITH LEVELING NUTS AND OVERSIZED WASHER PLATES OR WITH SHIM PACKS AT THE ERECTOR'S OPTION.

   7) AFTER FINAL BASE PLATE POSITIONING, ANCHOR ROD NUTS SHALL BE INSTALLED TO A SNUG-TIGHT CONDITION AND WASHER PLATES SHALL BE FIELD WELDED AS INDICATED IN THE CONSTRUCTION DOCUMENTS.

C. STEEL FABRICATION & FINISH:

   1) SHOP DRAWINGS SHALL BE SUBMITTED TO AND REVIEWED BY THE OWNER'S REPRESENTATIVE PRIOR TO COMMENCING FABRICATION. ANY FABRICATION INITIATED PRIOR TO APPROVAL OF SHOP DRAWINGS WILL BE AT THE SOLE RISK OF THE FABRICATOR.

   2) ALL SHOP AND FIELD WELDS SHALL BE MADE IN ACCORDANCE WITH AWS D1.1. ALL WELDING SHALL USE LOW HYDROGEN PROCESSES.

   3) ALL BEAMS THAT ARE REQUIRED TO HAVE CAMBER SHALL BE FABRICATED WITH CAMBER UPWARD. BEAMS WITHOUT SPECIFIED CAMBER SHALL BE FABRICATED SUCH THAT AFTER ERECTION, ANY NATURAL CAMBER DUE TO ROLLING OR SHOP FABRICATION IS UPWARD.

   4) CUTS, HOLES, COPING, ETC. REQUIRED FOR WORK OF OTHER TRADES SHALL BE SHOWN ON THE SHOP DRAWINGS AND MADE IN THE SHOP. CUTS OR BURNING OF HOLES IN STRUCTURAL STEEL MEMBERS IN THE FIELD WILL NOT BE PERMITTED.

   5) THE FABRICATOR SHALL BE RESPONSIBLE FOR ALL ERECTION AIDS. ANY SUCH ERECTION AIDS SHALL BE REMOVED FROM THE COMPLETED STRUCTURE IF DIRECTED BY THE OWNER'S REPRESENTATIVE.

   6) ALL EXTENSION BARS, RUN-OFF PLATES, AND BACKING BARS USED IN WELDED CONNECTIONS SHALL BE REMOVED AND THE JOINTS SHALL BE GROUND SMOOTH WHERE SUCH CONNECTION IS PERMANENTLY EXPOSED TO VIEW OR IS DESIGNATED AS ARCHITECTURALLY EXPOSED STRUCTURAL STEEL.

   7) HEADED STUDS AND DEFORMED BAR ANCHORS
      A) ALL HEADED STUDS AND DEFORMED BAR ANCHORS SHALL BE INSTALLED USING AUTOMATIC END-WELDING EQUIPMENT RECOMMENDED BY THE STUD OR ANCHOR MANUFACTURER. MANUAL WELDING OF HEADED STUDS OR DEFORMED BAR ANCHORS WILL NOT BE ALLOWED.
      B) IF A VISUAL INSPECTION REVEALS ANY STUD THAT DOES NOT SHOW A FULL 360-DEGREE FLASH OR ANY STUD THAT HAS BEEN REPAIRED BY MANUAL WELDING, SUCH STUD SHALL BE BENT TO AN ANGLE APPROXIMATELY 15-DEGREES FROM ITS ORIGINAL AXIS. THE DIRECTION OF BENDING FOR STUDS WITH LESS THAN A 360-DEGREE FLASH SHALL BE OPPOSITE TO THE MISSING PORTION OF THE FLASH.
      C) HEADED STUDS AND DEFORMED BAR ANCHORS THAT HAVE SUCCESSFULLY PASSED THE BEND TEST WITHOUT SIGN OF FAILURE SHALL BE ACCEPTABLE FOR USE AND LEFT IN THE BENT POSITION UNLESS DIRECTED OTHERWISE BY THE ENGINEER.
      D) WELDED STUDS NOT CONFORMING TO THE REQUIREMENTS OF AWS D1.1 SHALL BE REPAIRED OR REPLACED BY THE CONTRACTOR. THE CONTRACTOR SHALL REVISE THE WELDING PROCEDURE AS NECESSARY TO ENSURE THAT SUBSEQUENT STUD WELDING WILL MEET AWS D1.1 REQUIREMENTS.

   8) STEEL EMBEDMENTS IN CONCRETE:
      A) ALL STEEL COMPONENTS TO BE EMBEDDED IN CONCRETE SHALL HAVE COATINGS AS DEFINED IN THE TABLE BELOW.

COATINGS FOR STEEL EMBEDMENTS IN CONCRETE		
EXPOSURE	FIELD WELDING	FINISH
EXTERIOR	EITHER	GALVANIZED
INTERIOR	YES	UNPAINTED
	NO	GALVANIZED

SFOOTNOTES:
1. ALL WELDING TO PREVIOUSLY GALVANIZED COMPONENTS WILL REQUIRE REMOVAL OF THE GALVANIZING WITH GRINDING FOR AT LEAST 3-INCHES FROM EITHER SIDE OF THE INTENDED WELD AND ON BOTH SIDES OF THE WORKPIECE.
2. FIELD WELDED AREAS AND OTHER AREAS WITH REMOVAL OF, OR DAMAGE TO, THE GALVANIZED COATING SHALL HAVE THEIR COATING RESTORED IN ACCORDANCE TO ASTM A780, USING PAINT CONTAINING ZINC DUST OR SIMILAR PERMITTED PRODUCTS CAPABLE OF PROVIDING A MINIMUM ZINC-RICH COATING THICKNESS OF 2.0 MILS IN A SINGLE APPLICATION.

      B) IN ORDER TO REDUCE THE RISK OF HEAT-INDUCED CONCRETE SPALLING AT FIELD-WELDED EMBED PLATES:
         i) ALLOW SUPPORTING CONCRETE TO CURE FOR A MINIMUM OF 14-DAYS PRIOR TO FIELD WELDING.
         ii) PROVIDE THE WELD SIZE SHOWN IN DETAILS AND DO NOT OVER-WELD.

   9) SHOP PRIMER
      A) ALL STEEL EXPOSED TO EXTERIOR WEATHER OR AN UNCONTROLLED ENVIRONMENT SHALL BE BLAST CLEANED AND PRIMED WITH A SUBMITTED AND APPROVED ZINC-RICH PRIMER.
      B) INTERIOR STEEL SHALL BE SHOP PRIMED WITH THE FABRICATORS STANDARD SHOP PRIMER.
      C) SHOP PRIMER SHALL NOT BE APPLIED TO THE FOLLOWING AREAS:
         i) SURFACES EMBEDDED IN CONCRETE OR MORTAR. EXTEND PRIMING OF PARTIALLY EMBEDDED MEMBERS TO A DEPTH OF 2 INCHES.
         ii) SURFACES TO BE FIELD WELDED.
         iii) SURFACES TO BE HIGH-STRENGTH BOLTED WITH SLIP-CRITICAL CONNECTIONS.
         iv) SURFACES TO RECEIVE SPRAYED FIRE-RESISTIVE MATERIALS.
         v) GALVANIZED SURFACES.

D. STEEL MISCELLANEOUS:

   1) ALL EDGE ANGLES SUPPORTING ROOF OR FLOOR DECK SHALL BE CONTINUOUS BUTT-SPLICE WELDED OVER SUPPORTS.

   2) ALL ELEVATED MECHANICAL EQUIPMENT SHALL BE SUPPORTED BY STEEL FRAMING. IF SPECIFIC FRAMING SIZES ARE NOT PROVIDED ON THE FRAMING PLAN, REFER TYPICAL DETAILS FOR ROOF AND FLOOR OPENING FRAME DETAILS.

   3) SUBSTITUTION OF POST-INSTALLED ANCHORS FOR EMBEDDED ANCHORS SHOWN ON THE DRAWINGS WILL NOT BE PERMITTED UNLESS SPECIFICALLY APPROVED IN WRITING BY THE OWNER'S REPRESENTATIVE.

   4) WHERE POST-INSTALLED ANCHORS ARE USED IN CONTINUOUS ANGLES, FABRICATE ANGLE WITH OPTIONAL HOLE LOCATIONS TO ALLOW REMEDIATION OF CASES WHERE ANCHORS FOUL WITH REBAR. AS AN EXAMPLE, FOR A CONTINUOUS ANGLE WITH ANCHORS AT 24" ON CENTER, PROVIDE HOLES AT 6" ON CENTER.

   5) GALVANIZED LOOSE LEDGE ANGLES SHALL BE PROVIDED OVER ALL MASONRY VENEER OPENINGS OR RECESSES DEEPER THAN 1". LINTELS SHALL HAVE 1" OF BEARING AT EACH END FOR EVERY FOOT OF SPAN, WITH A MINIMUM OF 4" AND SIZED AS FOLLOWS UNLESS SHOWN OTHERWISE IN THE DRAWINGS.
      A) UP TO 4'-0".....L3-1/2 x 3-1/2 x 3/8
      B) 4'-1" to 5'-0".....L4 x 3-1/2 x 3/8 (LLV)
      C) 5'-1" to 6'-6".....L5 x 3-1/2 x 3/8 (LLV)
      D) 6'-7" to 8'-0".....L6 x 3-1/2 x 3/8 (LLV)

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12) STEEL JOIST AND BRIDGING NOTES

A. GOVERNING CODES AND STANDARDS: IN ADDITION TO THE REQUIREMENTS OF THE GOVERNING INTERNATIONAL BUILDING CODE, ALL STEEL JOIST, JOIST GIRDER, JOIST BRIDGING AND ASSOCIATED MATERIALS SHALL BE DETAILED, FABRICATED, AND ERECTED IN ACCORDANCE WITH THE FOLLOWING STEEL JOIST INSTITUTE (SJI) STANDARDS AND AS SUPPLEMENTED BY THESE GENERAL NOTES AND THE PROJECT DRAWINGS AND SPECIFICATIONS.
   1) SJI 100-15 "STANDARD SPECIFICATION FOR K-SERIES, LH-SERIES, AND DLH-SERIES OPEN WEB STEEL JOISTS AND JOIST GIRDERS"
   2) SJI 200-15 "STANDARD SPECIFICATION FOR CJ-SERIES COMPOSITE STEEL JOISTS"
   3) SJI TECHNICAL DIGEST NO. 9 "HANDLING AND ERECTION OF STEEL JOISTS AND JOIST GIRDERS"

B. COORDINATION BY GENERAL CONTRACTOR:

   1) THE GENERAL CONTRACTOR SHALL CONFIRM OR REVISE MECHANICAL EQUIPMENT SIZE AND WEIGHT AND PROVIDE THE JOIST MANUFACTURER THE POINT LOADS FOR WHICH SPECIAL JOISTS ARE TO BE DESIGNED. PRELIMINARY ROOF TOP UNIT (RTU) WEIGHTS ARE SHOWN ON THE ROOF PLANS. SHOULD WEIGHTS EXCEED THOSE SHOWN, CONTRACTOR SHALL CONTACT THE OWNER'S REPRESENTATIVE FOR REVIEW.

C. JOIST DESIGN BY MANUFACTURER

   1) AS A MINIMUM REQUIREMENT, THE JOIST MANUFACTURER SHALL DESIGN ALL JOISTS FOR THE DESIGN LOADS SPECIFIED IN THE STEEL JOIST INSTITUTE'S LOAD TABLES. IN ADDITION, JOISTS SHALL BE DESIGNED TO CARRY ANY OTHER LOADS INDICATED ON THE DRAWINGS, INCLUDING BUT NOT LIMITED TO, EQUIPMENT AND/OR PIPING SUPPORTED ON OR SUSPENDED FROM THE ROOF STRUCTURE.

   2) UNLESS SHOWN OTHERWISE IN THE DRAWINGS, JOISTS SHALL BE DESIGNED BY THE JOIST MANUFACTURER FOR A NET UPLIFT OF 10 PSF IN THE FIELD OF THE ROOF AND 15 PSF WITHIN 10 FEET OF ROOF EDGES.

   3) BETWEEN PANEL POINTS OF STEEL JOISTS THE CHORD MEMBERS SHALL BE DESIGNED TO SUPPORT 100 LBS VERTICAL LOAD WITHOUT REINFORCEMENT OF THE JOIST. TYPICALLY, UNDERHUNG LOADS SHALL BE SUPPORTED AT JOIST PANEL POINTS. OFF-PANEL POINT LOADING IN EXCESS OF 100 POUNDS WILL REQUIRE JOIST REINFORCING. REFER TYPICAL DETAILS FOR JOIST REINFORCING DETAIL.

   4) UNLESS MORE STRINGENT PROVISIONS ARE SHOWN IN THE CONTRACT DOCUMENTS, THE JOIST MANUFACTURER SHALL DESIGN ALL JOISTS FOR A MAXIMUM LIVE LOAD DEFLECTION OF L/360.

   5) JOISTS SEATS SHALL HAVE STANDARD JOIST SEAT DEPTHS UNLESS NOTED OTHERWISE. HOWEVER, FLAT BEARING SEATS SHALL BE PROVIDED FOR ALL JOISTS BY INCREASING THE DEPTH OF THE SEAT AT THE HIGH END OF SLOPED JOISTS. CONTRACTOR SHALL VERIFY FINAL SEAT DEPTHS PRIOR TO DETAILING SUPPORTING STRUCTURE. STANDARD JOIST SEAT DEPTHS ARE AS FOLLOWS:
      A) K-SERIES: 2-1/2"
      B) LH-SERIES: 5"
      C) G-SERIES: 7-1/2"

   6) UNLESS SHEAR COLLECTOR ASSEMBLIES ARE SHOWN AND DETAILED IN THE DRAWINGS, AT ALL PERIMETER DECK DIAPHRAGM BOUNDARIES AND AT SHEAR TRANSFER BAYS OF INTERIOR BRACED FRAME OR MOMENT FRAME LINES, JOIST SEATS AND THEIR ANCHORAGE TO SUPPORTING STEEL SHALL BE DESIGNED FOR THE FOLLOWING LATERAL SEAT ROLLOVER FORCES:
      A) FOR JOIST SEATS DEPTHS UP TO 3-1/2 INCHES, MINIMUM SERVICE LEVEL ROLLOVER CAPACITY SHALL BE 2,000 LBS.
      B) FOR JOIST SEATS DEPTHS GREATER THAN 3-1/2 INCHES AND LESS THAN OR EQUAL TO 5 INCHES, MINIMUM SERVICE LEVEL ROLLOVER CAPACITY SHALL BE 1,200 LBS.

   7) BOTTOM CHORDS ON ALL JOISTS SHALL BE EXTENDED TO RECEIVE CEILING OR POTENTIAL FUTURE CEILING.

   8) IN STEEL FRAMES, WHERE COLUMNS ARE NOT FRAMED IN AT LEAST TWO DIRECTIONS WITH SOLID WEB STRUCTURAL STEEL MEMBERS, STEEL JOISTS SHALL BE FIELD-BOLTED TO THE COLUMNS TO PROVIDE LATERAL STABILITY TO THE COLUMNS DURING ERECTION AND BOTTOM CHORD STABILITY PLATES SHALL BE PROVIDED AS REQUIRED BY OSHA SAFETY STANDARDS.

D. JOIST BRIDGING

   1) JOIST BRIDGING SHOWN ON FRAMING PLANS IS PRELIMINARY AND SHALL NOT BE USED AS THE BASIS FOR BID OR FOR ERECTION. ALL JOIST BRIDGING SHALL BE DESIGNED BY THE JOIST MANUFACTURER TO MEET OR EXCEED THE MINIMUM REQUIREMENTS OF CURRENT SJI SPECIFICATIONS AND ALL OSHA PROVISIONS REGARDING JOIST ERECTION.

   2) ADDITIONAL BRIDGING LINES AT THE BOTTOM CHORD OUTSIDE PANEL POINT HAVE NOT BEEN SHOWN FOR CLARITY BUT ARE REQUIRED FOR THE SUPPORT OF UPLIFT LOADS. PROVIDE AS DESIGNED BY THE JOIST MANUFACTURER.

   3) NO VERTICAL LOAD SHALL BE IMPOSED ON BRIDGING.

   4) HORIZONTAL BRIDGING ANGLES FOR TOP AND BOTTOM CHORDS OF JOISTS ARE SHOWN ON FRAMING PLANS THUS: - - - - -

   5) DIAGONAL BRIDGING IS SHOWN AS AN "X" ALONG A LINE OF HORIZONTAL BRIDGING. DIAGONAL BRIDGING SHALL BE PROVIDED WHERE SHOWN AND AT ANY DISCONTINUITIES IN THE ROW OF BRIDGING.

   6) ALL BRIDGING LINES SHALL BE TERMINATED WITH AN "X" OR ANCHORED TO A STRUCTURAL WALL. REFER TYPICAL DETAILS FOR JOIST BRIDGING DETAILS.

E. JOIST ERECTION
   1) ERECTION OF JOISTS SHALL FOLLOW CURRENT SJI SPECIFICATIONS, SJI TECHNICAL DIGEST NO. 9 AND ALL APPLICABLE PROVISIONS OF OSHA SAFETY STANDARDS. JOISTS SHALL NOT BE FULLY LOADED UNTIL ALL BRIDGING LINES ARE SECURED AND METAL DECKING IS IN PLACE. THE JOIST MANUFACTURER AND ERECTOR SHALL PROVIDE ADDITIONAL BRIDGING DURING CONSTRUCTION SEQUENCING AS REQUIRED BY THE CURRENT SJI SPECIFICATIONS AND OSHA SAFETY STANDARDS.

   2) NO LOAD APPLIED TO JOIST SHALL BE DONE IN A MANNER THAT EXCEEDS THE MOMENT OR SHEAR CAPACITY OF THE JOIST.

   3) ANY HANGERS SUPPORTED FROM JOISTS SHALL BE CONNECTED WITHOUT FIELD WELDING OR DRILLING TO THE JOIST.

13) METAL DECK NOTES

F. GOVERNING CODES AND STANDARDS: IN ADDITION TO THE REQUIREMENTS OF THE GOVERNING INTERNATIONAL BUILDING CODE, ALL STEEL DECK AND ASSOCIATED MATERIALS SHALL BE DETAILED, FABRICATED, AND ERECTED IN ACCORDANCE WITH THE FOLLOWING STEEL DECK INSTITUTE (SDI) STANDARDS AND AS SUPPLEMENTED BY THESE GENERAL NOTES AND THE PROJECT DRAWINGS AND SPECIFICATIONS.
   1) SDI NC-2017 "STANDARD FOR NONCOMPOSITE STEEL FLOOR DECK"
   2) SDI RD-2017 "STANDARD FOR STEEL ROOF DECK"
   3) SDI-C-2017 "STANDARD FOR COMPOSITE STEEL FLOOR DECK SLABS"
   4) SDI-QA/QC-2017 "STANDARD FOR QUALITY CONTROL AND QUALITY ASSURANCE FOR INSTALLATION OF STEEL DECK"

G. ROOF DECK:

   1) BASIS OF DESIGN: VULCRAFT TYPE 1.5B WIDE RIB DECK WITH THE CHARACTERISTICS AND STRUCTURAL PROPERTIES OUTLINED BELOW. WIDE RIB DECKS OF OTHER MANUFACTURERS ARE ACCEPTABLE IF THEY PROVIDE SIMILAR LOAD-CARRYING CAPACITY FOR THE DECK SPANS APPLICABLE TO THIS PROJECT.
      A) SDI DECK TYPE: WIDE RIB (WR)
      B) DEPTH: 1-1/2 IN.
      C) THICKNESS: 20 GAGE
      D) FINISH: GALVANIZED
      E) I = 0.212 IN4/FT
      F) Sp = 0.234 IN3/FT
      G) Sn = 0.247 IN3/FT
      H) Fy = 33 KSI
      I) SIDE LAPS: OVERLAPPED

   2) SUPPORT FASTENERS: ROOF DECK SHALL BE CONNECTED TO SUPPORTS WITH #12 MECHANICAL FASTENERS AT 6" O.C. (36/7 PATTERN).
      A) FASTENERS SHALL PENETRATE ALL PLIES OF DECKING INTO SUPPORTING SUBSTRATE OR 2 LINES OF FASTENERS SHALL BE PROVIDED.
      B) #12 MECHANICAL FASTENERS ARE CAPABLE OF SELF-TAPPING INTO A 1/2-INCH MAXIMUM SUPPORTING STEEL THICKNESS. IF SUPPORTING STEEL THICKNESS EXCEEDS 1/2-INCH OR IF SUPPORT IS AN EMBED PLATE, PROVIDE (1) 5/8-INCH DIAMETER PUDDLE WELD IN LIEU OF EACH #12 FASTENER.

   3) SIDE LAP FASTENERS: ROOF DECK SIDE LAPS SHALL BE FASTENED WITH #10 SIDE LAP FASTENERS AT 12" ON CENTER.

   4) MINIMUM BEARING LENGTH AND LAP LENGTH: MINIMUM BEARING LENGTH ON SUPPORTS AT DISCONTINUOUS ENDS OF ROOF DECK IS 1.5-INCHES. MINIMUM BEARING LENGTH AND LAP LENGTH OF CONTINUOUS ROOF DECK OVER INTERIOR SUPPORTS IS 3-INCHES.

H. COMPOSITE ROOF DECK:

   1) COMPOSITE ROOF SYSTEM: COMPOSITE ROOF SYSTEM SHALL BE AS NOTED ON FLOOR PLAN DRAWINGS AND AS SHOWN IN TYPICAL DETAILS.

   2) BASIS OF DESIGN: VULCRAFT TYPE 2VLI COMPOSITE METAL DECK WITH THE CHARACTERISTICS AND STRUCTURAL PROPERTIES OUTLINED BELOW. COMPOSITE FLOOR DECKS OF OTHER MANUFACTURERS ARE ACCEPTABLE IF THEY PROVIDE SIMILAR LOAD-CARRYING CAPACITY FOR THE DECK SPANS APPLICABLE TO THIS PROJECT.
      A) SDI DECK TYPE: COMPOSITE
      B) DEPTH: 2 IN.
      C) THICKNESS: 18 GAGE
      D) FINISH: GALVANIZED
      E) Ip = 0.559 IN4/FT
      F) In = 0.558 IN4/FT
      G) Sp = 0.495 IN3/FT
      H) Sn = 0.504 IN3/FT
      I) Fy = 50 KSI
      J) SIDE LAPS: OVERLAPPED
      K) UNIT WEIGHT OF NORMAL WEIGHT CONCRETE FILL: 145 PCF

   3) NON-COMPOSITE STRENGTH REQUIRED: THE COMPOSITE DECK SHALL BE CAPABLE OF SAFELY AND NON-COMPOSITELY SUPPORTING THE WET WEIGHT OF CONCRETE, INCLUDING AN ADDITIONAL CONCRETE PONDING WEIGHT OF 6 PSF DUE TO DEFLECTION OF DECK AND SUPPORTING STEEL FRAMING, PLUS TEMPORARY CONSTRUCTION LOADS WITHOUT REQUIRING SHORING. THE DECK SUPPLIER SHALL INFORM OWNER'S REPRESENTATIVE IF ANY PROJECT SPAN CONDITIONS DO NOT COMPLY WITH THIS REQUIREMENT AND SHALL RECOMMEND AREAS THAT MUST BE TEMPORARILY SHORED UNTIL CONCRETE HAS CURED FOR A MINIMUM OF 7 DAYS.

   4) DECK ORIENTATION: COMPOSITE FLOOR DECK SHALL BE PLACED WITH RIBS PERPENDICULAR TO SUPPORTING STEEL FRAMING EXCEPT AT SKEWED FRAMING MEMBERS.

   5) SUPPORT FASTENERS: ENDS OF COMPOSITE METAL DECKING SHALL BE BUTTED AND CONNECTED TO SUPPORTS WITH MINIMUM 5/8" DIAMETER PUDDLE WELDS AT MAXIMUM 12" SPACING.(EACH SIDE OF BUTTED JOINT)

   6) SIDE LAP FASTENERS: PROVIDE BUTTON PUNCHED SIDE LAPS 12" ON CENTER. SIDE LAP CONNECTIONS ARE DECK TO DECK CONNECTIONS.

   7) MINIMUM BEARING LENGTH: MINIMUM EXTERIOR AND INTERIOR BEARING LENGTHS SHALL BE AS RECOMMENDED BY THE DECK MANUFACTURER FOR THE SPECIFIC DECK TYPE, GAGE AND SLAB THICKNESS USED.

I. SUBSTITUTION OF WELDING OR PINS FOR MECHANICAL SCREW ANCHORS WILL NOT BE PERMITTED.

J. SUPPORTS FOR DECKING ARE DEFINED AS MEMBERS PROVIDING DIRECT TRANSVERSE SUPPORT AS WELL AS CONTINUOUS PARALLEL EDGE SUPPORT.

K. ALL DECKING SHALL BE PLACED WITH RIBS PERPENDICULAR TO SUPPORTING ROOF OR FLOOR MEMBERS AND SHALL SPAN A MINIMUM OF 3 SPANS UNLESS SHOWN OTHERWISE IN STRUCTURAL DRAWINGS.

L. METAL DECKING SHALL NOT BE USED TO SUPPORT ANY HANGING LOADS INCLUDING, BUT NOT LIMITED TO, SUSPENDED MECHANICAL, ELECTRICAL, OR PLUMBING EQUIPMENT, CABLE TRAYS OR RACEWAYS, CEILING FINISHES OR CEILING FRAMING.

M. ALL DECK OPENINGS UP TO 8-IN. SHALL BE REINFORCED WITH A MINIMUM 16-GAGE PLATE AS SHOWN IN TYPICAL ROOF DECK REINFORCING DETAIL.

N. ALL DECK OPENINGS GREATER THAN 8-IN. SHALL BE SUPPORTED BY AN ANGLE FRAME. IF SPECIFIC FRAMING SIZES ARE NOT PROVIDED ON THE FRAMING PLAN, REFER TYPICAL DETAILS FOR ROOF OPENING FRAME DETAIL.

O. PROVIDE SHEET STEEL COLUMN CLOSURES, Z-CLOSURES, CELL CLOSURES, POUR STOPS AND GIRDER FILLERS OF SAME MATERIAL AND FINISH AS DECK WITH THICKNESS AND PROFILE RECOMMENDED IN SDI FLOOR DECK DESIGN MANUAL, SECOND EDITION (JUNE 2020). WELD TO SUPPORTING STRUCTURE ACCORDING TO SDI RECOMMENDATIONS AND AS CONCEPTUALLY SHOWN IN TYPICAL FLOOR DECK CLOSURE DETAILS.

P. ALL FLOOR DECK EDGES SHALL BE SUPPORTED WITH POUR STOPS OR BENT PLATES. IF BENT PLATES ARE NOT SHOWN IN THE STRUCTURAL DRAWINGS, PROVIDE GAGE METAL POUR STOPS COMPLYING WITH SDI FLOOR DECK DESIGN MANUAL, SECOND EDITION (JUNE 2020), SECTION 5, TABLE 11 AND AS SHOWN IN TYPICAL DETAILS.

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1. SHELTER GENERAL INFORMATION

A. TYPE OF SHELTER: COMMUNITY TORNADO SHELTER.

B. SHELTER WIND DESIGN GUIDELINES: ICC/NSSA STANDARD FOR THE DESIGN AND CONSTRUCTION OF STORM SHELTERS - 2014 (ICC 500-2014).

C. ROOF SYSTEMS HAVE BEEN SELECTED IN ACCORDANCE WITH DEBRIS IMPACT TESTING IN ACCORDANCE WITH ASTM E 1886 AT TEXAS TECH UNIVERSITY (REFER SUMMARY REPORT DATED JUNE 2003 PREPARED BY WIND SCIENCE AND ENGINEERING RESEARCH CENTER). REFER SECTION A1 4" THICK CONCRETE-#4 REBAR REINFORCEMENT 12 INCHES ON CENTER EACH WAY (TESTED FOR DEBRIS IMPACT OF 162 MPH)-67 MPH REQUIRED.

D. WALL SYSTEMS HAVE BEEN SELECTED IN ACCORDANCE WITH DEBRIS IMPACT TESTING IN ACCORDANCE WITH ASTM E 1886 AT TEXAS TECH UNIVERSITY (REFER SUMMARY REPORT DATED JUNE 2003 PREPARED BY WIND SCIENCE AND ENGINEERING RESEARCH CENTER). REFER SECTION A1 8" REINFORCED CONCRETE WALLS (TESTED FOR DEBRIS IMPACT OF 135 MPH) - 100 MPH REQUIRED.

E. REFERENCE ELEVATION OF 100'-0" EQUALS DATUM FINISHED FLOOR ELEVATION OF 1249.33' FOR THE STORM SHELTER.

F. BASED ON THE FLOOD INSURANCE RATE MAPS (FIRM) FOR OKLAHOMA COUNTY (MAP NUMBER 40109C0294J) THE FINISHED FLOOR ELEVATIONS OF 1249.33' FOR THE STORM SHELTER IS GREATER THAN THE HIGHEST FLOOD ELEVATION OF 1206.00' WHICH HAS A 0.2-PERCENT ANNUAL CHANCE OF BEING EQUALED OR EXCEEDED IN ANY GIVEN YEAR. THE SHELTER IS NOT LOCATED IN AN AREA SUSCEPTIBLE TO FLOODING.

G. REFER MECHANICAL DRAWINGS FOR LOCATIONS OF SHELTER VENTILATION.

H. FURNISH LOOSE CONNECTION HARDWARE AND ANCHORAGE ITEMS TO BE EMBEDDED IN OR ATTACHED TO OTHER CONSTRUCTION BEFORE STARTING THAT WORK. PROVIDE LOCATIONS, SETTING DIAGRAMS, TEMPLATES, INSTRUCTIONS, AND DIRECTIONS, AS REQUIRED, FOR INSTALLATION.

2. SHELTER DESIGN LOADS

A. DEAD LOAD: SELF WEIGHT OF MATERIALS, UNLESS NOTED OTHERWISE

B. ROOF DEAD LOAD:
1) BUILT UP ROOF.....6 PSF
2) RIGID INSULATION.....2 PSF
3) CONCRETE DECK (4" NW CONC. ON 2" COMP. - 6" TOTAL).....63 PSF
4) STEEL BEAMS.....7 PSF
5) MISC (LIGHTING, DUCTWORK, PIPING, ETC.).....7 PSF
6) TOTAL.....85 PSF

C. LIVE LOADS:
1) ROOF LIVE LOAD (SHELTER).....100 PSF

D. SHELTER WIND PARAMETERS:
1) GOVERNING CODE:.....ICC 500-2014
2) IMPORTANCE FACTOR, Iw:.....1.0
3) EXPOSURE CATEGORY:.....C
4) INTERNAL PRESSURE COEFFICIENTS, PARTIALLY ENCLOSED, GCPI...+/-0.55
5) TOPOGRAPHIC FACTOR, KZT.....1.0
6) DIRECTIONALITY FACTOR, KD.....1.0
7) WIND VELOCITY, V:.....250 MPH

E. EXTREME WIND PRESSURES-MAIN WIND FORCE RESISTING SYSTEM:
1) +GCPI
A) WINDWARD WALL:.....18 PSF IN
B) LEEWARD WALL:.....132 PSF OUT
C) SIDE WALL:.....156 PSF OUT
2) -GCPI
A) WINDWARD WALL:.....167 PSF IN
B) LEEWARD WALL:.....39 PSF IN
C) SIDE WALL:.....6 PSF OUT
3) WINDWARD PARAPET:.....208 PSF IN
4) LEEWARD PARAPET:.....139 PSF OUT
5) ROOF 0'-0" TO 14'-0" FROM LEADING EDGE:.....179 PSF OUT
6) ROOF 14'-0" TO 28'-0" FROM LEADING EDGE:.....132 PSF OUT
7) ROOF BEYOND 28'-0" FROM LEADING EDGE:.....109 PSF OUT
8) ROOF:.....54 PSF IN

F. SNOW LOADS:
1) GOVERNING CODE:.....ASCE 7-16
2) IMPORTANCE FACTOR, Is:.....1.10
3) GROUND SNOW LOAD, Pg:.....10 PSF
4) EXPOSURE FACTOR, Ce:.....1.0
5) THERMAL FACTOR, Ct:.....1.0
6) ROOF SLOPE FACTOR, Cs:.....1.0
7) CALCULATED FLAT ROOF SNOW LOAD, Pf:.....7.7 PSF
8) MINIMUM FLAT ROOF SNOW LOAD, I*Pf:.....11 PSF
9) RAIN ON SNOW SURCHARGE LOAD..:.....5 PSF
10) DRIFT LOADS:.....ASCE 7-10

G. SEISMIC DESIGN CRITERIA:
1) GOVERNING CODE:.....ASCE 7-16
2) IMPORTANCE FACTOR, Ie:.....1.25
3) SOIL SITE CLASSIFICATION:.....C
4) 0.2 SEC. MAPPED SPECTRAL ACCELERATION, Ss:.....0.330
5) 1.0 SEC. MAPPED SPECTRAL ACCELERATION, S1:.....0.083
6) SITE COEFFICIENT, 0.2 SEC. PERIOD, Fa:.....1.2
7) SITE COEFFICIENT, 1.0 SEC. PERIOD, Fv:.....1.7
8) 0.2 SEC. DESIGN SPECTRAL ACCELERATION, Sds:.....0.286
9) 1.0 SEC. DESIGN SPECTRAL ACCELERATION, Sd1:.....0.083
10) SEISMIC DESIGN CATEGORY:.....B
11) SEISMIC PARAMETERS:
A) SEISMIC FORCE RESISTING SYSTEM: ORDINARY REINFORCED CONCRETE SHEAR WALLS
B) RESPONSE MODIFICATION COEFFICIENT, R:.....4.00
C) SYSTEM OVERSTRENGTH FACTOR, O:.....2.50
D) DEFLECTION AMPLIFICATION FACTOR, Cd:.....4.00
E) ANALYSIS PROCEDURE: EQUIVALENT LATERAL FORCE METHOD.
F) SEISMIC RESPONSE COEFFICIENT, Cs:.....0.0894
G) TOTAL SHELTER ONLY LATERAL BASE SHEAR, V:.....168 KIPS

H. IN ADDITION TO THE REQUIREMENTS OF THE SPECIAL INSPECTOR, THE CONSTRUCTION MANAGER SHALL EMPLOY A LICENSED PROFESSIONAL STRUCTURAL ENGINEER TO INSPECT THE FOLLOWING ELEMENTS OF THE MAIN WIND FORCE RESISTING SYSTEM OF THE SHELTER TO VERIFY CONFORMANCE WITH THE CONTRACT DOCUMENTS:
1) CONCRETE REBAR SIZE, SPACING, LAP LENGTHS AND EMBED PLATES
2) BEAM/COLUMN SIZE AND CONNECTIONS
3) HEADED STUD ANCHORS AND THE QUALITY OF THEIR CONNECTION TO THE TOP OF BEAM FLANGES
4) METAL DECKS SIZE AND ATTACHMENT

3. QUALITY ASSURANCE PLAN

A. DETAILED REQUIREMENTS: PER ICC 500, SECTION 107.3.1, DETAILS CONTAINED WITHIN THESE DOCUMENTS EXEMPLIFY THE FOLLOWING CRITERIA.

1) ROOF CLADDING, SOFFITS AND ROOF FRAMING CONNECTIONS.
A) COMPOSITE ROOF DECK ON STEEL BEAMS DETAILED REQUIREMENTS:
1. COMPOSITE DECK WELDED TO STEEL BEAMS.
2. HEADED STUDS CONNECTED TO STEEL BEAMS (THROUGH DECK) OR TO GIRDERS.
3. MINIMUM 4" CONCRETE THICKNESS OVER COMPOSITE METAL DECK.
4. REINFORCEMENT OF CONCRETE DECK WITH A MINIMUM OF #4 AT 12 INCHES ON CENTER EACH WAY.
5. STEEL BEAM CONNECTIONS TO WALL WITH EMBED PLATE.
6. STEEL BEAM CONNECTION TO BEAM SHEAR TAB PLATE.
7. STEEL BEAM TO INTERIOR COLUMN CONNECTION.

2) WALL CONNECTIONS TO ROOF DIAPHRAGM AND FRAMING.
A) DOWELS FROM CONCRETE WALL INTO SLAB.
B) EMBED PLATES IN CAST-IN-PLACE WALLS TO DECK ANGLES.

3) ROOF DIAPHRAGM SYSTEM, INCLUDING CONNECTORS, DRAG STRUTS AND BOUNDARY ELEMENTS.
A) CAST-IN-PLACE SLAB WITH MINIMUM #4 AT 12 INCHES ON CENTER AND MINIMUM CHORD STEEL OF 2 #6 BARS.

4) MAIN WIND FORCE RESISTING SYSTEMS INCLUDING BRACED FRAMES, MOMENT FRAMES AND SHEAR WALLS.
A) ORDINARY REINFORCED CAST-IN-PLACE CONCRETE SHEAR WALLS

5) MAIN WIND FORCE RESISTING SYSTEM CONNECTIONS TO THE FOUNDATION.
A) REINFORCING STEEL DOWELS.
B) ANCHOR BOLTS.
C) GROUT.

6) FABRICATION AND INSTALLATION OF COMPONENTS AND ASSEMBLIES OF THE SHELTER ENVELOPE REQUIRED TO MEET MISSILE IMPACT TEST REQUIREMENTS OF CHAPTER 3.
A) REFER TO ITEMS 1.D, 1.E, AND 1.F INDICATED ABOVE.
B) VERIFY DOOR TESTING AND ANCHORAGE REQUIREMENTS.
C) VERIFY SHUTTER TESTING AND ANCHORAGE REQUIREMENTS.
D) VERIFY OVERHEAD DOOR TESTING AND ANCHORAGE REQUIREMENTS.
E) VERIFY LOUVER TESTING AND ANCHORAGE REQUIREMENTS.

7) WALL CLADDING AND WALL CLADDING CONNECTIONS.
A) CAST-IN-PLACE - VERTICAL AND HORIZONTAL REINFORCING.

8) CORROSION RESISTANCE OR PROTECTION OF EXPOSED METAL CONNECTORS PROVIDING LOAD PATH CONTINUITY.
A) GALVANIZED EMBED PLATES.
B) ALL WELDS TO GALVANIZED EMBED PLATES MUST BE PROPERLY PREPPED PRIOR TO WELDING, SLAG REMOVED, WELD CLEANED AND COLD GALVANIZING PAINT ADDED.

9) FOUNDATION DESIGN:
A) DRILLED PIER AND GRADE BEAM SYSTEM WITH SLIDING AND PASSIVE RESISTANCE.
B) SLAB-ON-GRADE NOT USED AS DIAPHRAGM AND SUBGRADE DRAG.

B. MAIN WINDFORCE-RESISTING SYSTEMS AND WIND-RESISTING COMPONENTS
1) DRILLED PIERS
2) GRADE BEAMS
3) CONCRETE BEARING/SHEAR WALLS
4) COMPOSITE STEEL BEAMS
5) STEEL EMBEDS AND PERIMETER ANGLES
6) COMPOSITE METAL DECK
7) REINFORCING STEEL
8) STEEL PROTECTION DEVICES
9) SHELTER ROOM DOORS, WINDOWS, AND LOUVERS.

C. REQUIRED SPECIAL INSPECTIONS SHALL BE PROVIDED FOR CONSTRUCTION AND INSTALLATION OF MATERIALS AS REQUIRED BY THE AUTHORITY HAVING JURISDICTION IN ACCORDANCE WITH THE APPLICABLE BUILDING CODE. TYPE AND FREQUENCY ARE IDENTIFIED ON S1.05.
1) ANCHORAGE OF ALL OPENING PROTECTIVE DEVICES (DOORS, WINDOWS, SHUTTERS, LOUVERS, AND AFFIXED COWLINGS) SHALL BE CONTINUOUSLY OBSERVED BY A SPECIAL INSPECTOR.

D. INSPECTION OF FABRICATORS: WHERE FABRICATION OF STRUCTURAL LOAD-BEARING AND DEBRIS-IMPACT-RESISTANT COMPONENTS AND ASSEMBLIES IS BEING PERFORMED ON THE PREMISES OF A FABRICATOR SHOP, SPECIAL INSPECTION OF THE FABRICATOR SHALL BE PROVIDED.
1) EXCEPTION: PREFABRICATED STORM SHELTER COMPONENTS THAT HAVE BEEN INSPECTED AND LABELED BY AN APPROVED AGENCY MEETING THE REQUIREMENTS OF THE APPLICABLE BUILDING CODE.

E. STRUCTURAL OBSERVATIONS: IN ADDITION TO THE REQUIREMENTS OF THE SPECIAL INSPECTOR, THE OWNER SHALL EMPLOY A LICENSED PROFESSIONAL STRUCTURAL ENGINEER TO INSPECT THE FOLLOWING ELEMENTS OF THE MAIN WIND FORCE RESISTING SYSTEM OF THE SHELTER TO VERIFY CONFORMANCE WITH THE CONTRACT DOCUMENTS AT SIGNIFICANT CONSTRUCTION STAGES AND AT THE COMPLETION OF THE STRUCTURAL SYSTEM. DEFICIENCIES SHALL BE REPORTED IN WRITING TO THE OWNER AND AHJ. AT THE CONCLUSION OF THE WORK, THE REGISTER DESIGN PROFESSIONAL SHALL SUBMIT TO THE AHJ A WRITTEN STATEMENT INDICATING SITE VISITS MADE AND IDENTIFYING ANY OUTSTANDING DEFICIENCIES THAT HAVE NOT BEEN RESOLVED.
1) DRILLED PIERS (IF APPLICABLE)
A) PIER DIAMETER, EMBEDMENT INTO ROCK, REBAR SIZE, SPACING, LAP LENGTHS AND REBAR DOWELS SIZE, QUANTITY AND LOCATION.
2) FOUNDATIONS
A) REBAR SIZE, SPACING AND LAP LENGTHS AND LOCATIONS
3) WALLS
A) REBAR SIZE, SPACING, LAP LENGTHS
B) EMBED SIZE AND LOCATIONS
4) ROOF
A) REBAR SIZE, SPACING, LAP LENGTHS
B) PERIMETER AND OPENING DECK EDGE INSTALLATION
C) METAL DECK SIZE AND ATTACHMENT
D) HEADED STUD ANCHORS SIZE, SPACING, AND ATTACHMENT
5) DOORS
A) VERIFY INSTALLATION OF EACH DOOR IS PER MANUFACTURER'S TESTED ASSEMBLY.
B) VERIFY ALL DOOR HARDWARE IS FULLY OPERATIONAL.
C) VERIFY DOORS HAVE PROPER LABELS INDICATING REQUIRED PRESSURE AND IMPACT RATING.
6) PROTECTION DEVICES
A) VERIFY INSTALLATION OF EACH STEEL PLATE PROTECTION DEVICES IS PER CONTRACT DRAWINGS.
B) VERIFY ALL OPENINGS REQUIRING PROTECTION HAVE PROTECTION DEVICE INSTALLED.

F. CONTRACTOR RESPONSIBILITY: EACH CONTRACTOR RESPONSIBLE FOR THE CONSTRUCTION, FABRICATION OR INSTALLATION OF A MAIN WIND FORCE-RESISTING SYSTEM OR ANY COMPONENT LISTED IN THE QUALITY ASSURANCE PLAN SHALL SUBMIT A WRITTEN STATEMENT OF RESPONSIBILITY TO THE AHJ, THE ARCHITECT/ENGINEER, AND THE OWNER PRIOR TO THE COMMENCEMENT OF WORK ON THE SYSTEM OR COMPONENT. CONTRACTOR'S STATEMENT OF RESPONSIBILITY SHALL BE INCLUDED WITH THE FIRST SUBMITTAL/SHOP DRAWING. THE CONTRACTOR'S STATEMENT OF RESPONSIBILITY SHALL CONTAIN:
1) ACKNOWLEDGEMENT OF AWARENESS OF THE SPECIAL REQUIREMENTS CONTAINED IN THE QUALITY ASSURANCE PLAN.
2) ACKNOWLEDGEMENT THAT CONTROL WILL BE EXERCISED TO OBTAIN COMPLIANCE WITH THE CONSTRUCTION DOCUMENTS.
3) PROCEDURES FOR EXERCISING CONTROL WITHIN THE CONTRACTOR'S ORGANIZATION, THE METHOD AND FREQUENCY OF REPORTING AND THE DISTRIBUTION OF REPORTS.
4) IDENTIFICATION AND QUALIFICATIONS OF THE PERSON(S) EXERCISING SUCH CONTROL AND THEIR POSITION(S) IN THE ORGANIZATION.

G. PRE-CONSTRUCTION MEETING: TO BE HELD PRIOR TO STARTING CONSTRUCTION AN INCLUDE THE CONSTRUCTION MANAGER, DESIGN TEAM, SPECIAL INSPECTOR, STRUCTURAL OBSERVER, AND THE CONTRACTORS RESPONSIBLE FOR FABRICATION AND INSTALLATION OF THE MAIN WIND FORCE-RESISTING SYSTEM AND COMPONENTS. AT A MINIMUM THE MEETING SHALL CONSIST OF THE FOLLOWING ITEMS:
1) REVIEW THE CONSTRUCTION DOCUMENTS AND QUALITY ASSURANCE PLAN.
2) REVIEW THE CONTRACTORS STATEMENT OF RESPONSIBILITY.
3) REVIEW THE CONSTRUCTION SCHEDULE AND SEQUENCE OF REQUIRED SPECIAL INSPECTIONS.

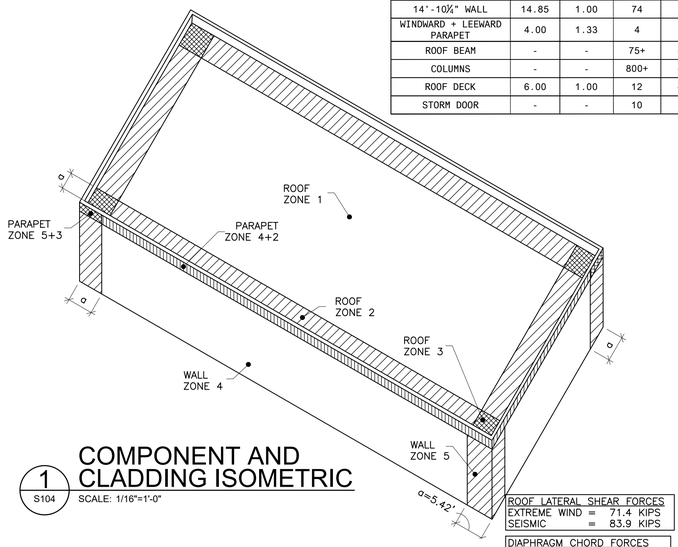
H. SHELTER PENETRATIONS: THE DESIGN TEAM, CONSTRUCTION MANAGER, MEP TRADES, PRECAST PROVIDER, AND SPECIAL INSPECTOR SHALL MEET TO IDENTIFY ALL ITEMS PENETRATING THE PRECAST SHELTER ENVELOPE. THE METHOD OF INSTALLATION (FIELD CORING VS. FORMING) AND APPROPRIATE PROTECTION DETAILS SHALL BE REVIEWED FOR EACH INSTANCE.

I. SHELTER SPECIAL INSPECTION
1) POST INSTALLED ANCHORAGE AT THE SHELTER IN CONCRETE SHALL BE CONTINUOUSLY INSPECTED.
2) INSTALLATION OF SHELTER DOORS OR AFFIXED COWLINGS SHALL BE CONTINUOUSLY INSPECTED.
3) WELDING OF SHELTER DOORS OR AFFIXED COWLINGS SHALL BE CONTINUOUSLY INSPECTED.
4) HEADED STUD ANCHORS AND THE QUALITY OF THEIR CONNECTION TO THE TOP OF BEAM FLANGES
5) COMPOSITE METAL DECK SIZE AND ATTACHMENT

NOTE: POSITIVE PRESSURES ARE DIRECTED INWARD ON THE EXTERIOR SURFACE. NEGATIVE PRESSURES ARE DIRECTED OUTWARD ON THE EXTERIOR SURFACE.

EXTREME WIND COMPONENTS AND CLADDING LOADS

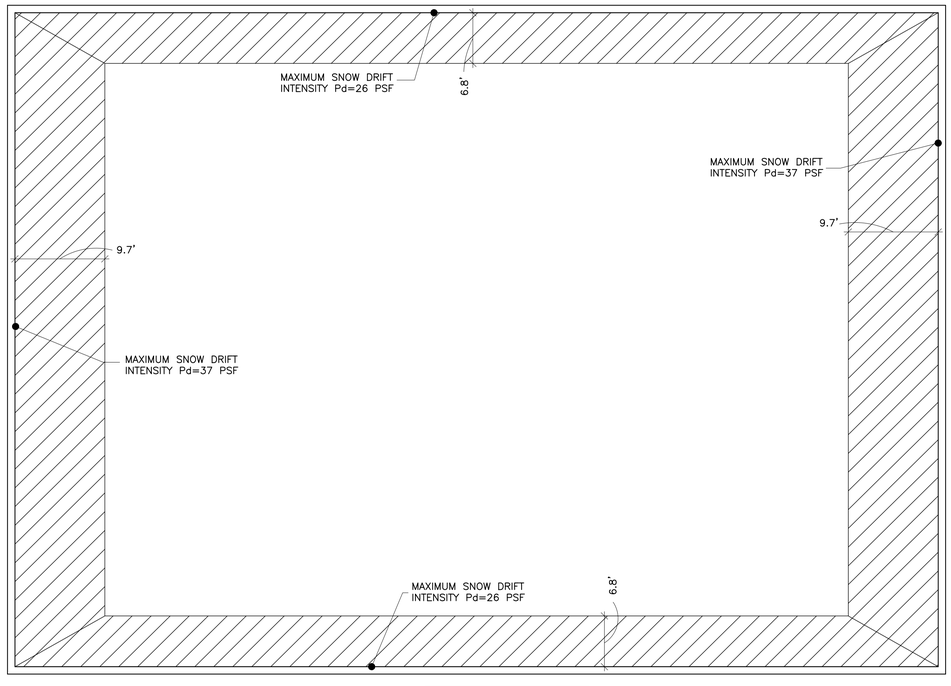
BUILDING ELEMENT	SPAN (FT)	WIDTH (FT)	AREA (FT^2)	WIND PRESSURE ZONE 1 (PSF)	WIND PRESSURE ZONE 2 (PSF)	WIND PRESSURE ZONE 3 (PSF)	WIND PRESSURE ZONE 4+2 (PSF)	WIND PRESSURE ZONE 5+3 (PSF)	WIND PRESSURE ZONE 4 (PSF)	WIND PRESSURE ZONE 5 (PSF)
12'-8" WALL	12.67	1.00	54						-193/181	-214/181
14'-10¼" WALL	14.85	1.00	74						-190/178	-208/178
WINDWARD + LEEWARD PARAPET	4.00	1.33	4				300	514		
ROOF BEAM	-	-	75+	-199/103	-235/103	-253/103				
COLUMNS	-	-	800+	-197/102	-224/102	-224/102				
ROOF DECK	6.00	1.00	12	-209/114	-312/114	-437/114				
STORM DOOR	-	-	10						-209/197	-246/197



1 S104 COMPONENT AND CLADDING ISOMETRIC
SCALE: 1/16"=1'-0"

ROOF LATERAL SHEAR FORCES
EXTREME WIND = 71.4 KIPS
SEISMIC = 83.9 KIPS

DIAPHRAGM CHORD FORCES
EXTREME WIND = 80.2 KIPS
SEISMIC = 20.6 KIPS



ROOF LATERAL SHEAR FORCES
EXTREME WIND = 162.9 KIPS
SEISMIC = 83.9 KIPS

DIAPHRAGM CHORD FORCES
EXTREME WIND = 19.3 KIPS
SEISMIC = 5.3 KIPS

ROOF LATERAL SHEAR FORCES
EXTREME WIND = 162.9 KIPS
SEISMIC = 83.9 KIPS

DIAPHRAGM CHORD FORCES
EXTREME WIND = 9.1 KIPS
SEISMIC = 5.3 KIPS

NOTES:
1. VERIFY FINAL LOCATION OF ALL ROOF PENETRATIONS AND HUNG EQUIPMENT.
2. REFER ARCHITECTURAL AND MECHANICAL DRAWINGS FOR ADDITIONAL HANGING LOADS NOT SHOWN.

ROOF LATERAL SHEAR FORCES
EXTREME WIND = 71.4 KIPS
SEISMIC = 83.9 KIPS

DIAPHRAGM CHORD FORCES
EXTREME WIND = 75.4 KIPS
SEISMIC = 20.6 KIPS

NORTH

2 S104 SHELTER LOAD PLAN
SCALE: 1/8"=1'-0"

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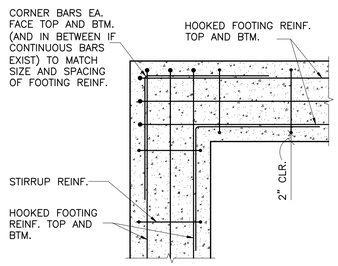
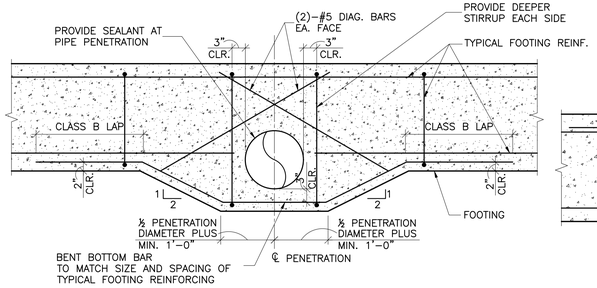
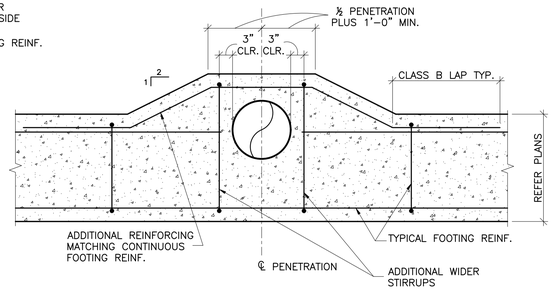


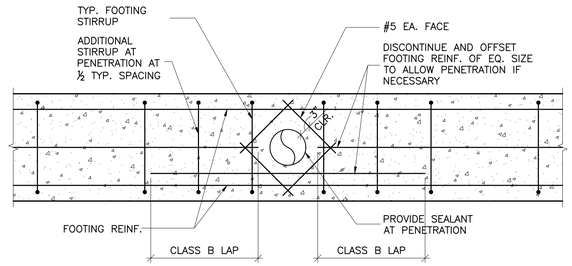
1 TYP. FOOTING CORNER REINF.
SCALE: NONE



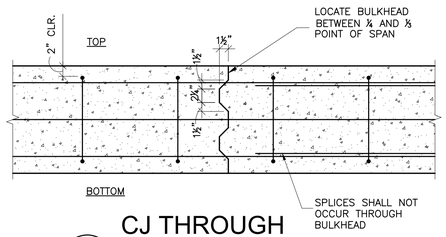
2 TYP. FOOTING PENETRATION
SCALE: NONE



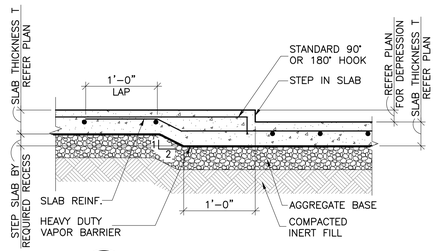
3 PLAN SECTION AT TYPICAL VERTICAL PENETRATION
SCALE: NONE



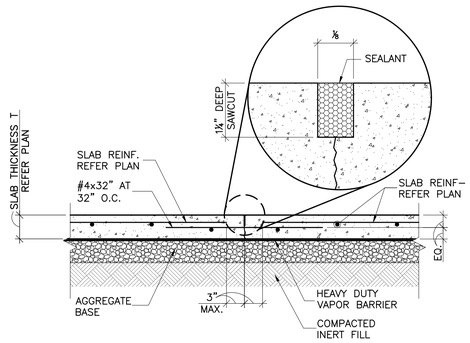
4 FOOTING PENETRATION
SCALE: NONE



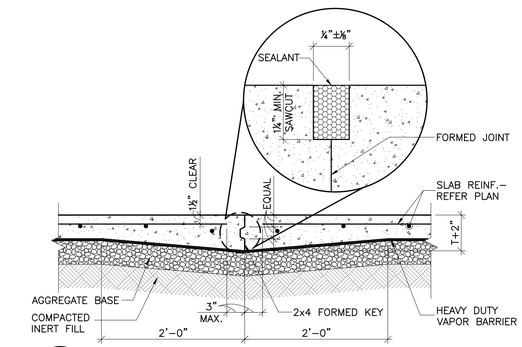
5 CJ THROUGH FOOTING
SCALE: NONE



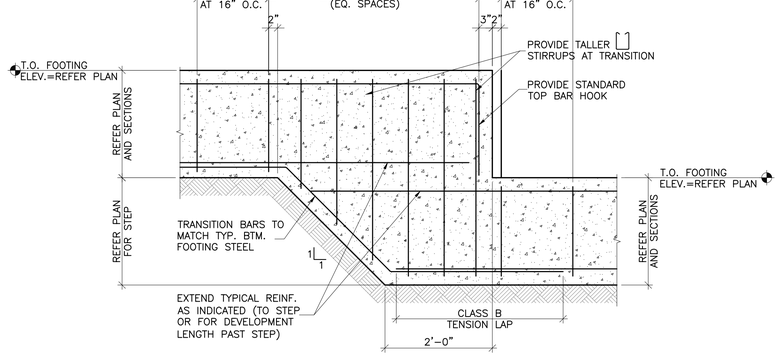
6 TYP. SLAB STEP
SCALE: NONE



7 TYP. SAWED JOINT (SJ)
SCALE: NONE

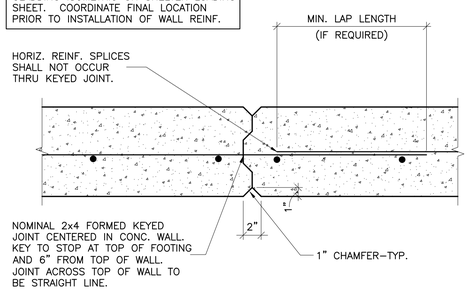


8 TYP. CONSTRUCTION JOINT (CJ)
SCALE: NONE



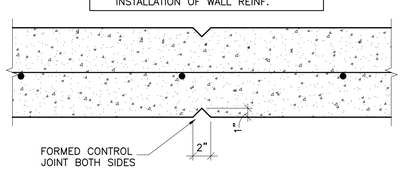
9 TYP. FOOTING STEP
SCALE: NONE

NOTE:
WALL C.J. SHALL NOT BE PLACED WITHIN WIND ZONE 5. REFER COMPONENT AND CLADDING ISOMETRIC ON SHELTER LOADING SHEET. COORDINATE FINAL LOCATION PRIOR TO INSTALLATION OF WALL REINF.

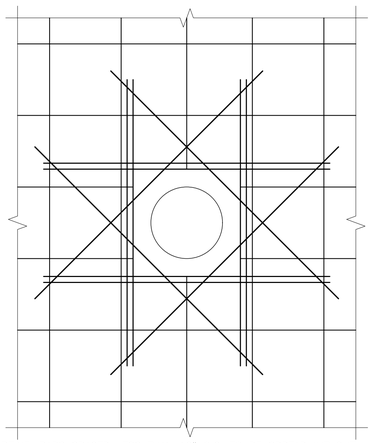


10 OPTIONAL VERTICAL CONSTRUCTION JOINT (C.J.)
SCALE: NONE

NOTES:
1. 30' MAX. SPACING TO BE COORDINATED WITH EOR AND SHOWN ON SUBMITTAL DRAWINGS.
2. WALL CONTROL JOINT SHALL NOT BE PLACED WITHIN WIND ZONE 5. REFER COMPONENT AND CLADDING ISOMETRIC ON SHELTER LOADING SHEET. COORDINATE FINAL LOCATION PRIOR TO INSTALLATION OF WALL REINF.



11 VERTICAL CONTROL JOINT
SCALE: NONE



REINF. BARS SPACED LESS THAN 12" O.C. TO BE SPREAD WITHOUT INTERRUPTION TO CLEAR PENETRATIONS LESS THAN 12" DIAM.
SIZE OF DIAGONAL AND EXTRA PARALLEL BARS TO EQUAL SIZE OF TYPICAL SLAB OR WALL REINFORCING BARS.
SEE DESIGN DRAWINGS FOR DIAMETER AND LOCATION OF PENETRATIONS NUMBER OF EXTRA PARALLEL BARS PLACED EACH WAY AROUND PENETRATION TO BE EQUAL TO NUMBER OF BARS INTERRUPTED. (TYPICAL FOR EACH FACE OF SLAB OR WALL). MINIMUM OF ONE BAR EACH WAY, EACH FACE OF SLAB OR WALL
FOR PENETRATIONS LESS THAN 12"ø, PROVIDE 4–#4x4'–0" DIAGONAL BARS EACH FACE.

12 TYP. PENETRATION THRU CONC. SLAB OR WALL
SCALE: NONE

TENSION DEVELOPMENT AND LAP–SPLICE LENGTHS FOR UNCOATED REINFORCING BARS

BAR SIZE	LAP CLASS	LENGTHS (IN.) PER CONCRETE STRENGTH f'c=3500 psi (NORMAL WEIGHT) TOP BARS CASE 1	TOP BARS CASE 2	OTHER BARS CASE 1	OTHER BARS CASE 2
#3	A	20	30	16	23
	B	26	39	20	30
#4	A	27	40	21	31
	B	35	52	27	40
#5	A	33	50	26	39
	B	43	65	33	50
#6	A	40	60	31	46
	B	52	78	40	60
#7	A	58	87	45	67
	B	75	113	58	87
#8	A	66	99	51	77
	B	86	129	66	99
#9	A	75	112	58	86
	B	97	145	75	112
#10	A	84	126	65	97
	B	109	164	84	126
#11	A	93	140	72	108
	B	121	182	93	140
#14	N/A	112	168	86	129
#18	N/A	149	224	115	172

TENSION DEVELOPMENT AND LAP–SPLICE LENGTHS FOR UNCOATED REINFORCING BARS

BAR SIZE	LAP CLASS	LENGTHS (IN.) PER CONCRETE STRENGTH f'c=4000 psi (NORMAL WEIGHT) TOP BARS CASE 1	TOP BARS CASE 2	OTHER BARS CASE 1	OTHER BARS CASE 2
#3	A	19	28	15	22
	B	24	36	19	28
#4	A	25	37	19	29
	B	32	48	25	37
#5	A	31	47	24	36
	B	40	60	31	47
#6	A	37	56	29	43
	B	48	72	37	56
#7	A	54	81	42	63
	B	70	106	54	81
#8	A	62	93	48	71
	B	80	121	62	93
#9	A	70	105	54	81
	B	91	136	70	105
#10	A	79	118	61	91
	B	102	153	79	118
#11	A	87	131	67	101
	B	113	170	87	131
#14	N/A	105	157	81	121
#18	N/A	139	209	107	161

NOTES: 1 in.=25.4 mm.
1. TABULATED VALUES ARE BASED ON GRADE 60 REINFORCING BARS AND NORMAL WEIGHT CONCRETE. LENGTHS ARE IN INCHES.
2. TENSION DEVELOPMENT LENGTHS AND TENSION LAP–SPLICE LENGTHS ARE CALCULATED PER ACI 318, SECTIONS 25.4.2.2 AND 25.5.2.1, RESPECTIVELY. TABULATED VALUES FOR BEAMS OR COLUMNS ARE BASED ON TRANSVERSE REINFORCEMENT AND CONCRETE COVER MEETING MINIMUM CODE REQUIREMENTS.
3. CASES 1 AND 2, WHICH DEPEND ON THE TYPE OF STRUCTURAL ELEMENT, CONCRETE COVER, AND CENTER–TO–CENTER SPACING OF THE BARS, ARE DEFINED AS: BEAMS OR COLUMNS: CASE 1–COVER AT LEAST $1.0d_b$ AND CENTER–TO–CENTER SPACING AT LEAST $2.0d_b$ AND CASE 2–COVER LESS THAN $1.0d_b$ OR CENTER–TO–CENTER SPACING LESS THAN $2.0d_b$. ALL OTHERS: CASE 1–COVER AT LEAST $1.0d_b$ AND CENTER–TO–CENTER SPACING AT LEAST $3.0d_b$. CASE 2–COVER LESS THAN $1.0d_b$ OR CENTER–TO–CENTER SPACING LESS THAN $3.0d_b$.
4. LAP SPLICE LENGTHS ARE MULTIPLES OF TENSION DEVELOPMENT LENGTHS; CLASS A=$1.0l_d$ AND CLASS B=$1.3l_d$ (ACI 318, SECTION 25.5.2.1).
5. ACI 318 DOES NOT ALLOW TENSION LAP SPLICES OF #14 OR #18 BARS. THE TABULATED VALUES FOR THOSE BAR SIZES ARE THE TENSION DEVELOPMENT LENGTHS.
6. TOP BARS ARE HORIZONTAL BARS WITH MORE THAN 12 in. OF CONCRETE CAST BELOW THE BARS.
7. FOR LIGHTWEIGHT–AGGREGATE CONCRETE, MULTIPLY THE TABULATED VALUES BY 1.3.

13 REINFORCING LAP LENGTHS
SCALE: NONE

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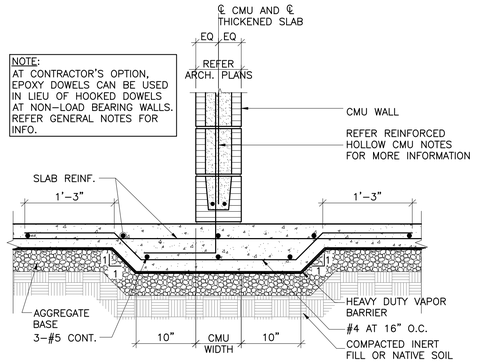
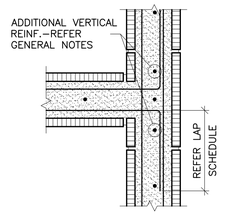
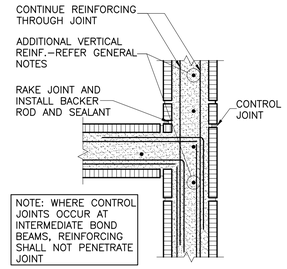


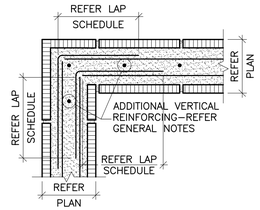
1 THICKENED SLAB AT CMU
SCALE: NONE



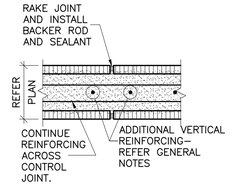
2 DETAIL AT BOND BEAM CORNER W/ NO CONTROL JT
SCALE: NONE



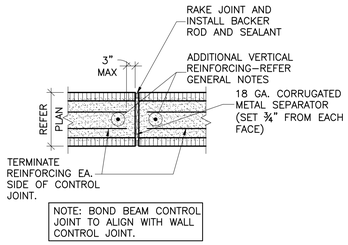
3 DETAIL AT FLOOR/ROOF BOND BEAM CORNER W/ CONTROL JT
SCALE: NONE



4 CORNER BOND BEAM WITH NO CONTROL JT
SCALE: NONE



5 CONTROL JT AT FLOOR/ROOF BOND BEAM
SCALE: NONE

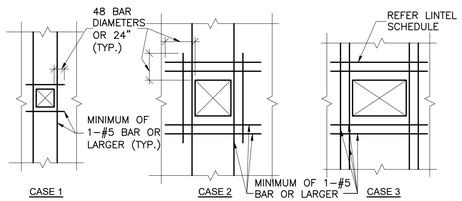


6 CONTROL JT AT INTERMEDIATE BOND BEAM
SCALE: NONE

BAR SIZE	LENGTH (in.)			
	CENTER			EDGE (2 IN CLEAR COVER)
	6" CMU	8" CMU	12" CMU	6", 8", 12" CMU
3	1'-0"	1'-0"	1'-0"	1'-6"
4	1'-6"	1'-6"	1'-0"	2'-0"
5	2'-6"	2'-0"	1'-6"	3'-0"
6	**	3'-6"	2'-0"	**
7	**	**	3'-0"	**
8	**	**	**	**

7 CMU REINFORCING LAP SCHEDULE
SCALE: NONE

NOTES:
1. f'm= 2000 psi
2. fy= 60,000 psi
*SCHEDULE ALSO APPLIES TO EMBEDMENT LENGTHS
**MECHANICAL SPLICES SHALL BE USED



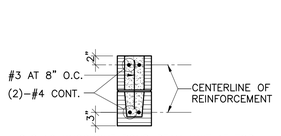
CASE 1 APPLIES TO: ALL OPENINGS 2 FEET OR LESS BOTH WAYS.

CASE 2 APPLIES TO: ALL OPENINGS EXCEEDING 2 FEET BUT NOT MORE THAN 4 FEET BOTH WAYS, WHERE NO LINTEL IS INDICATED

CASE 3 APPLIES TO: ALL OPENINGS EXCEEDING 4 FEET AND WIDER

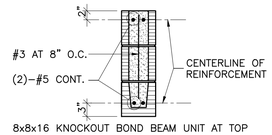
NOTE: 1.) WHERE VERTICAL REINFORCING CONSISTS OF 2 BARS OR MORE EACH BAR SHALL BE PLACED IN A SEPARATE CELL
2.) WHERE OPENING IS SUPPORTED BY A PERPENDICULAR WALL AND ONLY 8" OF WALL EXTENDS BEYOND THE OPENING, HOOK LINTEL AND SILL REINFORCING 90°

8 REINFORCING AROUND CMU WALL OPENING
SCALE: NONE



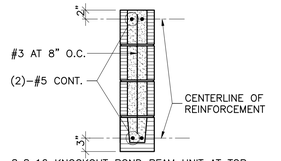
8x8x16 KNOCKOUT BOND BEAM UNIT AT TOP
8x8x16 SOLID BOTTOM BOND BEAM UNIT

LINTEL TYPE 1



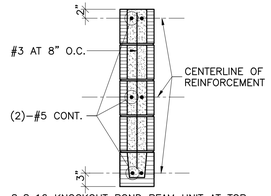
8x8x16 KNOCKOUT BOND BEAM UNIT AT TOP
8x8x16 STANDARD UNITS
8x8x16 SOLID BOTTOM BEAM UNIT AT BOTTOM

LINTEL TYPE 2



8x8x16 KNOCKOUT BOND BEAM UNIT AT TOP
8x8x16 STANDARD UNITS
8x8x16 SOLID BOTTOM BEAM UNIT AT BOTTOM

LINTEL TYPE 3



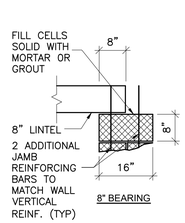
8x8x16 KNOCKOUT BOND BEAM UNIT AT TOP
8x8x16 STANDARD UNITS
8x8x16 SOLID BOTTOM BEAM UNIT AT BOTTOM

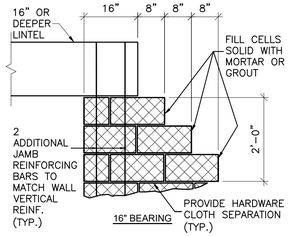
LINTEL TYPE 4

9 TYP. LINTEL TYPES
SCALE: NONE

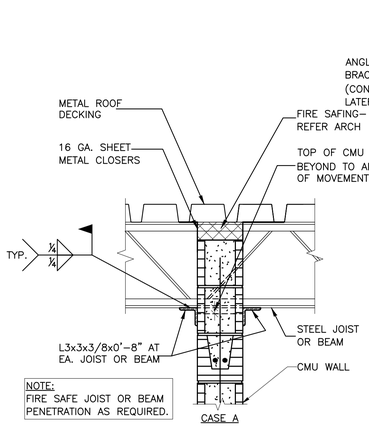
NON-LOAD BEARING CMU LINTEL SCHEDULE	
TYPE	SPAN IN FEET
1	UP TO 4'-0"
2	4'-1" TO 6'-8"
3	6'-9" TO 9'-4"
4	9'-5" TO 12'-0"

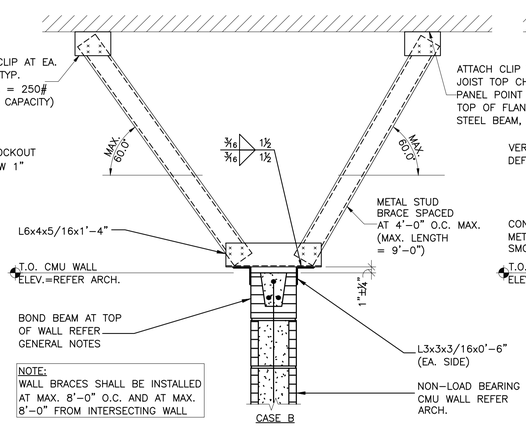
NOTE: REFER (#) ON PLANS FOR LINTEL TYPES.

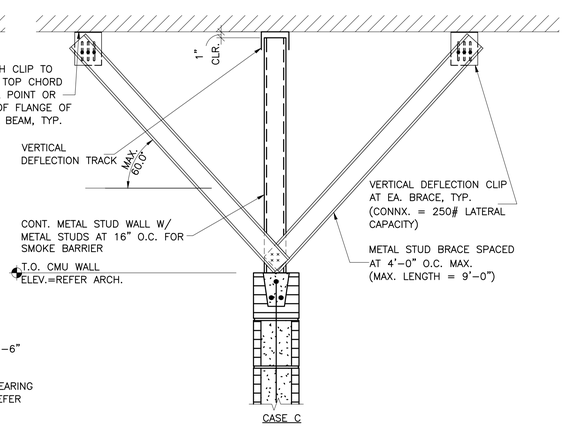




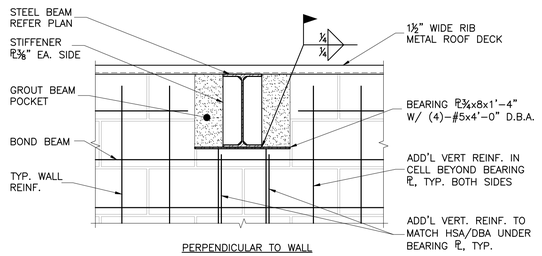
10 BEARING DETAILS TYP. LINTEL TYPES
SCALE: NONE



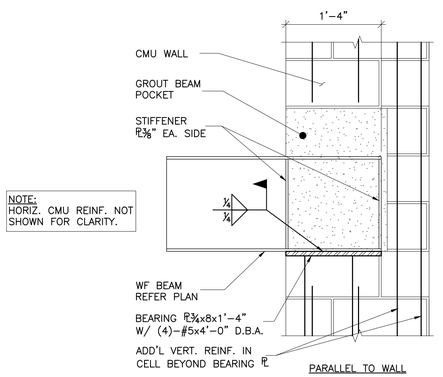




11 TYP. BRACING AT TOP OF NON-LOAD BEARING CMU
SCALE: NONE



PERPENDICULAR TO WALL



PARALLEL TO WALL

12 TYPICAL BEAM BEARING PLATE DETAILS
SCALE: NONE

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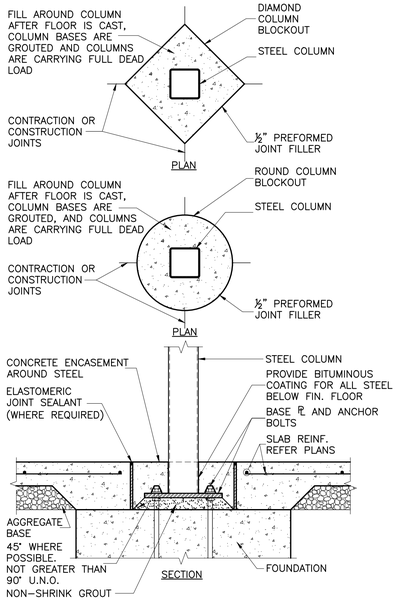
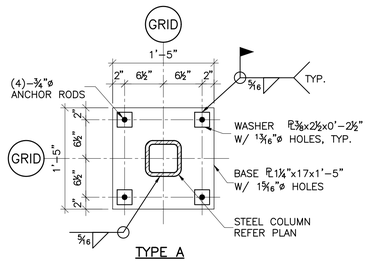


1 TYP. ISOLATION JOINT DETAILS
SCALE: NONE



2 BASE PLATE DETAILS
SCALE: NONE

¾"ø A325-N BOLT SCHEDULE FOR SINGLE PLATE SHEAR TAB CONNECTIONS (FACTORED LOADS)	
END REACTION	NO. OF BOLTS
0 THRU 31 KIPS	2-¾ø
31 THRU 47 KIPS	3-¾ø
47 THRU 63 KIPS	4-¾ø
63 THRU 79 KIPS	5-¾ø
79 THRU 95 KIPS	6-¾ø
95 THRU 111 KIPS	7-¾ø
111 THRU 127 KIPS	8-¾ø

NOTES:
1. VALUES SHOWN ARE APPLICABLE FOR SINGLE PLATE SHEAR TAB CONNECTIONS
2. SEE PLAN FOR END REACTIONS
3. L = PLATE LENGTH ≥ T/2 OF CONNECTED BEAM.
4. AT HSS OR PIPE COLUMNS, A THROUGH-PLATE WITH EQUAL WELD ON THE BACK SIDE OF THE COLUMN IS REQUIRED UNDER EITHER OF THE FOLLOWING CIRCUMSTANCES:

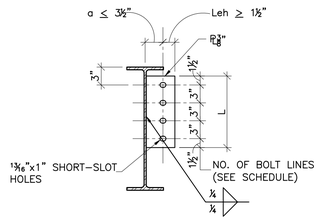
   A. FOR SQUARE OR RECTANGULAR HSS:

   $$\text{WHEN } \frac{B-2.79t}{0.93t} > 35.1$$

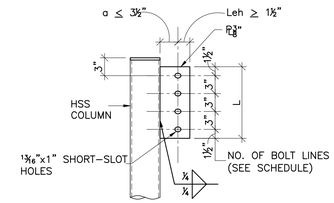
   B. FOR ROUND HSS OR PIPE:

   $$\text{WHEN } \frac{D}{t} > \frac{3,190}{Fy}$$

   WHERE:
   B = NOMINAL COLUMN WIDTH ACROSS THE COLUMN FACE WITH THE SINGLE PLATE CONNECTION, IN.
   D = OUTSIDE DIAMETER OF ROUND HSS OR PIPE, IN.
   t = NOMINAL THICKNESS OF COLUMN,IN.
   Fy = YIELD STRENGTH OF COLUMN, KSI

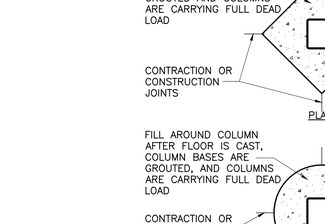


BEAM TO BEAM

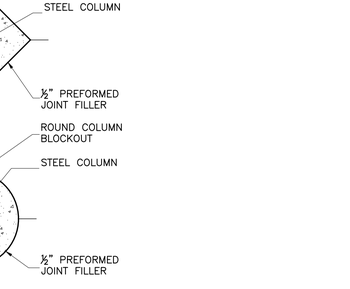


BEAM TO HSS COLUMN

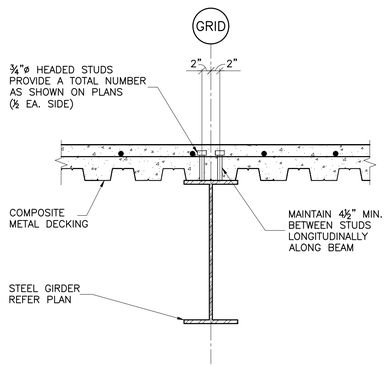
3 SINGLE PLATE SHEAR TAB CONNECTIONS (LRFD)
SCALE: NONE



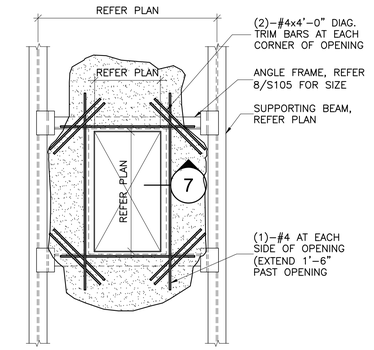
4 SECTION
SCALE: NONE



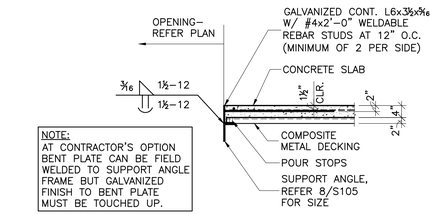
5 SECTION
SCALE: NONE



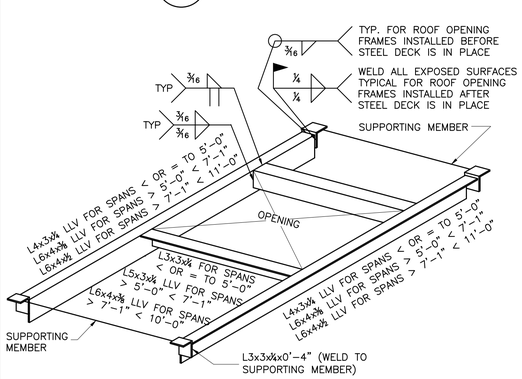
5A SECTION
SCALE: NONE



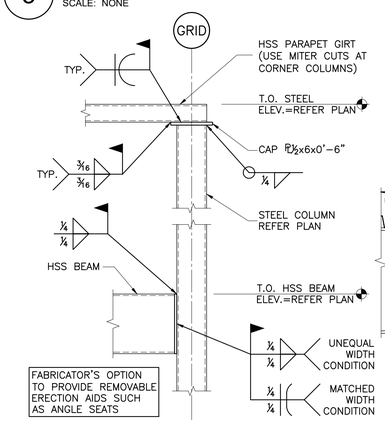
6 TYPICAL SHELTER ROOF ANGLE DETAIL
SCALE: NONE



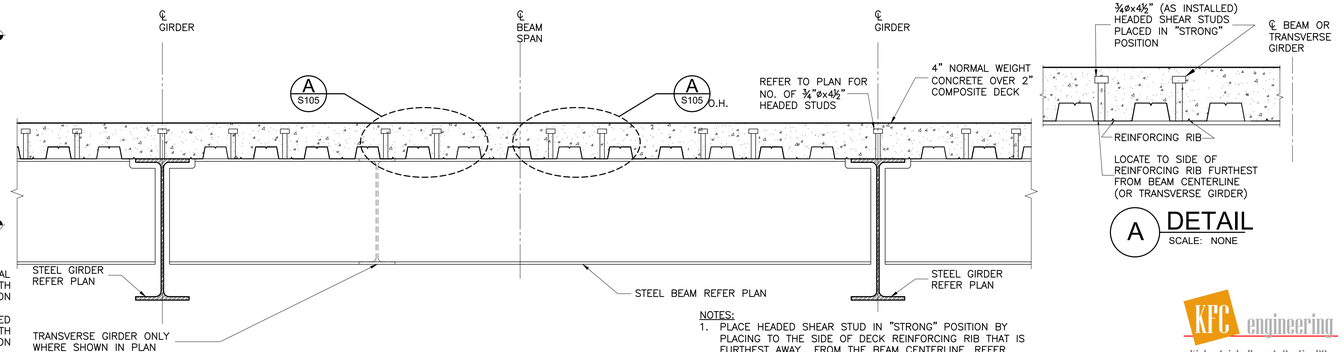
7 TYPICAL SECTION AT FLOOR OPENING
SCALE: NONE



8 TYP. ROOF OPENING FRAME AND MECHANICAL UNIT SUPPORT
SCALE: NONE



9 TYP. HSS BEAM/GIRT TO HSS COLUMN CONNX.
SCALE: NONE



NOTES:
1. PLACE HEADED SHEAR STUD IN "STRONG" POSITION BY PLACING TO THE SIDE OF DECK REINFORCING RIB THAT IS FURTHEST AWAY FROM THE BEAM CENTERLINE. REFER DETAIL A FOR ADDITIONAL INFORMATION.
2. IN SOME CASES, TRANSVERSE GIRDERS FRAME INTO THE BEAM NOT AT CENTERLINE, BUT WITHIN A FEW FEET. AT THIS CONDITION, PLACE STUDS IN "STRONG" POSITION RELATIVE TO TRANSVERSE GIRDER AND NOT CENTERLINE OF BEAM.

A DETAIL
SCALE: NONE

10 TYPICAL BEAM ELEVATION
SCALE: NONE

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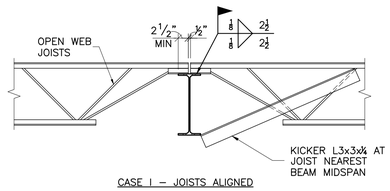
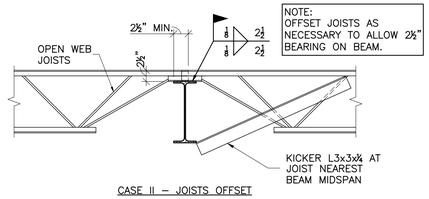


CASE I – JOISTS ALIGNED

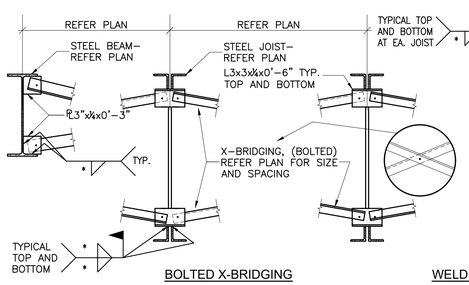


NOTE:
OFFSET JOISTS AS NECESSARY TO ALLOW 2½" BEARING ON BEAM.

CASE II – JOISTS OFFSET

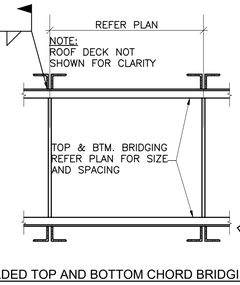
1 KICKER ANGLE AT BOTTOM FLANGE

SCALE: NONE

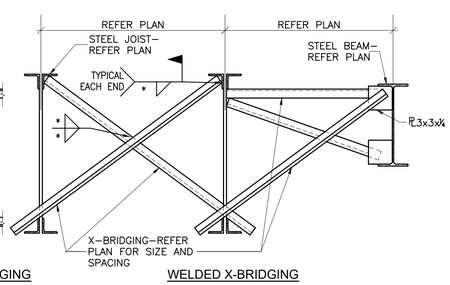


BOLTED X-BRIDGING

*WELD AS REQUIRED BY JOIST MANUFACTURER



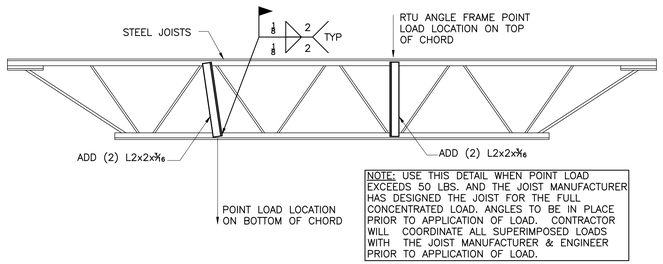
WELDED TOP AND BOTTOM CHORD BRIDGING



WELDED X-BRIDGING

2 TYP. BRIDGING DETAILS AT JOISTS

SCALE: NONE



NOTE: USE THIS DETAIL WHEN POINT LOAD EXCEEDS 50 LBS. AND THE JOIST MANUFACTURER HAS DESIGNED THE JOIST FOR THE FULL CONCENTRATED LOAD. ANGLES TO BE IN PLACE PRIOR TO APPLICATION OF LOAD. CONTRACTOR WILL COORDINATE ALL SUPERIMPOSED LOADS WITH THE JOIST MANUFACTURER & ENGINEER PRIOR TO APPLICATION OF LOAD.

3 BRACING DETAIL FOR STEEL JOISTS W/ POINT LOADS

SCALE: NONE

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1. STATEMENT OF SPECIAL INSPECTIONS NOTES:

A. THIS STATEMENT OF SPECIAL INSPECTIONS IS INCLUDED AS REQUIRED BY SECTIONS 1704.1 AND 1705 OF THE 2018 INTERNATIONAL BUILDING CODE.

B. SPECIAL INSPECTIONS SHALL CONFORM TO CHAPTER 17 OF THE 2018 INTERNATIONAL BUILDING CODE AND AS SUMMARIZED HEREIN. GENERAL REQUIREMENTS ARE LISTED BELOW AND IN THE ATTACHED INSPECTION TABLES.

C. REFER TO PROJECT SPECIFICATIONS FOR ADDITIONAL SPECIAL INSPECTION REQUIREMENTS. IF CONFLICTING REQUIREMENTS ARE FOUND BETWEEN THIS STATEMENT OF SPECIAL INSPECTIONS AND THE PROJECT SPECIFICATIONS, THE MORE STRINGENT PROVISION SHALL CONTROL UNLESS DIRECTED OTHERWISE IN WRITING BY THE STRUCTURAL ENGINEER OF RECORD.

D. THE CONTRACTOR SHALL EMPLOY ONE OR MORE SPECIAL INSPECTORS FOR THIS PROJECT. THE SPECIAL INSPECTOR SHALL BE A QUALIFIED PERSON WHO SHALL DEMONSTRATE COMPETENCE, TO THE SATISFACTION OF THE BUILDING OFFICIAL, FOR THE INSPECTION OF THE PARTICULAR TYPE OF CONSTRUCTION OR OPERATION REQUIRING SPECIAL INSPECTION.

E. THE SPECIAL INSPECTOR SHALL PROVIDE WRITTEN DOCUMENTATION TO THE BUILDING OFFICIAL DEMONSTRATING HIS OR HER COMPETENCE AND RELEVANT EXPERIENCE OR TRAINING. EXPERIENCE OR TRAINING SHALL BE CONSIDERED RELEVANT WHEN THE DOCUMENTED EXPERIENCE OR TRAINING IS RELATED IN COMPLEXITY TO THE SAME TYPE OF SPECIAL INSPECTION ACTIVITIES FOR PROJECTS OF SIMILAR COMPLEXITY AND MATERIAL QUALITIES.

F. THE SPECIAL INSPECTOR SHALL PROVIDE CONTINUOUS OR PERIODIC INSPECTIONS AS SHOWN IN THE ATTACHED INSPECTION TABLES

1) CONTINUOUS INSPECTION: THE SPECIAL INSPECTOR SHALL BE PRESENT AT ALL PROCEDURAL EVENTS.

2) PERIODIC INSPECTION: THE SPECIAL INSPECTOR SHALL BE PRESENT AT THE START OF THE WORK AND PERIODIC INSPECTION IS MADE TO VERIFY PROGRESS OF WORK IS IN COMPLIANCE.

G. INSPECTION OF FABRICATORS: WHERE FABRICATION OF STRUCTURAL LOADBEARING MEMBERS AND ASSEMBLIES IS BEING PERFORMED ON THE PREMISES OF A FABRICATOR'S SHOP, SPECIAL INSPECTION OF THE FABRICATED ITEMS SHALL BE REQUIRED BY SECTION 1704.2.5 OF THE 2018 INTERNATIONAL BUILDING CODE AND AS REQUIRED ELSEWHERE IN THE CODE.

H. FABRICATOR APPROVAL: SPECIAL INSPECTIONS REQUIRED BY SECTION 1704 ARE NOT REQUIRED WHERE THE WORK IS DONE ON THE PREMISES OF A FABRICATOR REGISTERED AND APPROVED TO PERFORM SUCH WORK WITHOUT SPECIAL INSPECTION. APPROVAL SHALL BE BASED UPON REVIEW OF THE FABRICATOR'S WRITTEN PROCEDURAL AND QUALITY CONTROL MANUALS AND PERIODIC AUDITING OF FABRICATION PRACTICES BY AN APPROVED SPECIAL INSPECTION AGENCY. AT COMPLETION OF FABRICATION, THE APPROVED FABRICATOR SHALL SUBMIT A CERTIFICATE OF COMPLIANCE TO THE BUILDING OFFICIAL STATING THAT THE WORK WAS PERFORMED IN ACCORDANCE WITH THE APPROVED CONSTRUCTION DOCUMENTS.

I. REPORT REQUIREMENTS: SPECIAL INSPECTORS SHALL KEEP RECORDS OF INSPECTIONS. THE SPECIAL INSPECTOR SHALL FURNISH INSPECTION REPORTS TO THE BUILDING OFFICIAL, AND TO THE REGISTERED DESIGN PROFESSIONAL IN RESPONSIBLE CHARGE. REPORTS SHALL INDICATE THAT WORK INSPECTED WAS OR WAS NOT COMPLETED IN CONFORMANCE TO APPROVED CONSTRUCTION DOCUMENTS. DISCREPANCIES SHALL BE BROUGHT TO THE IMMEDIATE ATTENTION OF THE CONTRACTOR FOR CORRECTION. IF THEY ARE NOT CORRECTED, THE DISCREPANCIES SHALL BE BROUGHT TO THE ATTENTION OF THE BUILDING OFFICIAL AND TO THE REGISTERED DESIGN PROFESSIONAL IN RESPONSIBLE CHARGE PRIOR TO THE COMPLETION OF THAT PHASE OF THE WORK. A FINAL REPORT DOCUMENTING REQUIRED SPECIAL INSPECTIONS AND CORRECTION OF ANY DISCREPANCIES NOTED IN THE INSPECTIONS SHALL BE SUBMITTED AT A POINT IN TIME AGREED UPON PRIOR TO THE START OF WORK BY THE APPLICANT AND THE BUILDING OFFICIAL.

J. THE CONTRACTOR IS RESPONSIBLE FOR PROVIDING REASONABLE NOTICE TO THE SPECIAL INSPECTOR(S) REGARDING WHEN ELEMENTS OF THE PROJECT WILL BE READY FOR EFFICIENT IMPLEMENTATION OF SPECIAL INSPECTIONS.

K. THE CONTRACTOR SHALL PROVIDE ACCESS TO THE LATEST VERSION OF ALL APPROVED PLANS AND SHOP DRAWINGS FOR THE SPECIAL INSPECTOR'S USE IN PERFORMING SPECIAL INSPECTIONS.

L. CONTRACTOR SHALL GRANT ACCESS TO OWNER'S SPECIAL INSPECTOR AS IS REASONABLY NECESSARY FOR THE PROPER PERFORMANCE OF SPECIAL INSPECTIONS.

M. SPECIAL INSPECTIONS DO NOT RELIEVE THE CONTRACTOR OF RESPONSIBILITY TO COMPLY WITH ALL REQUIREMENTS OF THE CONTRACT DOCUMENTS. CONSTRUCTION MEANS AND METHODS AND JOBSITE SAFETY ARE SOLELY THE RESPONSIBILITY OF THE CONTRACTOR.

TABLE 1705.3
REQUIRED SPECIAL INSPECTIONS AND TESTS OF CONCRETE CONSTRUCTION

TYPE	CONTINUOUS SPECIAL INSPECTION	PERIODIC SPECIAL INSPECTION	REFERENCED STANDARD	IBC REFERENCE
1) Inspect reinforcement, including prestressing tendon, and verify placement.	-	X	ACI 318 Ch. 20, 25.2, 25.3, 26.6.1-26.6.3	1908.4
2) Reinforcing bar welding:				
a) Verify weldability of reinforcing bars other than ASTM A706;	-	X	AWS D1.4 ACI 318: 26.6.4	-
b) Inspect single-pass fillet welds, maximum 5/16"; and	-	X		
c) Inspect all other welds.	X	-		
3) Inspect anchors cast in concrete.	-	X	ACI 318:17.8.2	-
4) Inspect anchors post-installed in hardened concrete members.	-	-		
a) Adhesive anchors installed in horizontally or upwardly inclined orientations to resist sustained tension loads.	X	-	ACI 318: 17.8.2.4	-
b) Mechanical anchors and adhesive anchors not defined in 4.a.	-	X	ACI 318: 17.8.2	
5) Verify use of required design mix.	-	X	ACI 318: Ch. 19, 26.4.3, 26.4.4	1904.1, 1904.2, 1908.2, 1908.3
6) Prior to concrete placement, fabricate specimens for strength tests, perform slump and air content tests, and determine the temperature of the concrete.	X	-	ASTM C 172 ASTM C 31 ACI 318: 26.5, 26.12	1908.10
7) Inspect concrete and shotcrete placement for proper application techniques.	X	-	ACI 318: 26.5	1908.6, 1908.7, 1908.8
8) Verify maintenance of specified curing temperature and techniques.	-	X	ACI 318: 26.5.3-26.5.5	1908.9
9) Inspect formwork for shape, location and dimensions of the concrete member being formed.	-	X	ACI 318: 26.11.1.2(b)	-

TABLE 4 QUALITY ASSURANCE:
MINIMUM SPECIAL INSPECTION REQUIREMENTS FOR MASONRY

INSPECTION TASK	FREQUENCY[a]			REFERENCE FOR CRITERIA	
	Level 1	Level 2	Level 3	TMS 402	TMS 602
1. As masonry construction begins, verify that the following are in compliance:					
a. Proportions of site-prepared mortar	NR	P	P		Art. 2.1, 2.6 A, & 2.6 C
b. Grade and size of prestressing tendons and anchorages	NR	P	P		Art. 2.4 B & 2.4 H
c. Grade, type and size of reinforcement, connectors, anchor bolts, and prestressing tendons and anchorages	NR	P	P		Art. 3.4 & 3.6 A
d. Prestressing technique	NR	P	P		Art. 3.6 B
e. Properties of thin-bed mortar for AAC masonry	NR	C(b)/P(c)	C		Art. 2.1 C.1
f. Sample panel construction	NR	P	C		Art. 1.6 D
2. Prior to grouting, verify that the following are in compliance:					
a. Grout space	NR	P	C		Art. 3.2 D & 3.2 F
b. Placement of prestressing tendons and anchorages	NR	P	P	Sec. 10.8 & 10.9	Art. 2.4 & 3.6
c. Placement of reinforcement, connectors, and anchor bolts	NR	P	C	Sec. 6.1, 6.3.1, 6.3.6, & 6.3.7	Art. 3.2 E & 3.4
d. Proportions of site-prepared grout and prestressing grout for bonded tendons	NR	P	P		Art. 2.6 B & 2.4 G.1.b
3. Verify compliance of the following during construction:					
a. Materials and procedures with the approved submittals	NR	P	P		Art. 1.5
b. Placement of masonry units and mortar joint construction	NR	P	P		Art. 3.3 B
c. Size and location of structural members	NR	P	P		Art. 3.3 F
d. Type, size, and location of anchors, including other details of anchorage of masonry to structural members, frames, or other construction.	NR	P(e)	C	Sec. 1.2.1(e), 6.2.1, & 6.3.1	
e. Welding of reinforcement	NR	C	C	Sec.6.1.6.1.2	
f. Preparation, construction and protection of masonry during cold weather (temperature below 40° (4.4° C)) or hot weather (temperature above 90° (32.2°))	NR	P	P		Art. 1.8 C & 1.8 D
g. Application and measurement of prestressing force	NR	C	C		Art. 3.6 B
h. Placement of grout and prestressing grout for bonded tendons is in compliance	NR	C(d)	C		Art. 3.5 & 3.6 C
i. Placement of AAC masonry units and construction of thin-bed mortar joints	NR	C(b)/P(c)	C		Art. 3.3 B.9 & 3.3 F.1.b
4. Observe preparation of grout specimens, mortar specimens, and/or prisms	NR	P	C		Art. 1.4 B.2.a.3, 1.4 B.2.b.3, 1.4 B.2, c.3, 1.4 B.3, & 1.4 B.4

(a) Frequency refers to the frequency of inspection, which may be continuous during the listed task, as defined in the table. NR=Not Required, P=Periodic, C=Continuous
(b) Required for the first 5000 square feet (465 square meters) of AAC masonry.
(c) Required after the first 5000 square feet (465 square meters) of AAC masonry.
(d) Continuous inspection of grouting is required for cmu walls in shelter.
(e) Continuous inspection of post-installed anchors in cmu walls in shelter.

REQUIRED VERIFICATION AND INSPECTION OF STEEL CONSTRUCTION

VERIFICATION AND INSPECTION	FREQUENCY OF INSPECTION: CONTINUOUS (inspect each joint/member)	FREQUENCY OF INSPECTION: PERIODIC (inspect random joint/members)	REFERENCED STANDARD
1. Material verification of high-strength bolts, nuts and washers:			
a. Identification markings to conform to ASTM standards specified in the approved construction documents.	-	QC and QA	AISC 360, Section A3.3 and applicable ASTM material standards
b. Manufacturer's certifications available for fastener materials.	QA	QC	AISC 360, Table N5.6-1
c. Fasteners marked in accordance with ASTM requirements.	-	QC and QA	
d. Proper fasteners selected for the joint detail (grade, type, bolt length if threads are to be excluded from shear plane).	-	QC and QA	
e. Proper bolting procedure selected for joint detail.	-	QC and QA	
f. Connecting elements, including the appropriate faying surface condition and hole preparation, if specified, meet applicable requirements.	-	QC and QA	
g. Pre-installation verification testing by installation personnel observed and documented for fastener assemblies and methods used.	QC	QA	
h. Proper storage provided for bolts, nuts, washers and other fastener components.	-	QC and QA	
2. Inspection of high-strength bolting: • For bolts requiring pretensioning, the special inspector shall observe the preinstallation testing and calibration procedures; determine that all plies of connected materials have been drawn together and properly snugged prior to pretensioning and monitor the installation of bolts to verify that fasteners are pretensioned in accordance with the RCSC Specification, progressing systematically from the most rigid point to the free edges. • For joints required to be tightened only to the snug-tight condition, the special inspector need only verify that the connected materials have been drawn together and properly snugged.			
a. Snug-tight joints.	-	QC and QA	AISC 360, Section M2.5
b. Pretensioned and slip-critical joints using turn-of-nut with matchmarking, twist-off bolt or direct tension indicator methods of installation.	-	QC and QA	
c. Pretensioned and slip-critical joints using turn-of-nut without matchmarking or calibrated wrench methods of installation.	QC and QA	-	
d. Fastener assemblies, of suitable condition, placed in all holes and washers (if required) are positioned as required.	-	QC and QA	AISC 360, Table N5.6-2
e. Fastener component not turned by the wrench prevented from rotating.	-	QC and QA	
f. Document acceptance or rejection of bolted connections.	QC and QA	-	AISC 360, Table N5.6-3
3. Material verification of structural steel and cold-formed steel deck U.N.O.:			
a. For structural steel, identification markings to conform to AISC 360.	-	QC and QA	AISC 360, Section M1
b. For other steel, identification markings to conform to ASTM standards specified in the approved construction documents.	-	QC and QA	Applicable ASTM material standards
4. Inspection prior to welding:			
a. Verify identification markings of weld filler materials conform to AWS specification in the approved construction documents.	-	QC and QA	AISC 360, Section A3.5 and applicable AWS AS documents
b. Welding procedure specifications are available.	QC and QA	-	AISC 360, Table N5.4-1
c. Manufacturer certifications for welding consumables available.	QC and QA	-	
d. Material identification (type/grade) and welded identification system.	-	QC and QA	
e. Fit-up of welds including but not limited to joint preparation, dimensions, cleanliness, tacking, and backing type/fit as applicable.	-	QC and QA	
f. Configuration and finish of access holes	-	QC and QA	
g. Check welding equipment.	-	QC	

REQUIRED VERIFICATION AND INSPECTION OF STEEL CONSTRUCTION

VERIFICATION AND INSPECTION	FREQUENCY OF INSPECTION: CONTINUOUS (inspect each joint/member)	FREQUENCY OF INSPECTION: PERIODIC (inspect random joint/members)	REFERENCED STANDARD
5. Inspection of welding:			
a. AISC 360 requirements for welding structural steel			
1) Use of qualified welders	-	QC and QA	AISC 360, Table N5.4-2 During Welding
2) Packaging and exposure control and handling of welding consumables.	-	QC and QA	
3) Welding over cracked tack welds	-	QC and QA	
4) Environmental conditions including but not limited to precipitation, temperature and wind.	-	QC and QA	
5) Verify settings on equipment, travel speeds, elected materials, shielding gas type/flowv rate, preheating interpass temperatures and proper position meets WPS standards.	-	QC and QA	
6) Verify welding techniques for interpass, final cleaning, profile limitations, and quality requirements.	-	QC and QA	
7) Welds are cleaned and painted where required.	-	QC and QA	AISC 360, Table N5.4-2 After Welding
8) Verify size, length and locations of welds.	QC and QA	-	
9) Visually verify welds for crack prohibition, weld/base-metal fusion, crater cross section, weld profiles, weld size, undercutting, and porosity.	QC and QA	-	
10) Arc strikes, k-area cracks within 3" of weld, removal of backing, and repair activities as applicable.	QC and QA	-	
11) Documentation of acceptance or rejection of welded joint or member.	QC and QA	-	
b. American Welding Society requirements for structural steel and cold-formed steel deck:			
1) Complete and partial joint penetration groove welds.	X	-	AWS D1.1
2) Multipass fillet welds.	X	-	
3) Single-pass fillet welds > 5/ 16"	X	-	
4) Plug and slot welds.	X	-	
5) Single-pass fillet welds ≤ 5/ 16"	-	X	
6) Floor and roof deck welds.	-	X	AWS D1.3
7) Welded studs & deformed bar anchors (DBA's).	-	X	AWS D1.1
8) Welded sheet steel for cold-formed steel members	-	X	AWS D1.3
9) Welding of stairs & railing systems	-	X	AWS D1.1
c. Reinforcing steel:			AWS D1.4, ACI 318: Section 3.5.2
1) Verification of weldability of reinforcing steel other than ASTM A 706.	-	X	
2) Reinforcing steel resisting flexural and axial forces in intermediate and special moment frames, and boundary elements of special structural walls of concrete and shear reinforcement.	X	-	
3) Shear reinforcement.	X	-	
4) Other reinforcing steel.	-	X	
6. Inspection of steel elements of composite construction prior to concrete placement:			
a. Placement and installation of steel deck.	QC and QA	-	AISC 360, Table N6.1
b. Placement and installation of steel HSA.	QC and QA	-	AISC 360, Table N6.1
c. Documentation of acceptance or rejection of steel elements.	QC and QA	-	AISC 360, Table N6.1

TABLE 1705.6
REQUIRED SPECIAL INSPECTIONS AND TESTS OF SOILS

TYPE	CONTINUOUS SPECIAL INSPECTION	PERIODIC SPECIAL INSPECTION
1. Verify materials below shallow foundations are adequate to achieve the design bearing capacity.	-	X
2. Verify excavations are extended to proper depth and have reached proper material.	-	X
3. Perform classification and testing of compacted fill materials.	-	X
4. Verify use of proper materials, densities and lift thicknesses during placement and compaction of compacted fill.	X	-
5. Prior to placement of compacted fill, inspect subgrade and verify that site has been prepared properly.	-	X

TABLE 1705.2.3
REQUIRED SPECIAL INSPECTIONS OF OPEN-WEB STEEL JOISTS AND JOIST GIRDERS

TYPE	CONTINUOUS SPECIAL INSPECTION	PERIODIC SPECIAL INSPECTION	REFERENCED STANDARD
1. Installation of open-web steel joists and joist girders.			
a. End connections – welding or bolted.	-	X	SJI specification listed in Section 2207.1
b. Bridging – horizontal or diagonal.			
1. Standard bridging.	-	X	SJI specification listed in Section 2207.1
2. Bridging that differs from SJI specifications listed in Section 2207.1	-	X	

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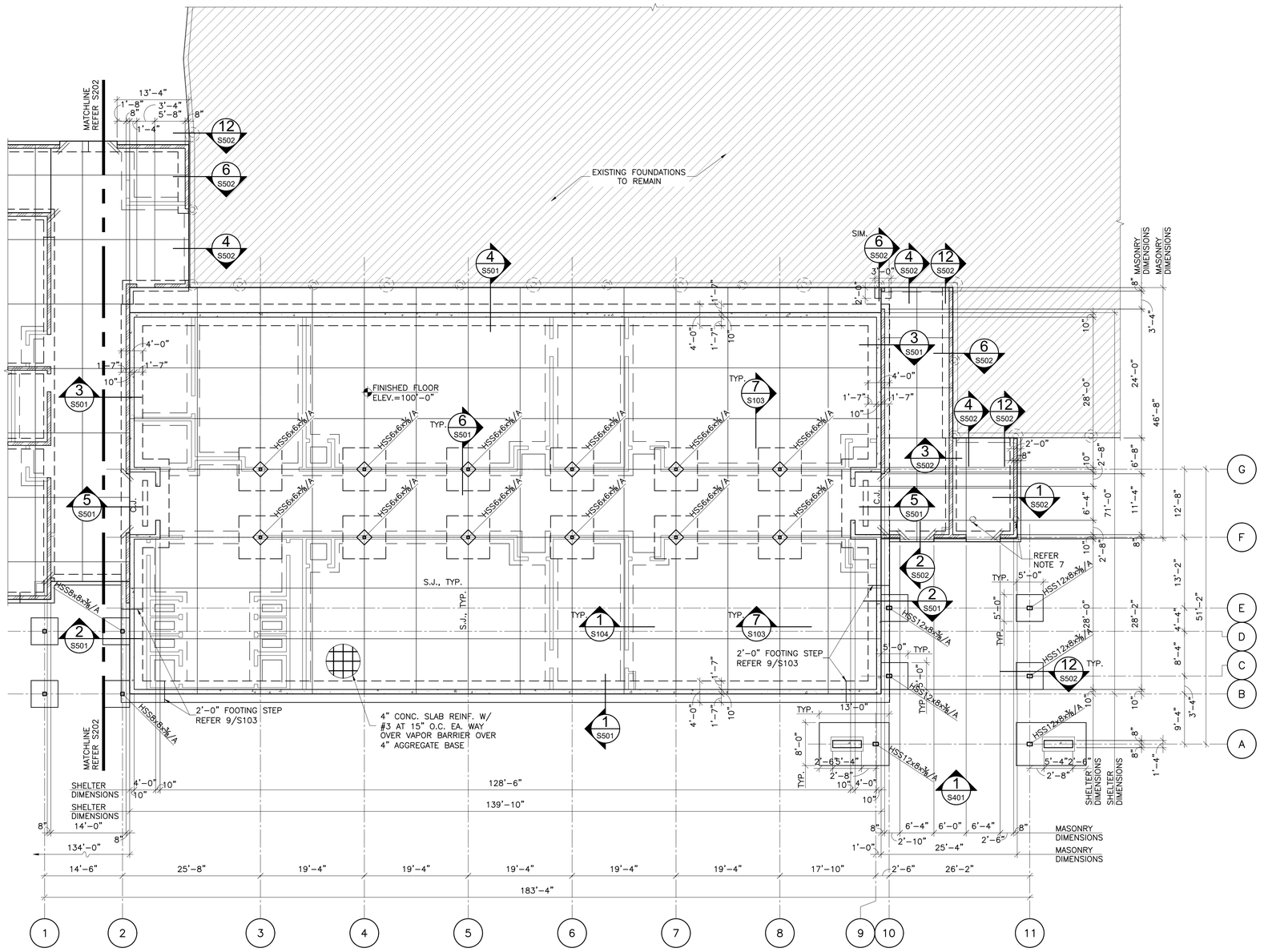
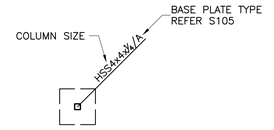


1 S201 FOUNDATION PLAN - AREA "A"

NORTH

SCALE: 3/32"=1'-0"

FOUNDATION PLAN LEGEND:

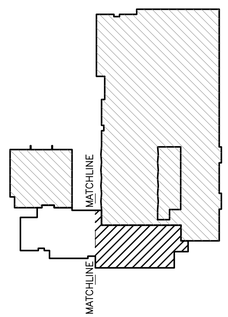


= LOAD BEARING MASONRY WALLS

= NON-LOAD BEARING MASONRY WALLS

FOUNDATION PLAN NOTES:

1. FOUNDATION AND SLAB SUBGRADE SHALL BE PREPARED AS OUTLINED IN THE STRUCTURAL GENERAL NOTES.
2. REFERENCE ELEVATION OF 100'-0" EQUALS DATUM FINISHED FLOOR ELEVATION OF 1249.33 FEET FOR THE NEW BUILDING.
3. EXCEPT WHERE SHOWN OTHERWISE, SLABS-ON-GRADE SHALL BE 4" THICK CONCRETE REINFORCED WITH #3 BARS AT 15" ON CENTER EACH WAY OVER A 15 MIL VAPOR RETARDER OVER A 4" AGGREGATE BASE COURSE. REINFORCING BARS SHALL BE PLACED 1½" CLEAR FROM TOP OF SLAB USING CHAIRS OR SLAB BOLSTERS COMPLYING WITH CRSI'S "MANUAL OF STANDARD PRACTICE".
4. SLABS-ON-GRADE SHALL BE WATER CURED FOR A MINIMUM OF 7 DAYS BY PONDING, SPRAYING, SPRINKLING OR BY USE OF SATURATED COVERINGS. THE USE OF CURING COMPOUNDS FOR SLABS-ON-GRADE IS PROHIBITED.
5. SAWED JOINTS (SJ) AND REQUIRED CONSTRUCTION JOINTS (CJ) ARE SHOWN ON THE DRAWINGS. AT THE CONTRACTOR'S OPTION, ADDITIONAL CONSTRUCTION JOINTS MAY BE PLACED AT LOCATIONS INDICATED TO BE SAWED JOINTS.
6. // INDICATES (2)#4 BARSx4'-0" TO BE PLACED IN SLAB-ON-GRADE AT ALL RE-ENTRANT CORNERS. RE-ENTRANT CORNERS ARE DEFINED AS INTERIOR CORNERS WHERE JOINTS DO NOT OCCUR IN BOTH DIRECTIONS. SIMILAR BARS SHALL BE PLACED AT ANY DISCONTINUOUS ENDS OF SAWED JOINTS OR CONSTRUCTION JOINTS.
7. REMOVE EXISTING PIERS THAT CONFLICT WITH NEW FOUNDATIONS
8. REFER MECHANICAL FOR FLOOR DRAIN (F.D.) INFORMATION.



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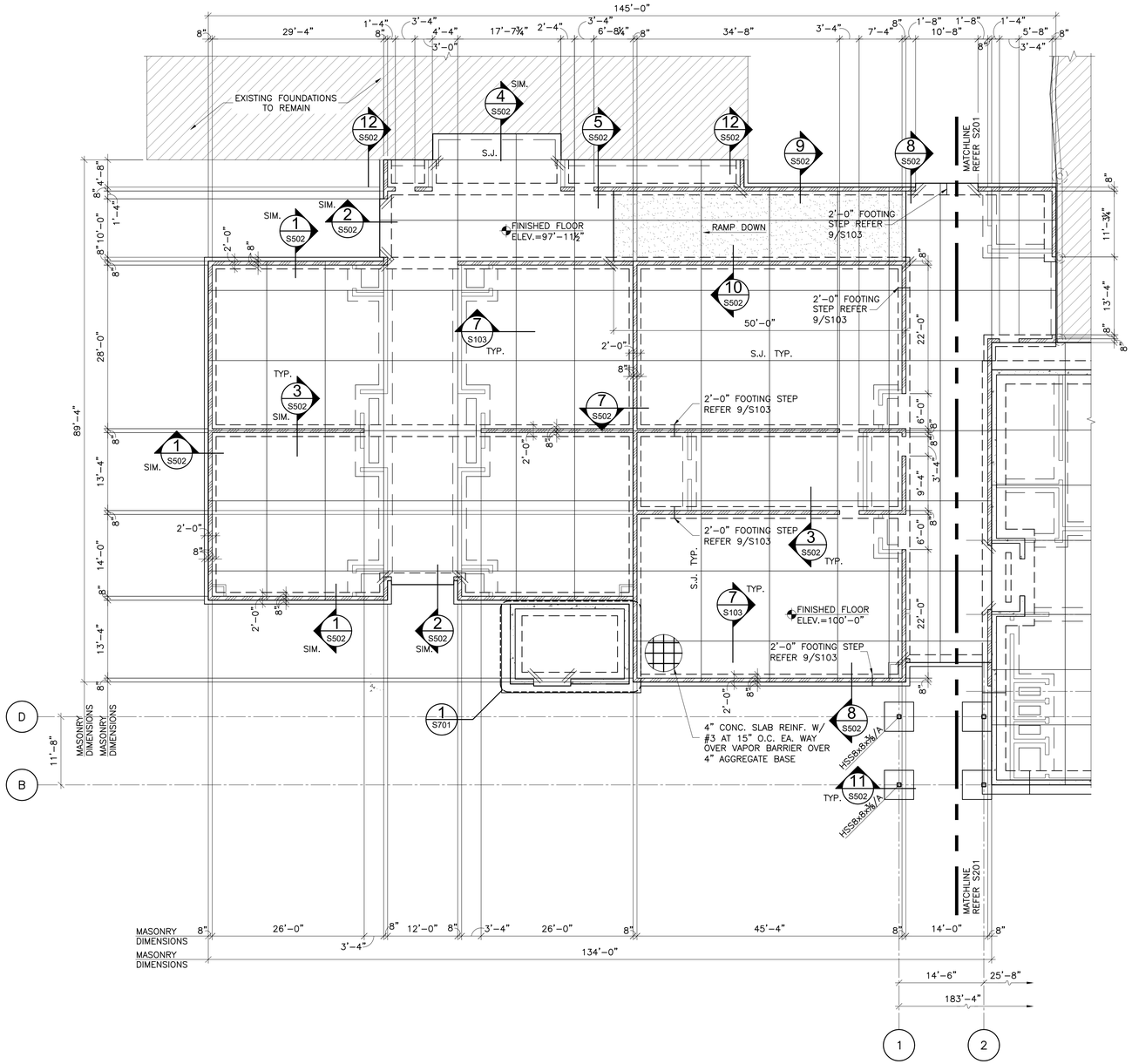
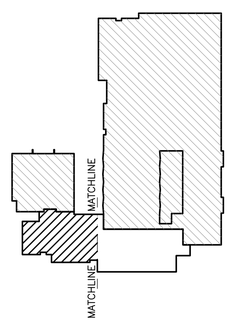


NORTH 1 S202 FOUNDATION PLAN - AREA "B"

SCALE: 3/32"=1'-0"

NOTE:
REFER S201 FOR FOUNDATION PLAN NOTES AND LEGEND



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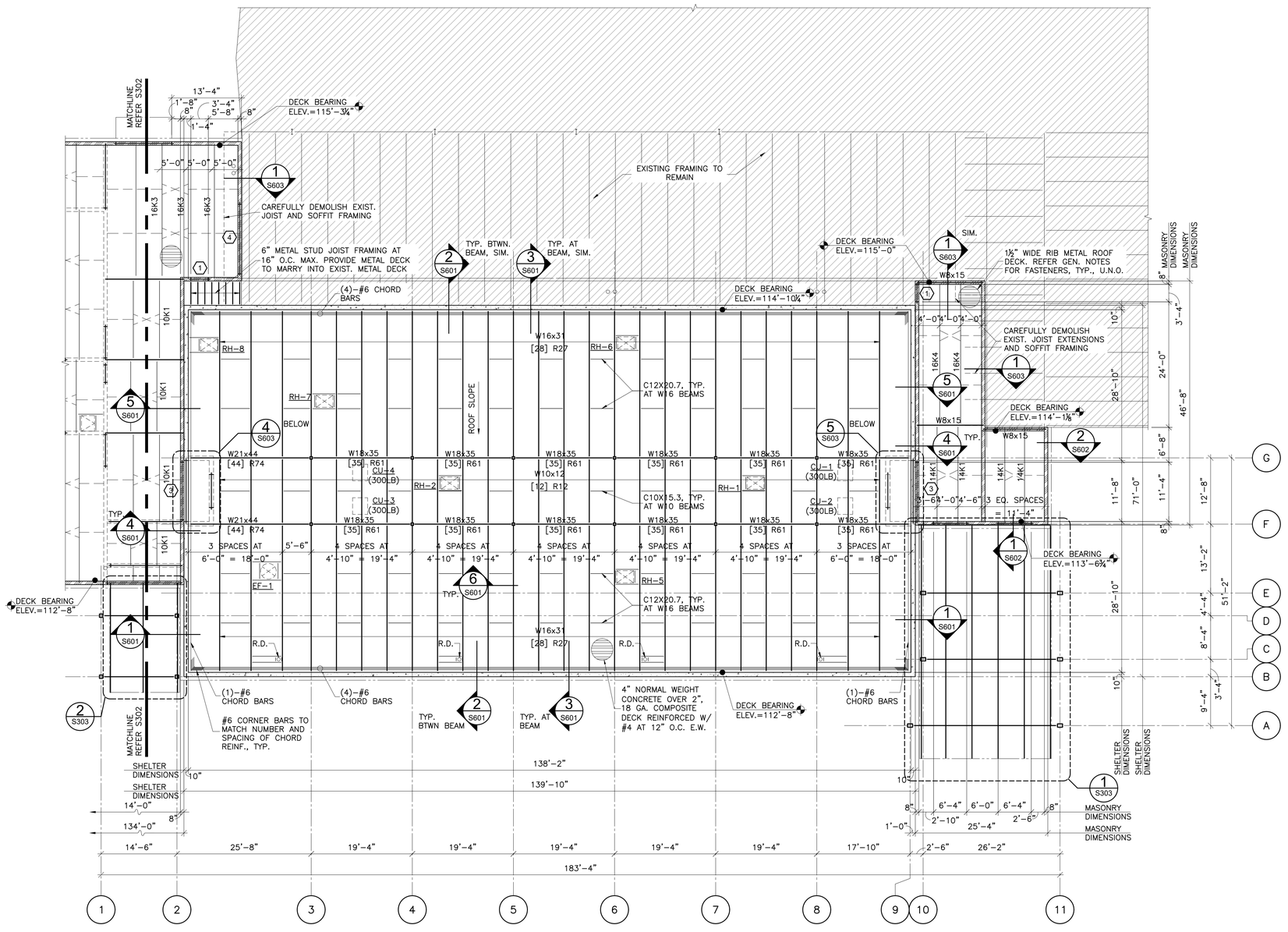
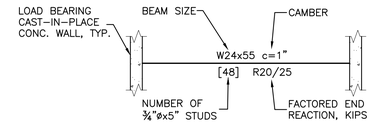


NORTH

1 S301 FRAMING PLAN - AREA "A"

SCALE: 3/32"=1'-0"

SHELTER FRAMING PLAN LEGEND:



= CAST-IN-PLACE CONCRETE SHELTER LOAD BEARING WALLS

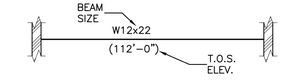
NOTE:
IF ONLY ONE NUMBER IS PROVIDED FOR END REACTIONS, REACTION APPLIES TO BOTH ENDS. WHERE NO REACTION IS GIVEN, USE 10K.

SHELTER ROOF FRAMING PLAN NOTES:
1. ALL ELEVATIONS ARE REFERENCED FROM FINISHED FLOOR DATUM OF 100'-0". REFER GENERAL NOTES FOR ACTUAL ELEVATION.
2. [10] INDICATES THE NUMBER OF 3/4"ø x 5" HEADED STUDS THAT ARE REQUIRED. AT BEAMS, HEADED STUDS ARE UNIFORMLY SPACED ALONG BEAM LENGTH. AT GIRDERS, STUDS ARE UNIFORMLY SPACED BETWEEN INTERSECTING TRANSVERSE BEAMS. LENGTH OF STUD IS THE FINAL INSTALLED LENGTH AFTER WELDING. SELECT LENGTH OF STUD PRIOR TO WELDING BASED ON BURN THROUGH CONDITIONS, I.E., THROUGH METAL DECK OR DIRECTLY TO STEEL.
3. AT COMPOSITE BEAMS, PLACE HEADED STUDS IN THE "STRONG" POSITION. REFER TYPICAL DETAILS.
4. PROVIDE (2)-#4x4'-0" DIAGONAL BARS AT ALL RE ENTRANT CORNERS.
5. ALL CONCRETE SLABS SHALL BE WET CURED FOR A MINIMUM OF 7 DAYS. USE OF SPRAY-ON OR ROLL-ON CURING COMPOUND IS PROHIBITED.
6. PROVIDE CONTINUOUS BUTT SPLICE WELDING IN FIELD AT DECK ANGLES.
7. ALL ROOF OPENINGS FOR MECHANICAL ROOF TOP UNITS ARE APPROXIMATELY LOCATED. EXACT SIZE AND LOCATIONS SHALL BE COORDINATED WITH THE SUCCESSFUL MECHANICAL CONTRACTOR. ALL ROOF/WALL OPENINGS SHALL BE SUPPORTED WITH TYPICAL ANGLE FRAME AND PENETRATION/SHROUD DETAILS.
8. DETAILING FOR CAST IN PLACE CONSTRUCTION ALLOWS FOR SHEAR WALLS TO BE PLACED VERTICALLY BEFORE PLACING ADDITIONAL FRAMING. THIS WILL REQUIRE TEMPORARY BRACING OF VERTICAL 10" WALLS UNTIL ROOF LEVELS ARE PLACED. COORDINATE BRACING OF WALLS WITH ARCHITECT IF BRACING TO EXPOSED STRUCTURE.
9. T.O. PARAPET REFERS TO THE TOP OF CONCRETE WALL ELEVATION WITH REFERENCE TO FINISH FLOOR ELEVATION SPECIFIED ON THE FOUNDATION PLAN U.N.O.
10. MECHANICAL OPENINGS SHALL NOT OCCUR WITHIN 24" OF EMBEDDED STUD ANCHORS.

ROOF FRAMING PLAN LEGEND:

= L1½x1½x7/64 MIN. HORIZONTAL JOIST BRIDGING BY JOIST MANUFACTURER

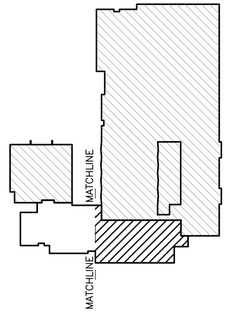
= L1½x1½x7/64 MIN. JOIST X-BRIDGING BY JOIST MANUFACTURER



= LOAD BEARING MASONRY WALLS

= INTERIOR LOAD BEARING MASONRY WALLS

ROOF FRAMING PLAN NOTES:
1. ALL ELEVATIONS ARE REFERENCED FROM FINISHED FLOOR DATUM OF 100'-0". REFER GENERAL NOTES FOR ACTUAL ELEVATION.
2. ALL ROOF OPENINGS FOR MECHANICAL ROOF TOP UNITS ARE APPROXIMATELY LOCATED. EXACT SIZE AND LOCATIONS SHALL BE COORDINATED WITH THE SUCCESSFUL MECHANICAL CONTRACTOR. ALL ROOF/WALL OPENINGS SHALL BE SUPPORTED WITH TYPICAL ANGLE FRAME UNLESS NOTED OTHERWISE.
3. T.O. PARAPET REFERS TO THE TOP OF MASONRY WALL ELEVATION WITH REFERENCE TO FINISH FLOOR ELEVATION SPECIFIED ON THE FOUNDATION PLAN U.N.O.
4. (1) DENOTES MASONRY LINTEL TYPE. REFER TYPICAL MASONRY DETAILS FOR ADDITIONAL INFORMATION.



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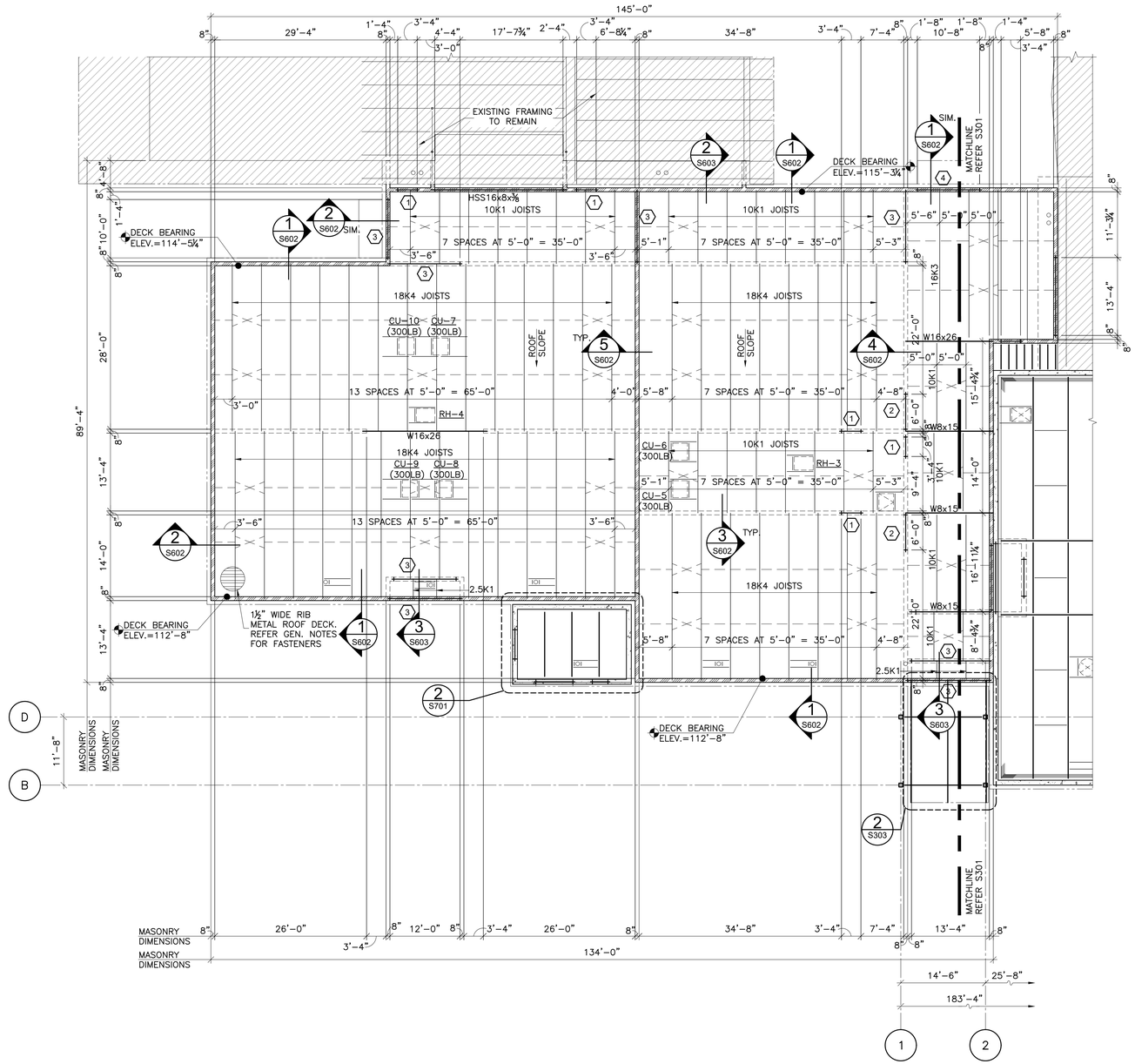
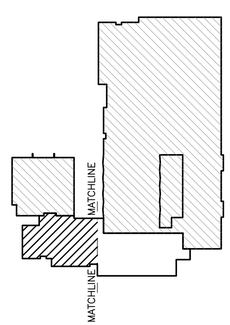


1 S302 FRAMING PLAN - AREA "B"

NORTH

SCALE: 3/32"=1'-0"

NOTE:
REFER S301 FOR FRAMING PLAN NOTES AND LEGEND



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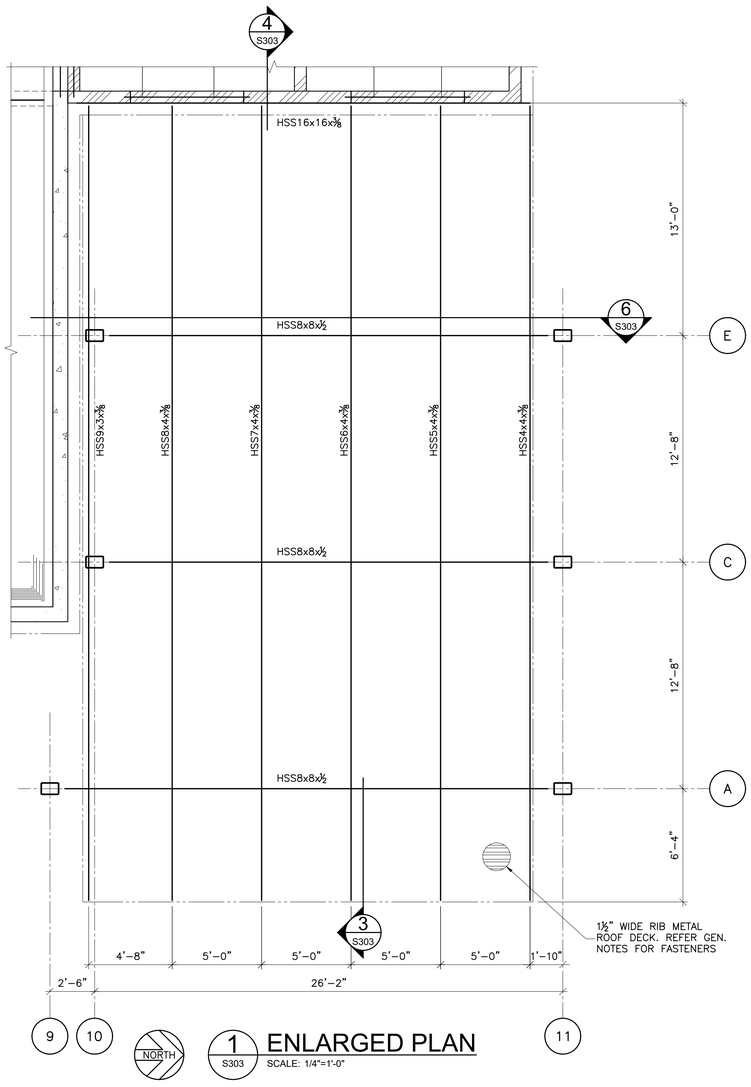
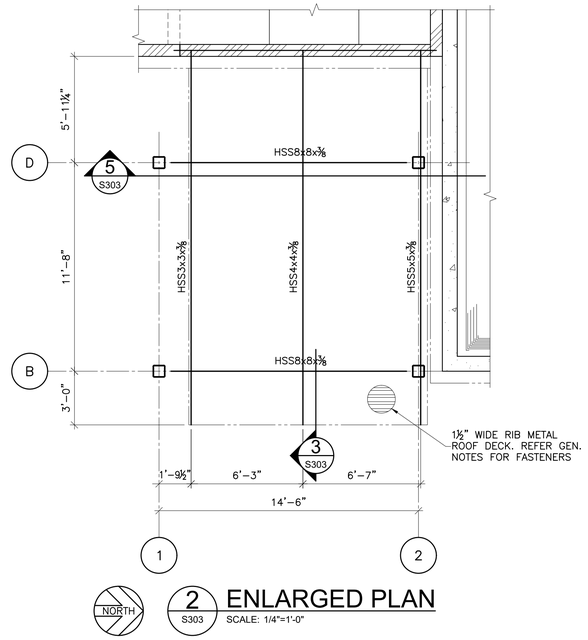


1 ENLARGED PLAN
S303 SCALE: 1/4"=1'-0"



2 ENLARGED PLAN
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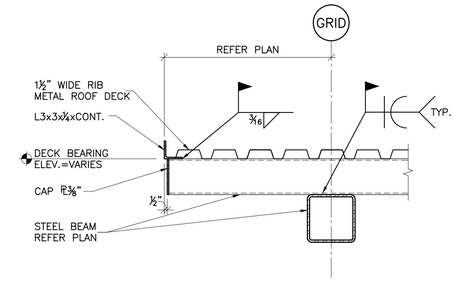

3 SECTION
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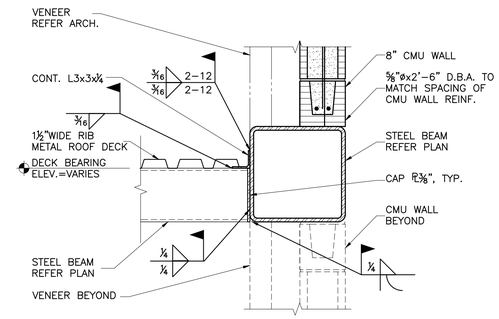

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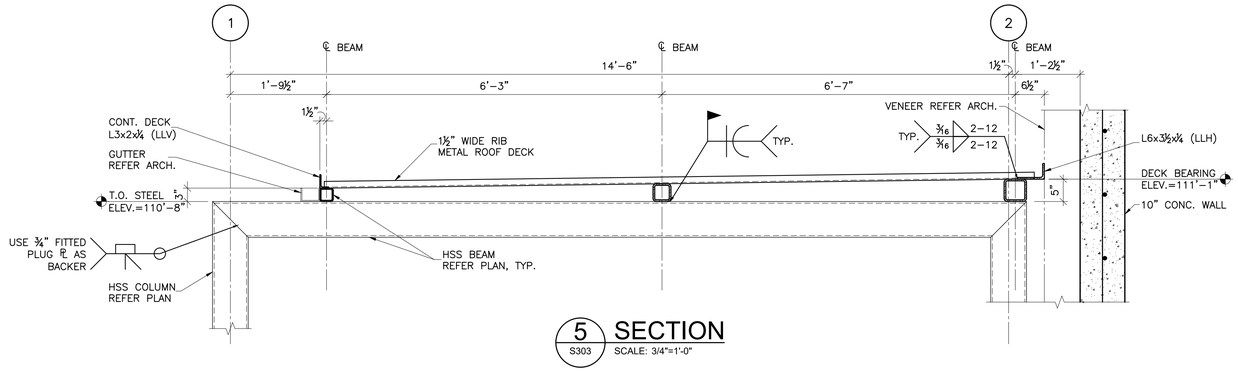

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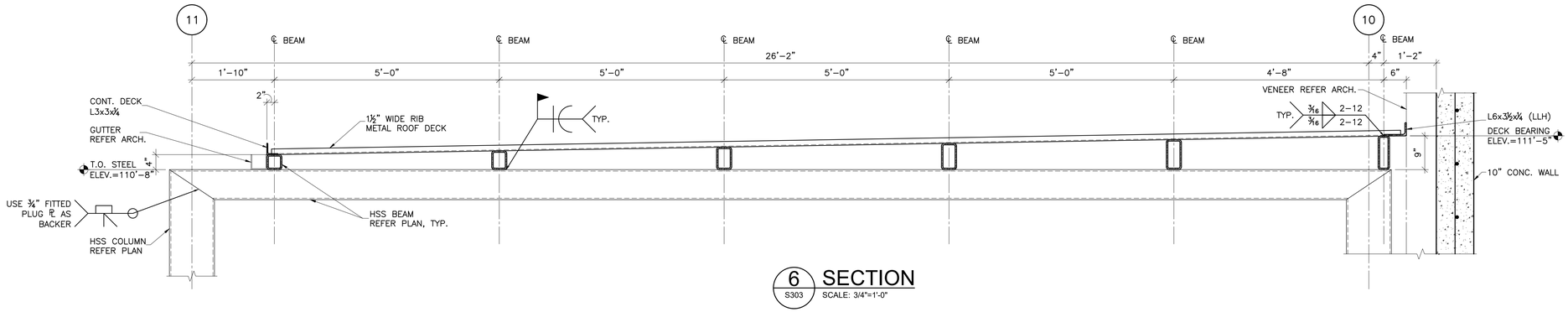

6 SECTION
S303 SCALE: 3/4"=1'-0"

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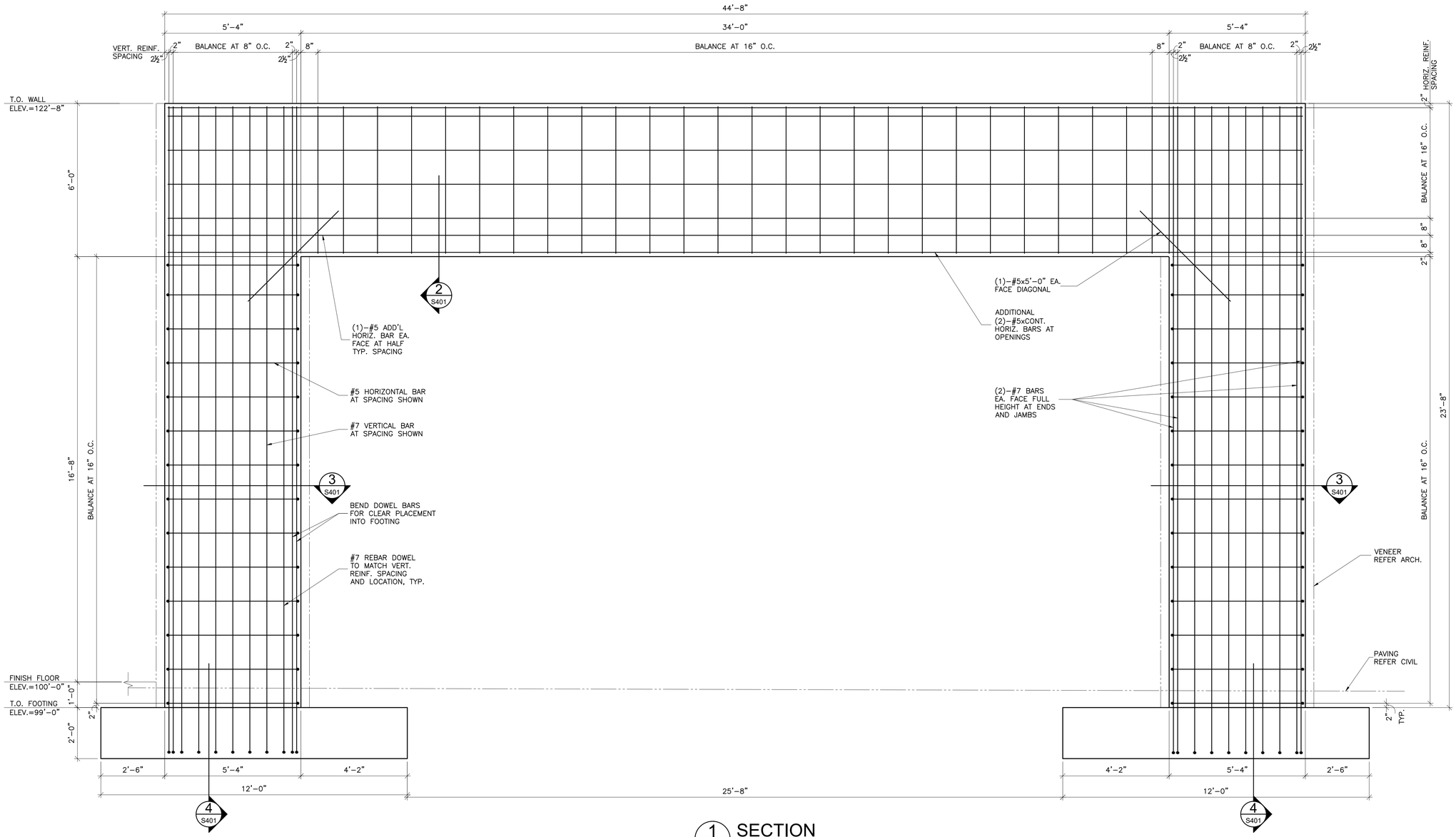

1 SECTION
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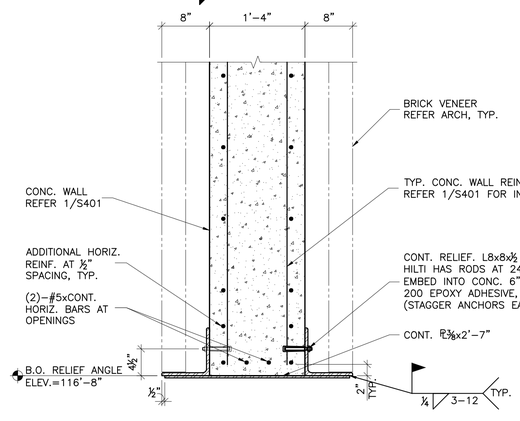

2 SECTION AT LINTEL
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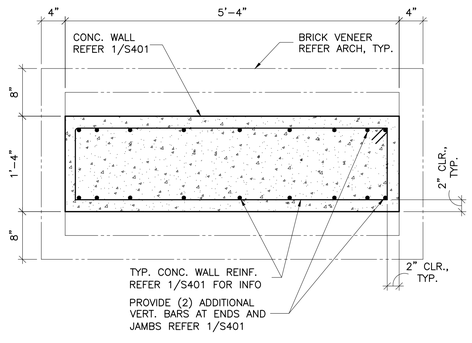

3 TYP. WALL SECTION
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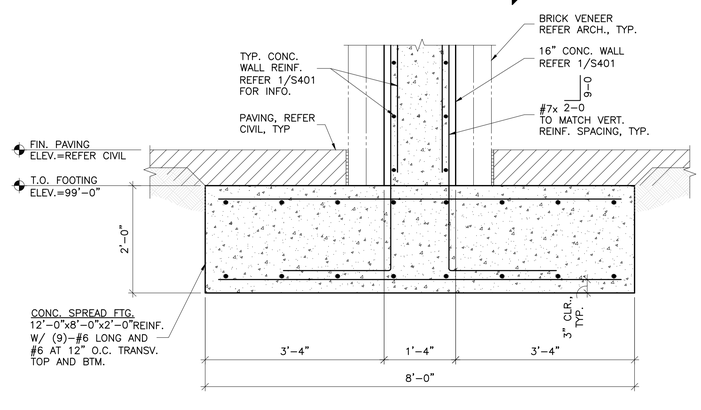

4 SECTION AT FOUNDATION
S401 SCALE: 3/4"=1'-0"

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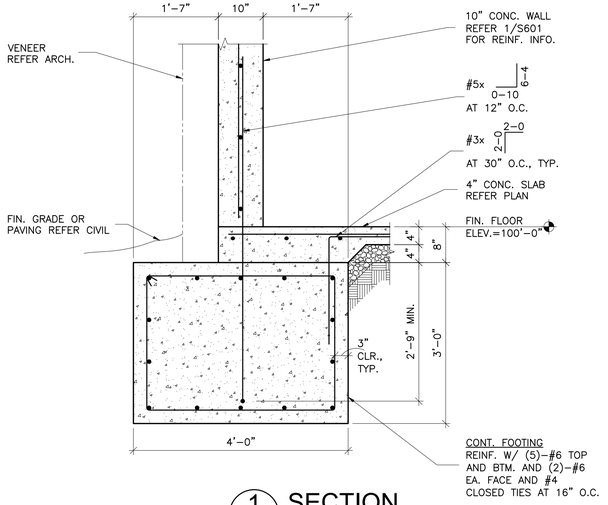

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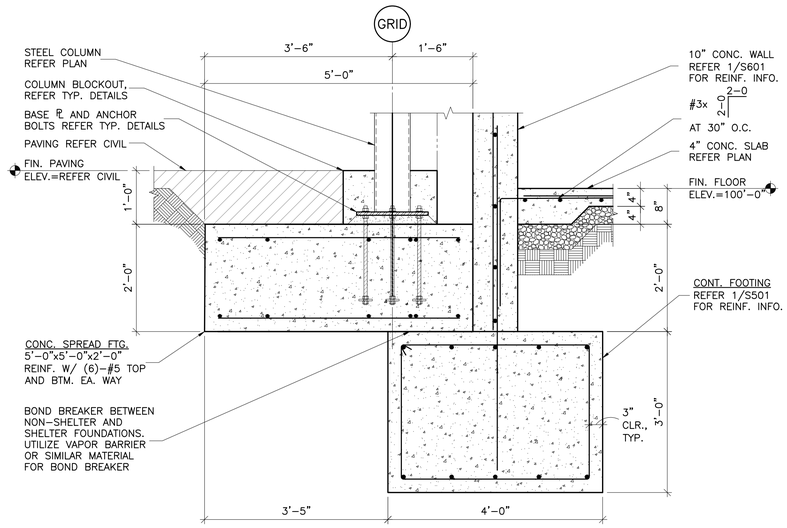

2 S501 SECTION
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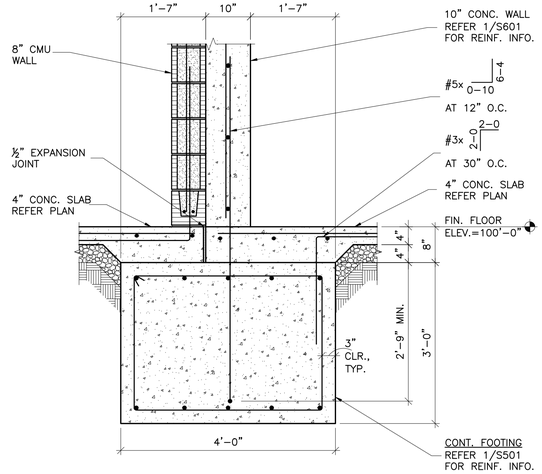

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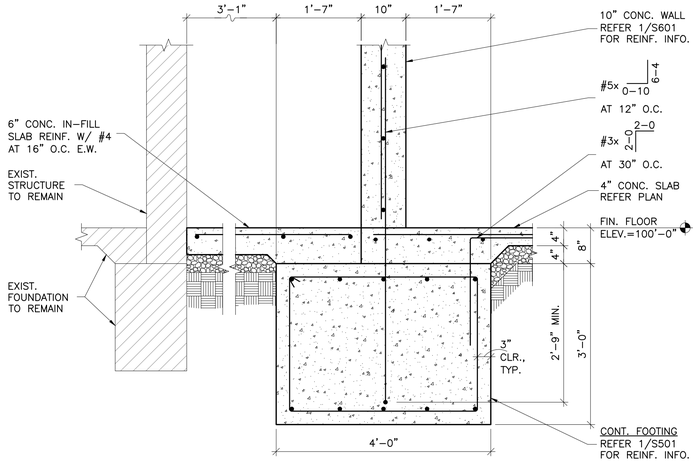

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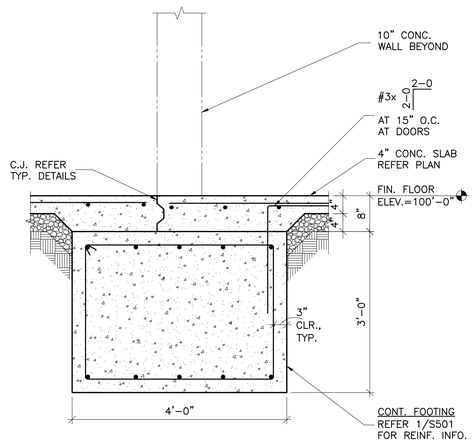

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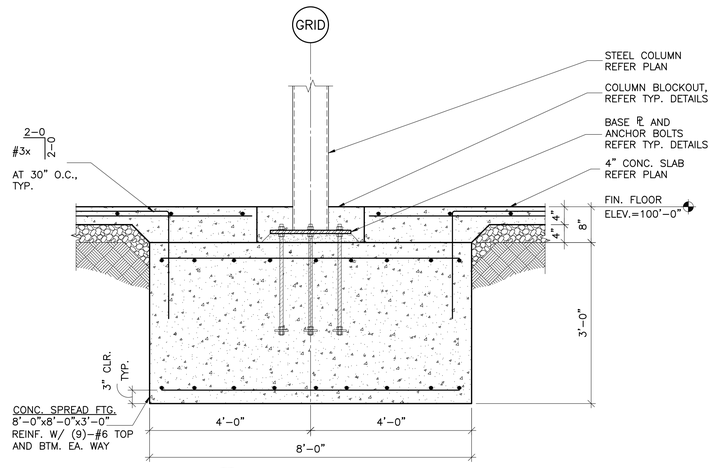

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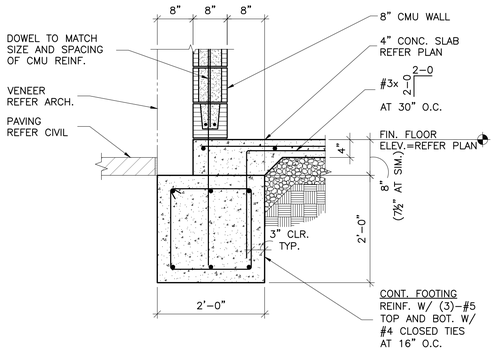

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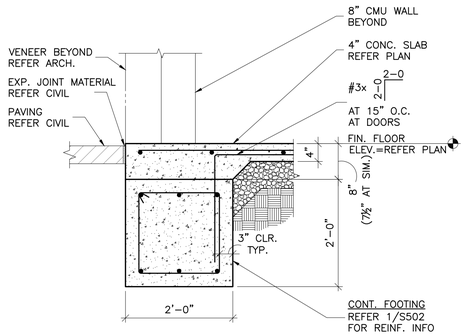

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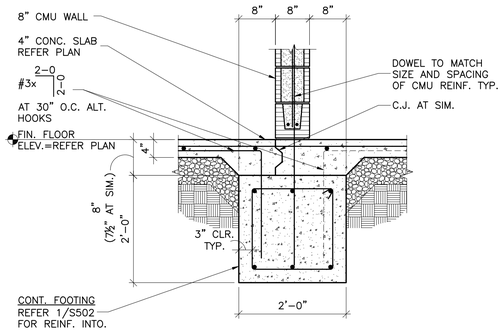

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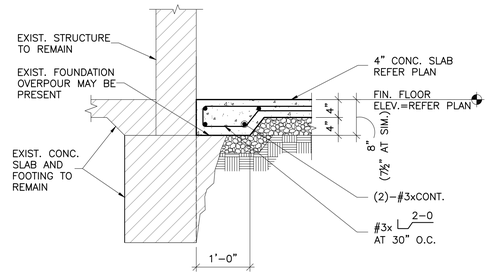

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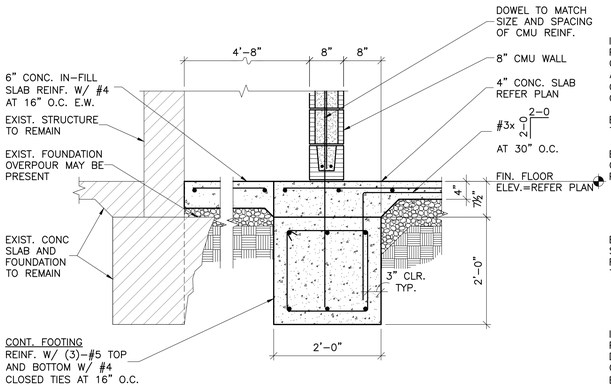

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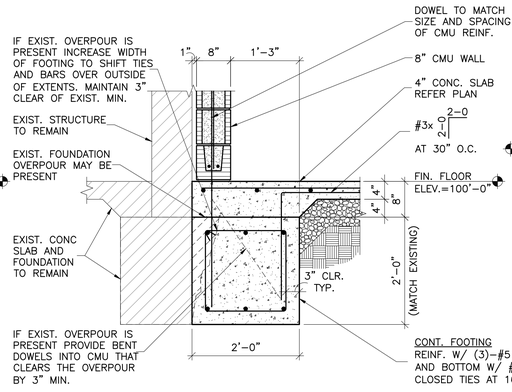

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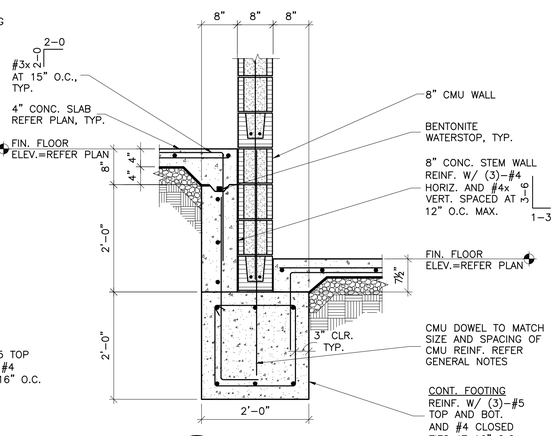

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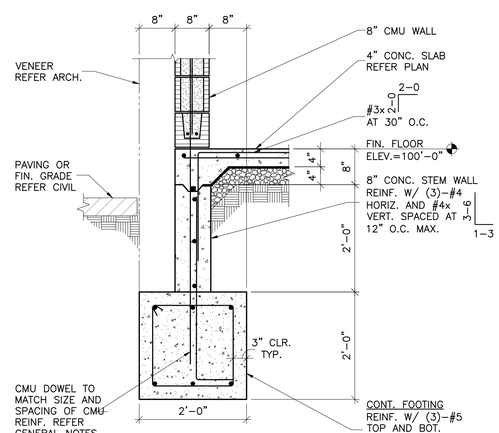

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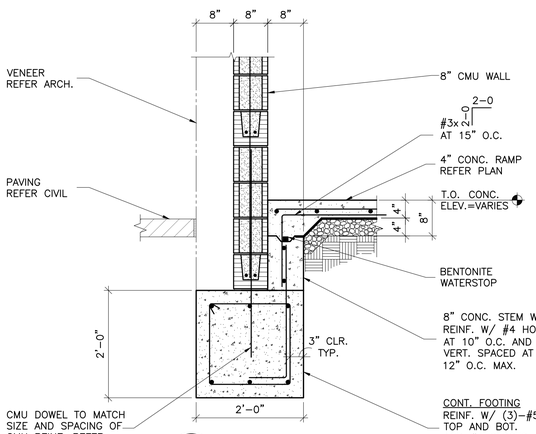

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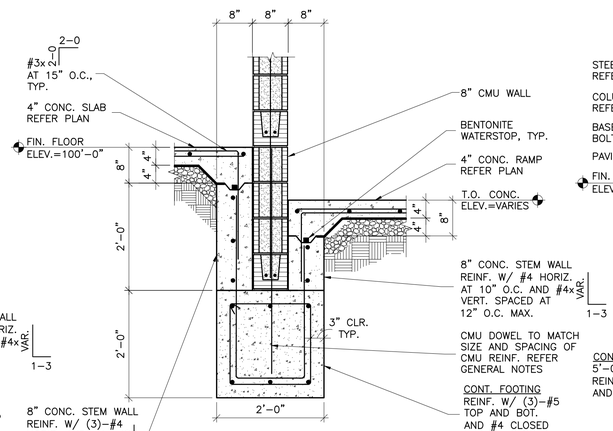

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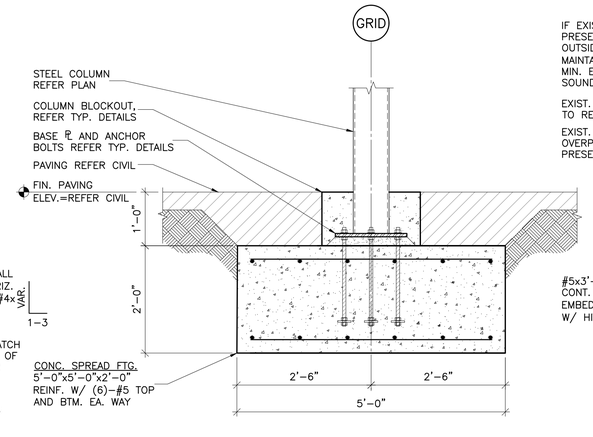

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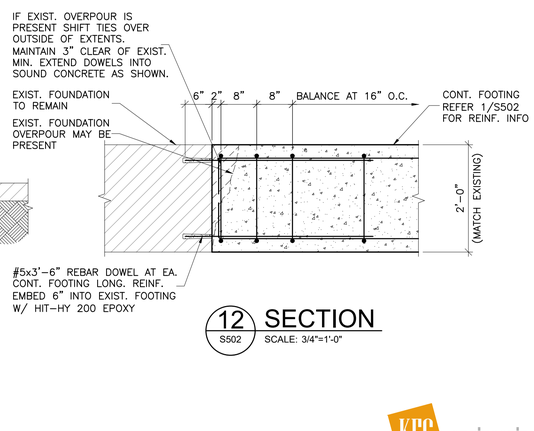

12 SECTION
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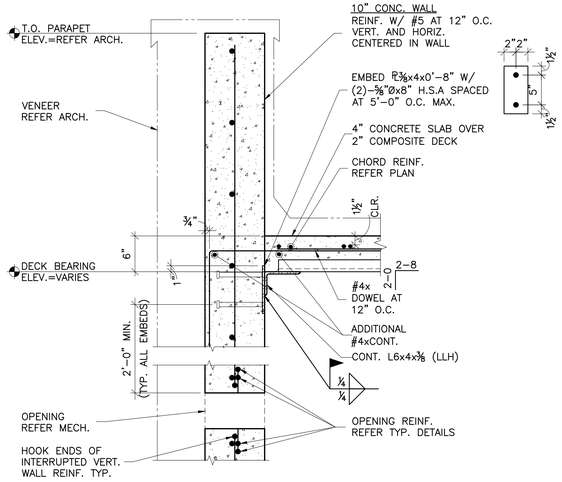
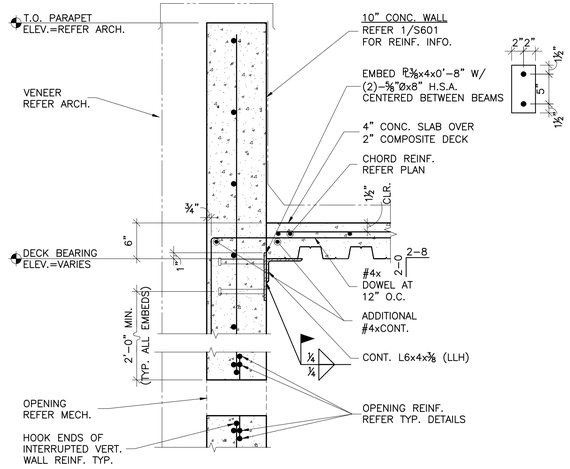
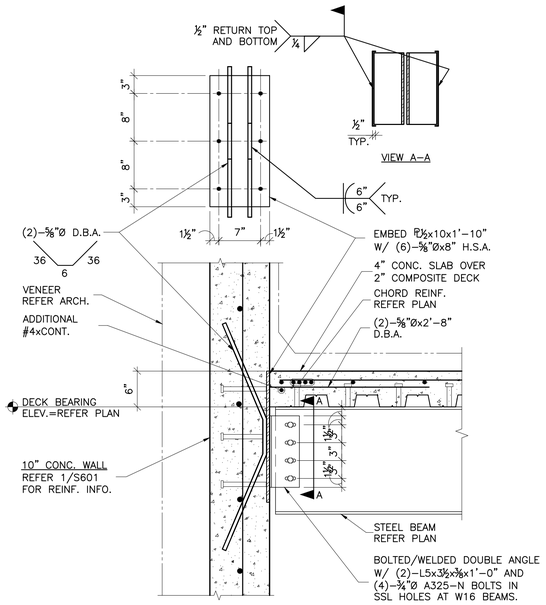


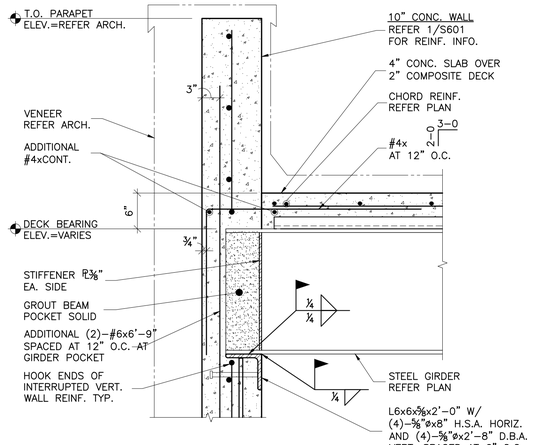
1 S601 **SECTION**
SCALE: 1"=1'-0"



2 S601 **SECTION**
SCALE: 1"=1'-0"

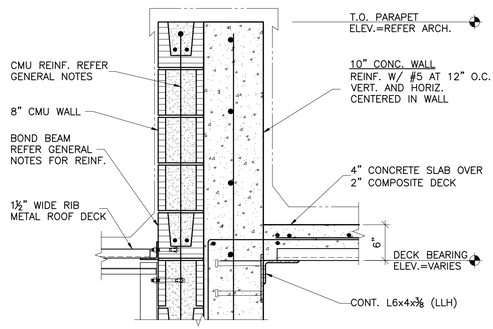


3 S601 **SECTION**
SCALE: 1"=1'-0"

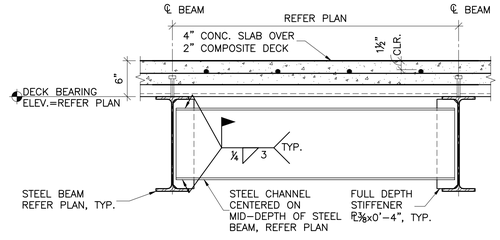


4 S601 **SECTION**
SCALE: 1"=1'-0"

NOTE:
REFER TO DETAILS 1/S601
AND 2/S602 FOR INFO
SHOWN BUT NOT NOTED.

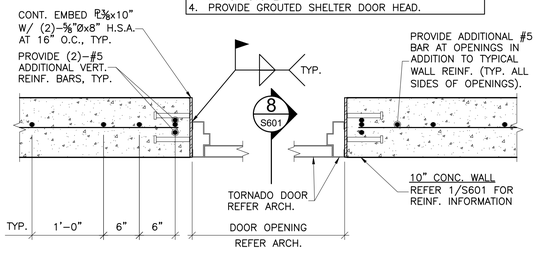


5 S601 **SECTION**
SCALE: 1"=1'-0"



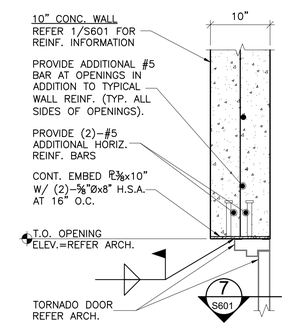
6 S601 **SECTION**
SCALE: 1"=1'-0"

NOTES:
1. COORDINATE ATTACHMENT OF DOOR FRAME TO EMBED PL W/ DOOR MANUFACTURER.
2. COORDINATE FINAL CONSTRUCTION TOLERANCES AND DIMENSIONS WITH MANUFACTURER. IT IS ANTICIPATED MAXIMUM SHIM SPACE AT DOOR HEAD IS ¼" FOR SINGLE JAMB AND ⅜" TOTAL FOR BOTH JAMBS.
3. CONTRACTOR SHALL COORDINATE FINAL DOOR ROUGH OPENING DIMENSIONS WITH FLOOR MANUFACTURER.
4. PROVIDE GROUTED SHELTER DOOR HEAD.



7 S601 **ENLARGED PLAN AT DOOR**
SCALE: 1"=1'-0"

NOTES:
1. COORDINATE ATTACHMENT OF DOOR FRAME TO EMBED PL W/ DOOR MANUFACTURER.
2. COORDINATE FINAL CONSTRUCTION TOLERANCES AND DIMENSIONS WITH MANUFACTURER. IT IS ANTICIPATED MAXIMUM SHIM SPACE AT DOOR HEAD IS ¼".
3. PROVIDE GROUTED SHELTER DOOR HEAD.



8 S601 **DOOR HEAD**
SCALE: 1"=1'-0"

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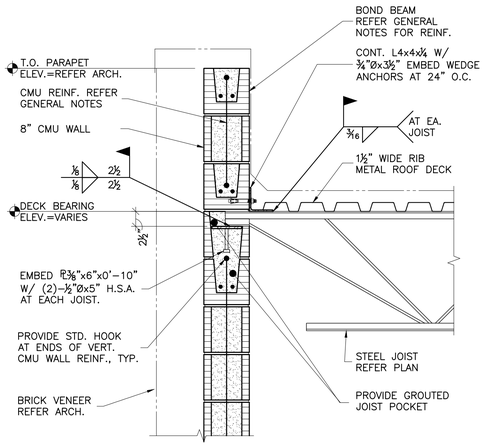
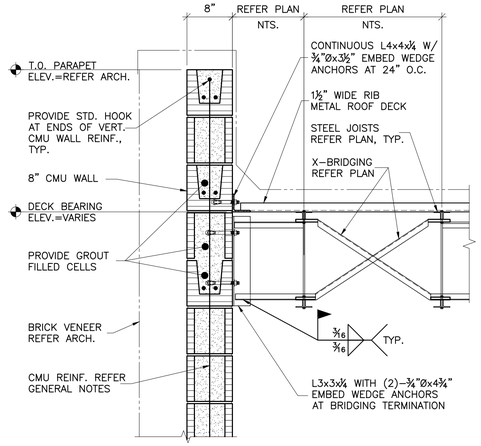
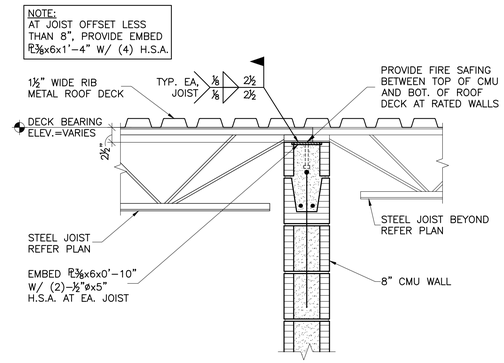


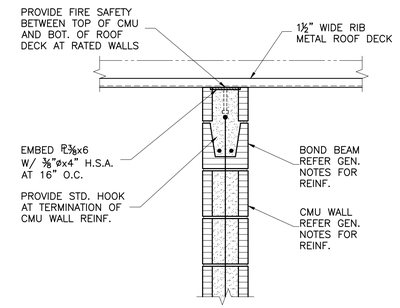
1 SECTION
S602 SCALE: 1"=1'-0"



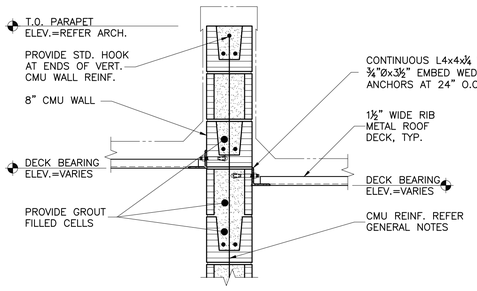
2 SECTION
S602 SCALE: 1"=1'-0"



3 SECTION
S602 SCALE: 1"=1'-0"

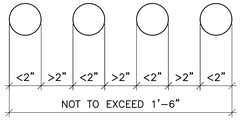


4 SECTION
S601 SCALE: 1"=1'-0"



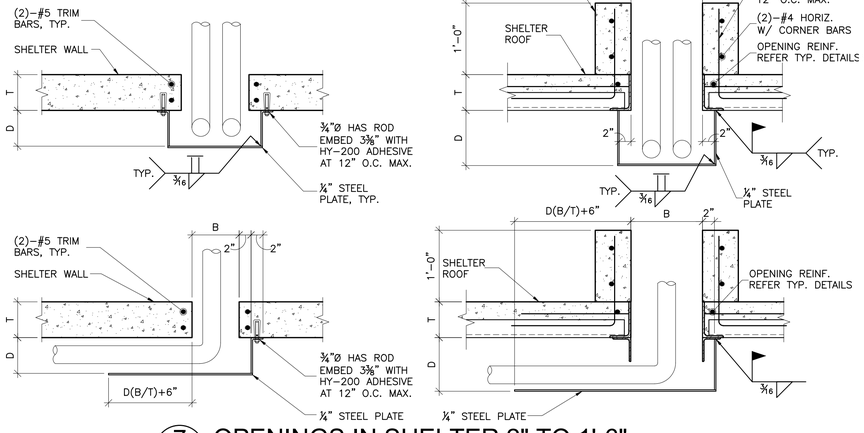
5 SECTION
S601 SCALE: 1"=1'-0"

NOTE:
OPENINGS 2" OR LESS MAY BE MADE IN THE SHELTER WALLS OR ROOF WITHOUT PROTECTION OR REGARD TO THE TYPICAL REINFORCING (SPECIAL REINFORCING AROUND OPENINGS SHALL NOT BE CUT). GROUPS OF UP TO 4 OPENINGS 2" OR LESS MAY BE MADE PROVIDED THE CLEAR SPACE BETWEEN OPENINGS EXCEEDS 2" AND THE TOTAL LENGTH OF THE GROUP DOES NOT EXCEED 18". OPENINGS CAN BE HORIZONTAL (AS SHOWN) OR VERTICAL



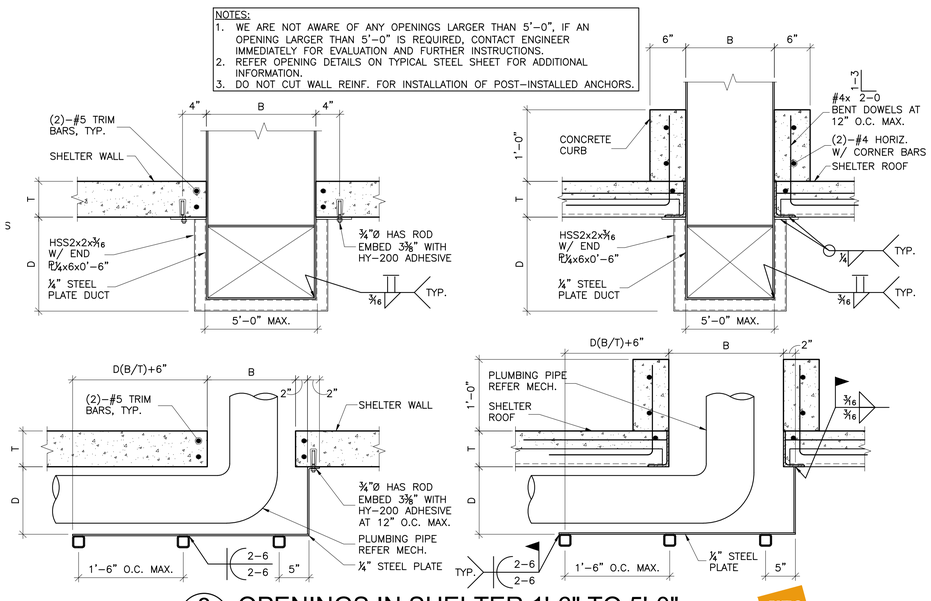
6 OPENINGS IN SHELTER 2" OR LESS
S602 SCALE: 1"=1'-0"

NOTES:
1. OPENINGS 18" OR LESS MAY BE MADE IN THE SHELTER WALLS OR ROOF AS SHOWN.
2. REFER OPENING DETAILS ON TYPICAL STEEL SHEET FOR ADDITIONAL INFORMATION.
3. DO NOT CUT WALL REINF. FOR INSTALLATION OF POST-INSTALLED ANCHORS.



7 OPENINGS IN SHELTER 2" TO 1'-6"
S602 SCALE: 1"=1'-0"

NOTES:
1. WE ARE NOT AWARE OF ANY OPENINGS LARGER THAN 5'-0", IF AN OPENING LARGER THAN 5'-0" IS REQUIRED, CONTACT ENGINEER IMMEDIATELY FOR EVALUATION AND FURTHER INSTRUCTIONS.
2. REFER OPENING DETAILS ON TYPICAL STEEL SHEET FOR ADDITIONAL INFORMATION.
3. DO NOT CUT WALL REINF. FOR INSTALLATION OF POST-INSTALLED ANCHORS.



8 OPENINGS IN SHELTER 1'-6" TO 5'-0"
S602 SCALE: 1"=1'-0"

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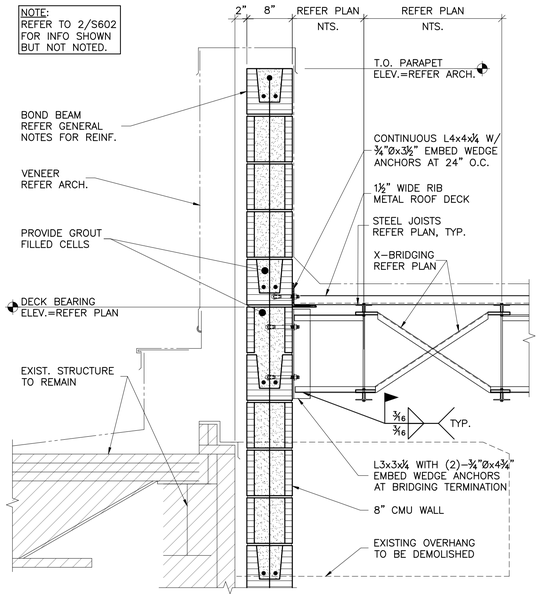
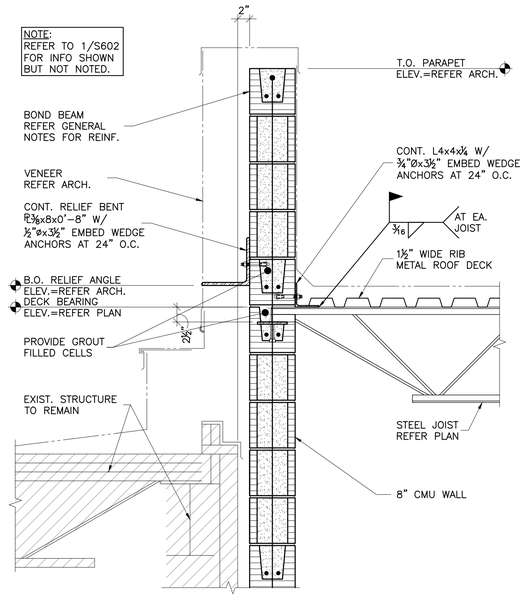


1 S603 **SECTION**
SCALE: 1"=1'-0"



2 S603 **SECTION**
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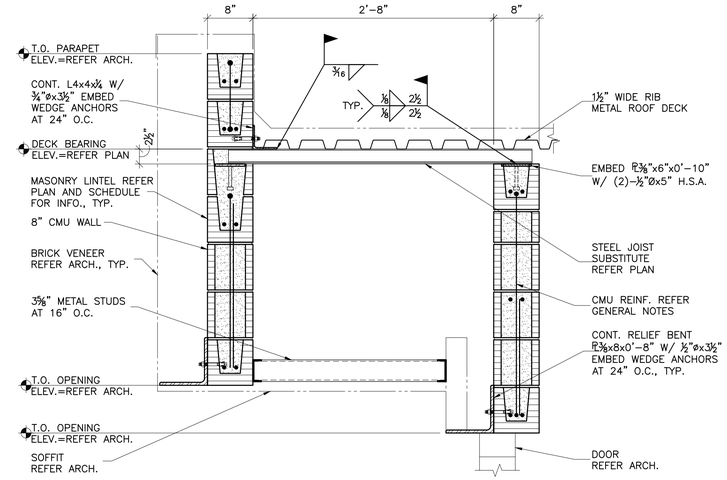

3 S603 **SECTION**
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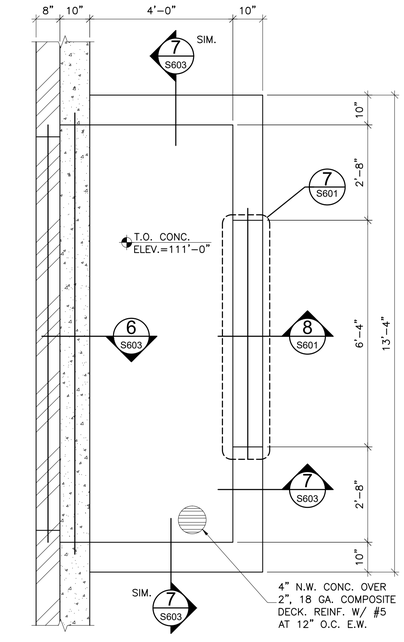
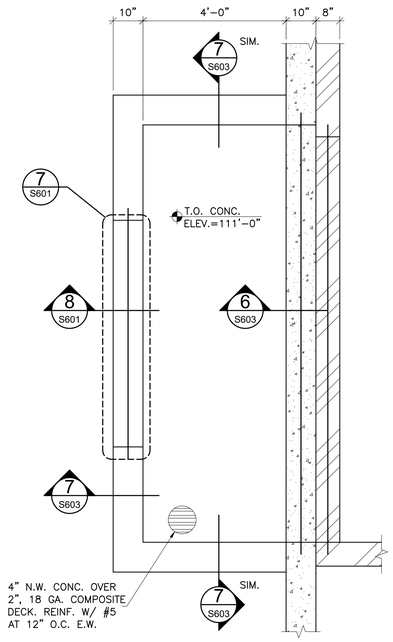
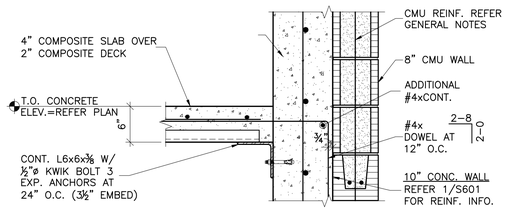


NORTH 4 S603 **ENLARGED PLAN**
SCALE: 1/2"=1'-0"



NORTH 5 S603 **ENLARGED PLAN**
SCALE: 1/2"=1'-0"



6 S603 **SECTION**
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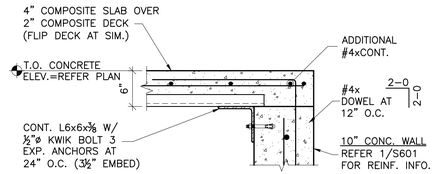

7 S603 **SECTION**
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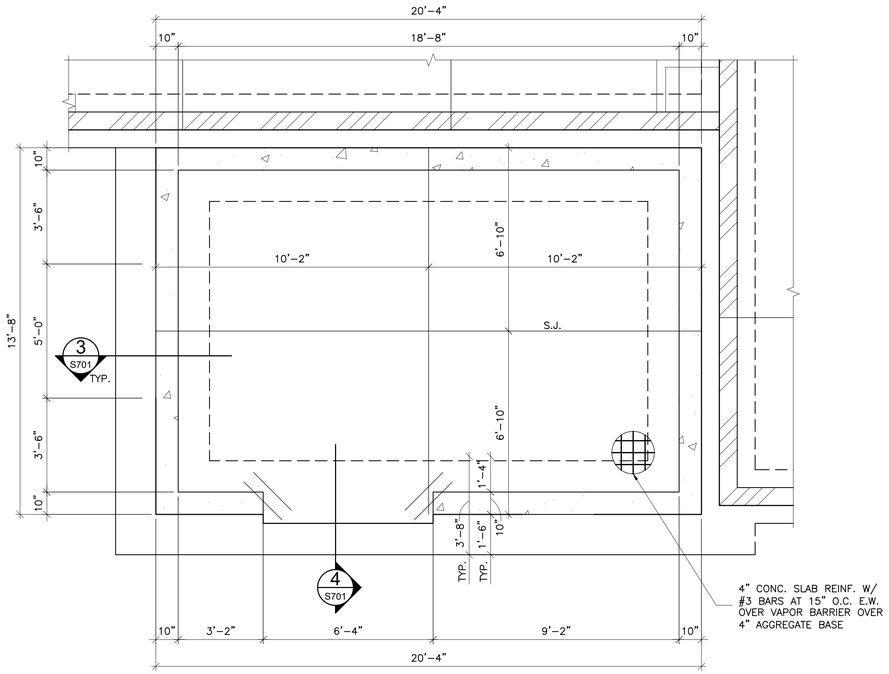
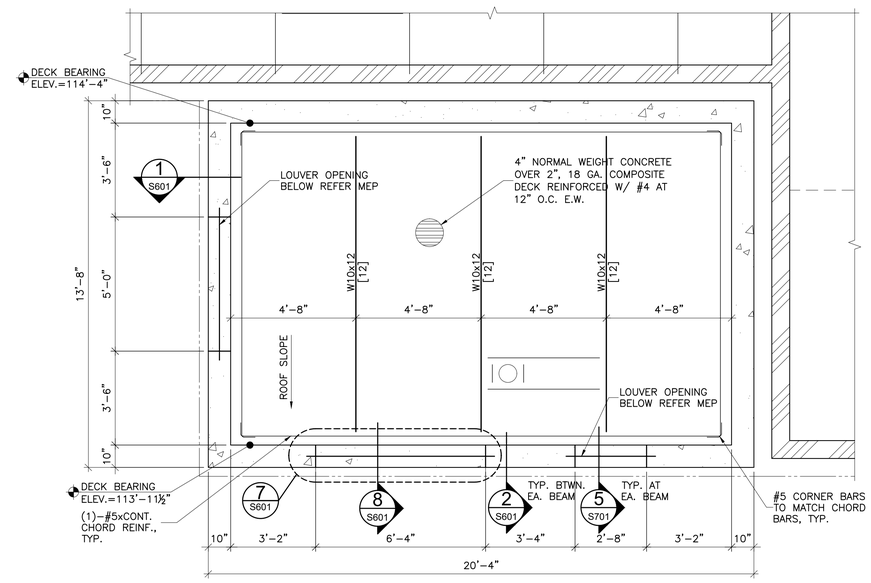
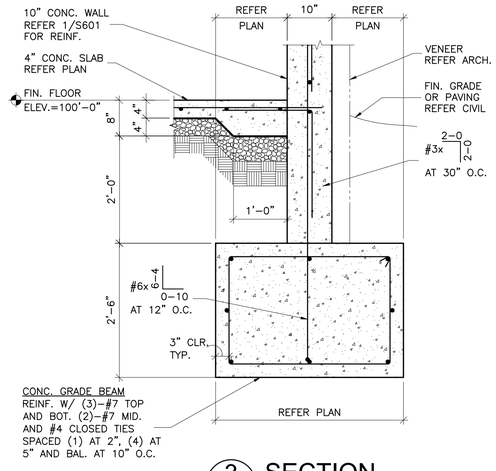


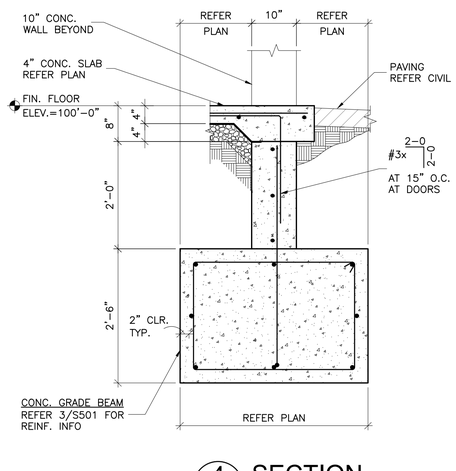
NORTH 1 S701 **GENERATOR FOUNDATION PLAN**
SCALE: 3/8"=1'-0"



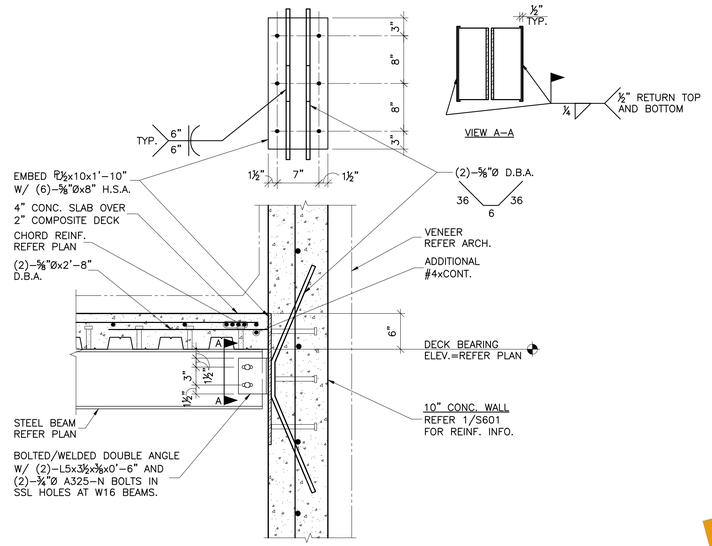
NORTH 2 S701 **GENERATOR FRAMING PLAN**
SCALE: 3/8"=1'-0"



3 S701 **SECTION**
SCALE: 3/4"=1'-0"



4 S501 **SECTION**
SCALE: 3/4"=1'-0"



5 S701 **SECTION**
SCALE: 1"=1'-0"

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SUMMARY OF QUANTITIES
(PRIVATE)

ITEM #	ITEM	UNIT	QUANTITY	AS-BUILT
1.	36" HP PIPE	L.F.	127	
2.	30" HP PIPE	L.F.	174	
3.	24" HP PIPE	L.F.	119	
4.	18" HP PIPE	L.F.	25	
5.	5' DIA. STORM MANHOLE	EA.	1	
6.	4' X 4' JUNCTION BOX	EA.	2	
7.	DES 2-0 CURB INLET	EA.	3	
8.	CRUSHED ROCK BEDDING	C.Y.	67	
9.	TYPE 'A' AGGREGATE	C.Y.	46	

SHEET INDEX

SHEET NUMBER	SHEET TITLE	DATE	REV/BID/CO/ADD
C0.00	WATER COVER SHEET	06.02.25	
C4.01	GRADING PLAN EAST	06.02.25	
C4.03	DA MAP	06.02.25	
C4.04	PRIVATE STORM SEWER LINE 1 PLAN & PROFILE	06.02.25	
C4.05	PRIVATE STORM SEWER LINE 1A, 1B, AND 1C PLAN & PROFILE	06.02.25	
C6.00	EROSION CONTROL PLAN	06.02.25	
C6.01	EROSION CONTROL DETAILS	06.02.25	

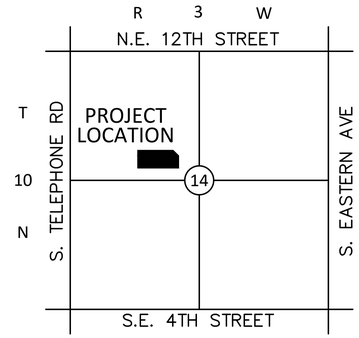
PRIVATE STORM SEWER PLANS

TO SERVE

CENTRAL JUNIOR HIGH CLASSROOM ADDITION

400 N. BROADWAY STREET

A PART OF THE NW/4 OF SEC. 14, T-10-N, R-3-W, I.M.
MOORE, CLEVELAND COUNTY, OKLAHOMA



N NOT TO SCALE

GENERAL NOTES:

A. CONTRACTOR SHALL BE RESPONSIBLE FOR RAZING AND REMOVAL OF THE EXISTING STRUCTURES, RELATED UTILITIES, PAVING, UNDERGROUND STORAGE TANKS AND ANY OTHER EXISTING IMPROVEMENTS AS NOTED.

B. CONTRACTOR IS TO REMOVE AND DISPOSE OF ALL DEBRIS, RUBBISH AND OTHER MATERIALS RESULTING FROM PREVIOUS AND CURRENT DEMOLITION OPERATIONS. DISPOSAL WILL BE IN ACCORDANCE WITH ALL LOCAL, STATE AND/OR FEDERAL REGULATIONS GOVERNING SUCH OPERATIONS.

C. THE GENERAL CONTRACTOR WILL BE HELD SOLELY RESPONSIBLE FOR AND SHALL TAKE ALL PRECAUTIONS NECESSARY TO AVOID PROPERTY DAMAGE TO ADJACENT PROPERTIES DURING THE CONSTRUCTION PHASES OF THIS PROJECT.

D. WARRANTY/DISCLAIMER: THE DESIGNS REPRESENTED IN THESE PLANS ARE IN ACCORDANCE WITH ESTABLISHED PRACTICES OF CIVIL ENGINEERING FOR THE DESIGN FUNCTIONS AND USES INTENDED BY THE OWNER AT THIS TIME. HOWEVER, NEITHER THE ENGINEER NOR ITS PERSONNEL CAN OR DO WARRANT THESE DESIGNS OR PLANS AS CONSTRUCTED EXCEPT IN THE SPECIFIC CASES WHERE THE ENGINEER INSPECTS AND CONTROLS THE PHYSICAL CONSTRUCTION ON A CONTEMPORARY BASIS AT THE SITE.

E. SAFETY NOTICE TO CONTRACTOR: IN ACCORDANCE WITH GENERALLY ACCEPTED CONSTRUCTION PRACTICES, THE CONTRACTOR SHALL BE SOLELY AND COMPLETELY RESPONSIBLE FOR CONDITIONS OF THE JOB SITE, INCLUDING SAFETY OF ALL PERSONS AND PROPERTY DURING PERFORMANCE OF THE WORK. THIS REQUIREMENT WILL APPLY CONTINUOUSLY AND NOT BE LIMITED TO NORMAL WORKING HOURS. ANY CONSTRUCTION OBSERVATION BY THE ENGINEER OF THE CONTRACTOR'S PERFORMANCE IS NOT INTENDED TO INCLUDE REVIEW OF THE ADEQUACY OF THE CONTRACTOR'S SAFETY MEASURES, IN, ON OR NEAR THE CONSTRUCTION SITE.

F. ALL CONSTRUCTION WITHIN STATE HIGHWAY DEPARTMENT RIGHT-OF-WAY SHALL BE COORDINATED WITH THE HIGHWAY DEPARTMENT RESIDENT MAINTENANCE ENGINEER.

G. ALL CONSTRUCTION TO BE IN STRICT ACCORDANCE WITH CURRENT CITY OF MOORE STANDARD DETAILS AND CITY OF MOORE STANDARDS AND SPECIFICATIONS

NOTE: TRACER WIRE REQUIRED WITH WATERLINE EXTENSION.

NOTE: ALL FITTINGS SHALL BE RESTRAINED. REFER TO CITY OF MOORE DETAILS THAT SHOW MIN. RESTRAINED LENGTH.

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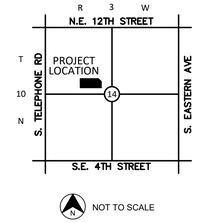
EXP. 06/30/26

LOCATION MAP:



N NOT TO SCALE

PROJECT:

CENTRAL JUNIOR HIGH CLASSROOM ADDITION

400 N. BROADWAY ST.
MOORE, OKLAHOMA

PROJECT NUMBER: 25031
DRAWING DATE: 06.02.25
ISSUE DATE: 06.02.25

SEAL:

SUBMITTAL:

PERMIT SET

REVISIONS:

MARK	DATE	DESCRIPTION

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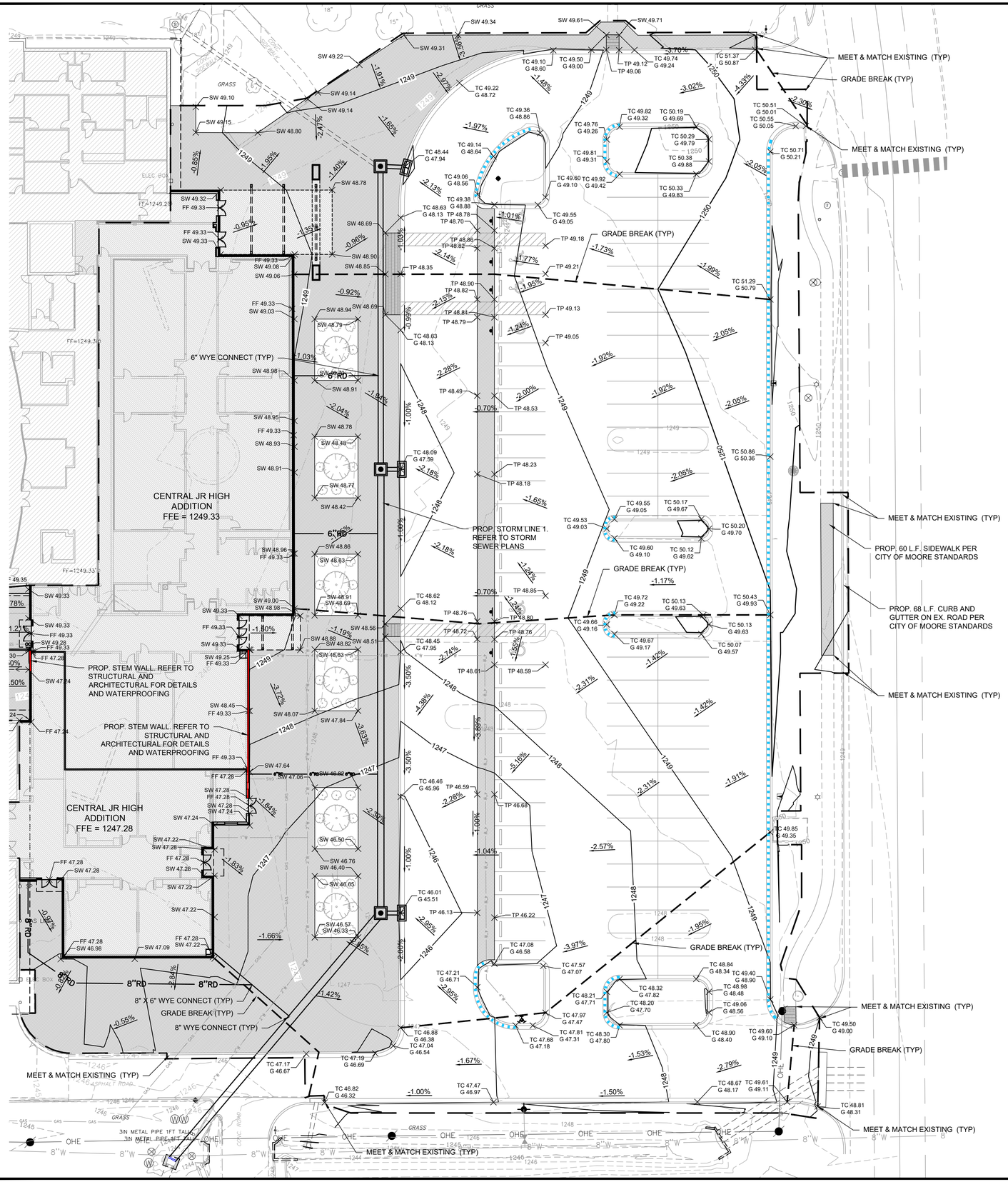
DRAWING TITLE:

COVER SHEET

SHEET:

C0.00



LEGEND

- EXISTING 1' CONTOUR
- EXISTING 5' CONTOUR
- PROPOSED 1' CONTOUR
- PROPOSED 5' CONTOUR
- BOUNDARY LINE
- RIGHT OF WAY LINE
- EASEMENT LINE
- EXISTING CURB AND GUTTER
- PROPOSED CURB AND GUTTER
- PROPOSED FIRE LANE STRIPING
- OHE — OVERHEAD ELECTRIC LINE
- UGE — UNDERGROUND ELECTRIC LINE
- GAS — GAS LINE
- UGT — UNDERGROUND TELEPHONE LINE
- FO — UNDERGROUND FIBER OPTIC LINE
- SS — SANITARY SEWER LINE
- W — WATERLINE
- RETAINING WALL
- SCREEN WALL
- WIRE FENCE
- CHAIN LINK FENCE
- BENCHMARK
- OMIT GUTTER VALLEY

- PROP. FIRE HYDRANT
- PROP. WATER VALVE
- PROP. WATER METER
- PROP. ELECT. METER
- PROP. LIGHT POLE
- PROP. BOLLARD
- PROP. TRANSFORMER
- PROP. PARKING COUNT
- PROP. WHEEL STOP
- PROP. FES
- PROP. HC RAMP
- PROP. POWER POLE
- PROP. SS MANHOLE
- PROP. GAS METER
- PROP. SIGN
- PROP. FIRE ROUTE SIGN

PROP. INLETS (SEE GRADING PLAN FOR TYPE)

VS — VERTICAL SEPARATION REQUIREMENT

*NOTE: REFER TO SURVEYING LEGEND FOR EXISTING STRUCTURES IDENTIFICATION

GRADING NOTES

A. CONTRACTOR SHALL REFER TO THE SITE SPECIFIC GEOTECHNICAL REPORT FOR EXISTING SOIL CONDITIONS, CONSIDERATIONS, AND RECOMMENDATIONS.

B. CONTRACTOR SHALL REFER TO THE CONSTRUCTION DOCUMENTS INCLUDING BUT NOT LIMITED TO THE WRITTEN SPECIFICATIONS, CONSTRUCTION DRAWINGS, STORM WATER POLLUTION PLAN, AND GEOTECHNICAL REPORT.

C. CONTRACTOR IS RESPONSIBLE FOR THEIR OWN HORIZONTAL AND VERTICAL CONTROL, REFERENCE POINTS AND CONSTRUCTION STAKING AS INCIDENTAL TO THE PROJECT.

D. THE CONTRACTOR SHALL FIELD VERIFY EXISTING ELEVATIONS/PROPERTY LINES/UTILITIES/DRAINAGE PRIOR TO CONSTRUCTION START.

E. ALL SITE EXCAVATION SHALL BE CONSIDERED UNCLASSIFIED EXCAVATION.

F. GENERAL CONTRACTOR TO PROVIDE A UNIT PRICE FOR REMOVAL AND REPLACEMENT OF SOILS ON THIS SITE SHOULD REMOVAL BE REQUIRED.

G. ALL WORK NOT CLASSIFIED AS A CONTRACT PAY ITEM SHALL BE CONSIDERED AS INCIDENTAL AND THE COST THEREOF SHALL BE INCLUDED IN THE UNIT PRICE BID FOR ITEMS WHICH ARE CLASSIFIED FOR PAYMENT.

H. CONTRACTOR SHALL PROVIDE FINAL GRADES THAT DO NOT OBSTRUCT ANY UTILITY ACCESS AND PROVIDE A SMOOTH TRANSITION TO MEET AND MATCH EXISTING GRADES ON ALL SIDES.

I. ADA ROUTES ARE NOT TO EXCEED 1:20 RUNNING SLOPE AND 2% CROSS SLOPE. HANDICAP PARKING AND ACCESS AISLES SHALL NOT EXCEED 2% IN ANY DIRECTION.

J. ALL NATURAL GROUND SLOPES SHALL NOT EXCEED 3:1. PAVING SLOPES SHALL NOT EXCEED 8%.

K. CONTRACTOR SHALL ENSURE THAT ALL NECESSARY EARTH DISTURBING PERMITS HAVE BEEN ACQUIRED AND MEET THE CONDITIONS/REQUIREMENTS SET FORTH IN THE PERMITS PRIOR TO CONSTRUCTION.

L. CONTRACTOR IS REQUIRED TO CALL ONE CALL AS WELL AS THE APPROPRIATE UTILITY COMPANY AT LEAST 48 HOURS BEFORE ANY EXCAVATION/CONSTRUCTION ACTIVITIES TAKE PLACE. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO RELOCATE ALL EXISTING UTILITIES WHICH ARE IN CONFLICT WITH PROPOSED IMPROVEMENTS.

M. THE CONTRACTOR SHALL GRADE SITE TO ENSURE ALL SURFACE WATER DRAINAGE IS AWAY FROM THE BUILDING AND PROVIDES POSITIVE DRAINAGE SO THAT NO STANDING/PONDING WATER TAKES PLACE ON SITE OR ON ADJACENT PROPERTIES.

N. ALL CONSTRUCTION SHALL BE IN STRICT ACCORDANCE WITH THE OWNERS DESIGN GUIDELINES AND SPECIFICATIONS, AND WHERE APPLICABLE SHALL MEET THE REQUIREMENTS OF THE GOVERNING/PERMITTING AUTHORITY HAVING JURISDICTION.

O. THE BUILDING SUBGRADE SHALL BE CONSTRUCTED TO INCLUDE A MINIMUM OF 10 FEET BEYOND THE BUILDING LIMITS AS SHOWN ON THE PLANS, OR AS DIRECTED BY THE OWNER.

P. REFERENCE ARCHITECTURAL AND STRUCTURAL DRAWINGS FOR REQUIRED FLOOR SLAB THICKNESS.

Q. THE BUILDING PAD SUBGRADE SHALL BE PREPARED IN STRICT ACCORDANCE WITH THE GEOTECHNICAL ENGINEERING STUDY AND THE CIVIL SPECIFICATIONS.

R. ESTABLISH FINAL SUBGRADE ELEVATIONS TO ALLOW FOR PAVEMENT/SLAB SECTIONS AS INDICATED ON THE PLANS.

S. IF CONFLICTS EXIST BETWEEN THE GEOTECHNICAL REPORT AND THE CONSTRUCTION DRAWINGS AND SPECIFICATIONS, THE MORE STRINGENT REQUIREMENTS SHALL APPLY.

SPOT ELEVATION LEGEND

TC - TOP OF CURB	FF - FINISH FLOOR
G - GUTTER	FG - FINAL GRADE
TP - TOP OF PAVEMENT	TW - TOP OF WALL
HP - HIGH POINT	BW - BOTTOM OF WALL
LP - LOW POINT	NOTE: BW IS BOTTOM OF WALL AT GRADE, NOT FOOTING
SW - SIDEWALK	

VS — VERTICAL SEPARATION REQUIREMENT

N

SCALE IN FEET
0 20' 30' 40'

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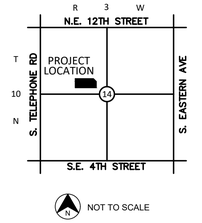

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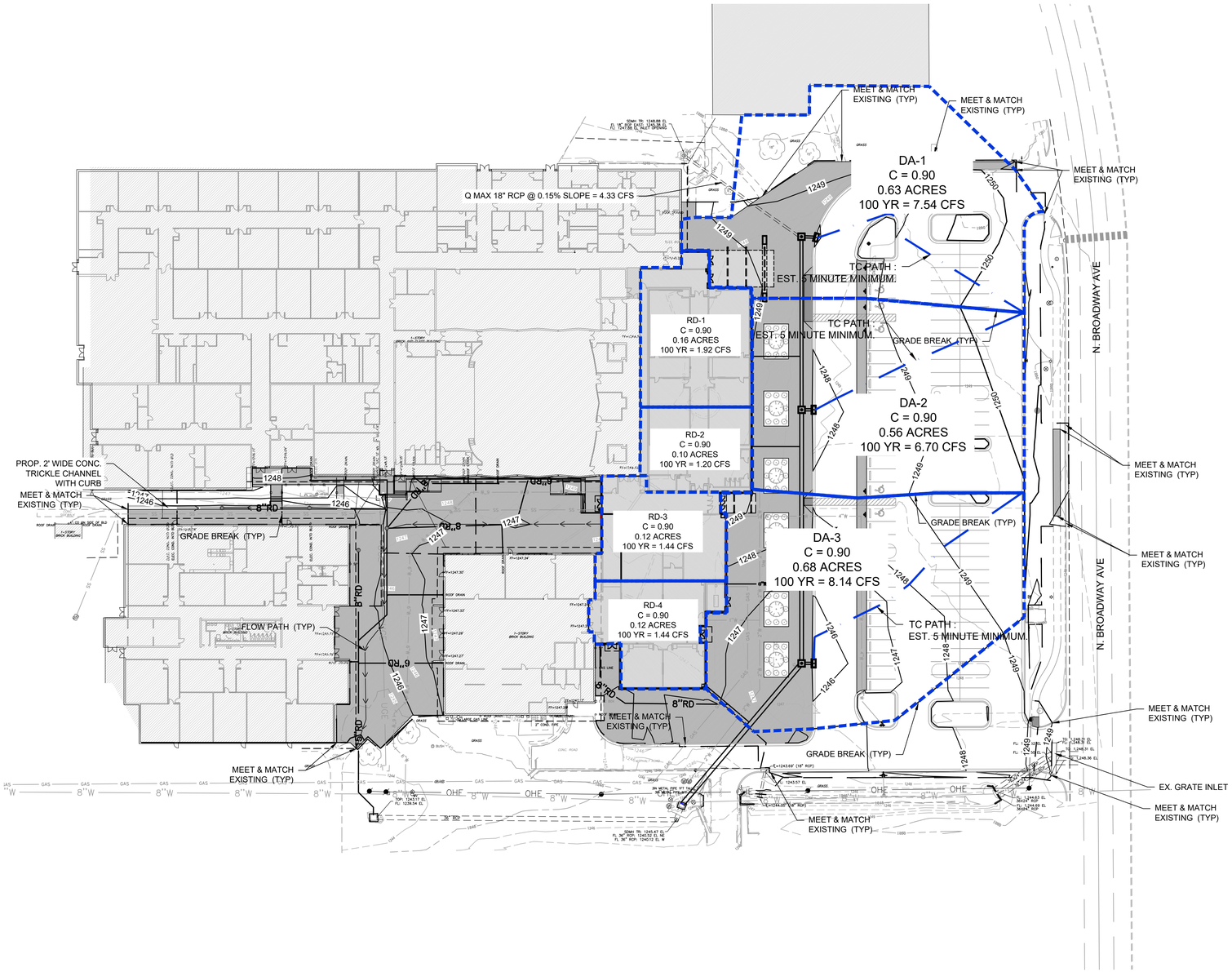
DRAWING TITLE:

GRADING PLAN EAST

SHEET:

C4.01



DRAINAGE CALCULATIONS							
DRAINAGE AREA	AREA (AC)	C VALUE	TC (MIN)	I5	I100	Q5	Q100
DA-1	0.63	0.9	5	7.3	13.3	4.14	7.54
DA-2	0.56	0.9	5	7.3	13.3	3.68	6.70
DA-3	0.68	0.9	5	7.3	13.3	4.47	8.14
RD-1	0.16	0.9	5	7.3	13.3	1.05	1.92
RD-2	0.10	0.9	5	7.3	13.3	0.66	1.20
RD-3	0.12	0.9	5	7.3	13.3	0.79	1.44
RD-4	0.12	0.9	5	7.3	13.3	0.79	1.44

INTENSITY TAKEN FROM NOAA ATLAS 14

N

SCALE IN FEET
0 20' 30' 40'

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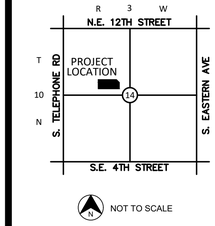

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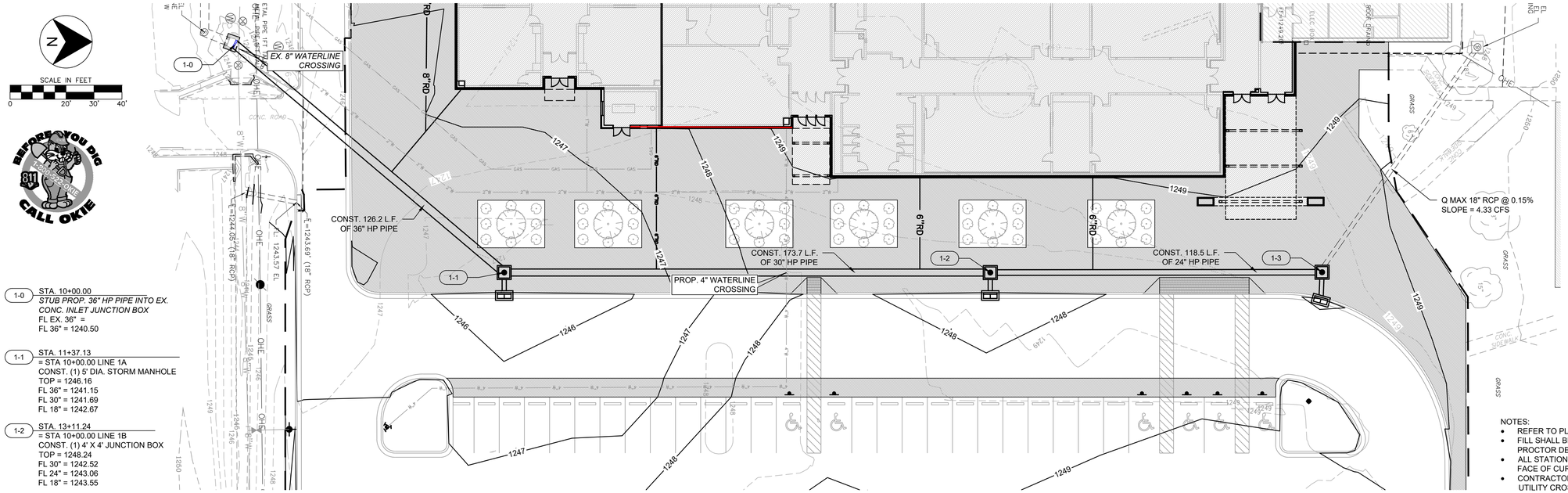
DRAWING TITLE:

DA-MAP

SHEET:

C4.03



1-0 STA. 10+00.00
STUB PROP. 36" HP PIPE INTO EX. CONC. INLET JUNCTION BOX
FL EX. 36" =
FL 36" = 1240.50

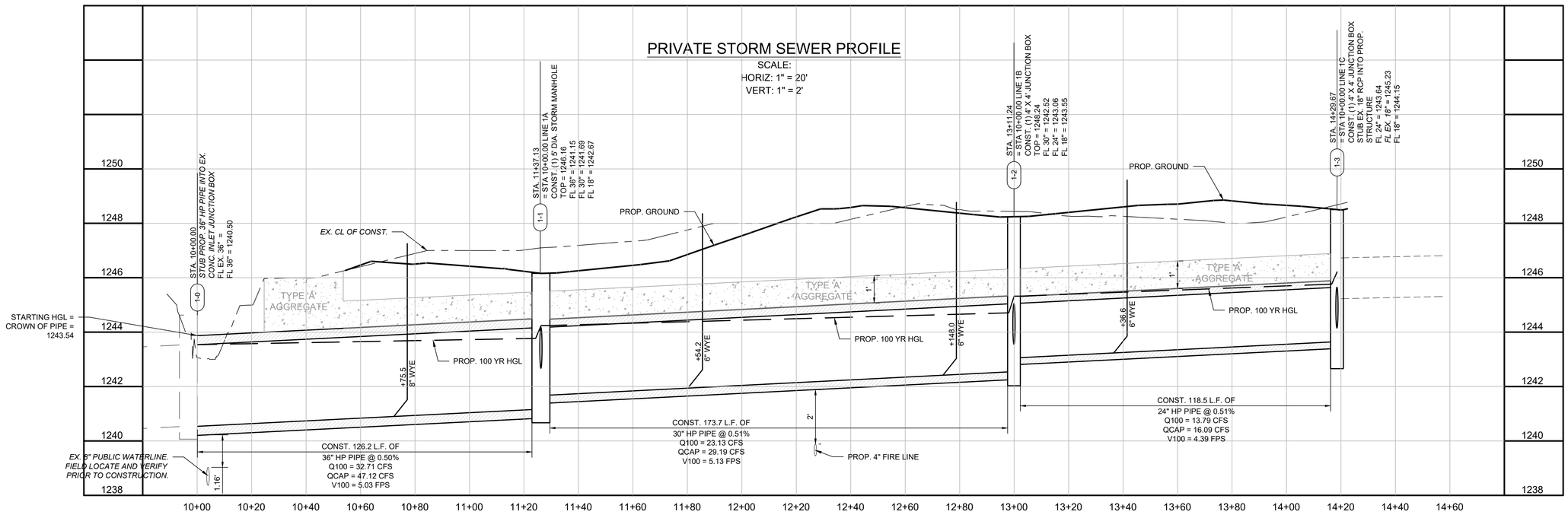
1-1 STA. 11+37.13
= STA 10+00.00 LINE 1A
CONST. (1) 5' DIA. STORM MANHOLE
TOP = 1246.16
FL 36" = 1241.15
FL 30" = 1241.69
FL 18" = 1242.67

1-2 STA. 13+11.24
= STA 10+00.00 LINE 1B
CONST. (1) 4' X 4' JUNCTION BOX
TOP = 1248.24
FL 30" = 1242.52
FL 24" = 1243.06
FL 18" = 1243.55

1-3 STA. 14+29.67
= STA 10+00.00 LINE 1C
CONST. (1) 4' X 4' JUNCTION BOX
STUB EX. 18" RCP INTO PROP. STRUCTURE
FL 24" = 1243.64
FL EX. 18" = 1245.23
FL 18" = 1244.15

NOTES:
- REFER TO PLAN VIEW FOR SPOT ELEVATIONS
- FILL SHALL BE COMPACTED TO 95% STANDARD PROCTOR DENSITY.
- ALL STATIONING FOR CURB INLETS ARE PLACED AT FACE OF CURB UNLESS OTHERWISE NOTED.
- CONTRACTOR SHALL FIELD LOCATE AND VERIFY UTILITY CROSSINGS PRIOR TO CONSTRUCTION.

PRIVATE STORM SEWER PLAN
SCALE: 1" = 20'



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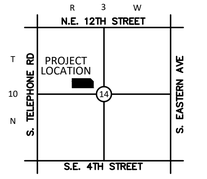

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DRAWING TITLE:

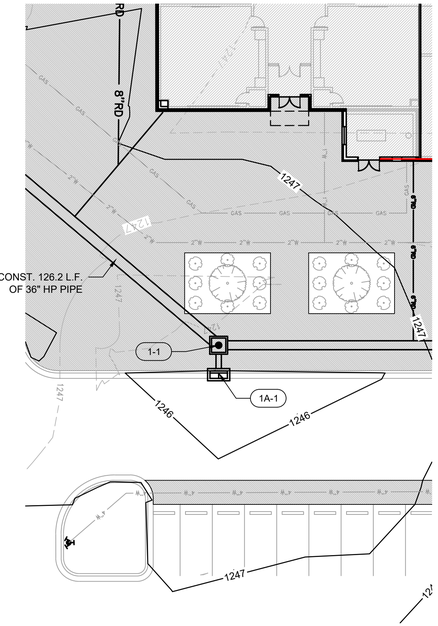
PRIVATE STORM SEWER LINE 1 PLAN & PROFILE

SHEET:

C4.04

SCALE IN FEET
0 20' 30' 40'

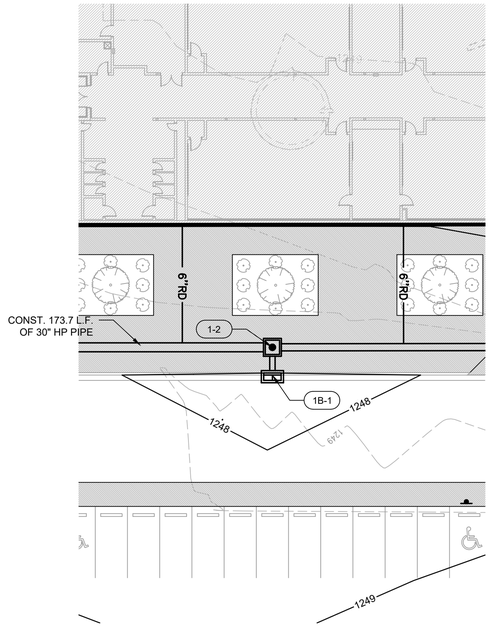
BEFORE YOU DIG 811 CALL OKIE



1-1 STA 10+00.00 LINE 1A
= STA 11+37.13 LINE 1
CONST. (1) 5' DIA. STORM MANHOLE
TOP = 1246.16
FL 36" = 1241.15
FL 30" = 1241.69
FL 18" = 1242.67

1A-1 STA 10+07.77 LINE 1A
= STA 11+37.13 LINE 1
CONST. (1) CITY OF OKC DES 2-0
GRATED CURB INLET
TG = 1245.51
FL 18" = 1242.75

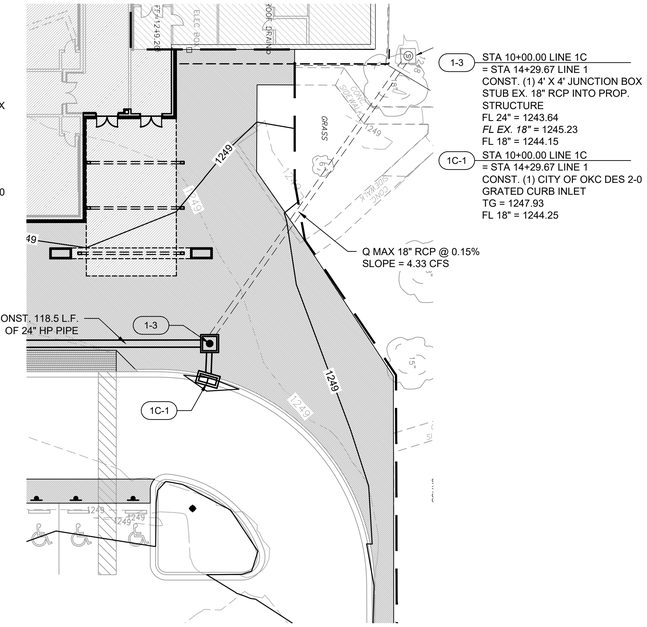
PRIVATE STORM SEWER LINE 1A PLAN
SCALE: 1" = 20'



1-2 STA 10+00.00 LINE 1B
= STA 13+11.24 LINE 1
CONST. (1) 4' X 4' JUNCTION BOX
TOP = 1248.24
FL 30" = 1242.52
FL 24" = 1243.06
FL 18" = 1243.55

1B-1 STA 10+07.75 LINE 1B
CONST. (1) CITY OF OKC DES 2-0
GRATED CURB INLET
TG = 1247.59
FL 18" = 1243.63

PRIVATE STORM SEWER LINE 1B PLAN
SCALE: 1" = 20'



1-3 STA 10+00.00 LINE 1C
= STA 14+29.67 LINE 1
CONST. (1) 4' X 4' JUNCTION BOX
STUB EX. 18" RCP INTO PROP.
STRUCTURE
FL 24" = 1243.64
FL EX. 18" = 1245.23
FL 18" = 1244.15

1C-1 STA 10+00.00 LINE 1C
= STA 14+29.67 LINE 1
CONST. (1) CITY OF OKC DES 2-0
GRATED CURB INLET
TG = 1247.93
FL 18" = 1244.25

PRIVATE STORM SEWER LINE 1C PLAN
SCALE: 1" = 20'

NOTES:
- REFER TO PLAN VIEW FOR SPOT ELEVATIONS
- FILL SHALL BE COMPACTED TO 95% STANDARD PROCTOR DENSITY.
- ALL STATIONING FOR CURB INLETS ARE PLACED AT FACE OF CURB UNLESS OTHERWISE NOTED.
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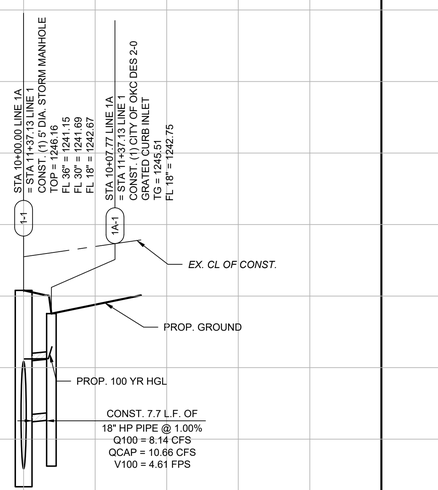
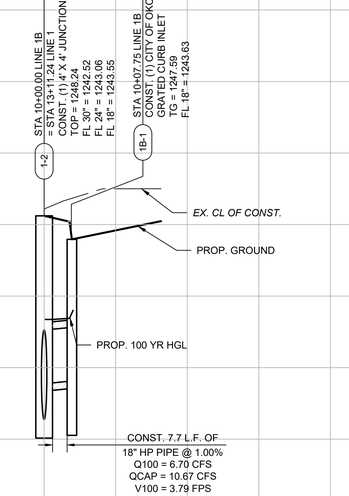
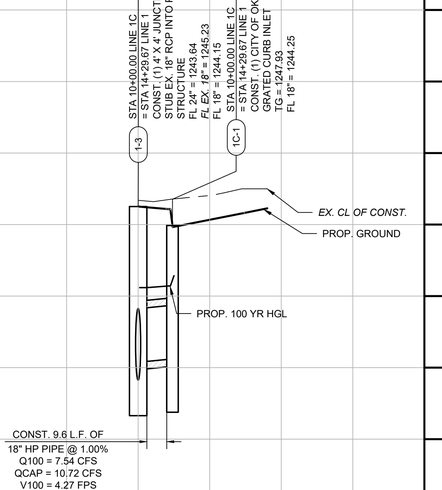


PRIVATE STORM SEWER LINE 1A PROFILE
SCALE:
HORIZ: 1" = 20'
VERT: 1" = 2'



PRIVATE STORM SEWER LINE 1B PROFILE
SCALE:
HORIZ: 1" = 20'
VERT: 1" = 2'



PRIVATE STORM SEWER LINE 1C PROFILE
SCALE:
HORIZ: 1" = 20'
VERT: 1" = 2'

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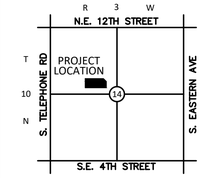
LOCATION MAP:



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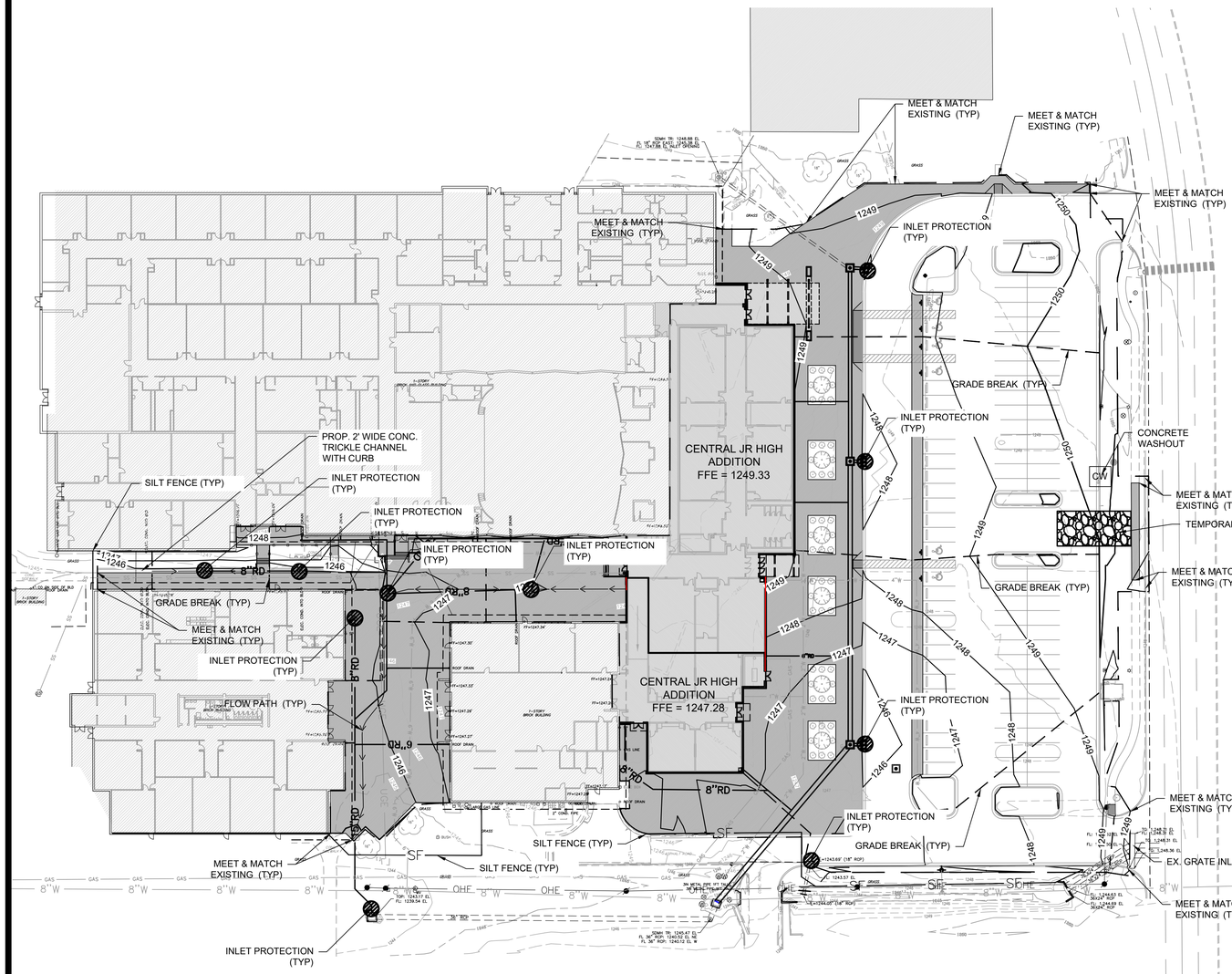
DRAWING TITLE:

PRIVATE STORM SEWER LINE 1A, 1B, AND 1C PLAN & PROFILE

SHEET:

C4.05



EROSION CONTROL NOTES

A. SEDIMENT BASINS ARE ATTRACTIVE TO CHILDREN AND CAN BE VERY DANGEROUS. IN ALL CASES, LOCAL ORDINANCES AND REGULATIONS REGARDING HEALTH AND SAFETY MUST BE ADHERED TO.

B. ALL CONTRACTORS AND SUBCONTRACTORS INVOLVED WITH STORM WATER POLLUTION PREVENTION SHALL OBTAIN A COPY OF THE STORM WATER POLLUTION PREVENTION PLAN AND THE STATE OF OKLAHOMA NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM GENERAL PERMIT (NPDES PERMIT) AND BECOME FAMILIAR WITH THEIR CONTENTS.

C. ALL TEMPORARY EROSION AND SEDIMENT CONTROL MEASURES SHALL BE DISPOSED OF WITHIN 30 DAYS AFTER FINAL STABILIZATION. FINAL STABILIZATION HAS OCCURRED WHEN ALL SOIL DISTURBING ACTIVITIES ARE COMPLETED AND A UNIFORM PERENNIAL VEGETATIVE COVER WITH A DENSITY OF 70% OF THE COVER FOR UNPAVED AREAS AND AREAS NOT COVERED BY PERMANENT STRUCTURES HAS BEEN EMPLOYED.

D. BEST MANAGEMENT PRACTICES (BMP'S) AND CONTROLS SHALL CONFORM TO FEDERAL, STATE, OR LOCAL REQUIREMENTS OR MANUAL OF PRACTICE, AS APPLICABLE CONTRACTOR SHALL IMPLEMENT ADDITIONAL CONTROLS AS DIRECTED BY PERMITTING AGENCY OR OWNER.

E. CONTRACTOR SHALL MINIMIZE CLEARING TO THE MAXIMUM EXTENT PRACTICAL OR AS REQUIRED BY THE GENERAL PERMIT.

F. GENERAL CONTRACTOR SHALL DENOTE ON PLAN THE TEMPORARY PARKING AND STORAGE AREA WHICH SHALL ALSO BE USED AS THE EQUIPMENT MAINTENANCE AND CLEANING AREA, EMPLOYEE PARKING AREA, AND AREA FOR LOCATING PORTABLE FACILITIES, OFFICE TRAILERS, AND TOILET FACILITIES.

G. ALL WASH WATER (CONCRETE TRUCKS, VEHICLE CLEANING, EQUIPMENT CLEANING, ETC.) SHALL BE DETAINED AND PROPERLY TREATED OR DISPOSED.

H. SUFFICIENT OIL AND GREASE ABSORBING MATERIALS AND FLOTATION BOOMS SHALL BE MAINTAINED ON SITE OR READILY AVAILABLE TO CONTAIN AND CLEAN-UP FUEL OR CHEMICAL SPILLS AND LEAKS.

I. DUST ON THE SITE SHALL BE CONTROLLED. THE USE OF MOTOR OILS AND OTHER PETROLEUM BASED OR TOXIC LIQUIDS FOR DUST SUPPRESSION OPERATIONS IS PROHIBITED.

J. RUBBISH, TRASH, GARBAGE, LITTER, OR OTHER SUCH MATERIALS SHALL BE DEPOSITED INTO SEALED CONTAINERS. MATERIALS SHALL BE PREVENTED FROM LEAVING THE PREMISES THROUGH THE ACTION OF WIND OR STORMWATER DISCHARGE INTO DRAINAGE DITCHES OR WATERS OF THE STATE.

K. ALL STORM WATER POLLUTION PREVENTION MEASURES PRESENTED ON THIS PLAN, AND IN THE STORM WATER POLLUTION PREVENTION PLAN, SHALL BE INITIATED AS SOON AS PRACTICABLE.

L. DISTURBED PORTIONS OF THE SITE WHERE CONSTRUCTION ACTIVITY HAS STOPPED FOR AT LEAST 14 DAYS, SHALL BE TEMPORARILY SEEDED. THESE AREAS SHALL BE SEEDED NO LATER THAN 14 DAYS FROM THE LAST CONSTRUCTION ACTIVITY OCCURRING IN THESE AREAS.

M. DISTURBED PORTIONS OF THE SITE WHERE CONSTRUCTION ACTIVITY HAS PERMANENTLY STOPPED SHALL BE PERMANENTLY SEEDED. THESE AREAS SHALL BE SEEDED NO LATER THAN 14 DAYS AFTER THE LAST CONSTRUCTION ACTIVITY OCCURRING IN THESE AREAS. REFER TO THE GRADING PLAN AND/OR LANDSCAPE PLAN.

N. IF THE ACTION OF VEHICLES TRAVELING OVER THE GRAVEL CONSTRUCTION ENTRANCES IS NOT SUFFICIENT TO REMOVE THE MAJORITY OF DIRT OR MUD, THEN THE TIRES MUST BE WASHED BEFORE THE VEHICLES ENTER A PUBLIC ROAD. IF WASHING IS USED, PROVISIONS MUST BE MADE TO INTERCEPT THE WASH WATER AND TRAP THE SEDIMENT BEFORE IT IS CARRIED OFF THE SITE.

O. ALL MATERIALS SPILLED, DROPPED, WASHED, OR TRACKED FROM VEHICLES ONTO ROADWAYS OR INTO STORM DRAINS MUST BE REMOVED IMMEDIATELY.

P. CONTRACTORS OR SUBCONTRACTORS WILL BE RESPONSIBLE FOR REMOVING SEDIMENT IN THE DETENTION POND AND ANY SEDIMENT THAT MAY HAVE COLLECTED IN THE STORM SEWER DRAINAGE SYSTEMS IN CONJUNCTION WITH THE STABILIZATION OF THE SITE.

Q. ON-SITE & OFFSITE SOIL STOCKPILE AND BORROW AREAS SHALL BE PROTECTED FROM EROSION AND SEDIMENTATION THROUGH IMPLEMENTATION OF BEST MANAGEMENT PRACTICES. STOCKPILE AND BORROW AREA LOCATIONS SHALL BE NOTED ON THE SITE PLAN AND PERMITTED IN ACCORDANCE WITH GENERAL PERMIT REQUIREMENTS.

R. SLOPES SHALL BE LEFT IN A ROUGHENED CONDITION DURING THE GRADING PHASE TO REDUCE RUNOFF VELOCITIES AND EROSION.

S. DUE TO THE GRADE CHANGES DURING THE DEVELOPMENT OF THE PROJECT, THE CONTRACTOR SHALL BE RESPONSIBLE FOR ADJUSTING THE EROSION CONTROL MEASURES (SILT FENCES, STRAW BALES, ETC.) TO PREVENT EROSION.

T. ALL CONSTRUCTION SHALL BE STABILIZED AT THE END OF EACH WORKING DAY, THIS INCLUDES BACKFILLING OF TRENCHES FOR UTILITY CONSTRUCTION AND PLACEMENT OF GRAVEL OR BITUMINOUS PAVING FOR ROAD CONSTRUCTION.

U. A 3' STRIP OF SOD SHALL BE PLACED ALONG THE EDGE OF ALL PAVING TO ACT AS A SEDIMENT BUFFER AND AID IN THE ESTABLISHMENT OF VEGETATION.

LEGEND

- EXISTING 1' CONTOUR
- EXISTING 5' CONTOUR
- PROPOSED 1' CONTOUR
- PROPOSED 5' CONTOUR
- BOUNDARY LINE
- RIGHT OF WAY LINE
- EASEMENT LINE
- EXISTING CURB AND GUTTER
- PROPOSED CURB AND GUTTER
- PROPOSED FIRE LANE STRIPING
- OHE — OVERHEAD ELECTRIC LINE
- UGE — UNDERGROUND ELECTRIC LINE
- GAS — GAS LINE
- UGT — UNDERGROUND TELEPHONE LINE
- FO — UNDERGROUND FIBER OPTIC LINE
- SS — SANITARY SEWER LINE
- W — WATERLINE
- RETAINING WALL
- SCREEN WALL
- WIRE FENCE
- CHAIN LINK FENCE
- BENCHMARK

- PROP. FIRE HYDRANT
- PROP. WATER VALVE
- PROP. WATER METER
- PROP. ELECT. METER
- PROP. LIGHT POLE
- PROP. BOLLARD
- PROP. TRANSFORMER
- PROP. PARKING COUNT
- PROP. WHEEL STOP
- PROP. FES
- PROP. HC RAMP
- PROP. POWER POLE
- PROP. SS MANHOLE
- PROP. GAS METER
- PROP. SIGN
- PROP. FIRE ROUTE SIGN

PROP. INLETS (SEE GRADING PLAN FOR TYPE)

- LIMITS OF DISTURBANCE
- SF — SILT FENCE
- TD — TEMPORARY DIVERSION DIKE
- SODDING
- INLET PROTECTION
- CW — CONCRETE WASHOUT AREA

*NOTE: REFER TO SURVEYING LEGEND FOR EXISTING STRUCTURES IDENTIFICATION

SEQUENCE OF CONSTRUCTION

PHASE 1

1. A PRE-CONSTRUCTION MEETING SHALL BE HELD BY THE GENERAL CONTRACTOR'S MANAGER, AND THE OPERATOR'S ENGINEER PRIOR TO LAND DISTURBING ACTIVITIES.
2. PREPARE AND PULL ALL NECESSARY PERMITS.
3. CONSTRUCT TEMPORARY CONSTRUCTION EXITS AT LOCATIONS SHOWN ON THE SWPPP PLANS AND PREPARE TEMPORARY PARKING AND STORAGE AREA. UPON IMPLEMENTATION AND INSTALLATION OF THE FOLLOWING AREAS: TRAILER, PARKING, LAY DOWN, PORTA-POTTY, WELL WASH, CONCRETE WASHOUT, MASONS AREA, FUEL AND MATERIAL STORAGE CONTAINERS, SOLID WASTE CONTAINERS, ETC., DENOTE THEM ON THE SITE MAPS IMMEDIATELY AND NOTE ANY CHANGE IN THE LOCATIONS AS THEY OCCUR THROUGHOUT THE CONSTRUCTION PROCESS.
4. CONSTRUCT THE SILT FENCES ON THE SITE. HALT ALL ACTIVITIES AND CONTACT THE CIVIL ENGINEERING CONSULTANT TO PERFORM INSPECTION AND CERTIFICATION OF BMP'S. GENERAL CONTRACTOR SHALL SCHEDULE AND CONDUCT STORMWATER PRE-CONSTRUCTION MEETING WITH ENGINEER AND ALL GROUND-DISTURBING CONTRACTORS BEFORE PROCEEDING WITH CONSTRUCTION.
5. INSTALL PUBLIC WATER, SEWER AND BOX CULVERT
6. DEMO, CLEAR AND GRUB THE SITE.
7. BEGIN GRADING THE SITE.
8. START CONSTRUCTION OF BUILDING PAD AND STRUCTURES.
9. DISTURBED AREAS OF THE SITE WHERE CONSTRUCTION ACTIVITY HAS CEASED FOR MORE THAN 14 DAYS SHALL BE TEMPORARILY SEEDED AND WATERED.

PHASE 2

1. INSTALL UTILITIES, UNDER DRAINS, STORM SEWERS, CURB AND GUTTERS.
2. INSTALL INLET PROTECTION DEVICES.
3. INSTALL RIP RAP AROUND OUTLET STRUCTURES.
4. FINALIZE PAVEMENT SUBGRADE PREPARATION.
5. INSTALL BASE MATERIAL AS REQUIRED FOR PAVEMENT.
6. PAVE LOT.
7. REMOVE TEMPORARY CONSTRUCTION EXITS ONLY PRIOR TO PAVEMENT CONSTRUCTION IN THESE AREAS. (THESE AREAS TO BE PAVED LAST)
8. DISTURBED AREAS OF THE SITE WHERE CONSTRUCTION ACTIVITY HAS CEASED FOR MORE THAN 14 DAYS SHALL BE TEMPORARILY SEEDED AND WATERED.
9. FINE GRADE AND INSTALL PERMANENT SEEDING AND PLANTINGS.
10. REMOVE ALL TEMPORARY EROSION AND SEDIMENT CONTROLS DEVISED. (ONLY IF SITE IS STABILIZED)
11. REMOVE INLET PROTECTIONS AROUND INLETS AND MANHOLES NO MORE THAN 48 HOURS PRIOR TO PLACING STABILIZED BASE COURSE.

SITE DATA

TOTAL AREA OF CONSTRUCTION SITE : (ACRES)
TOTAL AREA TO BE DISTURBED: (ACRES)
CURRENT (EXISTING) IMPERVIOUS AREA: (ACRES)
POST-CONSTRUCTION IMPERVIOUS AREA: (ACRES)
POST CONSTRUCTION RUNOFF COEFFICIENT: [IMPERVIOUS(0.95)]+PERVIOUS(.50)] \ OVERALL = C

BEFORE YOU DIG 811 OKIE LOCATE ONE-CALL CALL OKIE

N

SCALE IN FEET
0 40' 60' 80'

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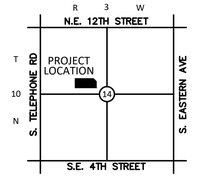
LOCATION MAP:



NOT TO SCALE

PROJECT:

CENTRAL JUNIOR HIGH CLASSROOM ADDITION

400 N. BROADWAY ST.
MOORE, OKLAHOMA

PROJECT NUMBER: 25031
DRAWING DATE: 06.02.25
ISSUE DATE: 06.02.25

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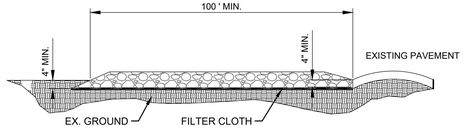
DRAWING TITLE:

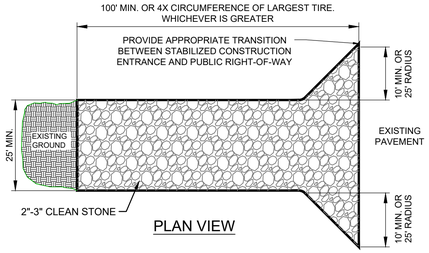
EROSION CONTROL PLAN

SHEET:

C6.00



SIDE ELEVATION



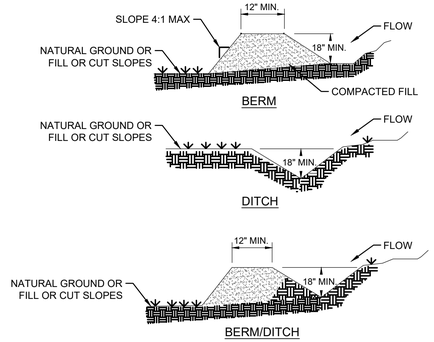
PLAN VIEW

NOTES:

1. STONE - USE COARSE AGGREGATE (3 INCH STONE MIN)
2. LENGTH - AS EFFECTIVE, BUT NOT LESS THAN 100 FEET.
3. THICKNESS - NOT LESS THAN EIGHT (8) INCHES.
4. WIDTH - NOT LESS THAN FULL WIDTH OF ALL POINTS OF INGRESS OR EGRESS.
5. WASHING - WHEN NECESSARY, WHEELS SHALL BE CLEANED TO REMOVE SEDIMENT PRIOR TO ENTRANCE ONTO PUBLIC RIGHT-OF-WAY. WHEN WASHING IS REQUIRED, IT SHALL BE DONE ON AN AREA STABILIZED WITH CRUSHED STONE WHICH DRAINS INTO AN APPROVED SEDIMENT TRAP OR SEDIMENT BASIN. ALL SEDIMENT SHALL BE PREVENTED FROM ENTERING ANY STORM DRAIN, DITCH, OR WATERCOURSE THROUGH USE OF SAND BAGS, GRAVEL, BOARDS OR OTHER APPROVED METHODS.
6. MAINTENANCE - THE ENTRANCE SHALL BE MAINTAINED IN A CONDITION WHICH WILL PREVENT TRACKING OR FLOWING OF SEDIMENT ONTO PUBLIC RIGHT-OF-WAY. THIS MAY REQUIRE PERIODIC TOP DRESSING WITH ADDITIONAL STONE AS CONDITIONS DEMAND AND REPAIR AND/OR CLEANOUT OF ANY MEASURES USED TO TRAP SEDIMENT. ALL SEDIMENT SPILLED, DROPPED, WASHED OR TRACKED ONTO PUBLIC RIGHTS-OF-WAY MUST BE REMOVED IMMEDIATELY.
7. 12' X 24' METAL GRATE MAY BE USED. GRATE SHALL BE 25' AWAY FROM PAVEMENT AND APPROPRIATE SEDIMENT CONTROL TRAPPING DEVICE SHALL BE USED AT GRATE OUTLET POINT.

STABILIZED CONSTRUCTION ENTRANCE

NOT TO SCALE

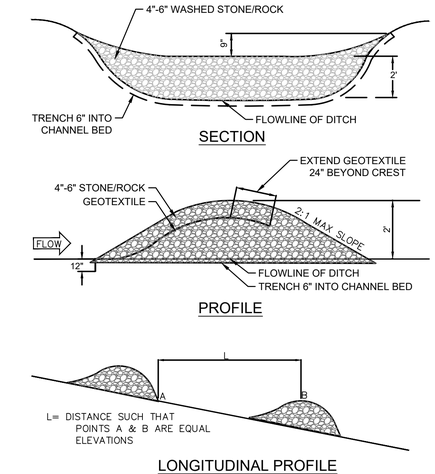


NOTES:

1. POSITIVE GRADE MUST BE PROVIDED TO ASSURE DRAINAGE. IF SLOPE EXCEEDS 2%, SEED AND MULCH DIVERSION, TRY NOT TO EXCEED 5% (HIGH RUNOFF VELOCITIES RESULT). MAXIMUM DRAINAGE AREA IS 5.00 ACRES WITHOUT SUPPORTING CALCULATIONS FOR PERMANENT CHANNEL. DIVERSIONS AT THE TOPS OF SLOPES MUST EMPTY INTO AN APPROVED SLOPE DRAIN (SEE DETAILS). THE BERM/ DITCH IS THE MOST COMMONLY USED DIVERSION.
2. MACHINE COMPACTION OF ALL FILL IS REQUIRED.
3. DIVERSIONS SUFFICIENT TO DIRECT ALL SEDIMENT-LADEN STORMWATER INTO SEDIMENT CONTROL DEVICE MUST BE INSTALLED PRIOR TO CLEARING AND GRUBBING OF AREA (OR IN CONJUNCTION WITH THIS OPERATION IF SEDIMENT CONTROLS AND DIVERSIONS ARE INSTALLED AT EACH CRITICAL POINT AS INDICATED).
4. DIVERSIONS SHOULD BE LOCATED TO MINIMIZE DAMAGES BY CONSTRUCTION OPERATIONS.
5. DIVERSIONS SHOULD BE SEEDED AND MULCHED IF THEY ARE TO REMAIN IN PLACE OVER 14 DAYS.
6. CHECK DIVERSIONS AFTER EACH RAIN, OR ONCE PER WEEK WHICH EVER IS THE SHORTER DURATION. REPAIR AS NEEDED TO MAINTAIN FUNCTION.

TEMPORARY DIVERSION BERM/DITCH DETAIL

NOT TO SCALE

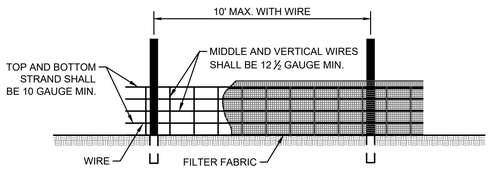


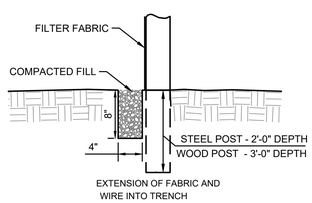
NOTES:

1. THE MAXIMUM HEIGHT OF THE CHECK DAM AT THE CENTER SHALL NOT EXCEED ONE HALF THE DEPTH OF THE CHANNEL.
2. MAXIMUM SPACING SHALL BE SO THE TOE OF THE UPSTREAM DAM IS THE SAME ELEVATION AS THE TOP OF THE DOWNSTREAM DAM.
3. REMOVE SEDIMENT WHEN 25% THE HEIGHT OF THE WEIR.
4. REMOVE CHECK DAMS WHEN SITE STABILIZATION IS ACHIEVED.

ROCK CHECK DAM DETAIL

NOT TO SCALE



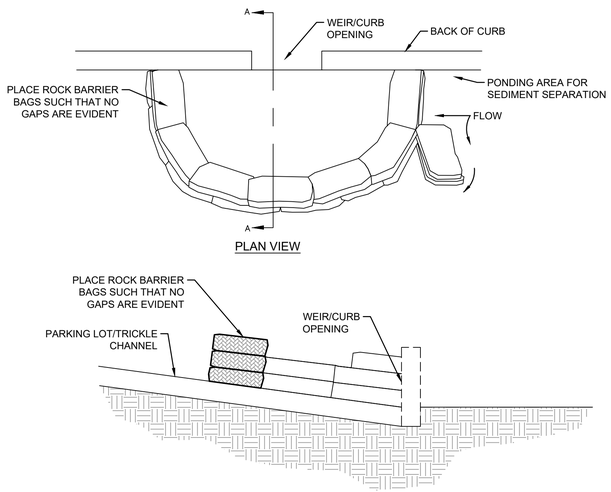


NOTES:

1. WIRE SHALL BE A MINIMUM OF 32" IN WIDTH AND SHALL HAVE A MINIMUM OF 6 LINE WIRES WITH 12" STAY SPACING.
2. FILTER FABRIC SHALL BE A MINIMUM OF 36" IN WIDTH AND SHALL BE FASTENED ADEQUATELY TO THE WIRE.
3. STEEL POST SHALL BE 5'-0" IN HEIGHT AND BE OF THE SELF-FASTENER ANGLE STEEL TYPE.
4. WOOD POST SHALL BE 6'-0" IN HEIGHT AND 3" IN DIAMETER.

SILT FENCE DETAIL

NOT TO SCALE

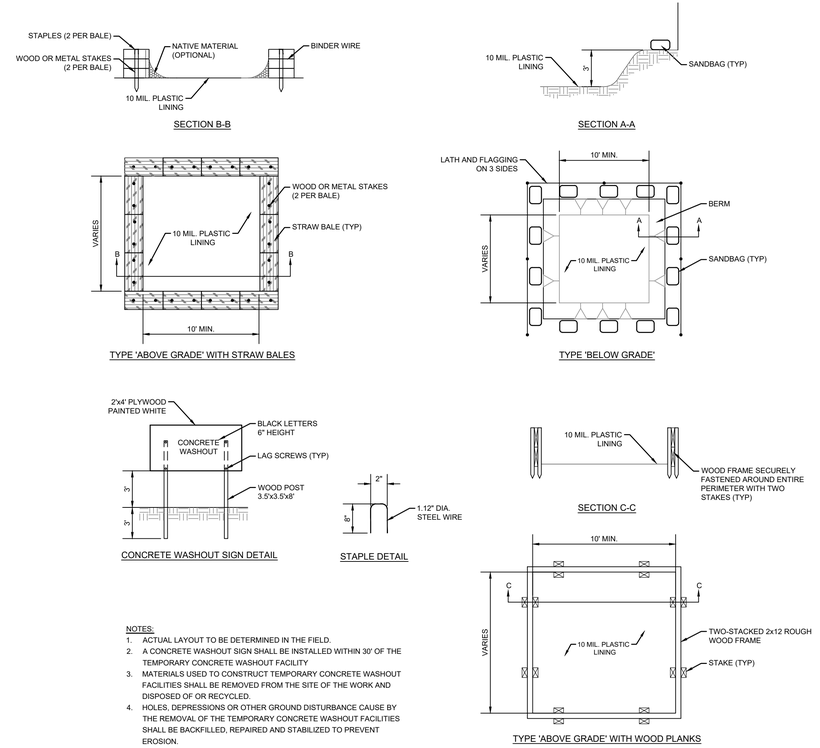


NOTES:

1. PLACE CURB TYPE ROCK BAG BARRIER ON GENTLY SLOPING PAVING, WHERE WATER CAN POND AND ALLOW SEDIMENT TO SEPARATE FROM RUNOFF.
2. BAGS OF WOVEN GEOTEXTILE FABRIC, FILLED WITH GRAVEL MUST BE LAYERED SUCH THAT NO GAPS ARE EVIDENT.
3. LEAVE ON ROCKBAG GAP IN THE TOP ROW ON THE SIDE AWAY FROM FLOW, TO PROVIDE A SPILLWAY; OR IN THE CENTER IF PONDING IS NEEDED ON BOTH SIDES.
4. INSPECT BARRIERS AND REMOVE SEDIMENT AFTER EACH STORM EVENT, SEDIMENT AND GRAVEL MUST BE REMOVED FROM THE TRAVELED WAY IMMEDIATELY.

CURB INLET PROTECTION DETAIL

NOT TO SCALE



NOTES:

1. ACTUAL LAYOUT TO BE DETERMINED IN THE FIELD.
2. A CONCRETE WASHOUT SIGN SHALL BE INSTALLED WITHIN 30' OF THE TEMPORARY CONCRETE WASHOUT FACILITY
3. MATERIALS USED TO CONSTRUCT TEMPORARY CONCRETE WASHOUT FACILITIES SHALL BE REMOVED FROM THE SITE OF THE WORK AND DISPOSED OF OR RECYCLED.
4. HOLES, DEPRESSIONS OR OTHER GROUND DISTURBANCE CAUSE BY THE REMOVAL OF THE TEMPORARY CONCRETE WASHOUT FACILITIES SHALL BE BACKFILLED, REPAIRED AND STABILIZED TO PREVENT EROSION.

CONCRETE WASHOUT DETAIL

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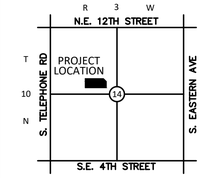

PROJECT:

CENTRAL JUNIOR HIGH CLASSROOM ADDITION

400 N. BROADWAY ST.
MOORE, OKLAHOMA

PROJECT NUMBER: 25031
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DRAWING TITLE:

EROSION CONTROL DETAILS

SHEET:

C6.01

SUMMARY OF QUANTITIES
(PUBLIC)

ITEM #	ITEM	UNIT	QUANTITY	AS-BUILT
1.	6" WATERLINE (C-900)	L.F.	15	
2.	8" X 6" TAPPING SLEEVE & BOX (M.J.)	EA	1	
3.	6" TAPPING VALVE & BOX	EA	1	
4.	FIRE HYDRANT	EA	1	
5.	FIRE HYDRANT RISER (IF NEEDED)	EA.	1	
6.	SAND BACKFILL	C.Y.	3	
7.	TESTING AND DISINFECTING	L.S.	1	

SHEET INDEX

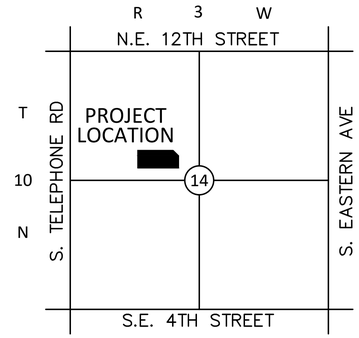
SHEET NUMBER	SHEET TITLE	DATE	REV/BID/CO/ADD
C0.00	WATER COVER SHEET	06.02.25	
C5.00	UTILITY PLAN	06.02.25	
C5.01	WATERLINE 1 PLAN AND PROFILE	06.02.25	
C5.02	WATERLINE DETAILS	06.02.25	
C6.00	EROSION CONTROL PLAN	06.02.25	
C6.01	EROSION CONTROL DETAILS	06.02.25	

PUBLIC WATERLINE PLANS

TO SERVE

CENTRAL JR. HIGH

A PART OF THE NW/4 OF SEC. 14, T-10-N, R-3-W, I.M.
MOORE, CLEVELAND COUNTY, OKLAHOMA



NOT TO SCALE

GENERAL NOTES:

A. CONTRACTOR SHALL BE RESPONSIBLE FOR RAZING AND REMOVAL OF THE EXISTING STRUCTURES, RELATED UTILITIES, PAVING, UNDERGROUND STORAGE TANKS AND ANY OTHER EXISTING IMPROVEMENTS AS NOTED.

B. CONTRACTOR IS TO REMOVE AND DISPOSE OF ALL DEBRIS, RUBBISH AND OTHER MATERIALS RESULTING FROM PREVIOUS AND CURRENT DEMOLITION OPERATIONS. DISPOSAL WILL BE IN ACCORDANCE WITH ALL LOCAL, STATE AND/OR FEDERAL REGULATIONS GOVERNING SUCH OPERATIONS.

C. THE GENERAL CONTRACTOR WILL BE HELD SOLELY RESPONSIBLE FOR AND SHALL TAKE ALL PRECAUTIONS NECESSARY TO AVOID PROPERTY DAMAGE TO ADJACENT PROPERTIES DURING THE CONSTRUCTION PHASES OF THIS PROJECT.

D. WARRANTY/DISCLAIMER: THE DESIGNS REPRESENTED IN THESE PLANS ARE IN ACCORDANCE WITH ESTABLISHED PRACTICES OF CIVIL ENGINEERING FOR THE DESIGN FUNCTIONS AND USES INTENDED BY THE OWNER AT THIS TIME. HOWEVER, NEITHER THE ENGINEER NOR ITS PERSONNEL CAN OR DO WARRANT THESE DESIGNS OR PLANS AS CONSTRUCTED EXCEPT IN THE SPECIFIC CASES WHERE THE ENGINEER INSPECTS AND CONTROLS THE PHYSICAL CONSTRUCTION ON A CONTEMPORARY BASIS AT THE SITE.

E. SAFETY NOTICE TO CONTRACTOR: IN ACCORDANCE WITH GENERALLY ACCEPTED CONSTRUCTION PRACTICES, THE CONTRACTOR SHALL BE SOLELY AND COMPLETELY RESPONSIBLE FOR CONDITIONS OF THE JOB SITE, INCLUDING SAFETY OF ALL PERSONS AND PROPERTY DURING PERFORMANCE OF THE WORK. THIS REQUIREMENT WILL APPLY CONTINUOUSLY AND NOT BE LIMITED TO NORMAL WORKING HOURS. ANY CONSTRUCTION OBSERVATION BY THE ENGINEER OF THE CONTRACTOR'S PERFORMANCE IS NOT INTENDED TO INCLUDE REVIEW OF THE ADEQUACY OF THE CONTRACTOR'S SAFETY MEASURES, IN, ON OR NEAR THE CONSTRUCTION SITE.

F. ALL CONSTRUCTION WITHIN STATE HIGHWAY DEPARTMENT RIGHT-OF-WAY SHALL BE COORDINATED WITH THE HIGHWAY DEPARTMENT RESIDENT MAINTENANCE ENGINEER.

G. ALL CONSTRUCTION TO BE IN STRICT ACCORDANCE WITH CURRENT CITY OF MOORE STANDARD DETAILS AND CITY OF MOORE STANDARDS AND SPECIFICATIONS

NOTE: THE CONTRACTOR SHALL BE RESPONSIBLE FOR ADHEREING TO THE FOLLOWING OKLAHOMA DEQ REQUIREMENTS AND SPECIFICATIONS LISTED OUT FROM OAC 252:626

a. 252:626-19-2(a) STANDARDS - THE STANDARDS IN THIS SECTION APPLY TO THE INSTALLATION OF PIPING IN PUBLIC WATER SUPPLY DISTRIBUTION LINES.

b. 252:626-19-2(b) BEDDING - PROVIDE CONTINUOUS AND UNIFORM BEDDING IN THE TRENCH FOR ALL BURIED PIPE. TAMP BACKFILL MATERIAL IN LAYERS AROUND THE PIPE AND TO A SUFFICIENT HEIGHT ABOVE THE PIPE TO ADEQUATELY SUPPORT AND PROTECT THE PIPE. REMOVE ALL STONE FOUND IN THE TRENCH TO A DEPTH OF AT LEAST 6 INCHES BELOW THE BOTTOM OF THE PIPE

c. 252:626-19-2(d) BLOCKING - PROVIDE REACTION BLOCKING, TIE RODS, OR JOINTS DESIGNED TO PREVENT MOVEMENT AT ALL TEES, BENDS, PLUGS AND HYDRANTS TO PREVENT MOVEMENT OF THE PIPE

d. 252:626-19-2(e) PRESSURE AND LEAKAGE TESTING - TEST THE INSTALLED PIPE FOR LEAKAGE IN ACCORDANCE WITH AWWA STANDARD SPECIFICATIONS. LEAKAGE MUST NOT EXCEED 10 GAL/INCH DIAMETER PER MILE PER 24 HOURS AT 150 PSI TESTING PRESSURE.

e. 252:626-19-2(f) DISINFECTION AND TESTING - DISINFECT ALL WATERLINES ACCORDING TO AWWA STANDARD SPECIFICATIONS. OBTAIN SAFE BACTERIOLOGICAL SAMPLES ON TWO CONSECUTIVE DAYS BEFORE PLACING THE WATERLINE INTO SERVICE.

f. 252:626-19-2(j) TRACER WIRE - INSTALL METAL TRACER WIRE ON ALL NON-FERROUS PIPING USED FOR PUBLIC WATER SUPPLY MAIN.

NOTE: TRACER WIRE REQUIRED WITH WATERLINE EXTENSION.

NOTE: ALL FITTINGS SHALL BE RESTRAINED. REFER TO CITY OF MOORE DETAILS THAT SHOW MIN. RESTRAINED LENGTH.

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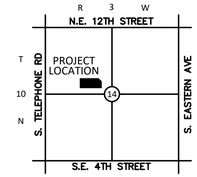

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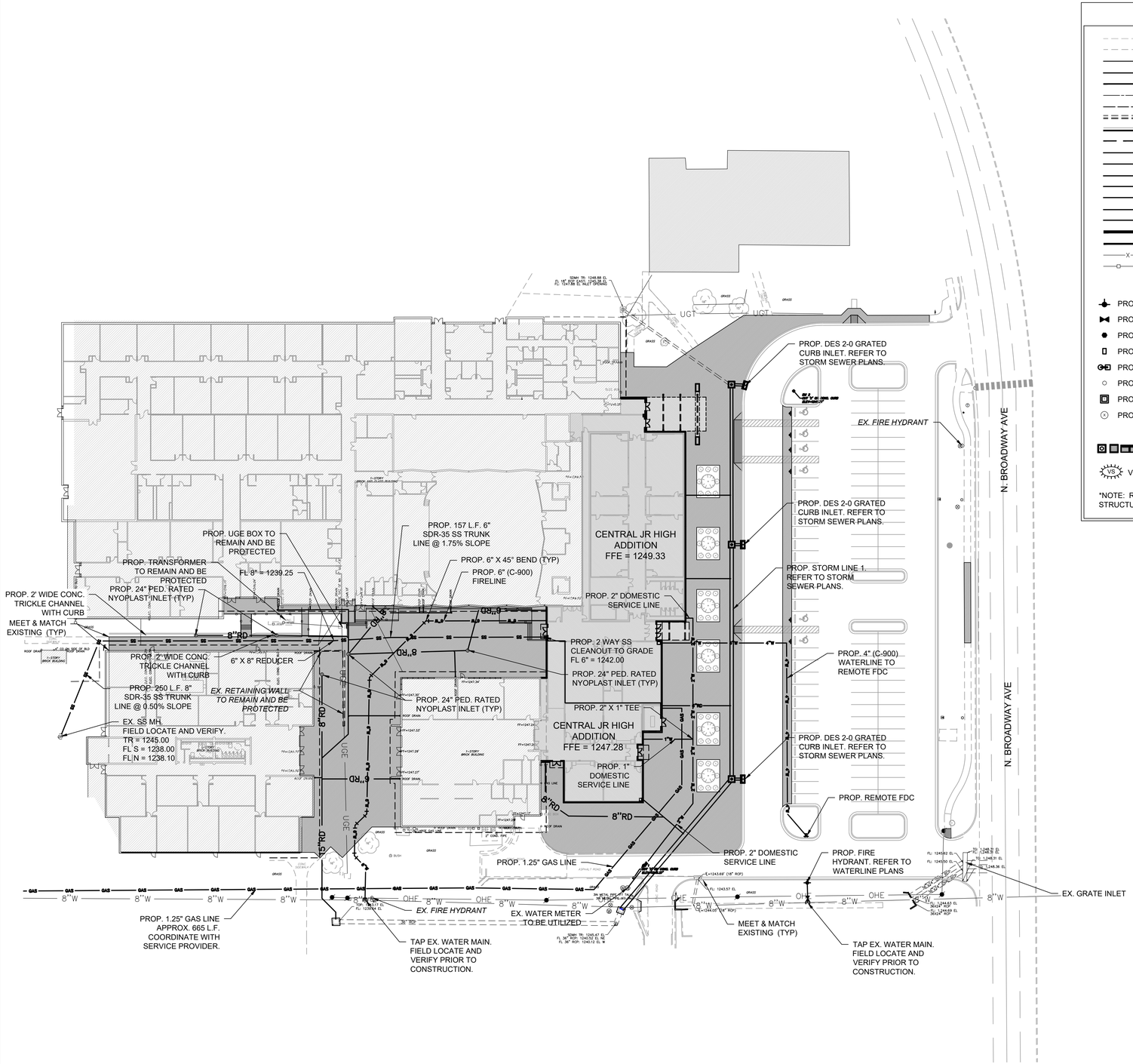
DRAWING TITLE:

COVER SHEET

SHEET:

C0.00



LEGEND

- EXISTING 1' CONTOUR
- EXISTING 5' CONTOUR
- PROPOSED 1' CONTOUR
- PROPOSED 5' CONTOUR
- BOUNDARY LINE
- RIGHT OF WAY LINE
- EASEMENT LINE
- EXISTING CURB AND GUTTER
- PROPOSED CURB AND GUTTER
- PROPOSED FIRE LANE STRIPING
- OHE — OVERHEAD ELECTRIC LINE
- UGE — UNDERGROUND ELECTRIC LINE
- GAS — GAS LINE
- UGT — UNDERGROUND TELEPHONE LINE
- FO — UNDERGROUND FIBER OPTIC LINE
- SS — SANITARY SEWER LINE
- W — WATERLINE
- RETAINING WALL
- SCREEN WALL
- WIRE FENCE
- CHAIN LINK FENCE
- BENCHMARK

- PROP. FIRE HYDRANT
- PROP. WATER VALVE
- PROP. WATER METER
- PROP. ELECT. METER
- PROP. LIGHT POLE
- PROP. BOLLARD
- PROP. TRANSFORMER
- PROP. PARKING COUNT
- PROP. WHEEL STOP
- PROP. FES
- PROP. HC RAMP
- PROP. POWER POLE
- PROP. SS MANHOLE
- PROP. GAS METER
- PROP. SIGN
- PROP. FIRE ROUTE SIGN

PROP. INLETS (SEE GRADING PLAN FOR TYPE)

VERTICAL SEPARATION REQUIREMENT

*NOTE: REFER TO SURVEYING LEGEND FOR EXISTING STRUCTURES IDENTIFICATION

UTILITY NOTES

A. CONTRACTOR SHALL REFER TO THE CONSTRUCTION DOCUMENTS INCLUDING BUT NOT LIMITED TO THE WRITTEN SPECIFICATIONS, CONSTRUCTION DRAWINGS, STORM WATER POLLUTION PLAN, AND GEOTECHNICAL REPORT.

B. ALL CONSTRUCTION SHALL BE IN STRICT ACCORDANCE WITH THE OWNERS DESIGN GUIDELINES AND SPECIFICATIONS, AND WHERE APPLICABLE SHALL MEET THE REQUIREMENTS OF THE GOVERNING/PERMITTING AUTHORITY HAVING JURISDICTION.

C. CONTRACTOR IS RESPONSIBLE FOR THEIR OWN HORIZONTAL AND VERTICAL CONTROL, REFERENCE POINTS AND CONSTRUCTION STAKING AS INCIDENTAL TO THE PROJECT.

D. THE CONTRACTOR SHALL FIELD VERIFY EXISTING ELEVATIONS/PROPERTY LINES/UTILITIES/DRAINAGE PRIOR TO CONSTRUCTION START.

E. ALL WORK NOT CLASSIFIED AS A CONTRACT PAY ITEM SHALL BE CONSIDERED AS INCIDENTAL AND THE COST THEREOF SHALL BE INCLUDED IN THE UNIT PRICE BID FOR ITEMS WHICH ARE CLASSIFIED FOR PAYMENT.

F. CONTRACTOR SHALL REFER TO THE ARCHITECTURAL AND MEP PLANS AND SPECIFICATIONS BEING A PART OF THE CONSTRUCTION DOCUMENTS FOR THE EXACT LOCATIONS AND DIMENSIONS OF ENTRY, EXIT PORCHES, PRECISE BUILDING DIMENSIONS, EXACT BUILDING UTILITY ENTRANCE, AND DOWNSPOUT LOCATIONS/SPECIFICATIONS/DETAILS.

G. REFER TO ARCHITECTURE PLANS FOR SITE LIGHTING/LIGHT POLE BASES AND ELECTRICAL CONDUIT PLACEMENT AND SPECIFICATIONS. POLE LOCATIONS ARE SHOWN ON THIS SHEET FOR REFERENCE ONLY. IT IS THE CONTRACTOR'S RESPONSIBILITY TO IDENTIFY AND ADJUST ANY CONSTRUCTED CONFLICTS WITH UNDERGROUND UTILITIES, SIDEWALKS, ETC.

H. CONTRACTOR IS REQUIRED TO CALL ONE CALL AS WELL AS THE APPROPRIATE UTILITY COMPANY AT LEAST 48 HOURS BEFORE ANY EXCAVATION/CONSTRUCTION ACTIVITIES TAKE PLACE. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO RELOCATE ALL EXISTING UTILITIES WHICH ARE IN CONFLICT WITH PROPOSED IMPROVEMENTS.

I. CONTRACTOR SHALL ENSURE ALL CONSTRUCTED UTILITIES MEET THE MINIMUM SEPARATION AND COVER REQUIREMENTS SET FORTH BY THE PROVIDER, FEDERAL/STATE/LOCAL REGULATIONS, OR SPECIFICATIONS. IN THE EVENT THERE IS A CONFLICT THE MOST STRINGENT SHALL APPLY.

J. GENERAL CONTRACTOR TO PROVIDE 2'X2'X6" THICK CONCRETE APRON AT ALL CLEANOUTS, VALVES AND METERS OUTSIDE OF BUILDING.

K. GENERAL CONTRACTOR SHALL BE RESPONSIBLE FOR ALL TAP AND TIE ON FEES REQUIRED, AS WELL AS COST OF UNDERGROUND SERVICE CONNECTIONS TO THE BUILDINGS.

L. THRUST BLOCKING SHALL BE PROVIDED AT ALL BENDS, TEES, AND FIRE HYDRANTS.

M. DIMENSIONS SHOWN ARE TO CENTERLINE OF PIPE OR FITTING.

N. ALL WATER AND SANITARY SEWER LEADS TO BUILDING SHALL END 5' OUTSIDE THE BUILDING LIMITS AS SHOWN ON PLAN AND SHALL BE PROVIDED WITH A TEMPORARY PLUG AT END.

O. ALL FIRE HYDRANTS SHALL BE PROVIDED WITH AN APPROVED GATE VALVE A MAXIMUM OF 5'(UNLESS OTHERWISE SPECIFIED BY CITY OFFICIAL) FROM HYDRANT.

P. CONTRACTOR SHALL COMPLY COMPLETELY WITH THE LATEST STANDARDS OF OSHA DIRECTIVES OR ANY OTHER AGENCY HAVING JURISDICTION FOR EXCAVATION AND TRENCHING PROCEDURES. THE CONTRACTOR SHALL USE SUPPORT SYSTEMS, SLOPING, BENCHING AND OTHER MEANS OF PROTECTION. THIS IS TO INCLUDE, BUT NOT LIMITED FOR ACCESS AND EGRESS FROM ALL EXCAVATION AND TRENCHING. CONTRACTOR IS RESPONSIBLE FOR COMPLYING WITH PERFORMANCE CRITERIA AS REQUIRED BY OSHA.

Q. REFER TO FIRE PROTECTION SHEETS FOR LOCATION AND DETAIL OF FIRE LINE LEAD IN. FIRE LINE SHALL BE STUBBED UP 1' ABOVE FFE IN SPRINKLER ROOM.

R. REFER TO PLUMBING SHEETS FOR LOCATION AND DETAILS OF SEWER, DOMESTIC, AND IRRIGATION CONNECTIONS.

S. CONTRACTOR SHALL REFER TO IRRIGATION PLANS FOR ACTUAL LOCATION, SIZE, LENGTH AND DEPTH. TEMPORARILY PLUG BOTH ENDS. IRRIGATION CONTRACTOR WILL REMOVE TEMPORARY PLUGS, INSTALL LINES AND PROPERLY SEAL BOTH ENDS.

T. THE FIRE DEPARTMENT CONNECTION (FDC) SHALL BE LOCATED ON THE STREET SIDE OF ANY STRUCTURE. THE FDC SHALL BE LOCATED AND ARRANGED SO THAT THE HOSE LINES CAN BE READILY ATTACHED TO THE INLETS WITHOUT INTERFERENCE FROM OBJECTS.

U. IT IS THE CONTRACTOR'S RESPONSIBILITY TO COORDINATE THE EXTENSIONS OF ALL UTILITY SERVICE LINES TO THE MAIN UTILITY LINES.

V. ALL CONDUIT SHALL BE SCHEDULE 40 PVC, UNLESS OTHERWISE NOTED.

W. CONTRACTOR SHALL REFER TO LANDSCAPE AND IRRIGATION PLAN FOR LOCATION AND CONSTRUCTION DETAILS OF LANDSCAPING AND IRRIGATION.

N

SCALE IN FEET
0 40' 60' 80'

BEFORE YOU DIG CALL OKIE 811

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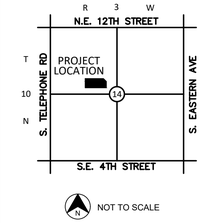
OK CA 5864
EXP. 06/30/26

LOCATION MAP:



NOT TO SCALE

PROJECT:

CENTRAL JUNIOR HIGH CLASSROOM ADDITION

400 N. BROADWAY ST.
MOORE, OKLAHOMA

PROJECT NUMBER: 25031
DRAWING DATE: 06.02.25
ISSUE DATE: 06.02.25

SEAL:

SUBMITTAL:

PERMIT SET

REVISIONS:

MARK	DATE	DESCRIPTION

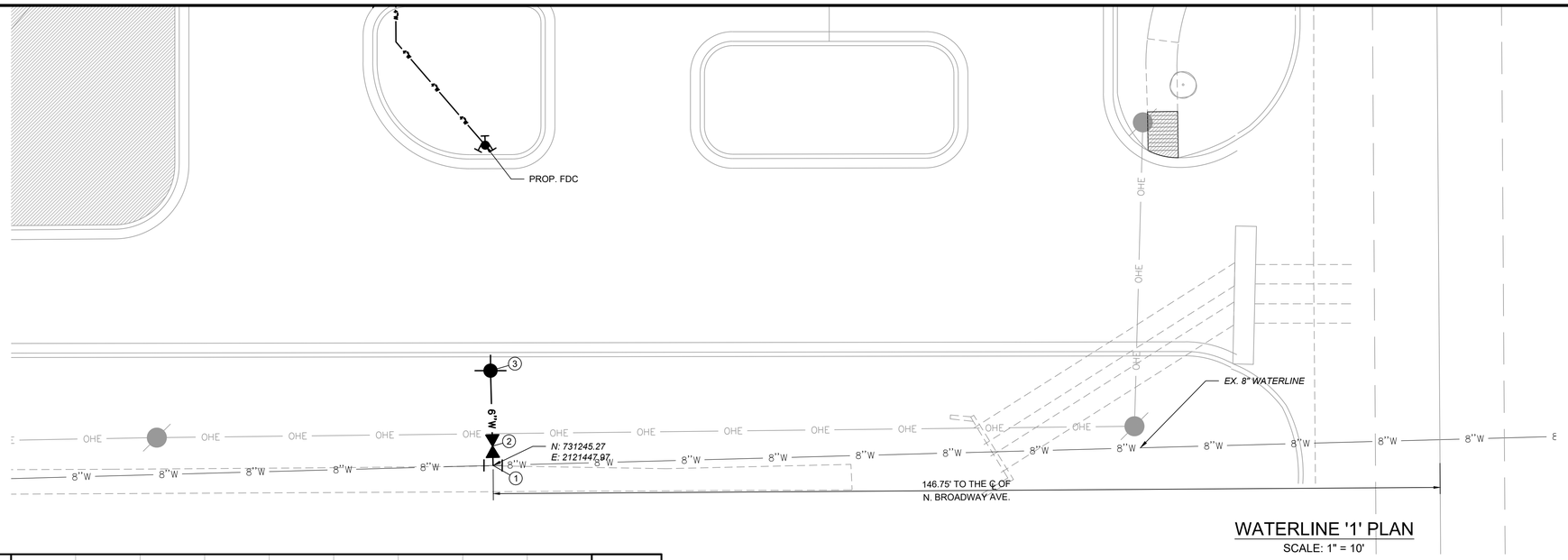
THESE PLANS AND DRAWINGS ARE NOT TO BE REPRODUCED, CHANGED OR COPIED IN ANY FORM OR MANNER WHATSOEVER WITHOUT FIRST OBTAINING THE WRITTEN PERMISSION AND CONSENT OF CEDAR CREEK CONSULTING INC. THIS SHEET IS NOT TO BE USED FOR CONSTRUCTION UNLESS THE ISSUE DATE IN THE TITLE BLOCK COINCIDES WITH OR POST DATES THE DRAWING DATE. ANY CHANGES MADE FROM THESE PLANS WITHOUT CONSENT OF CEDAR CREEK CONSULTING INC. ARE UNAUTHORIZED, AND SHALL RELIEVE CEDAR CREEK CONSULTING OF RESPONSIBILITY FOR ALL CONSEQUENCES ARRIVING OUT OF SUCH CHANGES.

DRAWING TITLE:

UTILITY PLAN

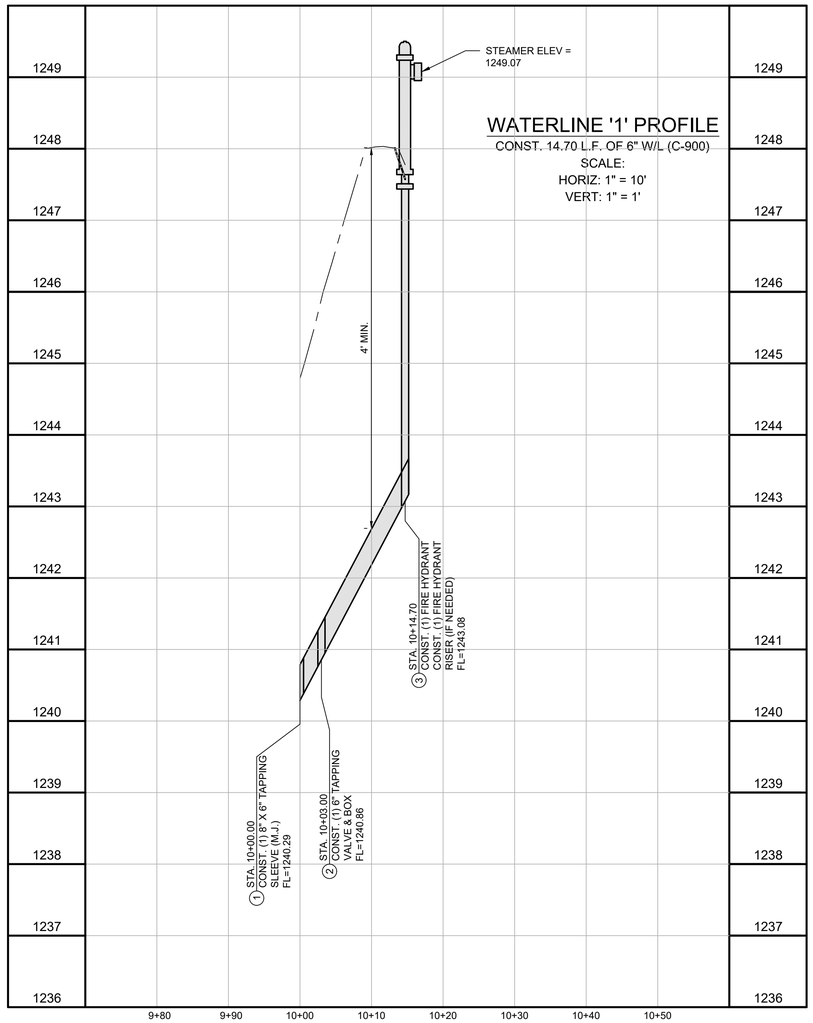
SHEET:

C5.00



WATERLINE '1' PLAN

SCALE: 1" = 10'



WATERLINE '1' PROFILE

CONST. 14.70 L.F. OF 6" W/L (C-900)

SCALE:
HORIZ: 1" = 10'
VERT: 1" = 1'

WATERLINE '1'

1. STA. 10+00.00
CONST. (1) 8" X 6" TAPPING SLEEVE (M.J.)
FL=1240.29

2. STA. 10+03.00
CONST. (1) 6" TAPPING VALVE & BOX
FL=1240.86

3. STA. 10+14.70
CONST. (1) FIRE HYDRANT
CONST. (1) FIRE HYDRANT RISER (IF NEEDED)
FL=1243.08

NOTES:
- WHERE FILL MATERIAL IS INDICATED SUCH MATERIAL SHALL BE PLACED AND COMPACTED IN SIX (6) INCH LIFTS FOR HAND-TAMPED EQUIPMENT AND THIRTY (30) INCH LIFTS FOR POWER-DRIVEN EQUIPMENT TO 95% STANDARD PROCTOR DENSITY PRIOR TO TRENCHING.
- CONTRACTOR SHALL FIELD LOCATE AND VERIFY UTILITY CROSSINGS PRIOR TO CONSTRUCTION.

BEFORE YOU DIG 811 1-800-522-OKIE CALL OKIE

N

SCALE IN FEET
0 10' 15' 20'

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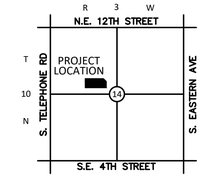
LOCATION MAP:



NOT TO SCALE

PROJECT:

CENTRAL JUNIOR HIGH CLASSROOM ADDITION

400 N. BROADWAY ST.
MOORE, OKLAHOMA

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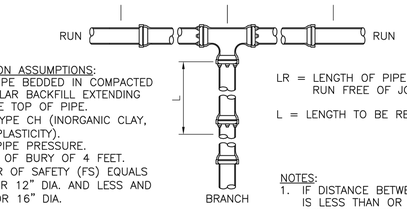
DRAWING TITLE:

WATERLINE '1' PLAN & PROFILE

SHEET:

C5.01



CALCULATION ASSUMPTIONS:
1. PVC PIPE BEDDED IN COMPACTED GRANULAR BACKFILL EXTENDING TO THE TOP OF PIPE.
2. SOIL TYPE CH (INORGANIC CLAY, HIGH PLASTICITY).
3. MAX. PIPE PRESSURE.
4. DEPTH OF BURY OF 4 FEET.
5. FACTOR OF SAFETY (FS) EQUALS 1.5 FOR 12" DIA. AND LESS AND 2.0 FOR 16" DIA.

LR = LENGTH OF PIPE ALONG THE RUN FREE OF JOINTS.

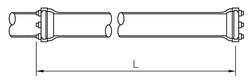
L = LENGTH TO BE RESTRAINED.

NOTES:
1. IF DISTANCE BETWEEN FITTINGS IS LESS THAN OR EQUAL TO RESTRAINED LENGTH, ALL JOINTS BETWEEN FITTINGS MUST BE RESTRAINED.

RESTRAINED LENGTHS FOR TEES			
PIPE SIZE (IN.)	BRANCH SIZE (IN.)	LR (FT.)	RESTRAINED LENGTH, L (FT.)
6	6	0	90
6	6	5	64
6	6	10	38
6	6	15	12
6	6	20	1
8	6	0	90
8	6	5	56
8	6	10	22
8	6	15	1
8	8	0	118
8	8	5	92
8	8	10	66
8	8	15	40
8	8	20	14
12	6	0	90
12	6	5	38
12	6	10	1
12	8	0	118
12	8	5	78
12	8	10	38

RESTRAINED LENGTHS FOR TEES			
PIPE SIZE (IN.)	BRANCH SIZE (IN.)	LR (FT.)	RESTRAINED LENGTH, L (FT.)
12	8	15	1
12	12	0	167
12	12	10	114
12	12	15	88
12	12	20	61
16	6	0	92
16	6	5	1
16	12	0	172
16	12	5	123
16	12	10	75
16	12	15	26
16	12	20	1
16	16	0	222
16	16	5	186
16	16	10	150
16	16	15	114
16	16	20	78

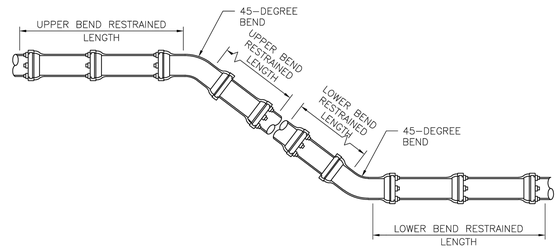
RESTRAINED JOINT DETAILS (1 OF 5) — DETAIL NO. 316-1 — APPROVED 09/18/2023



L = LENGTH TO BE RESTRAINED.

RESTRAINED LENGTHS FOR DEAD ENDS	
PIPE SIZE (INCH)	RESTRAINED LENGTH (FT)
6	90
8	118
12	167
16	222

RESTRAINED JOINT DETAILS (2 OF 5) — DETAIL NO. 316-2 — APPROVED 09/18/2023

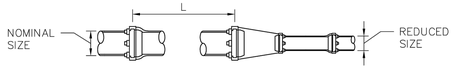


NOTES:
1. IF DISTANCE BETWEEN FITTINGS IS LESS THAN OR EQUAL TO RESTRAINED LENGTH, ALL JOINTS BETWEEN FITTINGS MUST BE RESTRAINED.

RESTRAINED LENGTHS FOR VERTICAL OFFSETS		
PIPE SIZE (INCH)	UPPER BEND RESTRAINED LENGTH (FT)	LOWER BEND RESTRAINED LENGTH (FT)
6	38	10
8	49	13
12	70	18
16	92	23

CALCULATION ASSUMPTIONS:
1. PVC PIPE BEDDED IN COMPACTED GRANULAR BACKFILL EXTENDING TO THE TOP OF PIPE.
2. SOIL TYPE CH (INORGANIC CLAY, HIGH PLASTICITY).
3. MAX. PIPE PRESSURE.
4. DEPTH OF BURY FOR UPPER BEND IS 4 FEET. LOWER DEPTH OF 6 FEET.
5. FACTOR OF SAFETY (FS) EQUALS 1.5 FOR 12" DIA. AND LESS AND 2.0 FOR 16" DIA.

RESTRAINED JOINT DETAILS (3 OF 5) — DETAIL NO. 316-3 — APPROVED 09/18/2023



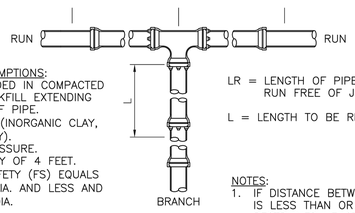
L = LENGTH TO BE RESTRAINED.

RESTRAINED LENGTHS FOR REDUCERS		
NOMINAL SIZE (INCH)	REDUCED SIZE (INCH)	RESTRAINED LENGTH (FT)
8	6	50
12	6	122
16	6	187
12	8	89
16	6	187
16	8	162
16	12	94

NOTES:
1. IF DISTANCE BETWEEN FITTINGS IS LESS THAN OR EQUAL TO RESTRAINED LENGTH, ALL JOINTS BETWEEN FITTINGS MUST BE RESTRAINED.

CALCULATION ASSUMPTIONS:
1. PVC PIPE BEDDED IN COMPACTED GRANULAR BACKFILL EXTENDING TO THE TOP OF PIPE.
2. SOIL TYPE CH (INORGANIC CLAY, HIGH PLASTICITY).
3. MAX. PIPE PRESSURE.
4. DEPTH OF BURY OF 4 FEET.
5. FACTOR OF SAFETY (FS) EQUALS 1.5 FOR 12" DIA. AND LESS AND 2.0 FOR 16" DIA.

RESTRAINED JOINT DETAILS (4 OF 5) — DETAIL NO. 316-4 — APPROVED 09/18/2023



CALCULATION ASSUMPTIONS:
1. PVC PIPE BEDDED IN COMPACTED GRANULAR BACKFILL EXTENDING TO THE TOP OF PIPE.
2. SOIL TYPE CH (INORGANIC CLAY, HIGH PLASTICITY).
3. MAX. PIPE PRESSURE.
4. DEPTH OF BURY OF 4 FEET.
5. FACTOR OF SAFETY (FS) EQUALS 1.5 FOR 12" DIA. AND LESS AND 2.0 FOR 16" DIA.

LR = LENGTH OF PIPE ALONG THE RUN FREE OF JOINTS.

L = LENGTH TO BE RESTRAINED.

NOTES:
1. IF DISTANCE BETWEEN FITTINGS IS LESS THAN OR EQUAL TO RESTRAINED LENGTH, ALL JOINTS BETWEEN FITTINGS MUST BE RESTRAINED.

RESTRAINED LENGTHS FOR TEES			
PIPE SIZE (IN.)	BRANCH SIZE (IN.)	LR (FT.)	RESTRAINED LENGTH, L (FT.)
6	6	0	90
6	6	5	64
6	6	10	38
6	6	15	12
6	6	20	1
8	6	0	90
8	6	5	56
8	6	10	22
8	6	15	1
8	8	0	118
8	8	5	92
8	8	10	66
8	8	15	40
8	8	20	14
12	6	0	90
12	6	5	38
12	6	10	1
12	8	0	118
12	8	5	78
12	8	10	38

RESTRAINED LENGTHS FOR TEES			
PIPE SIZE (IN.)	BRANCH SIZE (IN.)	LR (FT.)	RESTRAINED LENGTH, L (FT.)
12	8	15	1
12	12	0	167
12	12	10	114
12	12	15	88
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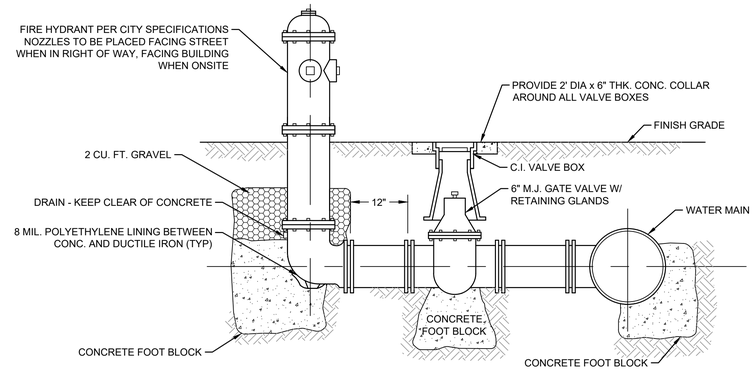
16	6	0	92
16	6	5	1
16	12	0	172
16	12	5	123
16	12	10	75
16	12	15	26
16	12	20	1
16	16	0	222
16	16	5	186
16	16	10	150
16	16	15	114
16	16	20	78

RESTRAINED JOINT DETAILS (1 OF 5) — DETAIL NO. 316-1 — APPROVED 09/18/2023



FIRE HYDRANT ASSEMBLY DETAIL

NOT TO SCALE

NOTE:
1. ALL WATERLINE SHALL BE INSTALLED WITH A #12 COPPER TRACER WIRE. CONTRACTOR SHALL REFER TO CITY.
2. ALL CONCRETE TO BE 4000 PSI P.C. CONCRETE
3. FIRE HYDRANT ASSEMBLY INCLUDES GATE VALVE AND APPURTENANCES
4. HYDRANTS TO BE PAINTED AND COLOR CODED PER LOCAL FIRE DEPT. REGULATIONS
5. FIRE HYDRANTS SHALL BE EITHER MUELLER OR CLOW BRAND
6. ALL WATER LINES ARE TO BE DUCTILE IRON WITH TYTON JOINT GASKETS
7. ALL CONSTRUCTION SHALL BE IN ACCORDANCE WITH CITY STANDARDS & SPECIFICATIONS
8. THE TOP BONNET SHALL BE PAINTED GRANITE DUST, INTERIOR/EXTERIOR GLOSS ENAMEL. THIS COLOR IS AVAILABLE AT LOWES. THE COLOR CHART NUMBER AT LOWES IS: VALSPAR, AMERICAN TRADITION BASE 1 5006-1C GRANITE DUST INT/EXT GLOSS ENAMEL 101-44 107-18 116-4
9. ALL OF THE REST OF THE FIRE HYDRANT SHALL BE PAINTED SUMMER SQUASH INT/EXT HIGH GLOSS. THE COLOR IS AVAILABLE AT LOWES THE COLOR CHART NUMBER AT LOWES IS: OLYMPIC PREMIUM BASE 5 A-12-6 SUMMER SQUASH, INT/EXT HIGH GLOSS LATEX 107-8 113-3Y16 114-10Y

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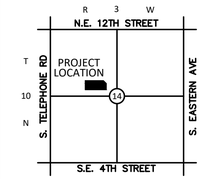
LOCATION MAP:



NOT TO SCALE

PROJECT:

CENTRAL JUNIOR HIGH CLASSROOM ADDITION

400 N. BROADWAY ST.
MOORE, OKLAHOMA

PROJECT NUMBER: 25031
DRAWING DATE: 06.02.25
ISSUE DATE: 06.02.25

SEAL:

SUBMITTAL:

PERMIT SET

REVISIONS:

MARK	DATE	DESCRIPTION

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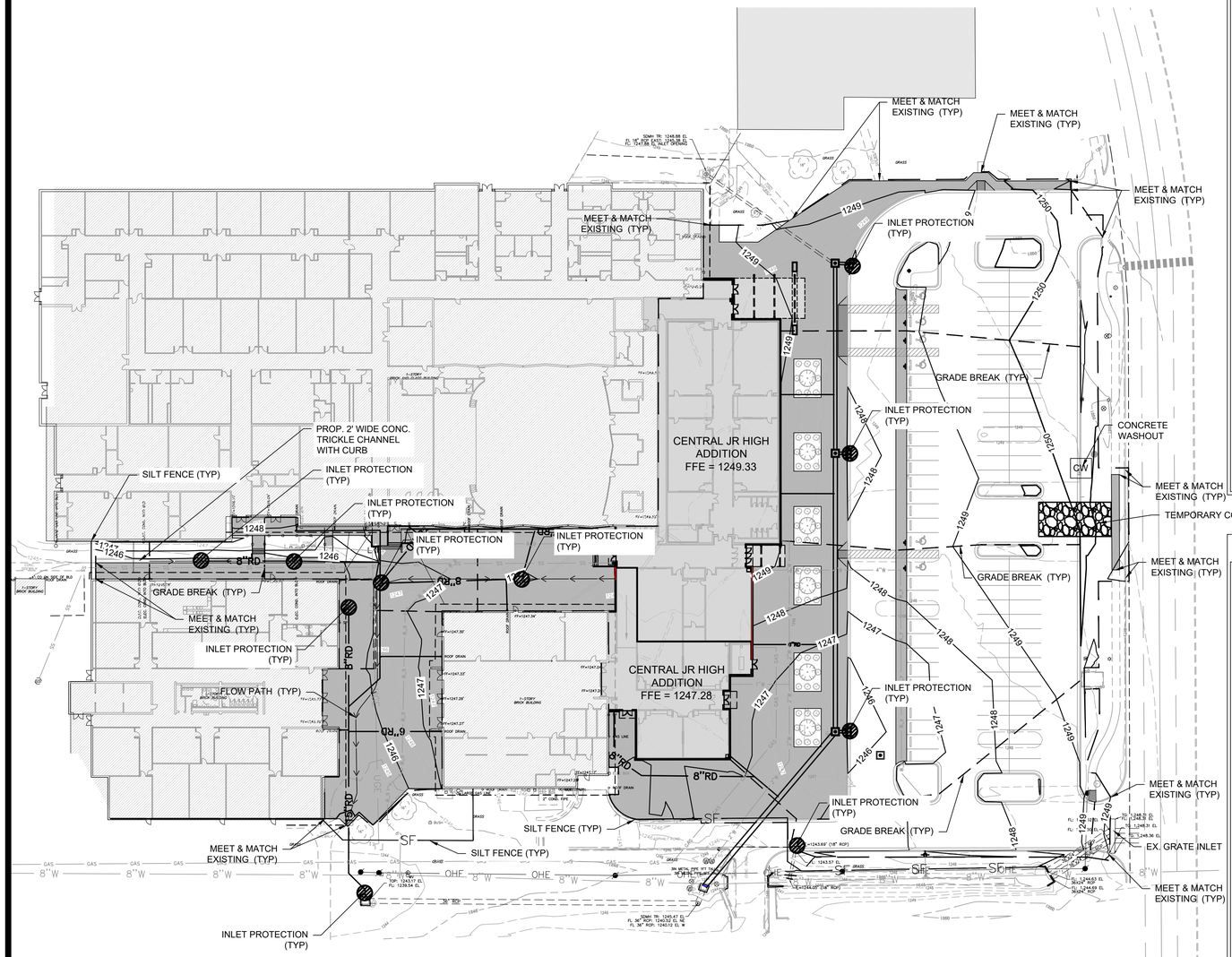
DRAWING TITLE:

WATERLINE DETAILS

SHEET:

C5.02



EROSION CONTROL NOTES

A. SEDIMENT BASINS ARE ATTRACTIVE TO CHILDREN AND CAN BE VERY DANGEROUS. IN ALL CASES, LOCAL ORDINANCES AND REGULATIONS REGARDING HEALTH AND SAFETY MUST BE ADHERED TO.

B. ALL CONTRACTORS AND SUBCONTRACTORS INVOLVED WITH STORM WATER POLLUTION PREVENTION SHALL OBTAIN A COPY OF THE STORM WATER POLLUTION PREVENTION PLAN AND THE STATE OF OKLAHOMA NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM GENERAL PERMIT (NPDES PERMIT) AND BECOME FAMILIAR WITH THEIR CONTENTS.

C. ALL TEMPORARY EROSION AND SEDIMENT CONTROL MEASURES SHALL BE DISPOSED OF WITHIN 30 DAYS AFTER FINAL STABILIZATION. FINAL STABILIZATION HAS OCCURRED WHEN ALL SOIL DISTURBING ACTIVITIES ARE COMPLETED AND A UNIFORM PERENNIAL VEGETATIVE COVER WITH A DENSITY OF 70% OF THE COVER FOR UNPAVED AREAS AND AREAS NOT COVERED BY PERMANENT STRUCTURES HAS BEEN EMPLOYED.

D. BEST MANAGEMENT PRACTICES (BMP'S) AND CONTROLS SHALL CONFORM TO FEDERAL, STATE, OR LOCAL REQUIREMENTS OR MANUAL OF PRACTICE, AS APPLICABLE CONTRACTOR SHALL IMPLEMENT ADDITIONAL CONTROLS AS DIRECTED BY PERMITTING AGENCY OR OWNER.

E. CONTRACTOR SHALL MINIMIZE CLEARING TO THE MAXIMUM EXTENT PRACTICAL OR AS REQUIRED BY THE GENERAL PERMIT.

F. GENERAL CONTRACTOR SHALL DENOTE ON PLAN THE TEMPORARY PARKING AND STORAGE AREA WHICH SHALL ALSO BE USED AS THE EQUIPMENT MAINTENANCE AND CLEANING AREA, EMPLOYEE PARKING AREA, AND AREA FOR LOCATING PORTABLE FACILITIES, OFFICE TRAILERS, AND TOILET FACILITIES.

G. ALL WASH WATER (CONCRETE TRUCKS, VEHICLE CLEANING, EQUIPMENT CLEANING, ETC.) SHALL BE DETAINED AND PROPERLY TREATED OR DISPOSED.

H. SUFFICIENT OIL AND GREASE ABSORBING MATERIALS AND FLOTATION BOOMS SHALL BE MAINTAINED ON SITE OR READILY AVAILABLE TO CONTAIN AND CLEAN-UP FUEL OR CHEMICAL SPILLS AND LEAKS.

I. DUST ON THE SITE SHALL BE CONTROLLED. THE USE OF MOTOR OILS AND OTHER PETROLEUM BASED OR TOXIC LIQUIDS FOR DUST SUPPRESSION OPERATIONS IS PROHIBITED.

J. RUBBISH, TRASH, GARBAGE, LITTER, OR OTHER SUCH MATERIALS SHALL BE DEPOSITED INTO SEALED CONTAINERS. MATERIALS SHALL BE PREVENTED FROM LEAVING THE PREMISES THROUGH THE ACTION OF WIND OR STORMWATER DISCHARGE INTO DRAINAGE DITCHES OR WATERS OF THE STATE.

K. ALL STORM WATER POLLUTION PREVENTION MEASURES PRESENTED ON THIS PLAN, AND IN THE STORM WATER POLLUTION PREVENTION PLAN, SHALL BE INITIATED AS SOON AS PRACTICABLE.

L. DISTURBED PORTIONS OF THE SITE WHERE CONSTRUCTION ACTIVITY HAS STOPPED FOR AT LEAST 14 DAYS, SHALL BE TEMPORARILY SEEDED. THESE AREAS SHALL BE SEEDED NO LATER THAN 14 DAYS FROM THE LAST CONSTRUCTION ACTIVITY OCCURRING IN THESE AREAS.

M. DISTURBED PORTIONS OF THE SITE WHERE CONSTRUCTION ACTIVITY HAS PERMANENTLY STOPPED SHALL BE PERMANENTLY SEEDED. THESE AREAS SHALL BE SEEDED NO LATER THAN 14 DAYS AFTER THE LAST CONSTRUCTION ACTIVITY OCCURRING IN THESE AREAS. REFER TO THE GRADING PLAN AND/OR LANDSCAPE PLAN.

N. IF THE ACTION OF VEHICLES TRAVELING OVER THE GRAVEL CONSTRUCTION ENTRANCES IS NOT SUFFICIENT TO REMOVE THE MAJORITY OF DIRT OR MUD, THEN THE TIRES MUST BE WASHED BEFORE THE VEHICLES ENTER A PUBLIC ROAD. IF WASHING IS USED, PROVISIONS MUST BE MADE TO INTERCEPT THE WASH WATER AND TRAP THE SEDIMENT BEFORE IT IS CARRIED OFF THE SITE.

O. ALL MATERIALS SPILLED, DROPPED, WASHED, OR TRACKED FROM VEHICLES ONTO ROADWAYS OR INTO STORM DRAINS MUST BE REMOVED IMMEDIATELY.

P. CONTRACTORS OR SUBCONTRACTORS WILL BE RESPONSIBLE FOR REMOVING SEDIMENT IN THE DETENTION POND AND ANY SEDIMENT THAT MAY HAVE COLLECTED IN THE STORM SEWER DRAINAGE SYSTEMS IN CONJUNCTION WITH THE STABILIZATION OF THE SITE.

Q. ON-SITE & OFFSITE SOIL STOCKPILE AND BORROW AREAS SHALL BE PROTECTED FROM EROSION AND SEDIMENTATION THROUGH IMPLEMENTATION OF BEST MANAGEMENT PRACTICES. STOCKPILE AND BORROW AREA LOCATIONS SHALL BE NOTED ON THE SITE PLAN AND PERMITTED IN ACCORDANCE WITH GENERAL PERMIT REQUIREMENTS.

R. SLOPES SHALL BE LEFT IN A ROUGHENED CONDITION DURING THE GRADING PHASE TO REDUCE RUNOFF VELOCITIES AND EROSION.

S. DUE TO THE GRADE CHANGES DURING THE DEVELOPMENT OF THE PROJECT, THE CONTRACTOR SHALL BE RESPONSIBLE FOR ADJUSTING THE EROSION CONTROL MEASURES (SILT FENCES, STRAW BALES, ETC.) TO PREVENT EROSION.

T. ALL CONSTRUCTION SHALL BE STABILIZED AT THE END OF EACH WORKING DAY, THIS INCLUDES BACKFILLING OF TRENCHES FOR UTILITY CONSTRUCTION AND PLACEMENT OF GRAVEL OR BITUMINOUS PAVING FOR ROAD CONSTRUCTION.

U. A 3' STRIP OF SOD SHALL BE PLACED ALONG THE EDGE OF ALL PAVING TO ACT AS A SEDIMENT BUFFER AND AID IN THE ESTABLISHMENT OF VEGETATION.

LEGEND

- EXISTING 1' CONTOUR
- EXISTING 5' CONTOUR
- PROPOSED 1' CONTOUR
- PROPOSED 5' CONTOUR
- BOUNDARY LINE
- RIGHT OF WAY LINE
- EASEMENT LINE
- EXISTING CURB AND GUTTER
- PROPOSED CURB AND GUTTER
- PROPOSED FIRE LANE STRIPING
- OHE — OVERHEAD ELECTRIC LINE
- UGE — UNDERGROUND ELECTRIC LINE
- GAS — GAS LINE
- UGT — UNDERGROUND TELEPHONE LINE
- FO — UNDERGROUND FIBER OPTIC LINE
- SS — SANITARY SEWER LINE
- W — WATERLINE
- RETAINING WALL
- SCREEN WALL
- WIRE FENCE
- CHAIN LINK FENCE
- BENCHMARK

- PROP. FIRE HYDRANT
- PROP. WATER VALVE
- PROP. WATER METER
- PROP. ELECT. METER
- PROP. LIGHT POLE
- PROP. BOLLARD
- PROP. TRANSFORMER
- PROP. PARKING COUNT
- PROP. WHEEL STOP
- PROP. FES
- PROP. HC RAMP
- PROP. POWER POLE
- PROP. SS MANHOLE
- PROP. GAS METER
- PROP. SIGN
- PROP. FIRE ROUTE SIGN

PROP. INLETS (SEE GRADING PLAN FOR TYPE)

- LIMITS OF DISTURBANCE
- SF — SILT FENCE
- TD — TEMPORARY DIVERSION DIKE
- SODDING
- INLET PROTECTION
- CW — CONCRETE WASHOUT AREA

*NOTE: REFER TO SURVEYING LEGEND FOR EXISTING STRUCTURES IDENTIFICATION

SEQUENCE OF CONSTRUCTION

PHASE 1

1. A PRE-CONSTRUCTION MEETING SHALL BE HELD BY THE GENERAL CONTRACTOR'S MANAGER, AND THE OPERATOR'S ENGINEER PRIOR TO LAND DISTURBING ACTIVITIES.
2. PREPARE AND PULL ALL NECESSARY PERMITS.
3. CONSTRUCT TEMPORARY CONSTRUCTION EXITS AT LOCATIONS SHOWN ON THE SWPPP PLANS AND PREPARE TEMPORARY PARKING AND STORAGE AREA. UPON IMPLEMENTATION AND INSTALLATION OF THE FOLLOWING AREAS: TRAILER, PARKING, LAY DOWN, PORTA-POTTY, WELL WASH, CONCRETE WASHOUT, MASONS AREA, FUEL AND MATERIAL STORAGE CONTAINERS, SOLID WASTE CONTAINERS, ETC., DENOTE THEM ON THE SITE MAPS IMMEDIATELY AND NOTE ANY CHANGE IN THE LOCATIONS AS THEY OCCUR THROUGHOUT THE CONSTRUCTION PROCESS.
4. CONSTRUCT THE SILT FENCES ON THE SITE. HALT ALL ACTIVITIES AND CONTACT THE CIVIL ENGINEERING CONSULTANT TO PERFORM INSPECTION AND CERTIFICATION OF BMP'S. GENERAL CONTRACTOR SHALL SCHEDULE AND CONDUCT STORMWATER PRE-CONSTRUCTION MEETING WITH ENGINEER AND ALL GROUND-DISTURBING CONTRACTORS BEFORE PROCEEDING WITH CONSTRUCTION.
5. INSTALL PUBLIC WATER, SEWER AND BOX CULVERT
6. DEMO, CLEAR AND GRUB THE SITE.
7. BEGIN GRADING THE SITE.
8. START CONSTRUCTION OF BUILDING PAD AND STRUCTURES.
9. DISTURBED AREAS OF THE SITE WHERE CONSTRUCTION ACTIVITY HAS CEASED FOR MORE THAN 14 DAYS SHALL BE TEMPORARILY SEEDED AND WATERED.

PHASE 2

1. INSTALL UTILITIES, UNDER DRAINS, STORM SEWERS, CURB AND GUTTERS.
2. INSTALL INLET PROTECTION DEVICES.
3. INSTALL RIP RAP AROUND OUTLET STRUCTURES.
4. FINALIZE PAVEMENT SUBGRADE PREPARATION.
5. INSTALL BASE MATERIAL AS REQUIRED FOR PAVEMENT.
6. PAVE LOT.
7. REMOVE TEMPORARY CONSTRUCTION EXITS ONLY PRIOR TO PAVEMENT CONSTRUCTION IN THESE AREAS. (THESE AREAS TO BE PAVED LAST)
8. DISTURBED AREAS OF THE SITE WHERE CONSTRUCTION ACTIVITY HAS CEASED FOR MORE THAN 14 DAYS SHALL BE TEMPORARILY SEEDED AND WATERED.
9. FINE GRADE AND INSTALL PERMANENT SEEDING AND PLANTINGS.
10. REMOVE ALL TEMPORARY EROSION AND SEDIMENT CONTROLS DEVISED. (ONLY IF SITE IS STABILIZED)
11. REMOVE INLET PROTECTIONS AROUND INLETS AND MANHOLES NO MORE THAN 48 HOURS PRIOR TO PLACING STABILIZED BASE COURSE.

SITE DATA

TOTAL AREA OF CONSTRUCTION SITE : (ACRES)
TOTAL AREA TO BE DISTURBED: (ACRES)
CURRENT (EXISTING) IMPERVIOUS AREA: (ACRES)
POST-CONSTRUCTION IMPERVIOUS AREA: (ACRES)
POST CONSTRUCTION RUNOFF COEFFICIENT: [IMPERVIOUS(0.95)]+PERVIOUS(.50)] \ OVERALL = C

BEFORE YOU DIG 811 LOCATE ZONE CALL OKIE

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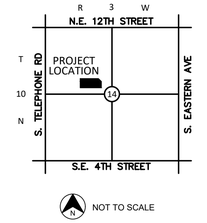
LOCATION MAP:



PROJECT:

CENTRAL JUNIOR HIGH CLASSROOM ADDITION

400 N. BROADWAY ST.
MOORE, OKLAHOMA

PROJECT NUMBER:	25031
DRAWING DATE:	06.02.25
ISSUE DATE:	06.02.25

SEAL:

SUBMITTAL:

PERMIT SET

REVISIONS:

MARK	DATE	DESCRIPTION

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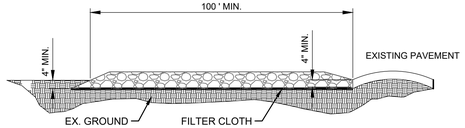
DRAWING TITLE:

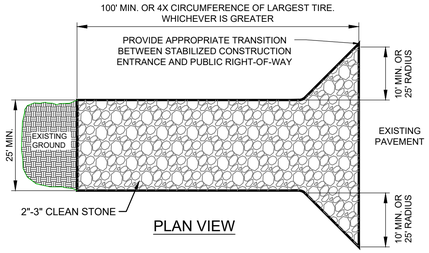
EROSION CONTROL PLAN

SHEET:

C6.00



SIDE ELEVATION



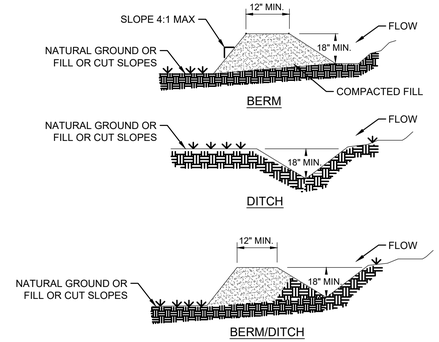
PLAN VIEW

NOTES:

1. STONE - USE COARSE AGGREGATE (3 INCH STONE MIN)
2. LENGTH - AS EFFECTIVE, BUT NOT LESS THAN 100 FEET.
3. THICKNESS - NOT LESS THAN EIGHT (8) INCHES.
4. WIDTH - NOT LESS THAN FULL WIDTH OF ALL POINTS OF INGRESS OR EGRESS.
5. WASHING - WHEN NECESSARY, WHEELS SHALL BE CLEANED TO REMOVE SEDIMENT PRIOR TO ENTRANCE ONTO PUBLIC RIGHT-OF-WAY. WHEN WASHING IS REQUIRED, IT SHALL BE DONE ON AN AREA STABILIZED WITH CRUSHED STONE WHICH DRAINS INTO AN APPROVED SEDIMENT TRAP OR SEDIMENT BASIN. ALL SEDIMENT SHALL BE PREVENTED FROM ENTERING ANY STORM DRAIN, DITCH, OR WATERCOURSE THROUGH USE OF SAND BAGS, GRAVEL, BOARDS OR OTHER APPROVED METHODS.
6. MAINTENANCE - THE ENTRANCE SHALL BE MAINTAINED IN A CONDITION WHICH WILL PREVENT TRACKING OR FLOWING OF SEDIMENT ONTO PUBLIC RIGHT-OF-WAY. THIS MAY REQUIRE PERIODIC TOP DRESSING WITH ADDITIONAL STONE AS CONDITIONS DEMAND AND REPAIR AND/OR CLEANOUT OF ANY MEASURES USED TO TRAP SEDIMENT. ALL SEDIMENT SPILLED, DROPPED, WASHED OR TRACKED ONTO PUBLIC RIGHTS-OF-WAY MUST BE REMOVED IMMEDIATELY.
7. 12' X 24' METAL GRATE MAY BE USED. GRATE SHALL BE 25' AWAY FROM PAVEMENT AND APPROPRIATE SEDIMENT CONTROL TRAPPING DEVICE SHALL BE USED AT GRATE OUTLET POINT.

STABILIZED CONSTRUCTION ENTRANCE

NOT TO SCALE

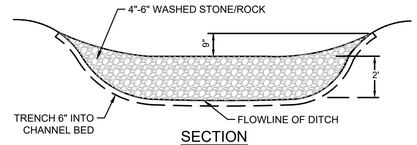


NOTES:

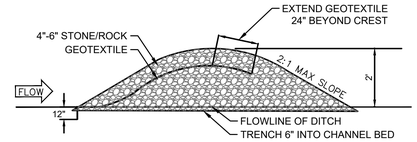
1. POSITIVE GRADE MUST BE PROVIDED TO ASSURE DRAINAGE. IF SLOPE EXCEEDS 2%, SEED AND MULCH DIVERSION, TRY NOT TO EXCEED 5% (HIGH RUNOFF VELOCITIES RESULT). MAXIMUM DRAINAGE AREA IS 5.00 ACRES WITHOUT SUPPORTING CALCULATIONS FOR PERMANENT CHANNEL. DIVERSIONS AT THE TOPS OF SLOPES MUST EMPTY INTO AN APPROVED SLOPE DRAIN (SEE DETAILS). THE BERM/ DITCH IS THE MOST COMMONLY USED DIVERSION.
2. MACHINE COMPACTION OF ALL FILL IS REQUIRED.
3. DIVERSIONS SUFFICIENT TO DIRECT ALL SEDIMENT-LADEN STORMWATER INTO SEDIMENT CONTROL DEVICE MUST BE INSTALLED PRIOR TO CLEARING AND GRUBBING OF AREA (OR IN CONJUNCTION WITH THIS OPERATION IF SEDIMENT CONTROLS AND DIVERSIONS ARE INSTALLED AT EACH CRITICAL POINT AS INDICATED).
4. DIVERSIONS SHOULD BE LOCATED TO MINIMIZE DAMAGES BY CONSTRUCTION OPERATIONS.
5. DIVERSIONS SHOULD BE SEEDED AND MULCHED IF THEY ARE TO REMAIN IN PLACE OVER 14 DAYS.
6. CHECK DIVERSIONS AFTER EACH RAIN, OR ONCE PER WEEK WHICH EVER IS THE SHORTER DURATION. REPAIR AS NEEDED TO MAINTAIN FUNCTION.

TEMPORARY DIVERSION BERM/DITCH DETAIL

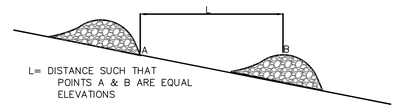
NOT TO SCALE



SECTION



PROFILE



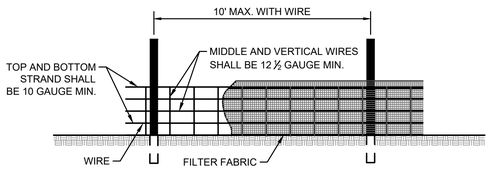
LONGITUDINAL PROFILE

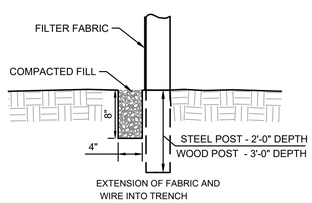
NOTES:

1. THE MAXIMUM HEIGHT OF THE CHECK DAM AT THE CENTER SHALL NOT EXCEED ONE HALF THE DEPTH OF THE CHANNEL.
2. MAXIMUM SPACING SHALL BE SO THE TOE OF THE UPSTREAM DAM IS THE SAME ELEVATION AS THE TOP OF THE DOWNSTREAM DAM.
3. REMOVE SEDIMENT WHEN 25% THE HEIGHT OF THE WEIR.
4. REMOVE CHECK DAMS WHEN SITE STABILIZATION IS ACHIEVED.

ROCK CHECK DAM DETAIL

NOT TO SCALE



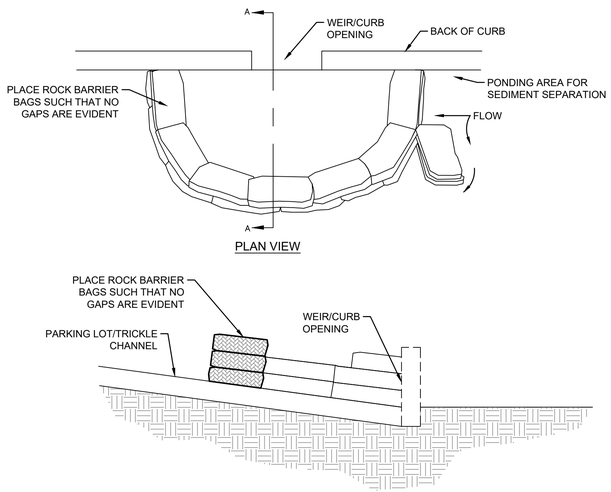


NOTES:

1. WIRE SHALL BE A MINIMUM OF 32" IN WIDTH AND SHALL HAVE A MINIMUM OF 6 LINE WIRES WITH 12" STAY SPACING.
2. FILTER FABRIC SHALL BE A MINIMUM OF 36" IN WIDTH AND SHALL BE FASTENED ADEQUATELY TO THE WIRE.
3. STEEL POST SHALL BE 5'-0" IN HEIGHT AND BE OF THE SELF-FASTENER ANGLE STEEL TYPE.
4. WOOD POST SHALL BE 6'-0" IN HEIGHT AND 3" IN DIAMETER.

SILT FENCE DETAIL

NOT TO SCALE



PLAN VIEW

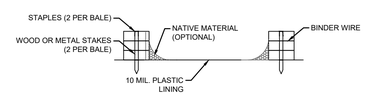
SECTION A-A

NOTES:

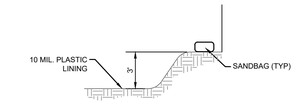
1. PLACE CURB TYPE ROCK BAG BARRIER ON GENTLY SLOPING PAVING, WHERE WATER CAN POND AND ALLOW SEDIMENT TO SEPARATE FROM RUNOFF.
2. BAGS OF WOVEN GEOTEXTILE FABRIC, FILLED WITH GRAVEL MUST BE LAYERED SUCH THAT NO GAPS ARE EVIDENT.
3. LEAVE ON ROCKBAG GAP IN THE TOP ROW ON THE SIDE AWAY FROM FLOW, TO PROVIDE A SPILLWAY; OR IN THE CENTER IF PONDING IS NEEDED ON BOTH SIDES.
4. INSPECT BARRIERS AND REMOVE SEDIMENT AFTER EACH STORM EVENT, SEDIMENT AND GRAVEL MUST BE REMOVED FROM THE TRAVELED WAY IMMEDIATELY.

CURB INLET PROTECTION DETAIL

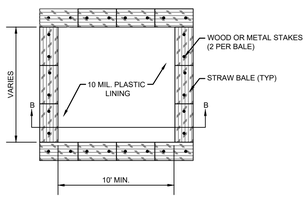
NOT TO SCALE



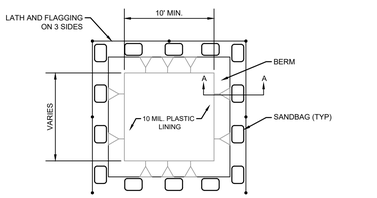
SECTION B-B



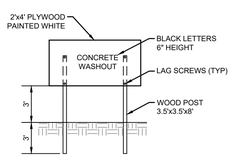
SECTION A-A



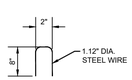
TYPE 'ABOVE GRADE' WITH STRAW BALES



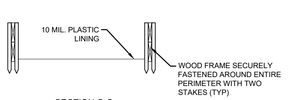
TYPE 'BELOW GRADE'



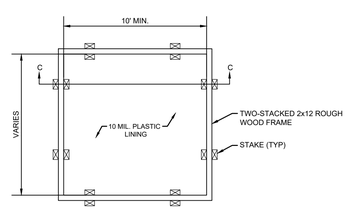
CONCRETE WASHOUT SIGN DETAIL



STAPLE DETAIL



SECTION C-C



TYPE 'ABOVE GRADE' WITH WOOD PLANKS

NOTES:

1. ACTUAL LAYOUT TO BE DETERMINED IN THE FIELD.
2. A CONCRETE WASHOUT SIGN SHALL BE INSTALLED WITHIN 30' OF THE TEMPORARY CONCRETE WASHOUT FACILITY
3. MATERIALS USED TO CONSTRUCT TEMPORARY CONCRETE WASHOUT FACILITIES SHALL BE REMOVED FROM THE SITE OF THE WORK AND DISPOSED OF OR RECYCLED.
4. HOLES, DEPRESSIONS OR OTHER GROUND DISTURBANCE CAUSE BY THE REMOVAL OF THE TEMPORARY CONCRETE WASHOUT FACILITIES SHALL BE BACKFILLED, REPAIRED AND STABILIZED TO PREVENT EROSION.

CONCRETE WASHOUT DETAIL

NOT TO SCALE

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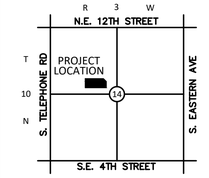
LOCATION MAP:



NOT TO SCALE

PROJECT:

CENTRAL JUNIOR HIGH CLASSROOM ADDITION

400 N. BROADWAY ST.
MOORE, OKLAHOMA

PROJECT NUMBER: 25031
DRAWING DATE: 06.02.25
ISSUE DATE: 06.02.25

SEAL:

SUBMITTAL:

PERMIT SET

REVISIONS:

MARK	DATE	DESCRIPTION

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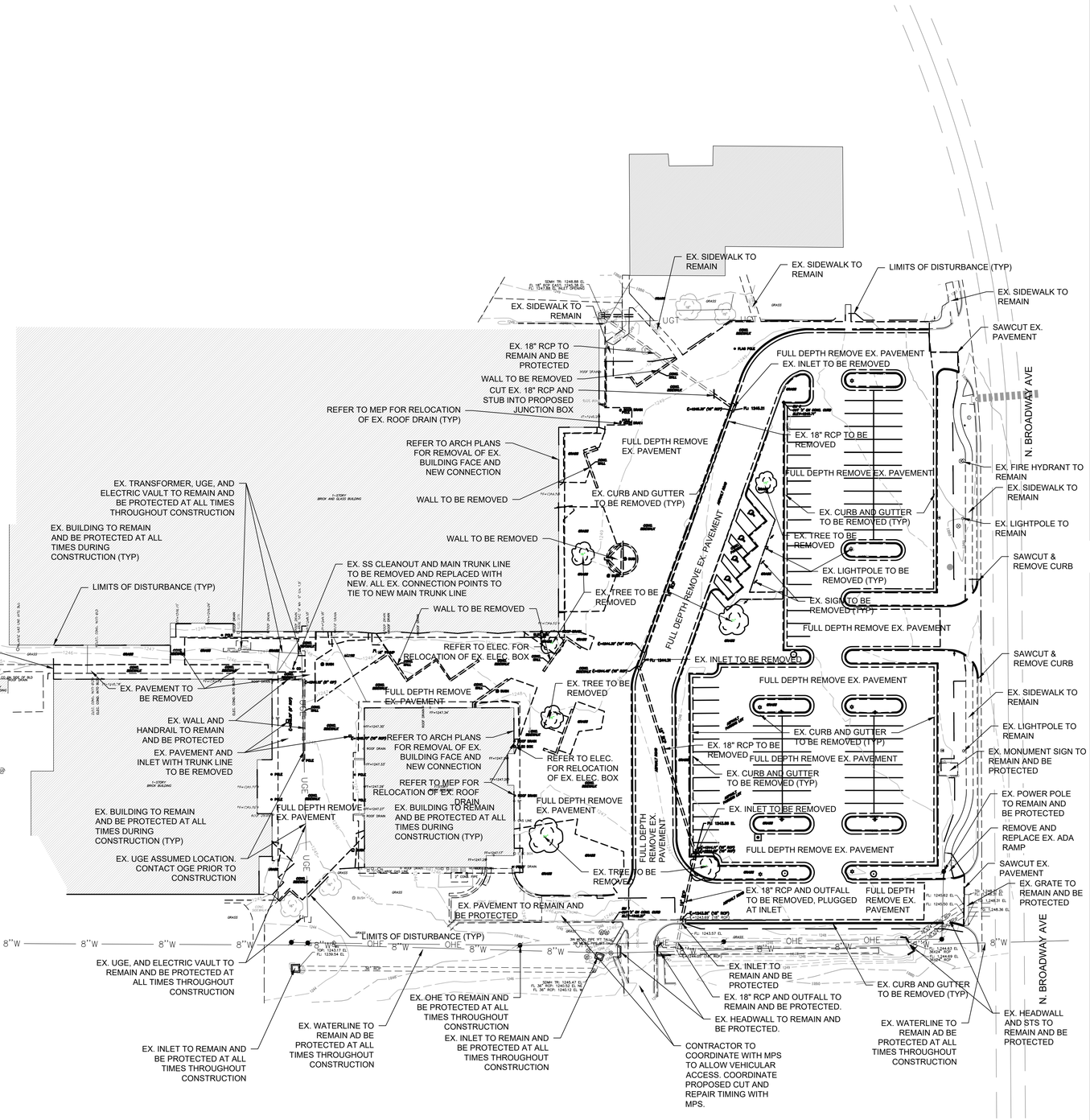
DRAWING TITLE:

EROSION CONTROL DETAILS

SHEET:

C6.01



LEGEND

- EXISTING 1' CONTOUR
- EXISTING 5' CONTOUR
- PROPOSED 1' CONTOUR
- PROPOSED 5' CONTOUR
- BOUNDARY LINE
- RIGHT OF WAY LINE
- EASEMENT LINE
- EXISTING CURB AND GUTTER
- PROPOSED CURB AND GUTTER
- PROPOSED FIRE LANE STRIPING
- OHE — OVERHEAD ELECTRIC LINE
- UGE — UNDERGROUND ELECTRIC LINE
- GAS — GAS LINE
- UGT — UNDERGROUND TELEPHONE LINE
- FO — UNDERGROUND FIBER OPTIC LINE
- SS — SANITARY SEWER LINE
- W — WATERLINE
- RETAINING WALL
- SCREEN WALL
- WIRE FENCE
- CHAIN LINK FENCE
- BENCHMARK

- PROP. FIRE HYDRANT
- PROP. WATER VALVE
- PROP. WATER METER
- PROP. ELECT. METER
- PROP. LIGHT POLE
- PROP. BOLLARD
- PROP. TRANSFORMER
- PROP. PARKING COUNT
- PROP. WHEEL STOP
- PROP. FES
- PROP. HC RAMP
- PROP. POWER POLE
- PROP. SS MANHOLE
- PROP. GAS METER
- PROP. SIGN
- PROP. FIRE ROUTE SIGN

PROP. INLETS (SEE GRADING PLAN FOR TYPE)

VERTICAL SEPARATION REQUIREMENT

*NOTE: REFER TO SURVEYING LEGEND FOR EXISTING STRUCTURES IDENTIFICATION

N

SCALE IN FEET
0 40' 60' 80'

BEFORE YOU DIG 811 811 IT'S THE LAW CALL OKIE

NOTE:CONTRACTOR SHALL ENSURE THAT PEDESTRIAN AND FIRE ACCESS TO THE EXISTING BUILDING IS PROVIDED AT ALL TIMES DURING DEMOLITION AND CONSTRUCTION.

NOTE: CONTRACTOR SHALL BE RESPONSIBLE TO REPAIR ANY DAMAGE TO EXISTING PAVEMENT DUE TO CONSTRUCTION.

NOTE: CONTRACTOR SHALL BE RESPONSIBLE FOR MAINTAINING SAFE EGRESS AND INGRESS TO AND FROM SITE ALL ALL TIMES, AS WELL AS ALONG PUBLIC STREETS.

DEMOLITION NOTES

1. THE CONTRACTOR SHALL ABIDE BY ALL FEDERAL, STATE AND LOCAL CODES FOR THE DEMOLITION AND DISPOSAL OF ALL MATERIALS.
2. CEDAR CREEK CONSULTING, INC. SHALL NOT BE LIABLE FOR ANY DEMOLITION PROCEDURES, SCHEDULING, AND DISPOSING OF ANY MATERIALS.
3. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO MAKE SURE THAT THE PROPERTY IS NOT DAMAGED AND IS ACCESSIBLE AT ALL TIMES, AND THAT CONSTRUCTION DOES NOT CREATE ANY HARDSHIP TO LAND OWNERS.
4. THE CONTRACTOR IS RESPONSIBLE FOR THE DEMOLITION, REMOVAL, AND DISPOSING IN A LOCATION APPROVED BY ALL GOVERNING AUTHORITIES, OF ALL STRUCTURES, PADS, WALLS, FLUMES, FOUNDATIONS, PARKING, DRIVES, DRAINAGE, UTILITIES, ETC., SUCH THAT THE IMPROVEMENTS SHOWN ON THE REMAINING PLANS CAN BE CONSTRUCTED. ALL FACILITIES TO BE REMOVED SHALL BE UNDERCUT TO SUITABLE MATERIAL AND BROUGHT TO GRADE WITH SUITABLE COMPACTED FILL MATERIAL PER THE SPECIFICATIONS.
5. THE CONTRACTOR SHALL COORDINATE WITH RESPECTIVE UTILITY COMPANIES PRIOR TO THE DISCONNECTION, REMOVAL AND RELOCATION OF ALL UTILITIES. THE CONTRACTOR SHALL COORDINATE WITH THE UTILITY COMPANY CONCERNING PORTIONS OF WORK WHICH MAY BE PERFORMED BY THE UTILITY COMPANY'S FORCES AND ANY FEES WHICH ARE TO BE PAID TO THE UTILITY COMPANY FOR SERVICES. THE CONTRACT IS RESPONSIBLE FOR PAYING ALL FEES AND CHARGES.
6. THE CONTRACTOR IS RESPONSIBLE FOR REMOVING EXISTING IRRIGATION SYSTEM IN THE AREAS OF PROPOSED IMPROVEMENTS. THE CONTRACTOR SHALL CAP THE EXISTING IRRIGATION SYSTEM TO REMAIN SUCH THAT THE REMAINING SYSTEM SHALL CONTINUE TO FUNCTION PROPERLY.
7. THE LOCATIONS OF ALL EXISTING UTILITIES SHOWN ON THIS PLAN HAVE BEEN DETERMINED FROM THE BEST INFORMATION AVAILABLE AND ARE GIVEN FOR THE CONVENIENCE OF THE CONTRACTOR. THE ENGINEER ASSUMES NO RESPONSIBILITY FOR THEIR ACCURACY. PRIOR TO THE START OF ANY DEMOLITION ACTIVITY, THE CONTRACTOR SHALL NOTIFY THE UTILITY COMPANIES FOR ONSITE LOCATIONS OF EXISTING UTILITIES.
8. ALL EXISTING SEWERS, PIPING AND UTILITIES SHOWN ARE NOT TO BE INTERPRETED AS THE EXACT LOCATION, OR AS THE ONLY OBSTACLES THAT MAY OCCUR ON THE SITE. VERIFY EXISTING CONDITIONS AND PROCEED WITH CAUTION AROUND ANY ANTICIPATED FEATURES. GIVE NOTICE TO ALL UTILITY COMPANIES REGARDING DESTRUCTION AND REMOVAL OF ALL SERVICE LINES AND CAP ALL LINES BEFORE PROCEEDING WITH WORK. UTILITIES DETERMINED TO BE ABANDONED AND LEFT IN PLACE SHALL BE GROUTED IF UNDER BUILDINGS.
9. ELECTRICAL, TELEPHONE, CABLE, WATER, FIBER OPTIC CABLE AND/OR GAS LINES NEEDING TO BE REMOVED OR RELOCATED SHALL BE COORDINATED WITH THE AFFECTED UTILITY COMPANY. ADEQUATE TIME SHALL BE PROVIDED FOR RELOCATION AND CLOSE COORDINATION WITH THE UTILITY COMPANY IS NECESSARY TO PROVIDE A SMOOTH TRANSITION IN UTILITY SERVICE.
10. THE CONTRACTOR MUST PROTECT THE PUBLIC AT ALL TIMES WITH FENCING, BARRICADES, ENCLOSURES, ETC.
11. ALL EROSION CONTROL DEVICES ARE TO BE INSTALLED PRIOR TO DEMOLITION.
12. THE CONTRACTOR MAY LIMIT SAW-CUT AND PAVEMENT REMOVAL TO ONLY THOSE AREAS WHERE IT IS REQUIRED AS SHOWN ON THE CONSTRUCTION PLANS BUT IF ANY DAMAGE IS INCURRED ON ANY OF THE SURROUNDING PAVEMENT, ETC., THE CONTRACTOR SHALL BE RESPONSIBLE FOR ITS REMOVAL AND REPAIR.
13. THE CONTRACTOR SHALL MAINTAIN ALL EXISTING PARKING, SIDEWALKS, DRIVES, ETC. CLEAR AND FREE FROM ANY CONSTRUCTION ACTIVITY INCLUDING FENCING AND CONSTRUCTION TRAILER AND/OR MATERIAL TO ENSURE EASY AND SAFE PEDESTRIAN AND VEHICULAR TRAFFIC TO AND FROM THE SITE.
14. THE CONTRACTOR SHALL COORDINATE WATERMAIN WORK WITH THE FIRE DEPARTMENT, THE CITY UTILITY DEPARTMENT TO PLAN PROPOSED IMPROVEMENTS AND TO ENSURE ADEQUATE FIRE PROTECTION IS CONSTANTLY AVAILABLE TO THE SITE THROUGHOUT THIS SPECIFIC WORK AND THROUGH ALL PHASES OF CONSTRUCTION. CONTRACTOR WILL BE RESPONSIBLE FOR ARRANGING/PROVIDING ANY REQUIRED WATERMAIN SHUT-OFFS WITH THE CITY/COUNTY DURING CONSTRUCTION. ANY COSTS ASSOCIATED WITH WATERMAIN SHUT-OFFS WILL BE THE RESPONSIBILITY OF THE CONTRACTOR AND NO EXTRA COMPENSATION WILL BE PROVIDED.
15. DAMAGE TO ALL EXISTING CONDITIONS TO REMAIN WILL BE REPLACED AT CONTRACTOR'S EXPENSE. REPAIRS SHALL RESTORE DAMAGED ITEMS TO EQUAL OR BETTER THAN EXISTING CONDITIONS. CONTRACTOR IS RESPONSIBLE FOR DOCUMENTING ALL EXISTING DAMAGE AND NOTIFYING THE CONSTRUCTION MANAGER PRIOR TO CONSTRUCTION START.
16. ALL TRENCHES AND/OR EXCAVATED AREAS SHALL BE FILLED /TESTED IN ACCORDANCE WITH THE GEOTECHNICAL ENGINEERING REPORT.
17. IF SEPTIC TANKS ARE FOUND PRESENT WITHIN THE LIMITS OF DISTURBANCE, THEY SHALL BE DISPOSED OF IN ACCORDANCE WITH LOCAL, STATE AND FEDERAL LAWS.
18. IF THE CONTRACTOR FINDS ANY UNDERGROUND TANKS ON SITE, THEY SHALL CONTACT THE ENGINEER IMMEDIATELY.
19. ALL WELLS SHALL BE CAPPED AND CLOSED IN ACCORDANCE WITH APPLICABLE STATE AND FEDERAL LAWS.
20. ALL ITEMS WITHIN LIMITS OF DEMOLITION SHALL BE REMOVED UNLESS OTHERWISE NOTED.
21. CONTRACTOR SHALL BEGIN CONSTRUCTION OF ANY LIGHT POLE BASES FOR RELOCATED LIGHT FIXTURES AND RELOCATION OF ELECTRICAL SYSTEM AS SOON AS DEMOLITION BEGINS. CONTRACTOR SHALL BE AWARE THAT INTERRUPTION OF POWER TO ANY LIGHT POLES OR SIGNS SHALL NOT EXCEED 24 HOURS.
22. CONTRACTOR IS TO VERIFY LOCATION OF EXISTING IRRIGATION SYSTEM, VALVE BOXES, CONTROL BOXES, BACKFLOW PREVENTION DEVICES AND LIGHTING CONDUIT. IF DAMAGED THEY MUST BE REPAIRED AT CONTRACTOR'S EXPENSE.

CEDAR CREEK
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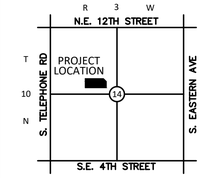
www.cedarcreekinc.com
OK CA 5864
EXP. 06/30/26

LOCATION MAP:



NOT TO SCALE

PROJECT:

CENTRAL JUNIOR HIGH CLASSROOM ADDITION

400 N. BROADWAY ST.
MOORE, OKLAHOMA

PROJECT NUMBER: 25031
DRAWING DATE: 06.02.25
ISSUE DATE: 06.02.25

SEAL:

SUBMITTAL:

PERMIT SET

REVISIONS:

MARK	DATE	DESCRIPTION

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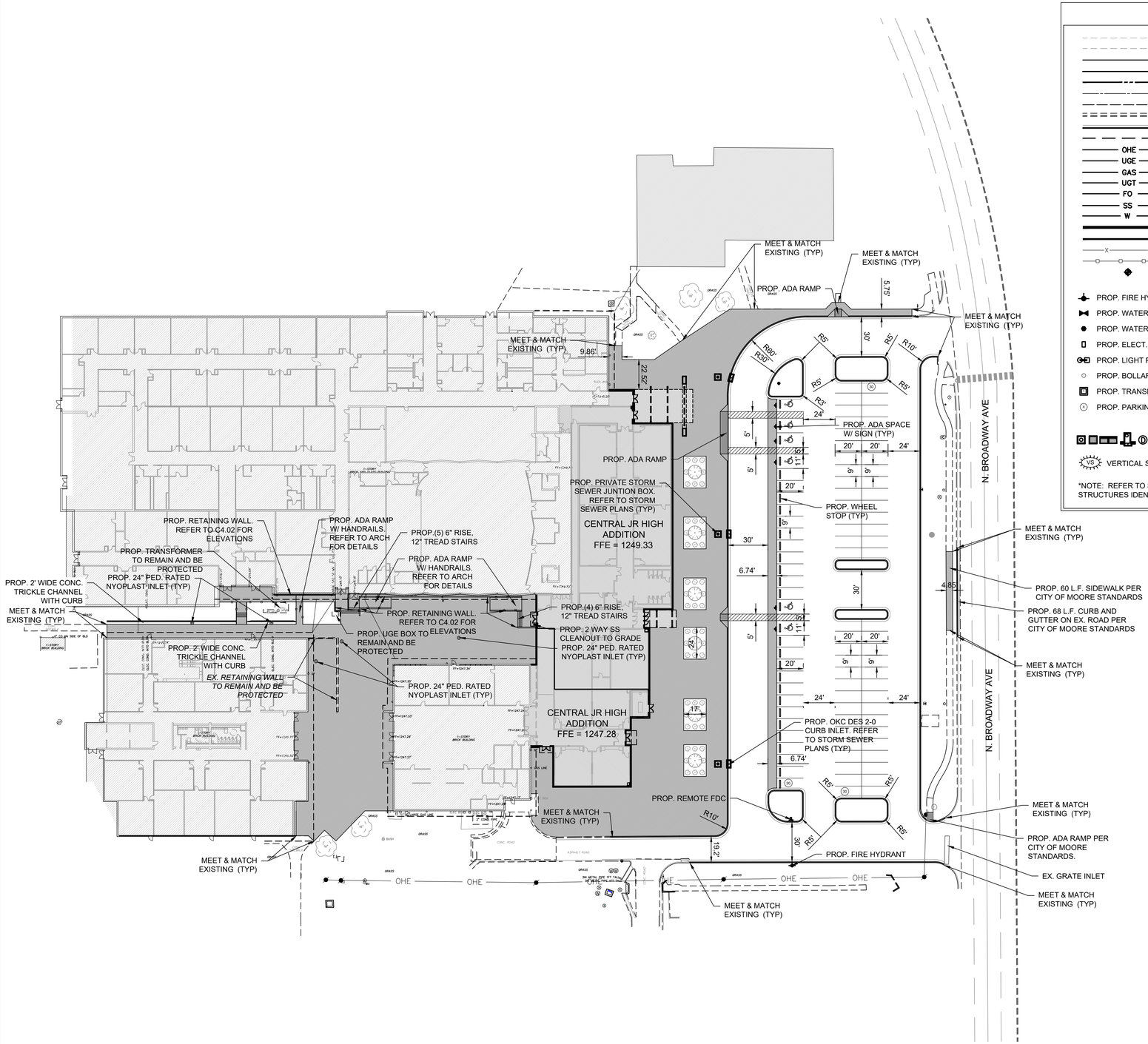
DRAWING TITLE:

DEMOLITION PLAN

SHEET:

C1.00



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PROP. INLETS (SEE GRADING PLAN FOR TYPE)

VERTICAL SEPARATION REQUIREMENT

*NOTE: REFER TO SURVEYING LEGEND FOR EXISTING STRUCTURES IDENTIFICATION

SITE NOTES

A. CONTRACTOR SHALL REFER TO THE CONSTRUCTION DOCUMENTS INCLUDING BUT NOT LIMITED TO THE WRITTEN SPECIFICATIONS, CONSTRUCTION DRAWINGS, STORM WATER POLLUTION PLAN, AND GEOTECHNICAL REPORT.

B. ALL CONSTRUCTION SHALL BE IN STRICT ACCORDANCE WITH THE OWNERS DESIGN GUIDELINES AND SPECIFICATIONS, AND WHERE APPLICABLE SHALL MEET THE REQUIREMENTS OF THE GOVERNING/PERMITTING AUTHORITY HAVING JURISDICTION.

C. CONTRACTOR IS RESPONSIBLE FOR THEIR OWN HORIZONTAL AND VERTICAL CONTROL, REFERENCE POINTS AND CONSTRUCTION STAKING AS INCIDENTAL TO THE PROJECT.

D. THE CONTRACTOR SHALL FIELD VERIFY EXISTING ELEVATIONS/PROPERTY LINES/UTILITIES/DRAINAGE PRIOR TO CONSTRUCTION START.

E. ALL WORK NOT CLASSIFIED AS A CONTRACT PAY ITEM SHALL BE CONSIDERED AS INCIDENTAL AND THE COST THEREOF SHALL BE INCLUDED IN THE UNIT PRICE BID FOR ITEMS WHICH ARE CLASSIFIED FOR PAYMENT.

F. CONTRACTOR SHALL REFER TO THE ARCHITECTURAL AND MEP PLANS AND SPECIFICATIONS BEING A PART OF THE CONSTRUCTION DOCUMENTS FOR THE EXACT LOCATIONS AND DIMENSIONS OF ENTRY, EXIT PORCHES, PRECISE BUILDING DIMENSIONS, EXACT BUILDING UTILITY ENTRANCE, AND DOWNSPOUT LOCATIONS/SPECIFICATIONS/DETAILS.

G. ALL DIMENSIONS SHOWN ARE TO THE FACE OF CURB (FC) UNLESS OTHERWISE NOTED.

H. PARKING LOT STRIPING SHALL BE 4" WIDE AND WHITE IN COLOR. HANDICAP PARKING STALLS STRIPING AND SIGNAGE SHALL BE IN STRICT ACCORDANCE WITH FEDERAL, STATE, AND LOCAL REQUIREMENTS.

I. UNLESS OTHERWISE NOTED ALL RADII SHALL BE 3'.

J. BUILDING DIMENSIONS ARE TO OUTSIDE OF MASONRY, UNLESS OTHERWISE SHOWN.

K. CONTRACTOR SHALL REFER TO THE ARCHITECTURAL PLANS AND SPECIFICATIONS FOR ACTUAL LOCATION AND DETAILS OF ALL UTILITY ENTRANCES. CONTRACTOR SHALL COORDINATE INSTALLATION OF UTILITIES IN SUCH A MANNER AS TO AVOID CONFLICTS AND ASSURE PROPER DEPTHS ARE ACHIEVED, AS WELL AS COORDINATED WITH ANY UTILITY COMPANIES FOR APPROVED LOCATIONS AND SCHEDULING OF TIE-INS/CONNECTIONS TO THEIR FACILITIES.

L. REFER TO ARCHITECTURE PLANS FOR SITE LIGHTING AND ELECTRICAL CONDUIT PLANS. POLE LOCATIONS ARE SHOWN ON THIS SHEET FOR REFERENCE ONLY. IT IS THE CONTRACTOR'S RESPONSIBILITY TO IDENTIFY AND ADJUST ANY CONSTRUCTED CONFLICTS WITH UNDERGROUND UTILITIES, SIDEWALKS, ETC.

M. CHECK ARCHITECTURAL PLANS FOR EXACT DOWNSPOUT LOCATIONS.

N. CONTRACTOR SHALL REFER TO LANDSCAPE AND IRRIGATION PLAN FOR LOCATION AND CONSTRUCTION DETAILS OF LANDSCAPING AND IRRIGATION.

NOTE: CONTRACTOR IS RESPONSIBLE FOR ENSURING THAT ALL PROPOSED WORK MEETS ADA REQUIREMENTS. REFER TO www.access-board.gov/ada-aba/ada-standards-doj.cfm

NOTE: CONTRACTOR SHALL CONSTRUCT AND INSTALL WHEEL STOPS, SIGNS, AND ADA RAMPS AT ALL HANDICAP SPACES.

N

SCALE IN FEET
0 40' 60' 80'

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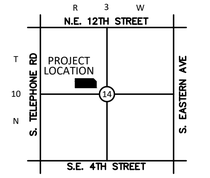
LOCATION MAP:



NOT TO SCALE

PROJECT:

CENTRAL JUNIOR HIGH CLASSROOM ADDITION

400 N. BROADWAY ST.
MOORE, OKLAHOMA

PROJECT NUMBER: 25031
DRAWING DATE: 06.02.25
ISSUE DATE: 06.02.25

SEAL:

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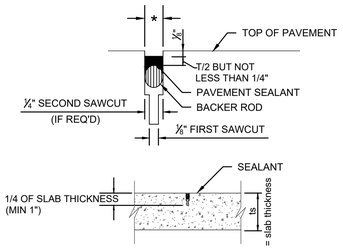
DRAWING TITLE:

SITE PLAN

SHEET:

C2.00



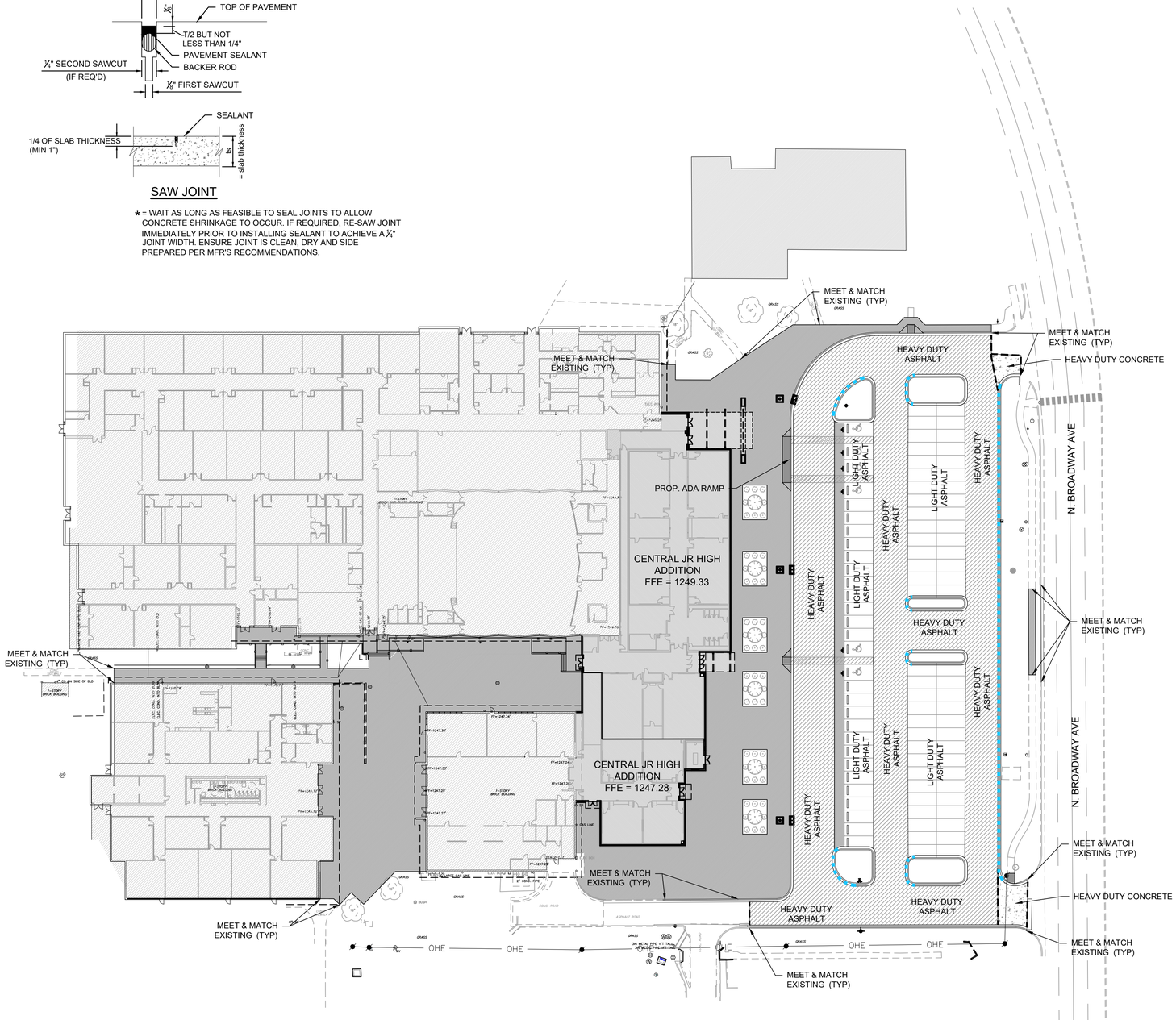
SAW JOINT

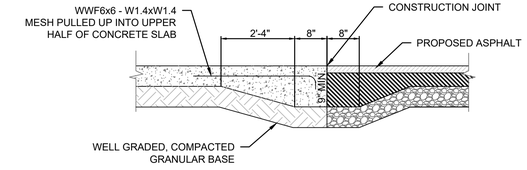
★ = WAIT AS LONG AS FEASIBLE TO SEAL JOINTS TO ALLOW CONCRETE SHRINKAGE TO OCCUR. IF REQUIRED, RE-SAW JOINT IMMEDIATELY PRIOR TO INSTALLING SEALANT TO ACHIEVE A ¼" JOINT WIDTH. ENSURE JOINT IS CLEAN, DRY AND SIDE PREPARED PER MFR'S RECOMMENDATIONS.

PAVING LEGEND

- SIDEWALK PAVEMENT
- HEAVY DUTY DUMPSTER CONCRETE PAVEMENT
- HEAVY DUTY ASPHALT PAVEMENT
- LIGHT DUTY ASPHALT PAVEMENT
- ASPHALT TO CONCRETE THICKENED EDGE
- OMIT GUTTER VALLEY

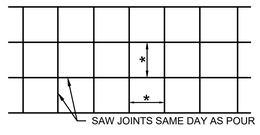
NOTE: PAVING SECTIONS SHOWN ON CIVIL PLANS ARE FOR INFORMATIONAL PURPOSES ONLY. GEOTECHNICAL REPORT AND RECOMMENDATIONS SHALL GOVERN. CONTRACTOR SHALL CONTACT ENGINEER IF THERE IS A CONFLICT BETWEEN GEOTECHNICAL RECOMMENDATIONS AND CIVIL PLANS.





CONCRETE TO ASPHALT THICKENED EDGE

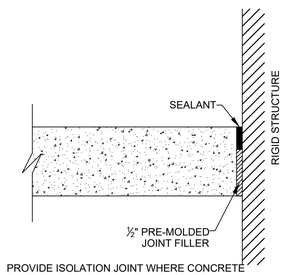
NOT TO SCALE



★ = 30 x SLAB THICKNESS

CONCRETE PAVEMENT

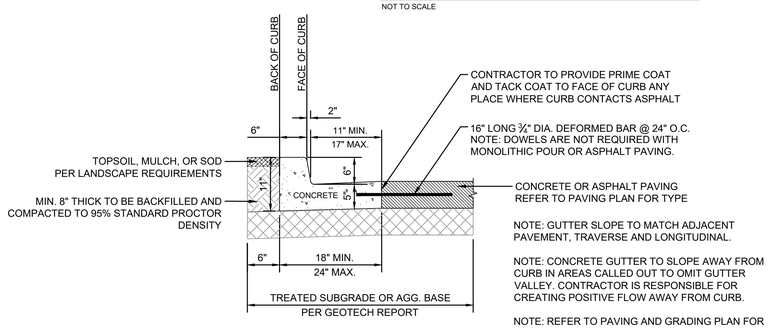
PLAN VIEW



PROVIDE ISOLATION JOINT WHERE CONCRETE PAVEMENT ABUTS A RIGID STRUCTURE

ISOLATION JOINT

NOT TO SCALE



NOTE: GUTTER SLOPE TO MATCH ADJACENT PAVEMENT, TRAVERSE AND LONGITUDINAL.

NOTE: CONCRETE GUTTER TO SLOPE AWAY FROM CURB IN AREAS CALLED OUT TO OMIT GUTTER VALLEY. CONTRACTOR IS RESPONSIBLE FOR CREATING POSITIVE FLOW AWAY FROM CURB.

NOTE: REFER TO PAVING AND GRADING PLAN FOR AREAS TO OMIT VALLEY GUTTER.

CURB & GUTTER DETAIL

NOT TO SCALE

N

SCALE IN FEET
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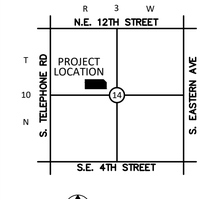

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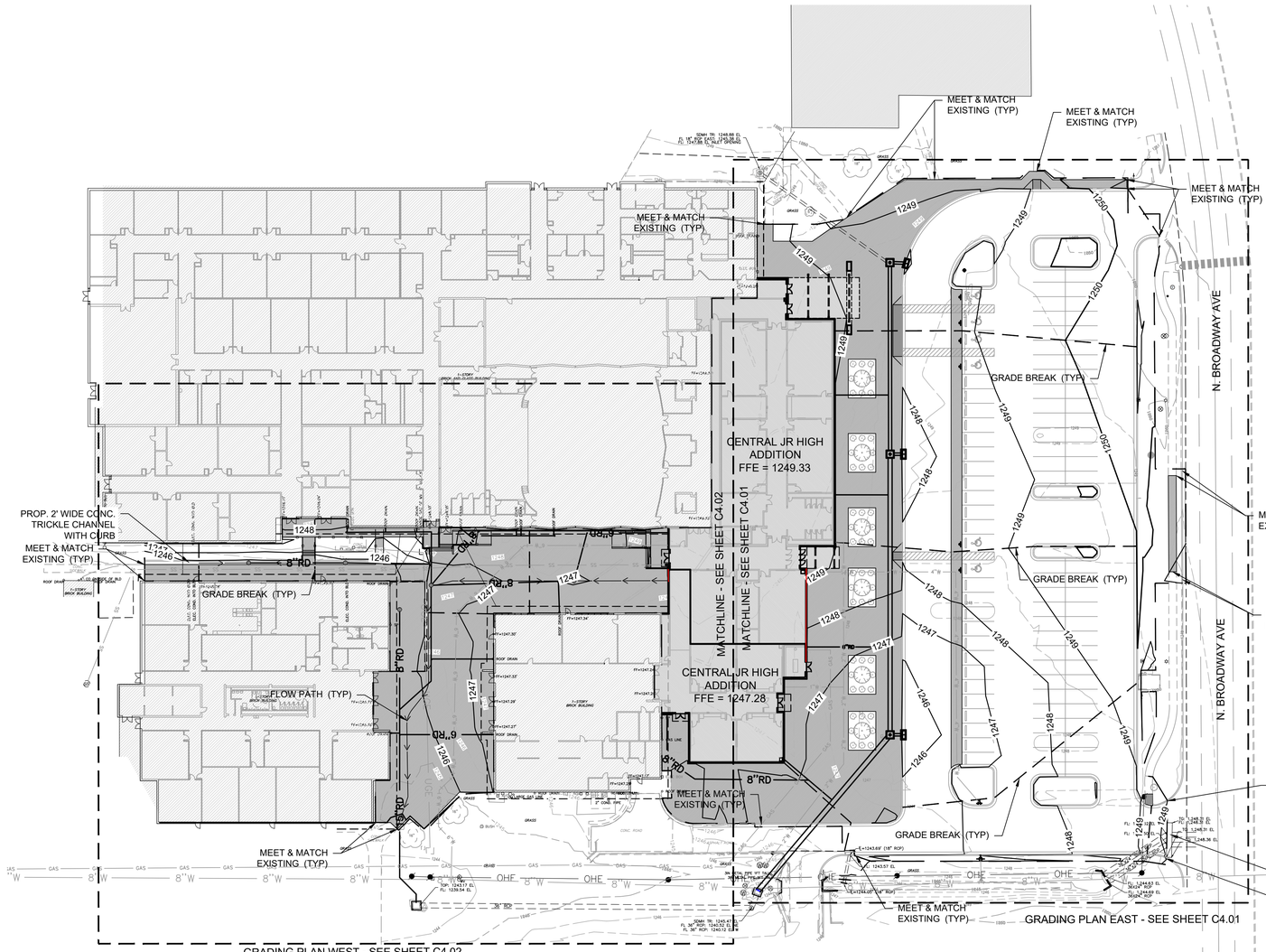
DRAWING TITLE:

PAVING PLAN

SHEET:

C3.00



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PROP. INLETS (SEE GRADING PLAN FOR TYPE)

VERTICAL SEPARATION REQUIREMENT

*NOTE: REFER TO SURVEYING LEGEND FOR EXISTING STRUCTURES IDENTIFICATION

GRADING NOTES

A. CONTRACTOR SHALL REFER TO THE SITE SPECIFIC GEOTECHNICAL REPORT FOR EXISTING SOIL CONDITIONS, CONSIDERATIONS, AND RECOMMENDATIONS.

B. CONTRACTOR SHALL REFER TO THE CONSTRUCTION DOCUMENTS INCLUDING BUT NOT LIMITED TO THE WRITTEN SPECIFICATIONS, CONSTRUCTION DRAWINGS, STORM WATER POLLUTION PLAN, AND GEOTECHNICAL REPORT.

C. CONTRACTOR IS RESPONSIBLE FOR THEIR OWN HORIZONTAL AND VERTICAL CONTROL, REFERENCE POINTS AND CONSTRUCTION STAKING AS INCIDENTAL TO THE PROJECT.

D. THE CONTRACTOR SHALL FIELD VERIFY EXISTING ELEVATIONS/PROPERTY LINES/UTILITIES/DRAINAGE PRIOR TO CONSTRUCTION START.

E. ALL SITE EXCAVATION SHALL BE CONSIDERED UNCLASSIFIED EXCAVATION.

F. GENERAL CONTRACTOR TO PROVIDE A UNIT PRICE FOR REMOVAL AND REPLACEMENT OF SOILS ON THIS SITE SHOULD REMOVAL BE REQUIRED.

G. ALL WORK NOT CLASSIFIED AS A CONTRACT PAY ITEM SHALL BE CONSIDERED AS INCIDENTAL AND THE COST THEREOF SHALL BE INCLUDED IN THE UNIT PRICE BID FOR ITEMS WHICH ARE CLASSIFIED FOR PAYMENT.

H. CONTRACTOR SHALL PROVIDE FINAL GRADES THAT DO NOT OBSTRUCT ANY UTILITY ACCESS AND PROVIDE A SMOOTH TRANSITION TO MEET AND MATCH EXISTING GRADES ON ALL SIDES.

I. ADA ROUTES ARE NOT TO EXCEED 1:20 RUNNING SLOPE AND 2% CROSS SLOPE. HANDICAP PARKING AND ACCESS AISLES SHALL NOT EXCEED 2% IN ANY DIRECTION.

J. ALL NATURAL GROUND SLOPES SHALL NOT EXCEED 3:1. PAVING SLOPES SHALL NOT EXCEED 8%.

K. CONTRACTOR SHALL ENSURE THAT ALL NECESSARY EARTH DISTURBING PERMITS HAVE BEEN ACQUIRED AND MEET THE CONDITIONS/REQUIREMENTS SET FORTH IN THE PERMITS PRIOR TO CONSTRUCTION.

L. CONTRACTOR IS REQUIRED TO CALL ONE CALL AS WELL AS THE APPROPRIATE UTILITY COMPANY AT LEAST 48 HOURS BEFORE ANY EXCAVATION/CONSTRUCTION ACTIVITIES TAKE PLACE. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO RELOCATE ALL EXISTING UTILITIES WHICH ARE IN CONFLICT WITH PROPOSED IMPROVEMENTS.

M. THE CONTRACTOR SHALL GRADE SITE TO ENSURE ALL SURFACE WATER DRAINAGE IS AWAY FROM THE BUILDING AND PROVIDES POSITIVE DRAINAGE SO THAT NO STANDING/PONDING WATER TAKES PLACE ON SITE OR ON ADJACENT PROPERTIES.

N. ALL CONSTRUCTION SHALL BE IN STRICT ACCORDANCE WITH THE OWNERS DESIGN GUIDELINES AND SPECIFICATIONS, AND WHERE APPLICABLE SHALL MEET THE REQUIREMENTS OF THE GOVERNING/PERMITTING AUTHORITY HAVING JURISDICTION.

O. THE BUILDING SUBGRADE SHALL BE CONSTRUCTED TO INCLUDE A MINIMUM OF 10 FEET BEYOND THE BUILDING LIMITS AS SHOWN ON THE PLANS, OR AS DIRECTED BY THE OWNER.

P. REFERENCE ARCHITECTURAL AND STRUCTURAL DRAWINGS FOR REQUIRED FLOOR SLAB THICKNESS.

Q. THE BUILDING PAD SUBGRADE SHALL BE PREPARED IN STRICT ACCORDANCE WITH THE GEOTECHNICAL ENGINEERING STUDY AND THE CIVIL SPECIFICATIONS.

R. ESTABLISH FINAL SUBGRADE ELEVATIONS TO ALLOW FOR PAVEMENT/SLAB SECTIONS AS INDICATED ON THE PLANS.

S. IF CONFLICTS EXIST BETWEEN THE GEOTECHNICAL REPORT AND THE CONSTRUCTION DRAWINGS AND SPECIFICATIONS, THE MORE STRINGENT REQUIREMENTS SHALL APPLY.

SPOT ELEVATION LEGEND

- TC - TOP OF CURB
- G - GUTTER
- TP - TOP OF PAVEMENT
- HP - HIGH POINT
- LP - LOW POINT
- SW - SIDEWALK
- FF - FINISH FLOOR
- FG - FINAL GRADE
- TW - TOP OF WALL
- BW - BOTTOM OF WALL
- NOTE: BW IS BOTTOM OF WALL AT GRADE, NOT FOOTING

VERTICAL SEPARATION REQUIREMENT

N

SCALE IN FEET
0 20' 30' 40'

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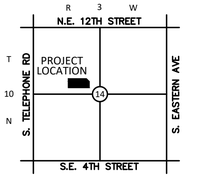
LOCATION MAP:



NOT TO SCALE

PROJECT:

CENTRAL JUNIOR HIGH CLASSROOM ADDITION

400 N. BROADWAY ST.
MOORE, OKLAHOMA

PROJECT NUMBER: 25031
DRAWING DATE: 06.02.25
ISSUE DATE: 06.02.25

SEAL:

SUBMITTAL:

PERMIT SET

REVISIONS:

MARK	DATE	DESCRIPTION

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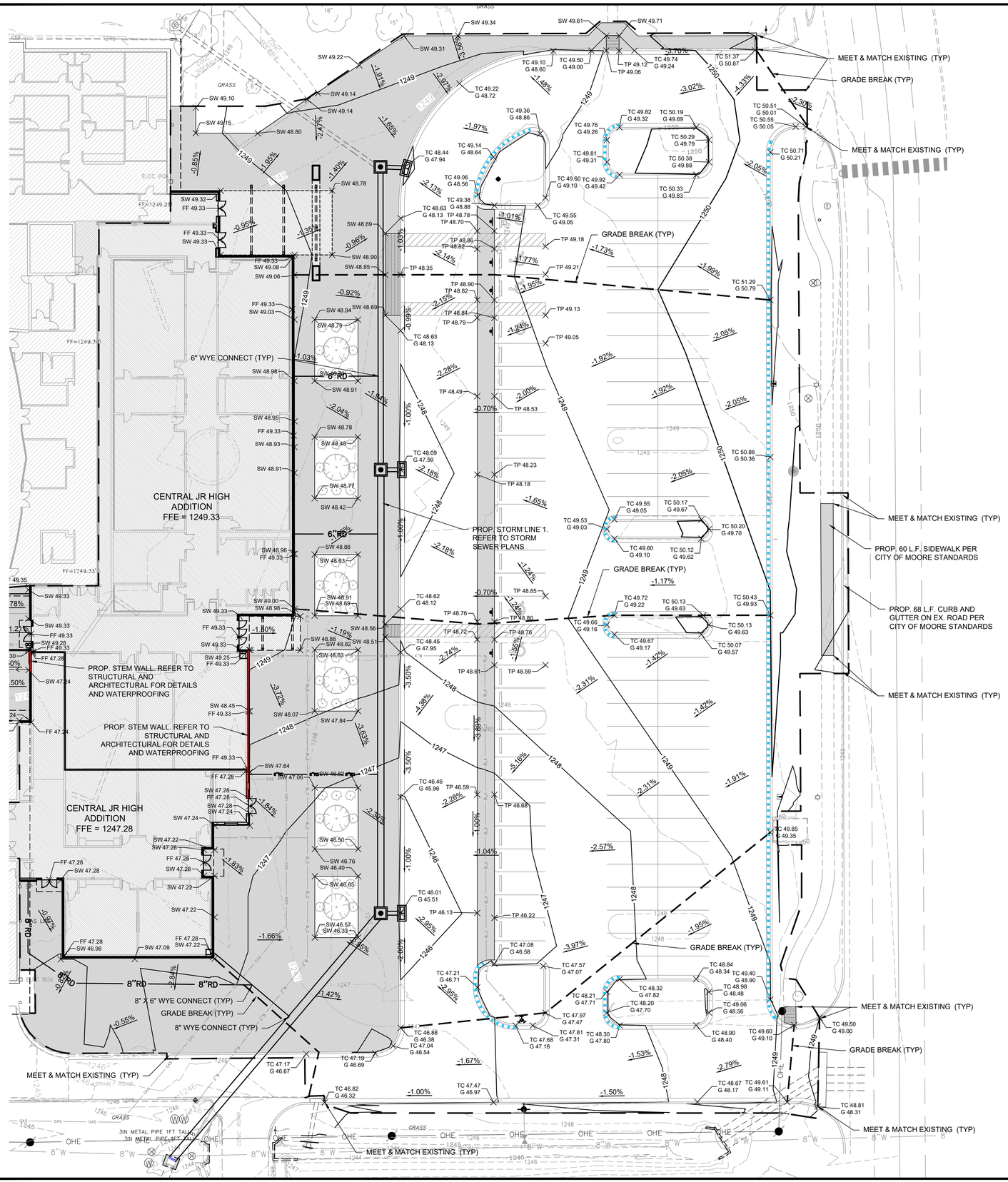
DRAWING TITLE:

GRADING PLAN

SHEET:

C4.00


CENTRAL JR HIGH ADDITION FFE = 1249.33
CENTRAL JR HIGH ADDITION FFE = 1247.28
6" WYE CONNECT (TYP)
6" RD
6"RD
8"RD
8" X 6" WYE CONNECT (TYP)
GRADE BREAK (TYP)
8" WYE CONNECT (TYP)
PROP. STORM LINE 1. REFER TO STORM SEWER PLANS
PROP. STEM WALL. REFER TO STRUCTURAL AND ARCHITECTURAL FOR DETAILS AND WATERPROOFING
PROP. STEM WALL. REFER TO STRUCTURAL AND ARCHITECTURAL FOR DETAILS AND WATERPROOFING
MEET & MATCH EXISTING (TYP)
GRADE BREAK (TYP)
MEET & MATCH EXISTING (TYP)
MEET & MATCH EXISTING (TYP)
PROP. 60 L.F. SIDEWALK PER CITY OF MOORE STANDARDS
PROP. 68 L.F. CURB AND GUTTER ON EX. ROAD PER CITY OF MOORE STANDARDS
MEET & MATCH EXISTING (TYP)
MEET & MATCH EXISTING (TYP)
GRADE BREAK (TYP)
GRADE BREAK (TYP)
GRADE BREAK (TYP)
MEET & MATCH EXISTING (TYP)
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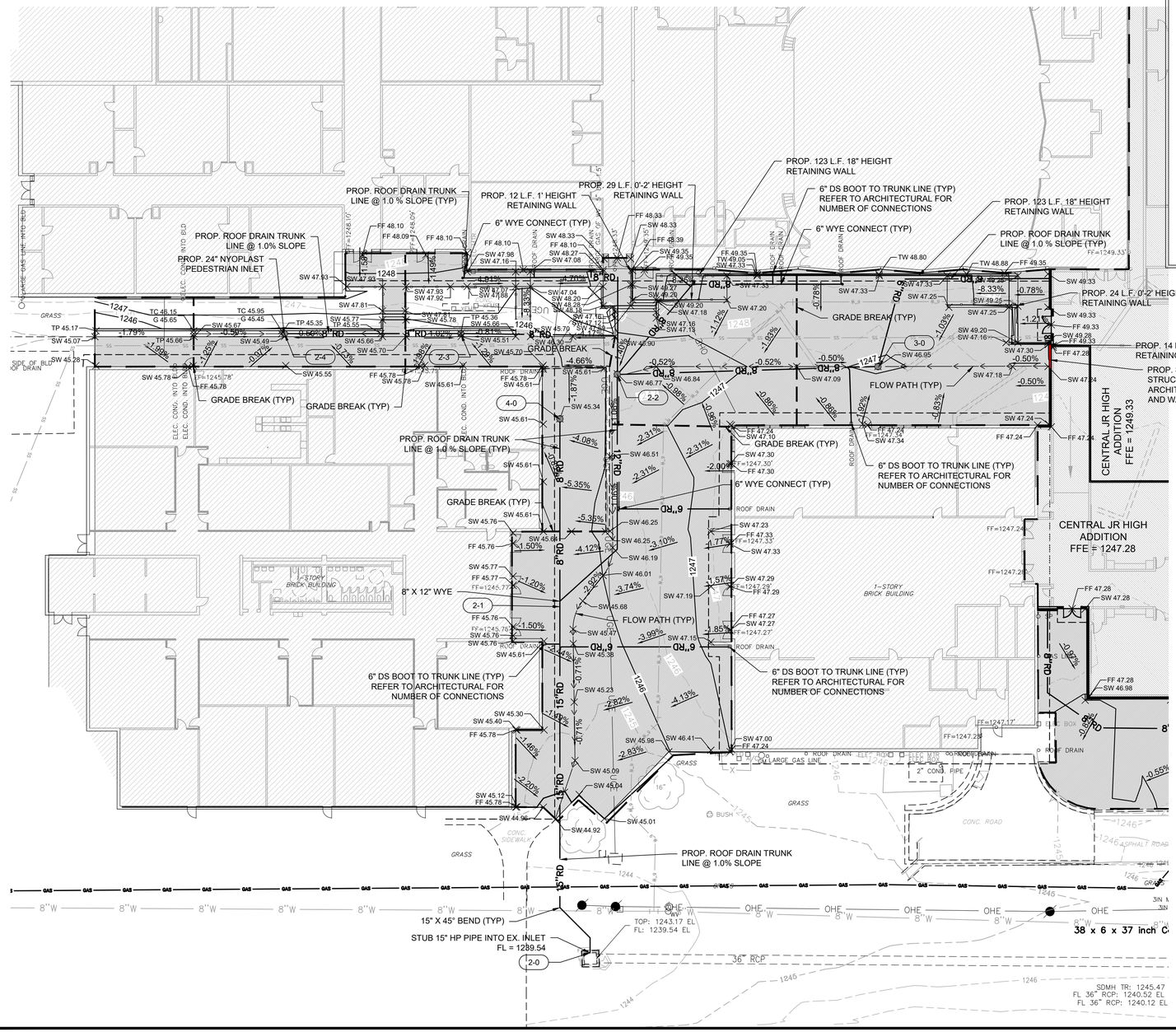

LEGEND

- EXISTING 1' CONTOUR
- EXISTING 5' CONTOUR
- PROPOSED 1' CONTOUR
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- BOUNDARY LINE
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- UGT — UNDERGROUND TELEPHONE LINE
- FO — UNDERGROUND FIBER OPTIC LINE
- SS — SANITARY SEWER LINE
- W — WATERLINE
- RETAINING WALL
- SCREEN WALL
- WIRE FENCE
- CHAIN LINK FENCE
- BENCHMARK
- OMIT GUTTER VALLEY

- PROP. FIRE HYDRANT
- PROP. WATER VALVE
- PROP. WATER METER
- PROP. ELECT. METER
- PROP. LIGHT POLE
- PROP. BOLLARD
- PROP. TRANSFORMER
- PROP. PARKING COUNT
- PROP. WHEEL STOP
- PROP. FES
- PROP. HC RAMP
- PROP. POWER POLE
- PROP. SS MANHOLE
- PROP. GAS METER
- PROP. SIGN
- PROP. FIRE ROUTE SIGN

PROP. INLETS (SEE GRADING PLAN FOR TYPE)

VS VERTICAL SEPARATION REQUIREMENT

*NOTE: REFER TO SURVEYING LEGEND FOR EXISTING STRUCTURES IDENTIFICATION

GRADING NOTES

A. CONTRACTOR SHALL REFER TO THE SITE SPECIFIC GEOTECHNICAL REPORT FOR EXISTING SOIL CONDITIONS, CONSIDERATIONS, AND RECOMMENDATIONS.

B. CONTRACTOR SHALL REFER TO THE CONSTRUCTION DOCUMENTS INCLUDING BUT NOT LIMITED TO THE WRITTEN SPECIFICATIONS, CONSTRUCTION DRAWINGS, STORM WATER POLLUTION PLAN, AND GEOTECHNICAL REPORT.

C. CONTRACTOR IS RESPONSIBLE FOR THEIR OWN HORIZONTAL AND VERTICAL CONTROL, REFERENCE POINTS AND CONSTRUCTION STAKING AS INCIDENTAL TO THE PROJECT.

D. THE CONTRACTOR SHALL FIELD VERIFY EXISTING ELEVATIONS/PROPERTY LINES/UTILITIES/DRAINAGE PRIOR TO CONSTRUCTION START.

E. ALL SITE EXCAVATION SHALL BE CONSIDERED UNCLASSIFIED EXCAVATION.

F. GENERAL CONTRACTOR TO PROVIDE A UNIT PRICE FOR REMOVAL AND REPLACEMENT OF SOILS ON THIS SITE SHOULD REMOVAL BE REQUIRED.

G. ALL WORK NOT CLASSIFIED AS A CONTRACT PAY ITEM SHALL BE CONSIDERED AS INCIDENTAL AND THE COST THEREOF SHALL BE INCLUDED IN THE UNIT PRICE BID FOR ITEMS WHICH ARE CLASSIFIED FOR PAYMENT.

H. CONTRACTOR SHALL PROVIDE FINAL GRADES THAT DO NOT OBSTRUCT ANY UTILITY ACCESS AND PROVIDE A SMOOTH TRANSITION TO MEET AND MATCH EXISTING GRADES ON ALL SIDES.

I. ADA ROUTES ARE NOT TO EXCEED 1:20 RUNNING SLOPE AND 2% CROSS SLOPE. HANDICAP PARKING AND ACCESS AISLES SHALL NOT EXCEED 2% IN ANY DIRECTION.

J. ALL NATURAL GROUND SLOPES SHALL NOT EXCEED 3:1. PAVING SLOPES SHALL NOT EXCEED 8%.

K. CONTRACTOR SHALL ENSURE THAT ALL NECESSARY EARTH DISTURBING PERMITS HAVE BEEN ACQUIRED AND MEET THE CONDITIONS/REQUIREMENTS SET FORTH IN THE PERMITS PRIOR TO CONSTRUCTION.

L. CONTRACTOR IS REQUIRED TO CALL ONE CALL AS WELL AS THE APPROPRIATE UTILITY COMPANY AT LEAST 48 HOURS BEFORE ANY EXCAVATION/CONSTRUCTION ACTIVITIES TAKE PLACE. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO RELOCATE ALL EXISTING UTILITIES WHICH ARE IN CONFLICT WITH PROPOSED IMPROVEMENTS.

M. THE CONTRACTOR SHALL GRADE SITE TO ENSURE ALL SURFACE WATER DRAINAGE IS AWAY FROM THE BUILDING AND PROVIDES POSITIVE DRAINAGE SO THAT NO STANDING/PONDING WATER TAKES PLACE ON SITE OR ON ADJACENT PROPERTIES.

N. ALL CONSTRUCTION SHALL BE IN STRICT ACCORDANCE WITH THE OWNERS DESIGN GUIDELINES AND SPECIFICATIONS, AND WHERE APPLICABLE SHALL MEET THE REQUIREMENTS OF THE GOVERNING/PERMITTING AUTHORITY HAVING JURISDICTION.

O. THE BUILDING SUBGRADE SHALL BE CONSTRUCTED TO INCLUDE A MINIMUM OF 10 FEET BEYOND THE BUILDING LIMITS AS SHOWN ON THE PLANS, OR AS DIRECTED BY THE OWNER.

P. REFERENCE ARCHITECTURAL AND STRUCTURAL DRAWINGS FOR REQUIRED FLOOR SLAB THICKNESS.

Q. THE BUILDING PAD SUBGRADE SHALL BE PREPARED IN STRICT ACCORDANCE WITH THE GEOTECHNICAL ENGINEERING STUDY AND THE CIVIL SPECIFICATIONS.

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SW - SIDEWALK	

VS VERTICAL SEPARATION REQUIREMENT

- (2-0) STUB PROP. 15" HP PIPE INTO EX. CONCRETE BOX — FL = 1239.54
- (2-1) 12" TO 15" REDUCER — FL = 1240.79
- (2-2) 24" NYOPLAST PEDESTRIAN INLET — TG = 1246.77; FL 12" S = 1241.61; FL 8" N = 1241.65; FL 8" E = 1241.65; FL 8" NE = 1241.65
- (2-3) 24" NYOPLAST PEDESTRIAN INLET — TG = 1245.36; FL 8" W = 1242.30; FL 8" E = 1242.26
- (2-4) 24" NYOPLAST PEDESTRIAN INLET — TG = 1245.35; FL 8" E = 1242.87
- (3-0) 24" NYOPLAST PEDESTRIAN INLET — TG = 1246.95; FL 8" W = 1244.51
- (4-0) 24" NYOPLAST PEDESTRIAN INLET — TG = 1245.34; FL 8" S = 1241.40

N

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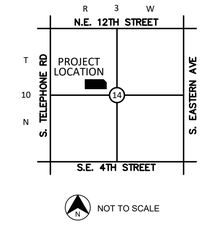

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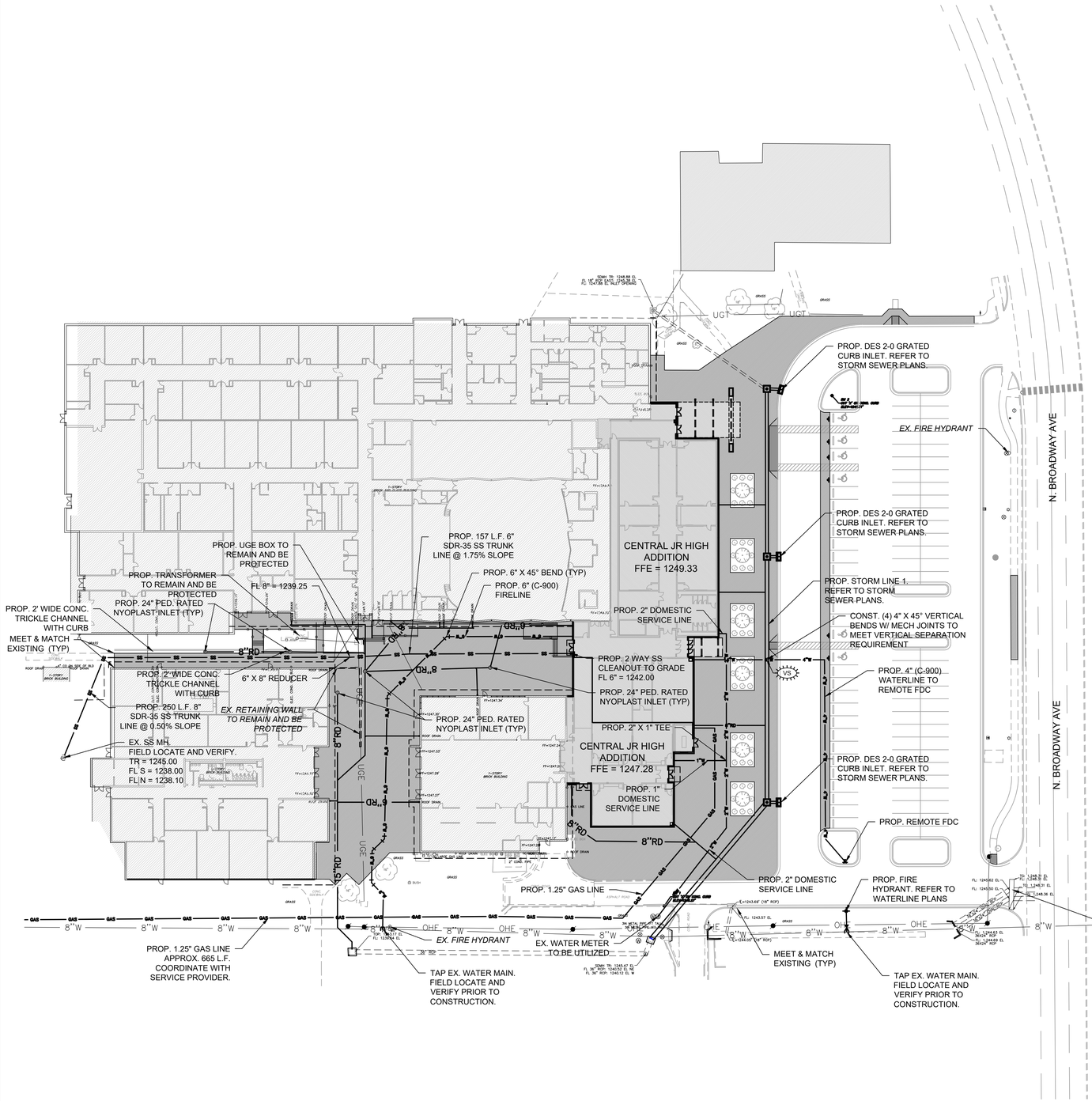
DRAWING TITLE:

GRADING PLAN WEST

SHEET:

C4.02



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PROP. INLETS (SEE GRADING PLAN FOR TYPE)

VERTICAL SEPARATION REQUIREMENT

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E. ALL WORK NOT CLASSIFIED AS A CONTRACT PAY ITEM SHALL BE CONSIDERED AS INCIDENTAL AND THE COST THEREOF SHALL BE INCLUDED IN THE UNIT PRICE BID FOR ITEMS WHICH ARE CLASSIFIED FOR PAYMENT.

F. CONTRACTOR SHALL REFER TO THE ARCHITECTURAL AND MEP PLANS AND SPECIFICATIONS BEING A PART OF THE CONSTRUCTION DOCUMENTS FOR THE EXACT LOCATIONS AND DIMENSIONS OF ENTRY, EXIT PORCHES, PRECISE BUILDING DIMENSIONS, EXACT BUILDING UTILITY ENTRANCE, AND DOWNSPOUT LOCATIONS/SPECIFICATIONS/DETAILS.

G. REFER TO ARCHITECTURE PLANS FOR SITE LIGHTING/LIGHT POLE BASES AND ELECTRICAL CONDUIT PLACEMENT AND SPECIFICATIONS. POLE LOCATIONS ARE SHOWN ON THIS SHEET FOR REFERENCE ONLY. IT IS THE CONTRACTOR'S RESPONSIBILITY TO IDENTIFY AND ADJUST ANY CONSTRUCTED CONFLICTS WITH UNDERGROUND UTILITIES, SIDEWALKS, ETC.

H. CONTRACTOR IS REQUIRED TO CALL ONE CALL AS WELL AS THE APPROPRIATE UTILITY COMPANY AT LEAST 48 HOURS BEFORE ANY EXCAVATION/CONSTRUCTION ACTIVITIES TAKE PLACE. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO RELOCATE ALL EXISTING UTILITIES WHICH ARE IN CONFLICT WITH PROPOSED IMPROVEMENTS.

I. CONTRACTOR SHALL ENSURE ALL CONSTRUCTED UTILITIES MEET THE MINIMUM SEPARATION AND COVER REQUIREMENTS SET FORTH BY THE PROVIDER, FEDERAL/STATE/LOCAL REGULATIONS, OR SPECIFICATIONS. IN THE EVENT THERE IS A CONFLICT THE MOST STRINGENT SHALL APPLY.

J. GENERAL CONTRACTOR TO PROVIDE 2'X2'X6" THICK CONCRETE APRON AT ALL CLEANOUTS, VALVES AND METERS OUTSIDE OF BUILDING.

K. GENERAL CONTRACTOR SHALL BE RESPONSIBLE FOR ALL TAP AND TIE ON FEES REQUIRED, AS WELL AS COST OF UNDERGROUND SERVICE CONNECTIONS TO THE BUILDINGS.

L. THRUST BLOCKING SHALL BE PROVIDED AT ALL BENDS, TEES, AND FIRE HYDRANTS.

M. DIMENSIONS SHOWN ARE TO CENTERLINE OF PIPE OR FITTING.

N. ALL WATER AND SANITARY SEWER LEADS TO BUILDING SHALL END 5' OUTSIDE THE BUILDING LIMITS AS SHOWN ON PLAN AND SHALL BE PROVIDED WITH A TEMPORARY PLUG AT END.

O. ALL FIRE HYDRANTS SHALL BE PROVIDED WITH AN APPROVED GATE VALVE A MAXIMUM OF 5'(UNLESS OTHERWISE SPECIFIED BY CITY OFFICIAL) FROM HYDRANT.

P. CONTRACTOR SHALL COMPLY COMPLETELY WITH THE LATEST STANDARDS OF OSHA DIRECTIVES OR ANY OTHER AGENCY HAVING JURISDICTION FOR EXCAVATION AND TRENCHING PROCEDURES. THE CONTRACTOR SHALL USE SUPPORT SYSTEMS, SLOPING, BENCHING AND OTHER MEANS OF PROTECTION. THIS IS TO INCLUDE, BUT NOT LIMITED FOR ACCESS AND EGRESS FROM ALL EXCAVATION AND TRENCHING. CONTRACTOR IS RESPONSIBLE FOR COMPLYING WITH PERFORMANCE CRITERIA AS REQUIRED BY OSHA.

Q. REFER TO FIRE PROTECTION SHEETS FOR LOCATION AND DETAIL OF FIRE LINE LEAD IN. FIRE LINE SHALL BE STUBBED UP 1' ABOVE FFE IN SPRINKLER ROOM.

R. REFER TO PLUMBING SHEETS FOR LOCATION AND DETAILS OF SEWER, DOMESTIC, AND IRRIGATION CONNECTIONS.

S. CONTRACTOR SHALL REFER TO IRRIGATION PLANS FOR ACTUAL LOCATION, SIZE, LENGTH AND DEPTH. TEMPORARILY PLUG BOTH ENDS. IRRIGATION CONTRACTOR WILL REMOVE TEMPORARY PLUGS, INSTALL LINES AND PROPERLY SEAL BOTH ENDS.

T. THE FIRE DEPARTMENT CONNECTION (FDC) SHALL BE LOCATED ON THE STREET SIDE OF ANY STRUCTURE. THE FDC SHALL BE LOCATED AND ARRANGED SO THAT THE HOSE LINES CAN BE READILY ATTACHED TO THE INLETS WITHOUT INTERFERENCE FROM OBJECTS.

U. IT IS THE CONTRACTOR'S RESPONSIBILITY TO COORDINATE THE EXTENSIONS OF ALL UTILITY SERVICE LINES TO THE MAIN UTILITY LINES.

V. ALL CONDUIT SHALL BE SCHEDULE 40 PVC, UNLESS OTHERWISE NOTED.

W. CONTRACTOR SHALL REFER TO LANDSCAPE AND IRRIGATION PLAN FOR LOCATION AND CONSTRUCTION DETAILS OF LANDSCAPING AND IRRIGATION.

N

SCALE IN FEET
0 40' 60' 80'

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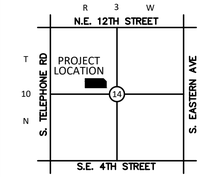

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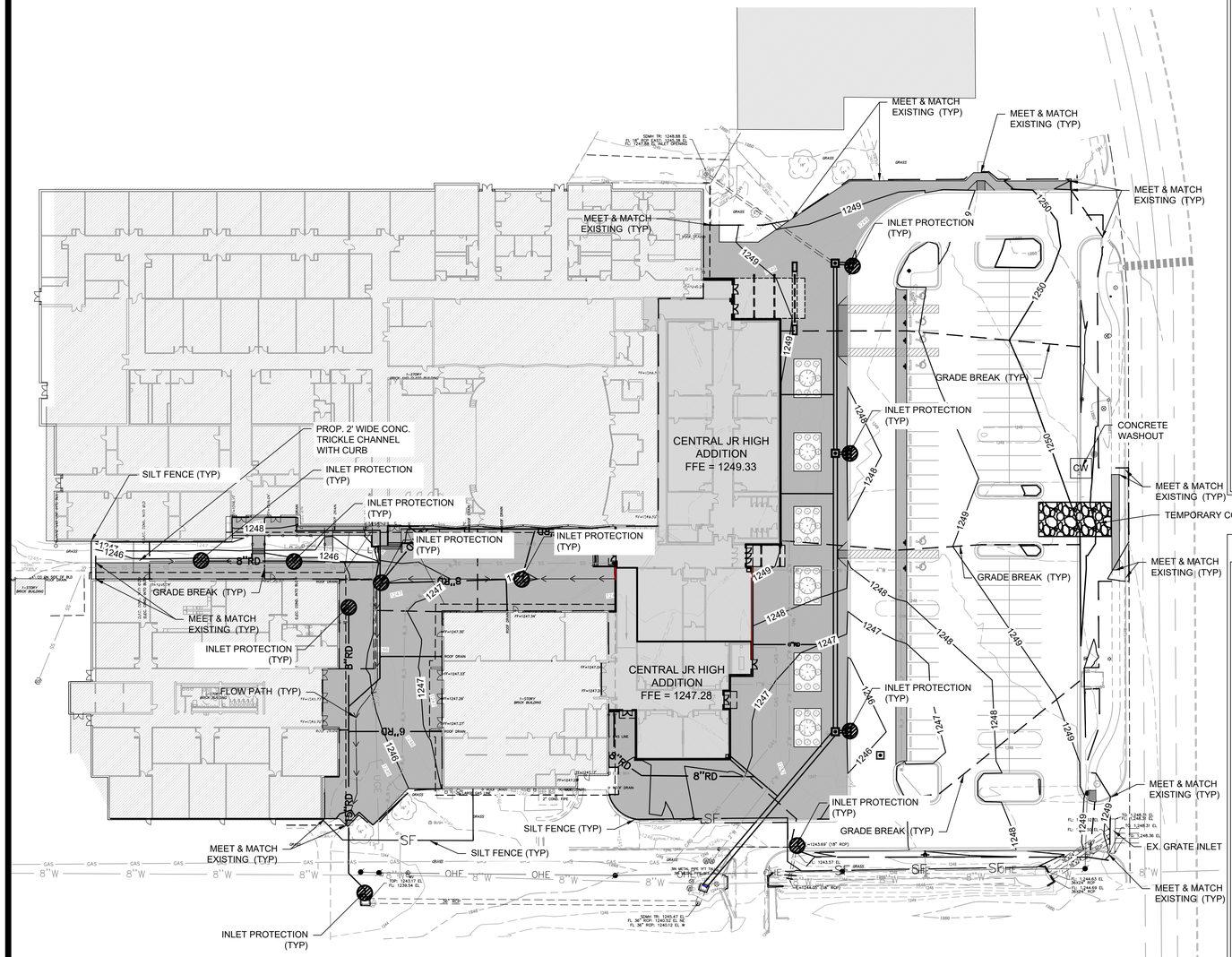
DRAWING TITLE:

UTILITY PLAN

SHEET:

C5.00



EROSION CONTROL NOTES

A. SEDIMENT BASINS ARE ATTRACTIVE TO CHILDREN AND CAN BE VERY DANGEROUS. IN ALL CASES, LOCAL ORDINANCES AND REGULATIONS REGARDING HEALTH AND SAFETY MUST BE ADHERED TO.

B. ALL CONTRACTORS AND SUBCONTRACTORS INVOLVED WITH STORM WATER POLLUTION PREVENTION SHALL OBTAIN A COPY OF THE STORM WATER POLLUTION PREVENTION PLAN AND THE STATE OF OKLAHOMA NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM GENERAL PERMIT (NPDES PERMIT) AND BECOME FAMILIAR WITH THEIR CONTENTS.

C. ALL TEMPORARY EROSION AND SEDIMENT CONTROL MEASURES SHALL BE DISPOSED OF WITHIN 30 DAYS AFTER FINAL STABILIZATION. FINAL STABILIZATION HAS OCCURRED WHEN ALL SOIL DISTURBING ACTIVITIES ARE COMPLETED AND A UNIFORM PERENNIAL VEGETATIVE COVER WITH A DENSITY OF 70% OF THE COVER FOR UNPAVED AREAS AND AREAS NOT COVERED BY PERMANENT STRUCTURES HAS BEEN EMPLOYED.

D. BEST MANAGEMENT PRACTICES (BMP'S) AND CONTROLS SHALL CONFORM TO FEDERAL, STATE, OR LOCAL REQUIREMENTS OR MANUAL OF PRACTICE, AS APPLICABLE CONTRACTOR SHALL IMPLEMENT ADDITIONAL CONTROLS AS DIRECTED BY PERMITTING AGENCY OR OWNER.

E. CONTRACTOR SHALL MINIMIZE CLEARING TO THE MAXIMUM EXTENT PRACTICAL OR AS REQUIRED BY THE GENERAL PERMIT.

F. GENERAL CONTRACTOR SHALL DENOTE ON PLAN THE TEMPORARY PARKING AND STORAGE AREA WHICH SHALL ALSO BE USED AS THE EQUIPMENT MAINTENANCE AND CLEANING AREA, EMPLOYEE PARKING AREA, AND AREA FOR LOCATING PORTABLE FACILITIES, OFFICE TRAILERS, AND TOILET FACILITIES.

G. ALL WASH WATER (CONCRETE TRUCKS, VEHICLE CLEANING, EQUIPMENT CLEANING, ETC.) SHALL BE DETAINED AND PROPERLY TREATED OR DISPOSED.

H. SUFFICIENT OIL AND GREASE ABSORBING MATERIALS AND FLOTATION BOOMS SHALL BE MAINTAINED ON SITE OR READILY AVAILABLE TO CONTAIN AND CLEAN-UP FUEL OR CHEMICAL SPILLS AND LEAKS.

I. DUST ON THE SITE SHALL BE CONTROLLED. THE USE OF MOTOR OILS AND OTHER PETROLEUM BASED OR TOXIC LIQUIDS FOR DUST SUPPRESSION OPERATIONS IS PROHIBITED.

J. RUBBISH, TRASH, GARBAGE, LITTER, OR OTHER SUCH MATERIALS SHALL BE DEPOSITED INTO SEALED CONTAINERS. MATERIALS SHALL BE PREVENTED FROM LEAVING THE PREMISES THROUGH THE ACTION OF WIND OR STORMWATER DISCHARGE INTO DRAINAGE DITCHES OR WATERS OF THE STATE.

K. ALL STORM WATER POLLUTION PREVENTION MEASURES PRESENTED ON THIS PLAN, AND IN THE STORM WATER POLLUTION PREVENTION PLAN, SHALL BE INITIATED AS SOON AS PRACTICABLE.

L. DISTURBED PORTIONS OF THE SITE WHERE CONSTRUCTION ACTIVITY HAS STOPPED FOR AT LEAST 14 DAYS, SHALL BE TEMPORARILY SEEDED. THESE AREAS SHALL BE SEEDED NO LATER THAN 14 DAYS FROM THE LAST CONSTRUCTION ACTIVITY OCCURRING IN THESE AREAS.

M. DISTURBED PORTIONS OF THE SITE WHERE CONSTRUCTION ACTIVITY HAS PERMANENTLY STOPPED SHALL BE PERMANENTLY SEEDED. THESE AREAS SHALL BE SEEDED NO LATER THAN 14 DAYS AFTER THE LAST CONSTRUCTION ACTIVITY OCCURRING IN THESE AREAS. REFER TO THE GRADING PLAN AND/OR LANDSCAPE PLAN.

N. IF THE ACTION OF VEHICLES TRAVELING OVER THE GRAVEL CONSTRUCTION ENTRANCES IS NOT SUFFICIENT TO REMOVE THE MAJORITY OF DIRT OR MUD, THEN THE TIRES MUST BE WASHED BEFORE THE VEHICLES ENTER A PUBLIC ROAD. IF WASHING IS USED, PROVISIONS MUST BE MADE TO INTERCEPT THE WASH WATER AND TRAP THE SEDIMENT BEFORE IT IS CARRIED OFF THE SITE.

O. ALL MATERIALS SPILLED, DROPPED, WASHED, OR TRACKED FROM VEHICLES ONTO ROADWAYS OR INTO STORM DRAINS MUST BE REMOVED IMMEDIATELY.

P. CONTRACTORS OR SUBCONTRACTORS WILL BE RESPONSIBLE FOR REMOVING SEDIMENT IN THE DETENTION POND AND ANY SEDIMENT THAT MAY HAVE COLLECTED IN THE STORM SEWER DRAINAGE SYSTEMS IN CONJUNCTION WITH THE STABILIZATION OF THE SITE.

Q. ON-SITE & OFFSITE SOIL STOCKPILE AND BORROW AREAS SHALL BE PROTECTED FROM EROSION AND SEDIMENTATION THROUGH IMPLEMENTATION OF BEST MANAGEMENT PRACTICES. STOCKPILE AND BORROW AREA LOCATIONS SHALL BE NOTED ON THE SITE PLAN AND PERMITTED IN ACCORDANCE WITH GENERAL PERMIT REQUIREMENTS.

R. SLOPES SHALL BE LEFT IN A ROUGHENED CONDITION DURING THE GRADING PHASE TO REDUCE RUNOFF VELOCITIES AND EROSION.

S. DUE TO THE GRADE CHANGES DURING THE DEVELOPMENT OF THE PROJECT, THE CONTRACTOR SHALL BE RESPONSIBLE FOR ADJUSTING THE EROSION CONTROL MEASURES (SILT FENCES, STRAW BALES, ETC.) TO PREVENT EROSION.

T. ALL CONSTRUCTION SHALL BE STABILIZED AT THE END OF EACH WORKING DAY, THIS INCLUDES BACKFILLING OF TRENCHES FOR UTILITY CONSTRUCTION AND PLACEMENT OF GRAVEL OR BITUMINOUS PAVING FOR ROAD CONSTRUCTION.

U. A 3' STRIP OF SOD SHALL BE PLACED ALONG THE EDGE OF ALL PAVING TO ACT AS A SEDIMENT BUFFER AND AID IN THE ESTABLISHMENT OF VEGETATION.

LEGEND

- EXISTING 1' CONTOUR
- EXISTING 5' CONTOUR
- PROPOSED 1' CONTOUR
- PROPOSED 5' CONTOUR
- BOUNDARY LINE
- RIGHT OF WAY LINE
- EASEMENT LINE
- EXISTING CURB AND GUTTER
- PROPOSED CURB AND GUTTER
- PROPOSED FIRE LANE STRIPING
- OHE — OVERHEAD ELECTRIC LINE
- UGE — UNDERGROUND ELECTRIC LINE
- GAS — GAS LINE
- UGT — UNDERGROUND TELEPHONE LINE
- FO — UNDERGROUND FIBER OPTIC LINE
- SS — SANITARY SEWER LINE
- W — WATERLINE
- RETAINING WALL
- SCREEN WALL
- WIRE FENCE
- CHAIN LINK FENCE
- BENCHMARK

- PROP. FIRE HYDRANT
- PROP. WATER VALVE
- PROP. WATER METER
- PROP. ELECT. METER
- PROP. LIGHT POLE
- PROP. BOLLARD
- PROP. TRANSFORMER
- PROP. PARKING COUNT
- PROP. WHEEL STOP
- PROP. FES
- PROP. HC RAMP
- PROP. POWER POLE
- PROP. SS MANHOLE
- PROP. GAS METER
- PROP. SIGN
- PROP. FIRE ROUTE SIGN

PROP. INLETS (SEE GRADING PLAN FOR TYPE)

- LIMITS OF DISTURBANCE
- SF — SILT FENCE
- TD — TEMPORARY DIVERSION DIKE
- SODDING
- INLET PROTECTION
- CW — CONCRETE WASHOUT AREA

*NOTE: REFER TO SURVEYING LEGEND FOR EXISTING STRUCTURES IDENTIFICATION

SEQUENCE OF CONSTRUCTION

PHASE 1

1. A PRE-CONSTRUCTION MEETING SHALL BE HELD BY THE GENERAL CONTRACTOR'S MANAGER, AND THE OPERATOR'S ENGINEER PRIOR TO LAND DISTURBING ACTIVITIES.
2. PREPARE AND PULL ALL NECESSARY PERMITS.
3. CONSTRUCT TEMPORARY CONSTRUCTION EXITS AT LOCATIONS SHOWN ON THE SWPPP PLANS AND PREPARE TEMPORARY PARKING AND STORAGE AREA. UPON IMPLEMENTATION AND INSTALLATION OF THE FOLLOWING AREAS: TRAILER, PARKING, LAY DOWN, PORTA-POTTY, WELL WASH, CONCRETE WASHOUT, MASONS AREA, FUEL AND MATERIAL STORAGE CONTAINERS, SOLID WASTE CONTAINERS, ETC., DENOTE THEM ON THE SITE MAPS IMMEDIATELY AND NOTE ANY CHANGE IN THE LOCATIONS AS THEY OCCUR THROUGHOUT THE CONSTRUCTION PROCESS.
4. CONSTRUCT THE SILT FENCES ON THE SITE. HALT ALL ACTIVITIES AND CONTACT THE CIVIL ENGINEERING CONSULTANT TO PERFORM INSPECTION AND CERTIFICATION OF BMP'S. GENERAL CONTRACTOR SHALL SCHEDULE AND CONDUCT STORMWATER PRE-CONSTRUCTION MEETING WITH ENGINEER AND ALL GROUND-DISTURBING CONTRACTORS BEFORE PROCEEDING WITH CONSTRUCTION.
5. INSTALL PUBLIC WATER, SEWER AND BOX CULVERT
6. DEMO, CLEAR AND GRUB THE SITE.
7. BEGIN GRADING THE SITE.
8. START CONSTRUCTION OF BUILDING PAD AND STRUCTURES.
9. DISTURBED AREAS OF THE SITE WHERE CONSTRUCTION ACTIVITY HAS CEASED FOR MORE THAN 14 DAYS SHALL BE TEMPORARILY SEEDED AND WATERED.

PHASE 2

1. INSTALL UTILITIES, UNDER DRAINS, STORM SEWERS, CURB AND GUTTERS.
2. INSTALL INLET PROTECTION DEVICES.
3. INSTALL RIP RAP AROUND OUTLET STRUCTURES.
4. FINALIZE PAVEMENT SUBGRADE PREPARATION.
5. INSTALL BASE MATERIAL AS REQUIRED FOR PAVEMENT.
6. PAVE LOT.
7. REMOVE TEMPORARY CONSTRUCTION EXITS ONLY PRIOR TO PAVEMENT CONSTRUCTION IN THESE AREAS. (THESE AREAS TO BE PAVED LAST)
8. DISTURBED AREAS OF THE SITE WHERE CONSTRUCTION ACTIVITY HAS CEASED FOR MORE THAN 14 DAYS SHALL BE TEMPORARILY SEEDED AND WATERED.
9. FINE GRADE AND INSTALL PERMANENT SEEDING AND PLANTINGS.
10. REMOVE ALL TEMPORARY EROSION AND SEDIMENT CONTROLS DEVISED. (ONLY IF SITE IS STABILIZED)
11. REMOVE INLET PROTECTIONS AROUND INLETS AND MANHOLES NO MORE THAN 48 HOURS PRIOR TO PLACING STABILIZED BASE COURSE.

SITE DATA

TOTAL AREA OF CONSTRUCTION SITE : (ACRES)
TOTAL AREA TO BE DISTURBED: (ACRES)
CURRENT (EXISTING) IMPERVIOUS AREA: (ACRES)
POST-CONSTRUCTION IMPERVIOUS AREA: (ACRES)
POST CONSTRUCTION RUNOFF COEFFICIENT: [IMPERVIOUS(0.95)]+PERVIOUS(.50)] \ OVERALL = C

BEFORE YOU DIG 811 LOCATE ZONE CALL OKIE

N

SCALE IN FEET
0 40' 60' 80'

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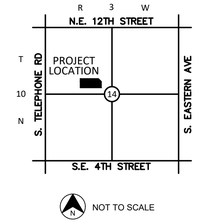
LOCATION MAP:



NOT TO SCALE

PROJECT:

CENTRAL JUNIOR HIGH CLASSROOM ADDITION

400 N. BROADWAY ST.
MOORE, OKLAHOMA

PROJECT NUMBER: 25031
DRAWING DATE: 06.02.25
ISSUE DATE: 06.02.25

SEAL:

SUBMITTAL:

PERMIT SET

REVISIONS:

MARK	DATE	DESCRIPTION

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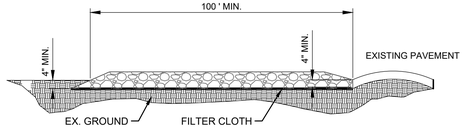
DRAWING TITLE:

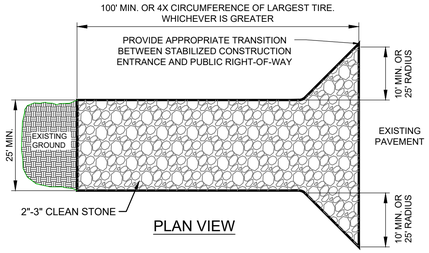
EROSION CONTROL PLAN

SHEET:

C6.00



SIDE ELEVATION



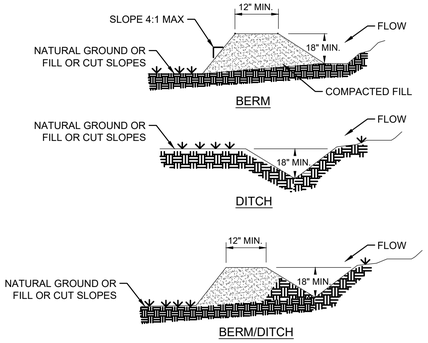
PLAN VIEW

NOTES:

1. STONE - USE COARSE AGGREGATE (3 INCH STONE MIN)
2. LENGTH - AS EFFECTIVE, BUT NOT LESS THAN 100 FEET.
3. THICKNESS - NOT LESS THAN EIGHT (8) INCHES.
4. WIDTH - NOT LESS THAN FULL WIDTH OF ALL POINTS OF INGRESS OR EGRESS.
5. WASHING - WHEN NECESSARY, WHEELS SHALL BE CLEANED TO REMOVE SEDIMENT PRIOR TO ENTRANCE ONTO PUBLIC RIGHT-OF-WAY. WHEN WASHING IS REQUIRED, IT SHALL BE DONE ON AN AREA STABILIZED WITH CRUSHED STONE WHICH DRAINS INTO AN APPROVED SEDIMENT TRAP OR SEDIMENT BASIN. ALL SEDIMENT SHALL BE PREVENTED FROM ENTERING ANY STORM DRAIN, DITCH, OR WATERCOURSE THROUGH USE OF SAND BAGS, GRAVEL, BOARDS OR OTHER APPROVED METHODS.
6. MAINTENANCE - THE ENTRANCE SHALL BE MAINTAINED IN A CONDITION WHICH WILL PREVENT TRACKING OR FLOWING OF SEDIMENT ONTO PUBLIC RIGHT-OF-WAY. THIS MAY REQUIRE PERIODIC TOP DRESSING WITH ADDITIONAL STONE AS CONDITIONS DEMAND AND REPAIR AND/OR CLEANOUT OF ANY MEASURES USED TO TRAP SEDIMENT. ALL SEDIMENT SPILLED, DROPPED, WASHED OR TRACKED ONTO PUBLIC RIGHTS-OF-WAY MUST BE REMOVED IMMEDIATELY.
7. 12' X 24' METAL GRATE MAY BE USED. GRATE SHALL BE 25' AWAY FROM PAVEMENT AND APPROPRIATE SEDIMENT CONTROL TRAPPING DEVICE SHALL BE USED AT GRATE OUTLET POINT.

STABILIZED CONSTRUCTION ENTRANCE

NOT TO SCALE



BERM

DITCH

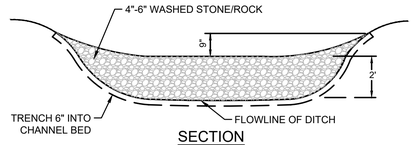
BERM/DITCH

NOTES:

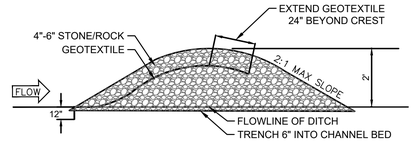
1. POSITIVE GRADE MUST BE PROVIDED TO ASSURE DRAINAGE. IF SLOPE EXCEEDS 2%, SEED AND MULCH DIVERSION, TRY NOT TO EXCEED 5% (HIGH RUNOFF VELOCITIES RESULT). MAXIMUM DRAINAGE AREA IS 5.00 ACRES WITHOUT SUPPORTING CALCULATIONS FOR PERMANENT CHANNEL. DIVERSIONS AT THE TOPS OF SLOPES MUST EMPTY INTO AN APPROVED SLOPE DRAIN (SEE DETAILS). THE BERM/ DITCH IS THE MOST COMMONLY USED DIVERSION.
2. MACHINE COMPACTION OF ALL FILL IS REQUIRED.
3. DIVERSIONS SUFFICIENT TO DIRECT ALL SEDIMENT-LADEN STORMWATER INTO SEDIMENT CONTROL DEVICE MUST BE INSTALLED PRIOR TO CLEARING AND GRUBBING OF AREA (OR IN CONJUNCTION WITH THIS OPERATION IF SEDIMENT CONTROLS AND DIVERSIONS ARE INSTALLED AT EACH CRITICAL POINT AS INDICATED).
4. DIVERSIONS SHOULD BE LOCATED TO MINIMIZE DAMAGES BY CONSTRUCTION OPERATIONS.
5. DIVERSIONS SHOULD BE SEEDED AND MULCHED IF THEY ARE TO REMAIN IN PLACE OVER 14 DAYS.
6. CHECK DIVERSIONS AFTER EACH RAIN, OR ONCE PER WEEK WHICH EVER IS THE SHORTER DURATION. REPAIR AS NEEDED TO MAINTAIN FUNCTION.

TEMPORARY DIVERSION BERM/DITCH DETAIL

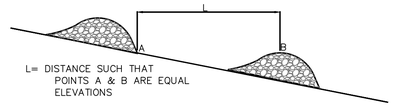
NOT TO SCALE



SECTION



PROFILE



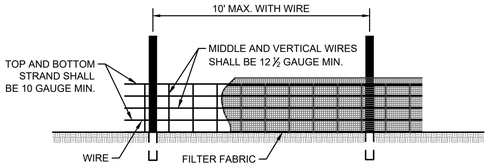
LONGITUDINAL PROFILE

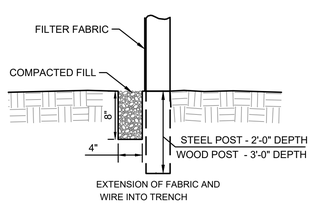
NOTES:

1. THE MAXIMUM HEIGHT OF THE CHECK DAM AT THE CENTER SHALL NOT EXCEED ONE HALF THE DEPTH OF THE CHANNEL.
2. MAXIMUM SPACING SHALL BE SO THE TOE OF THE UPSTREAM DAM IS THE SAME ELEVATION AS THE TOP OF THE DOWNSTREAM DAM.
3. REMOVE SEDIMENT WHEN 25% THE HEIGHT OF THE WEIR.
4. REMOVE CHECK DAMS WHEN SITE STABILIZATION IS ACHIEVED.

ROCK CHECK DAM DETAIL

NOT TO SCALE



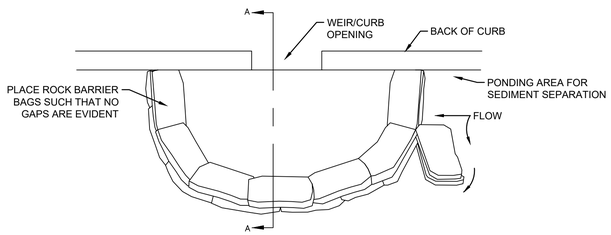


NOTES:

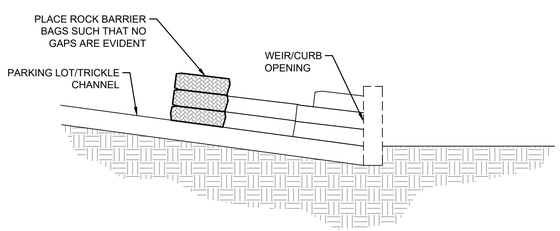
1. WIRE SHALL BE A MINIMUM OF 32" IN WIDTH AND SHALL HAVE A MINIMUM OF 6 LINE WIRES WITH 12" STAY SPACING.
2. FILTER FABRIC SHALL BE A MINIMUM OF 36" IN WIDTH AND SHALL BE FASTENED ADEQUATELY TO THE WIRE.
3. STEEL POST SHALL BE 5'-0" IN HEIGHT AND BE OF THE SELF-FASTENER ANGLE STEEL TYPE.
4. WOOD POST SHALL BE 6'-0" IN HEIGHT AND 3" IN DIAMETER.

SILT FENCE DETAIL

NOT TO SCALE



PLAN VIEW



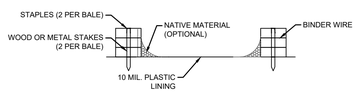
SECTION A-A

NOTES:

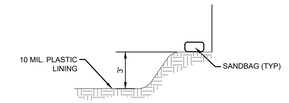
1. PLACE CURB TYPE ROCK BAG BARRIER ON GENTLY SLOPING PAVING, WHERE WATER CAN POND AND ALLOW SEDIMENT TO SEPARATE FROM RUNOFF.
2. BAGS OF WOVEN GEOTEXTILE FABRIC, FILLED WITH GRAVEL MUST BE LAYERED SUCH THAT NO GAPS ARE EVIDENT.
3. LEAVE ON ROCKBAG GAP IN THE TOP ROW ON THE SIDE AWAY FROM FLOW, TO PROVIDE A SPILLWAY; OR IN THE CENTER IF PONDING IS NEEDED ON BOTH SIDES.
4. INSPECT BARRIERS AND REMOVE SEDIMENT AFTER EACH STORM EVENT, SEDIMENT AND GRAVEL MUST BE REMOVED FROM THE TRAVELED WAY IMMEDIATELY.

CURB INLET PROTECTION DETAIL

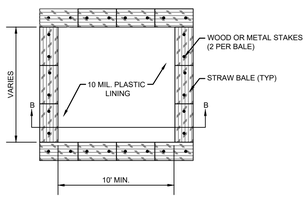
NOT TO SCALE



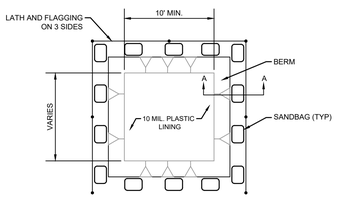
SECTION B-B



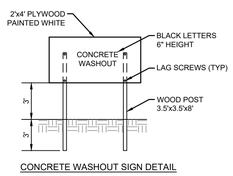
SECTION A-A



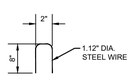
TYPE 'ABOVE GRADE' WITH STRAW BALES



TYPE 'BELOW GRADE'



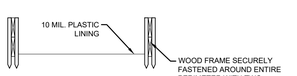
CONCRETE WASHOUT SIGN DETAIL



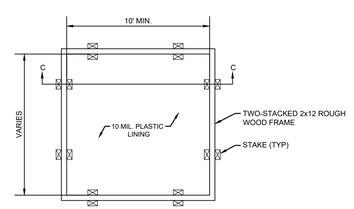
STAPLE DETAIL

NOTES:

1. ACTUAL LAYOUT TO BE DETERMINED IN THE FIELD.
2. A CONCRETE WASHOUT SIGN SHALL BE INSTALLED WITHIN 30' OF THE TEMPORARY CONCRETE WASHOUT FACILITY
3. MATERIALS USED TO CONSTRUCT TEMPORARY CONCRETE WASHOUT FACILITIES SHALL BE REMOVED FROM THE SITE OF THE WORK AND DISPOSED OF OR RECYCLED.
4. HOLES, DEPRESSIONS OR OTHER GROUND DISTURBANCE CAUSE BY THE REMOVAL OF THE TEMPORARY CONCRETE WASHOUT FACILITIES SHALL BE BACKFILLED, REPAIRED AND STABILIZED TO PREVENT EROSION.



SECTION C-C



TYPE 'ABOVE GRADE' WITH WOOD PLANKS

CONCRETE WASHOUT DETAIL

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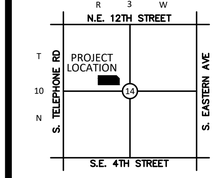
LOCATION MAP:



NOT TO SCALE

PROJECT:

CENTRAL JUNIOR HIGH CLASSROOM ADDITION

400 N. BROADWAY ST.
MOORE, OKLAHOMA

PROJECT NUMBER: 25031
DRAWING DATE: 06.02.25
ISSUE DATE: 06.02.25

SEAL:

SUBMITTAL:

PERMIT SET

REVISIONS:

MARK	DATE	DESCRIPTION

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DRAWING TITLE:

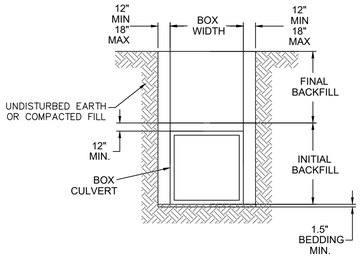
EROSION CONTROL DETAILS

SHEET:

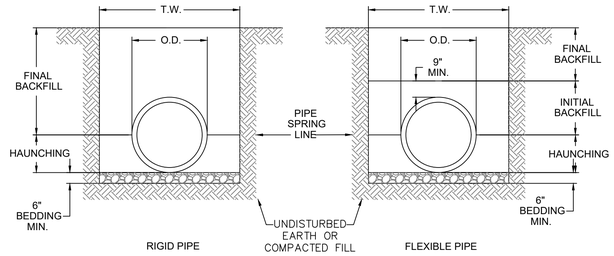
C6.01

TABLE 1: CLASSES OF EMBEDMENT AND BACKFILL MATERIALS

ASTM D 2321 MATERIAL CLASS	ASTM D 2487 USCS SOIL GROUP	MATERIAL TYPE	% PASSING			ATTERBERG LIMITS	
			1 1/2 IN.	NO. 4	NO. 200	LL	PI
IA	NONE	MANUFACTURED OPEN GRADED AGGREGATES	100%	≤10%	<5%	NON PLASTIC	
IB	NONE	MANUFACTURED DENSE GRADED AGGREGATES	100%	≤50%	<5%	NON PLASTIC	
II	GW	COARSE-GRAINED SOILS, CLEAN	100%	<50% OF "COARSE FRACTION"	<5%	NON PLASTIC	
	GP			>50% OF "COARSE FRACTION"			
	SW						
	SP						
III	GM	COARSE-GRAINED SOILS W/ FINES	100%	<50% OF "COARSE FRACTION"	12% TO 50%		<4 OR <"A" LINE
	GC						<7 OR >"A" LINE
	SM			>50% OF "COARSE FRACTION"			>4 OR <"A" LINE
	SC						>7 OR >"A" LINE
IV-A	ML	FINE-GRAINED SOILS	100%	100%	>50%	<50	<4 OR <"A" LINE
	CL						>7 OR >"A" LINE



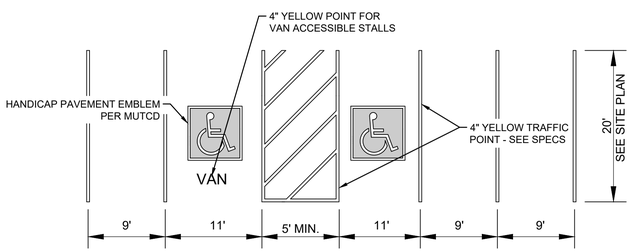
CONCRETE BOX CULVERT



TRENCH AND BEDDING DETAILS

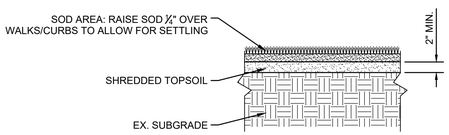
NOT TO SCALE

1. BEDDING SHALL BE DUMPED CLASS I-A WORKED BY HAND, OR CLASS I-B COMPACTED TO 85% STANDARD PROCTOR. LOCAL CODE PERMITTING WITH GEOTECHNICAL ENGINEER AND OWNER APPROVAL, NATIVE SOIL MAY BE USED FOR BEDDING PROVIDED IT MEETS THE EMBEDMENT AND BACKFILL MATERIALS IN TABLE 1 EXCLUDING CLASS IV-A.
2. HAUNCHING SHALL BE WORKED AROUND THE PIPE BY HAND TO ELIMINATE VOIDS AND SHALL BE CLASS I-A, OR CLASS I-B OR CLASS II COMPACTED TO 95% STANDARD PROCTOR. PEA GRAVEL SHALL NOT BE USED AS A HAUNCHING MATERIAL. CLASS III MATERIAL SHALL BE ALLOWED FOR RIGID PIPE COMPACTED AT 95% STANDARD PROCTOR.
3. INITIAL BACKFILL SHALL BE CLASS I-A WORKED BY HAND, OR CLASS I-B OR CLASS II COMPACTED TO 90% STANDARD PROCTOR, OR CLASS III COMPACTED 95% STANDARD PROCTOR. CLASS I & II MATERIAL SHALL BE USED FOR FLEXIBLE PIPE WHEN FILL HEIGHTS EXCEED 8'.
4. FINAL BACKFILL SHALL BE CLASS I-A WORKED BY HAND, OR CLASS I-B OR CLASS II COMPACTED TO 90% STANDARD PROCTOR, OR CLASS III COMPACTED TO 95% STANDARD PROCTOR.
5. FINAL BACKFILL NOT UNDER PAVED AREAS CAN BE CLASS IV-A COMPACTED TO 95% STANDARD PROCTOR.
6. ALL MATERIALS ARE CLASSIFIED IN ACCORDANCE WITH ASTM D 2321. (SEE TABLE 1)
7. ALL MATERIALS SHALL BE INSTALLED IN MAXIMUM 8" LOOSE LIFTS IN ACCORDANCE WITH ASTM D 698. CLASS III AND IV-A MATERIALS SHALL BE COMPACTED NEAR OPTIMUM MOISTURE CONTENT.
8. FILL SALVAGED FROM EXCAVATION SHALL BE FREE OF DEBRIS, ORGANICS AND ROCKS LARGER THAN 3".
9. ALL TRENCH EXCAVATIONS SHALL BE SLOPED, SHORED, SHEETED, BRACED, OR OTHERWISE SUPPORTED IN COMPLIANCE WITH OSHA REGULATIONS AND LOCAL ORDINANCES.
10. DESIGN ENGINEER SHALL DESIGNATE ON THE PLANS WHERE WATERTIGHT JOINTS ARE TO BE REQUIRED.
11. REPLACE WET OR UNSUITABLE SOIL AS NECESSARY TO PROVIDE A SUITABLE BASE, AS DIRECTED BY GEOTECHNICAL ENGINEER OR OWNER.
12. WHERE GROUND WATER IS PRESENT CLASS I-A MATERIAL SHALL BE WRAPPED WITH A NON-WOVEN GEO-TEXTILE, EXCLUDING BEDDING MATERIAL BETWEEN 4" & 6" THICK.
13. CONTRACTOR SHALL REFER TO GEOTECHNICAL REPORT FOR SOIL TYPE AND CLASSIFICATIONS FOR THIS PROJECT.
14. CONTRACTOR SHALL REFER TO THE LATEST VERSION OF ASTM STANDARDS PRIOR TO CONSTRUCTION.



STANDARD PARKING LAYOUT DETAIL

NOT TO SCALE

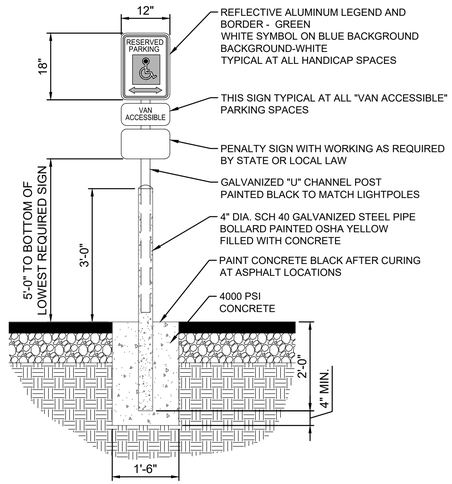


NOTE:
REMOVE WEEDS AND DEBRIS, RAKE ALL SURFACE AREAS SMOOTH PRIOR TO LAYING SOD OR SEEDING. SLOPE TO DRAIN AWAY FROM BUILDINGS. ADHERE TO THE FOLLOWING SUPPLEMENTAL WATERING SCHEDULE (ADJUST AS NEEDED FOR UNSEASONAL RAINFALL CONDITIONS):

APPROXIMATE SUPPLEMENTAL WATER FOR AN AVERAGE TRADITIONAL LAWN (INCHES PER WEEK)						
APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER
0.25"	0.75"	1.25"	1.25"	1.0"	0.75"	0.5"

SOD PLANTING DETAIL

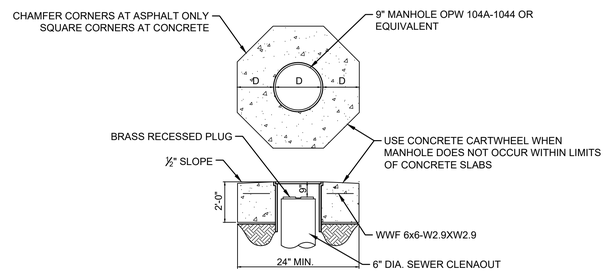
NOT TO SCALE



HANDICAP PARKING SIGN DETAIL

NOT TO SCALE

ONE AT EACH HANDICAP SPACE. WHERE HANDICAP SPACES FACE EACH OTHER WITHOUT WALKWAY, THERE SHALL BE ONE POST WITH SIGNS MOUNTED BOTH SIDES



TYPICAL CLEANOUT MANHOLE DETAIL

NOT TO SCALE

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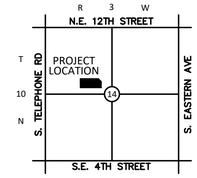
P.O. Box 14534 Oklahoma City, OK 73113
405-778-3385
www.cedarcreekinc.com
OK CA 5864
EXP. 06/30/26

LOCATION MAP:



NOT TO SCALE

PROJECT:

CENTRAL JUNIOR HIGH CLASSROOM ADDITION

400 N. BROADWAY ST.
MOORE, OKLAHOMA

PROJECT NUMBER: 25031
DRAWING DATE: 06.02.25
ISSUE DATE: 06.02.25

SEAL:

SUBMITTAL:

PERMIT SET

REVISIONS:

MARK	DATE	DESCRIPTION

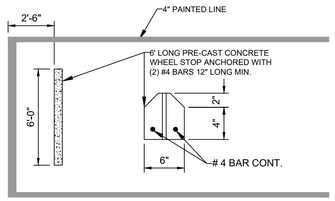
THESE PLANS AND DRAWINGS ARE NOT TO BE REPRODUCED, CHANGED OR COPIED IN ANY FORM OR MANNER WHATSOEVER WITHOUT FIRST OBTAINING THE WRITTEN PERMISSION AND CONSENT OF CEDAR CREEK CONSULTING INC. THIS SHEET IS NOT TO BE USED FOR CONSTRUCTION UNLESS THE ISSUE DATE IN THE TITLE BLOCK COINCIDES WITH OR POST DATES THE DRAWING DATE. ANY CHANGES MADE FROM THESE PLANS WITHOUT CONSENT OF CEDAR CREEK CONSULTING INC. ARE UNAUTHORIZED, AND SHALL RELIEVE CEDAR CREEK CONSULTING OF RESPONSIBILITY FOR ALL CONSEQUENCES ARRIVING OUT OF SUCH CHANGES.

DRAWING TITLE:

STANDARD DETAILS

SHEET:

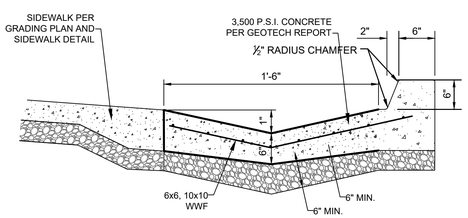
C7.00



NOTE:
SEE SITE PLAN FOR PARKING SPACE SIZE
AND FOR WHEEL STOP LOCATIONS.
PAINT WHEEL STOPS OSHA YELLOW

WHEEL STOP DETAIL

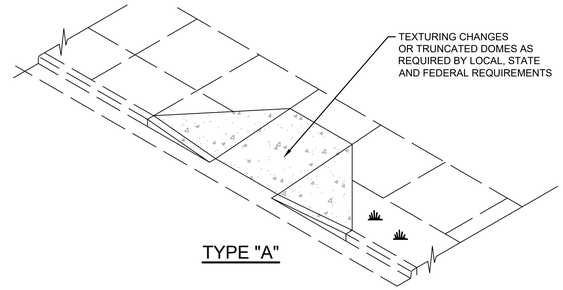
NOT TO SCALE



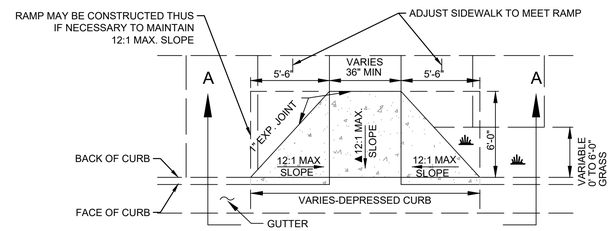
TRICKLE CHANNEL WITH CURB DETAIL

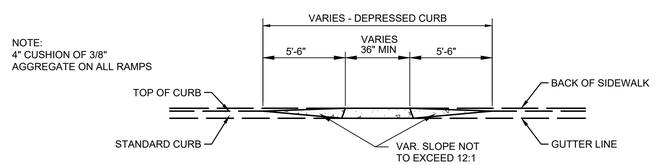
NOT TO SCALE

ALL ADA ACCESSIBLE ROUTES, INCLUDING RAMPS, CURB RAMPS AND SIDEWALKS SALL NOT EXCEED 1:48 (1/4"/ft)
(2.083% SLOPE AT ANY POINT. CROSS SLOPE IS THE SLOPE PERPENDICULAR TO THE DIRECTION OF TRAVEL.



TYPE "A"





SECTION A-A

ADA RAMP DETAIL

NOT TO SCALE

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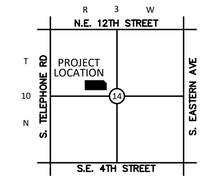
OK CA 5864
EXP. 06/30/26

LOCATION MAP:



NOT TO SCALE

PROJECT:

CENTRAL JUNIOR HIGH CLASSROOM ADDITION

400 N. BROADWAY ST.
MOORE, OKLAHOMA

PROJECT NUMBER:	25031
DRAWING DATE:	06.02.25
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MARK	DATE	DESCRIPTION

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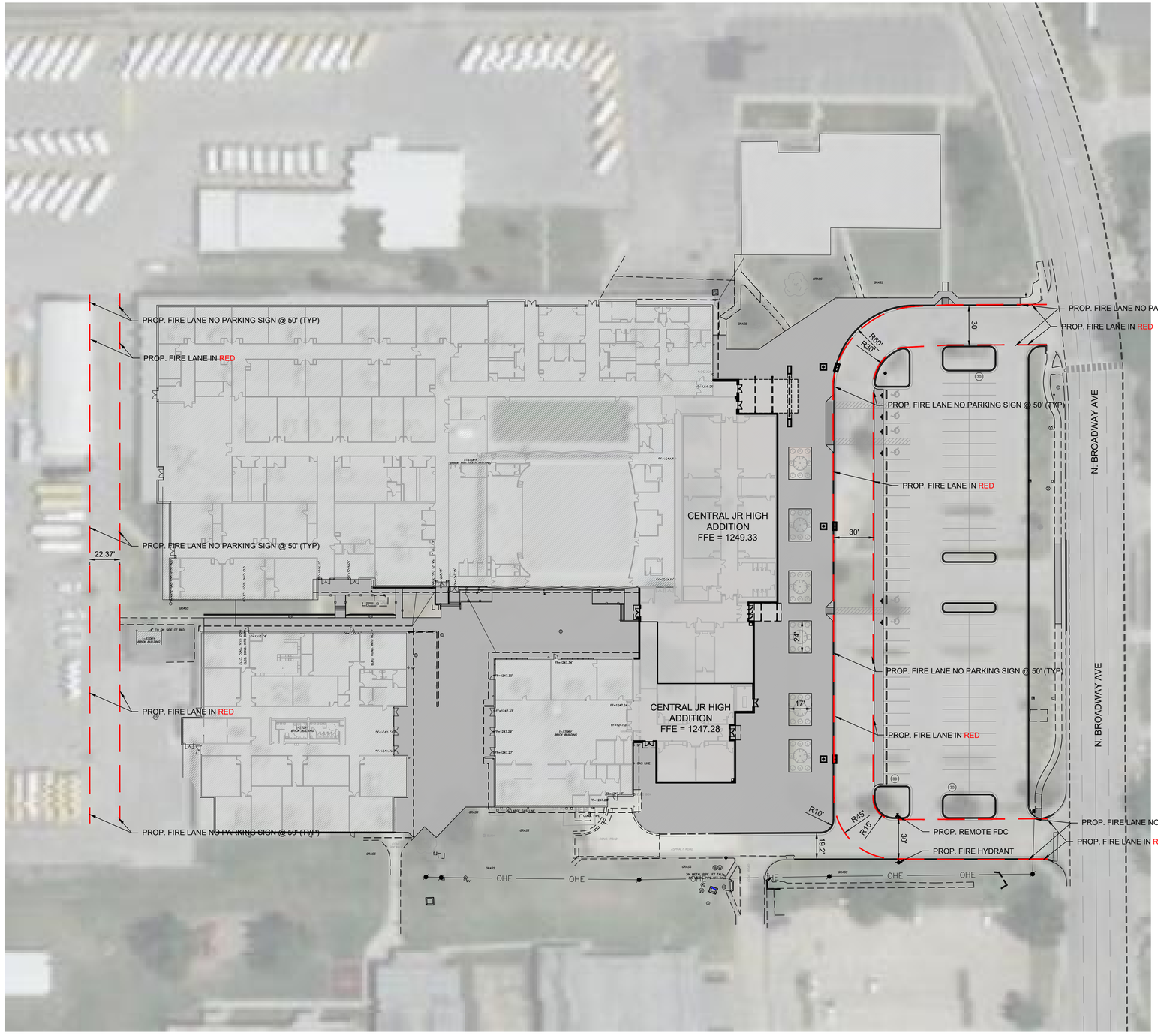
DRAWING TITLE:

STANDARD DETAILS

SHEET:

C7.01



6"

25'

NO PARKING FIRE LANE NO PARKING FIRE

FIRE LANE STRIPING SHALL BE 6" RED STRIPES WITH 4" INCH WHITE LETTERS READING "NO PARKING FIRE LANE" STRIPING SHALL BE PLACED ON FACE OF CURB WHENEVER POSSIBLE, OR AS SPECIFIED BY LOCAL CODES.

NO PARKING FIRE LANE NO PARKING FIRE

FIRE LANE MARKING

NOT TO SCALE

LEGEND

- EXISTING 1' CONTOUR
- EXISTING 5' CONTOUR
- PROPOSED 1' CONTOUR
- PROPOSED 5' CONTOUR
- BOUNDARY LINE
- RIGHT OF WAY LINE
- EASEMENT LINE
- EXISTING CURB AND GUTTER
- PROPOSED CURB AND GUTTER
- PROPOSED FIRE LANE STRIPING
- OHE — OVERHEAD ELECTRIC LINE
- UGE — UNDERGROUND ELECTRIC LINE
- GAS — GAS LINE
- UGT — UNDERGROUND TELEPHONE LINE
- FO — UNDERGROUND FIBER OPTIC LINE
- SS — SANITARY SEWER LINE
- W — WATERLINE
- RETAINING WALL
- SCREEN WALL
- WIRE FENCE
- CHAIN LINK FENCE
- BENCHMARK

- PROP. FIRE HYDRANT
- PROP. WATER VALVE
- PROP. WATER METER
- PROP. ELECT. METER
- PROP. LIGHT POLE
- PROP. BOLLARD
- PROP. TRANSFORMER
- PROP. PARKING COUNT
- PROP. WHEEL STOP
- PROP. FES
- PROP. HC RAMP
- PROP. POWER POLE
- PROP. SS MANHOLE
- PROP. GAS METER
- PROP. SIGN
- PROP. FIRE ROUTE SIGN

PROP. INLETS (SEE GRADING PLAN FOR TYPE)

VS VERTICAL SEPARATION REQUIREMENT

*NOTE: REFER TO SURVEYING LEGEND FOR EXISTING STRUCTURES IDENTIFICATION

N

SCALE IN FEET
0 40' 60' 80'

BEFORE YOU DIG CALL OKIE 811 OKIE ONE CALL SUPPORT

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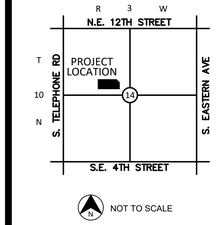

NOT TO SCALE

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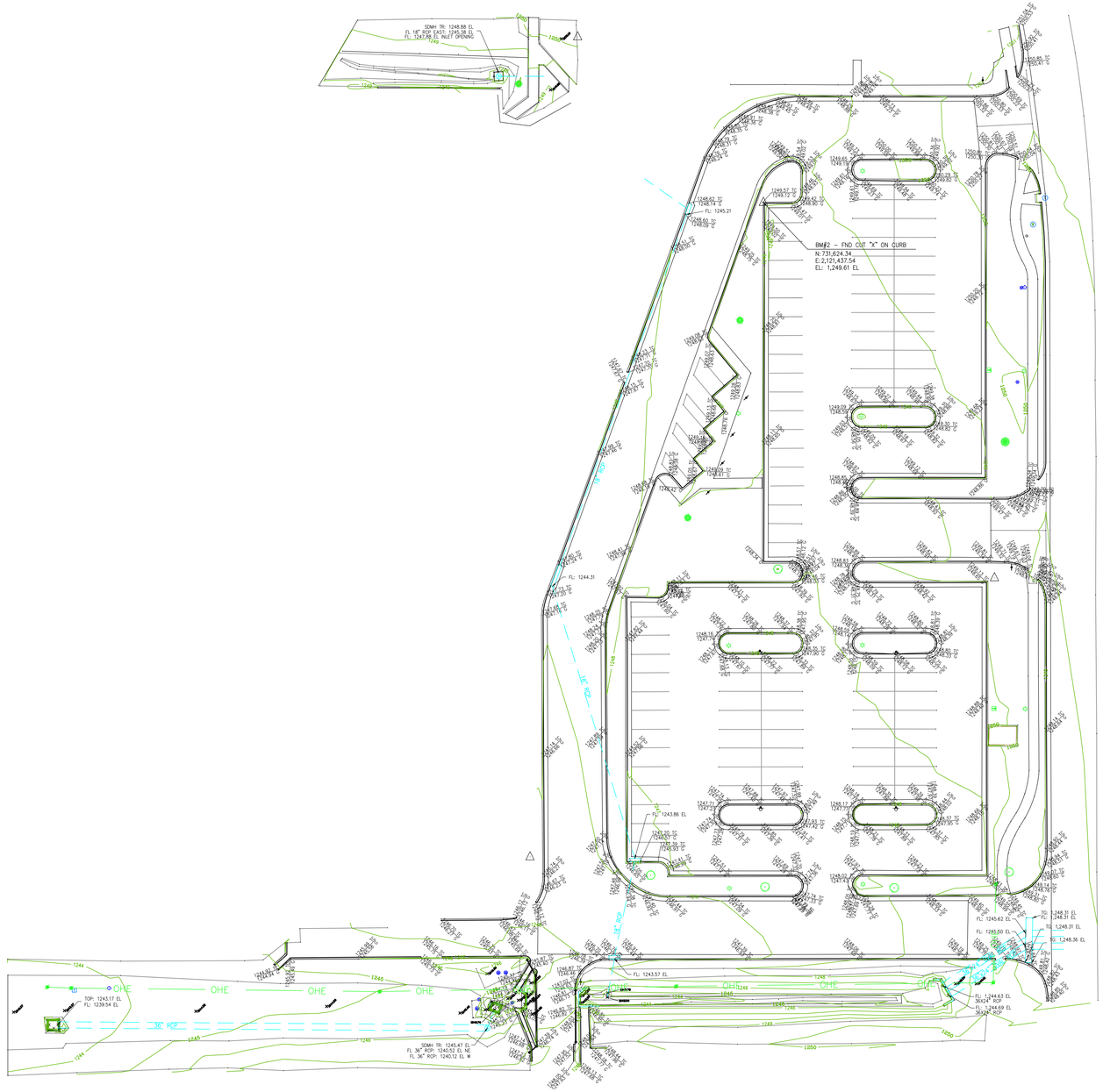
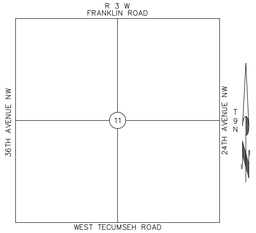
DRAWING TITLE:

FIRE PLAN

SHEET:

F1.00





VICINITY MAP
(NOT TO SCALE)

HORIZONTAL AND VERTICAL CONTROL BASIS:
HORIZONTAL DATUM: OKLAHOMA
STATE PLANE NAD83 HARN
(SOUTH ZONE (US FOOT)
VERTICAL DATUM: NAVD88
(US FOOT)

CITY OF MOORE SURVEY CONTROL:
MONUMENT #228
N: 728756.086
E: 2120823.671
EL: 1229.187

0' 15 30
SCALE: 1" = 30'

LEGEND:

	BUILDING OVERHANG	CONC	CONCRETE
x x x	CHAIN LINK FENCE	3 WIRES	# OF OVERHEAD WIRES
o o o	OTHER FENCE	CONDUIT	ELEC CONDUIT
FOC	FIBER OPTIC CABLE	E	ELEC MANHOLE
GAS	GAS LINE	EPB	ELEC PULL BOX
OHE	OVERHEAD ELECTRIC	FH	FIRE HYDRANT
UE	UNDERGROUND ELECTRIC		SET MONUMENT
SS	SANITARY SEWER		FOUND MONUMENT
	STORM SEWER	GM	GAS METER
TEL	TELEPHONE CABLE	IRR	IRRIGATION VALVE
WL	WATER	LP	LIGHT POLE
		PP	POWER POLE
		RD	ROOF DRAIN
		SMH	SANITARY SEWER MANHOLE
		CO	SANITARY SEWER CLEANOUT
			SIGN
			STORM DRAIN MANHOLE
		T	TEL RISER
			TRAFFIC CONTROL BOX
		XFMR	TRANSFORMER OR TRANSFORMER
		WV	WATER VALVE
		WM	WATER METER

CERTIFICATE OF SURVEY:

I, KENNETH R. SHUFORD, CERTIFY THAT THIS PROJECT WAS COMPLETED UNDER MY DIRECT AND RESPONSIBLE CHARGE FROM AN ACTUAL SURVEY MADE UNDER MY SUPERVISION; THAT THIS GROUND SURVEY WAS PERFORMED AT THE 95 PERCENT CONFIDENCE LEVEL TO MEET FEDERAL GEOGRAPHIC DATA COMMITTEE STANDARDS; THAT THIS SURVEY WAS PERFORMED TO MEET THE SPECIFICATIONS FOR TOPOGRAPHIC AND PLANIMETRIC MAPPING CONTAINED IN THE OKLAHOMA MINIMUM STANDARDS FOR THE PRACTICE OF LAND SURVEYING AS ADOPTED BY THE OKLAHOMA STAT BOARD OF LICENSURE FOR PROFESSIONAL ENGINEERS AND LAND SURVEYORS. THE ORIGINAL DATA WAS OBTAINED ON APRIL 7TH, 2025; THAT THE SURVEY WAS COMPLETED ON APRIL 7TH, 2025; THAT CONTOURS CLOUDED AND NOTED MAY NOT MEET THE STANDARDS; AND ALL COORDINATES ARE BASED ON OKLAHOMA STATE PLANE COORDINATES, SOUTH ZONE, NAD83 (2011) AND ALL ELEVATIONS ARE BASED ON NAVD88.

This Plat Of Survey Meets The Oklahoma Minimum Standards For The Practice Of Land Surveying As Adopted By The Oklahoma State Board Of Registration For Professional Engineers And Land Surveyors.

Underground utilities as shown on drawing were located in the field by above ground and visible appurtenances only. Other utilities may exist that do not have above ground appurtenances or other features to make them visible to the surveyor. Oklahoma One Call, Inc. "CALL OKIE", should be consulted for additional information.

This drawing is the instrument of service and shall remain the property of Delta Surveying Company whether the project for which it is prepared is executed or not. The reproduction, copy or unauthorized use of this drawing without the written consent of Delta Surveying Company is forbidden to any person for any purpose and any unauthorized use may be prosecuted to the fullest extent permitted by law.

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Any abridgement or violation of the rights of Delta Surveying Company may be prosecuted to the fullest extent possible under the law.

Revisions

No.	Date	Description

Project No. 122-34-25
Designed By PAT
Drawn By PAT
Approved By KRS
Bk. No.
Date: 04/12/2025

TOPOGRAPHIC SURVEY
CENTRAL JUNIOR HIGH SCHOOL

IN THE CITY OF MOORE
400 N Broadway Ave
Moore, OK 73160

SEAL

Kenneth R. Shuford
Okla. L.S. #1360

Sheet No.
1 of 1

DELTA SURVEYING CO.
201 N.E. 38TH TERRACE, SUITE A, OKLAHOMA CITY, OKLAHOMA 73105
TEL: 405-789-5984
CA # 930 Expires 6-30-24

MOORE
PUBLIC SCHOOLS

MOORE PUBLIC SCHOOLS DISTRICT NO. I-2
CLEVELAND COUNTY MOORE, OKLAHOMA

CLASSROOM ADDITION
CENTRAL JUNIOR HIGH SCHOOL

400 NORTH BROADWAY
MOORE , OK. 73160

AGP | the Abla Griffin Partnership

313 SE. 5TH ST. MOORE, OK. 73160
405.735.3477 AGP@theAGP.net www.the AGP.net

CONSTRUCTION MANAGER

OMNI CONSTRUCTION

1909 S. EASTERN AVE.
MOORE, OK 73160

INDEX TO DRAWINGS

SHEET NUMBER	DESCRIPTION
C	COVER SHEET
--	TOPOGRAPHIC SURVEY - FOR INFORMATION ONLY
G100	LEGENDS / MAPS / ETC.
G101	SHELTER CALCULATION PLAN / SHELTER LOCATION PLAN
C1.00	DEMOLITION PLAN
C2.00	SITE PLAN
C3.00	PAVING PLAN
C4.00	GRADING PLAN
C4.01	GRADING PLAN EAST
C4.02	GRADING PLAN WEST
C5.00	UTILITY PLAN
C6.00	EROSION CONTROL PLAN
C6.01	EROSION CONTROL DETAILS
C7.00	STANDARD DETAILS
C7.01	STANDARD DETAILS
F1.00	FIRE PLAN
C900	RAMP PLAN / SECTIONS / DETAILS
PUBLIC WATER PLANS	
C0.00	COVER SHEET
C5.00	UTILITY PLAN
C5.01	WATERLINE 1 PLAN AND PROFILE
C5.02	WATERLINE DETAILS
C6.00	EROSION CONTROL PLAN
C6.01	EROSION CONTROL DETAILS
PRIVATE STORM SEWER PLANS	
C0.00	COVER SHEET
C4.01	GRADING PLAN EAST
C4.03	DA-MAP
C4.04	PRIVATE STORM SEWER LINE 1 PLAN & PROFILE
C4.05	PRIVATE STORM SEWER LINE 1A, 1B AND 1C PLAN & PROFILE
C6.00	EROSION CONTROL PLAN
C6.01	EROSION CONTROL DETAILS
L100	LANDSCAPE PLAN / PLANT SCHEDULE / DETAILS
L101	IRRIGATION PLAN
L102	LANDSCAPE DETAILS
S100	GENERAL NOTES
S101	GENERAL NOTES
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S103	GENERAL NOTES
S104	SHELTER INFORMATION / SHELTER LOAD PLAN
S105	DETAILS
S106	DETAILS
S107	DETAILS
S108	DETAILS
S109	SPECIAL INSPECTIONS
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S202	FOUNDATION PLAN AREA "B"
S301	FRAMING PLAN AREA "A"
S302	FRAMING PLAN AREA "B"
S303	ENLARGED FRAMING PLAN / SECTIONS
S401	SECTIONS
S501	FOUNDATION SECTIONS
S502	FOUNDATION SECTIONS
S601	FRAMING SECTIONS
S602	FRAMING SECTIONS
S603	FRAMING SECTIONS
S701	GENERATOR FOUNDATION PLAN / FRAMING PLAN / SECTIONS
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A101	OVERALL FLOOR PLAN
A102	WALL TYPE FLOOR PLAN - AREA "A"
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A104	FLOOR PLAN - AREA "A"
A105	FLOOR PLAN - AREA "B"
A106	ENLARGED FLOOR PLANS
A107	DEMOLITION PLAN
A108	LIFE SAFETY PLAN
A109	ROOF PLAN
A110	ROOF DETAILS
A111	LVT DESIGN PLAN - AREA "A"
A112	LVT DESIGN PLAN - AREA "B"
A113	EQUIPMENT FLOOR PLAN - AREA "A"
A114	EQUIPMENT FLOOR PLAN - AREA "B"
A115	ENLARGED FLOOR PLAN - TYP. LAB EQUIPMENT & STOR. ROOM / ENLARGED FLOOR PLAN - STOR. ROOM #22 / ENLARGED PLAN RM. #10 / LAB EQUIPMENT SCHEDULE

SHEET NUMBER	DESCRIPTION
A201	BUILDING ELEVATIONS
A202	BUILDING ELEVATIONS
A301	BUILDING SECTION
A302	BUILDING SECTIONS / WALL SECTIONS
A303	WALL SECTIONS / DETAILS
A304	WALL SECTIONS / DETAILS
A305	WALL SECTIONS / DETAILS
A305	WALL SECTIONS
A401	INTERIOR ELEVATIONS
A501	DETAILS
A502	DETAILS
A601	ROOM FINISH SCHEDULE / COLOR SCHEDULE
A602	DOOR SCHEDULE / DOOR ELEVATIONS / FRAME ELEVATIONS
A701	MILLWORK DETAILS
A702	MILLWORK DETAILS
F000	FIRE SPRINKLER RISER DETAIL / NOTES
F101	FIRE PROTECTION PLAN - AREA "A"
F102	FIRE PROTECTION PLAN - AREA "B'
P000	GENERAL PLUMBING NOTES
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P102	PLUMBING PLAN - BELOW GRADE - AREA "B"
P110	PLUMBING PLAN - ABOVE GRADE - AREA "A"
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P301	PLUMBING ISOMETRIC WASTE & VENT
P302	PLUMBING ISOMETRIC WATER SUPPLY
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P601	SCHEDULES
M000	MECHANICAL NOTES
M101	MECHANICAL PLAN - AREA "A"
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M501	DETAILS
M502	DETAILS
M601	SCHEDULES
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T101	TECHNOLOGY DEMO FLOOR PLAN - AREA "A"
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T503	DETAILS
T504	DETAILS
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T602	SYSTEM SPECIFICATIONS
T603	SYSTEM SPECIFICATIONS
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E100	ELECTRICAL SITE PLAN
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E401	ELECTRICAL ONE-LINE DIAGRAM - PART ONE
E402	ELECTRICAL ONE-LINE DIAGRAM - PART TWO
E501	DETAILS
E502	DETAILS
E601	SCHEDULES
E602	SCHEDULES
E603	SCHEDULES

CLASSROOM ADDITION
CENTRAL JUNIOR HIGH SCHOOL

SET NO. ____

STRUCTURAL

KFC ENGINEERING

205 NW 63rd, SUITE 390
OKLAHOMA CITY, OK 73116

MECHANICAL/ELECTRICAL/PLUMBING

SALAS O'BRIEN

2900 S. TELEPHONE RD., SUITE 120
MOORE, OKLAHOMA 73160

CIVIL

CEDAR CREEK

11912 N. PENNSYLVANIA AVE., SUITE D4
OKLAHOMA CITY, OK 73120

revisions:

sheet no: C

date: APRIL 2025

ABBREVIATIONS

@	AT
ABV	ABOVE
ACOUST.	ACOUSTICAL
ADJ.	ADJUSTABLE
ANCH.	ANCHOR
APPROX.	APPROXIMATE
BD.	BOARD
BLK'G.	BLOCKING
BM.	BEAM
BOT.	BOTTOM
Ç	CENTERLINE
CL'G.	CEILING
CONC.	CONCRETE
CMU	CONCRETE MASONRY UNIT
COL.	COLUMN
CONT.	CONTINUOUS
D.F.	DRINKING FOUNTAIN
DIM.	DIMENSION
DR.	DOOR
DWG.	DRAWING
DWL.	DOWEL
EA.	EACH
ELECT.	ELECTRICAL
ELEV.	ELEVATION
EQ.	EQUAL
E.J.	EXPANSION JOINT
E.W.	EACH WAY
EXIST.	EXISTING
EXP.	EXPANSION
EXT.	EXTERIOR
FD.	FLOOR DRAIN
FE.	FIRE EXTINGUISHER
FEC.	FIRE EXTINGUISHER CABINET
FFL.	FINISH FLOOR LINE
FIN.	FINISH
FRM'G.	FRAMING
GA.	GAUGE
G.B.	GRAB BAR
GALV.	GALVANIZED
GYP. BD.	GYPSUM BOARD
H.C.	HANDICAP
HDWD.	HARDWOOD
HDWR.	HARDWARE
HORIZ.	HORIZONTAL
HT.	HEIGHT
INSUL.	INSULATION
JST.	JOIST
JT.	JOINT
LAV.	LAVATORY
MAT'L	MATERIAL
MAX.	MAXIMUM
MECH.	MECHANICAL
MFG.	MANUFACTURING
MFR.	MANUFACTURER
MIN.	MINIMUM
MISC.	MISCELLANEOUS
MTL.	METAL
N.I.C.	NOT IN CONTRACT
NO. / #	NUMBER
N.T.S.	NOT TO SCALE
O.C.	ON CENTER
OPN'G.	OPENING
OPP.	OPPOSITE
PP.	POWER POLE
PREFIN.	PREFINISHED
P.T.	PAPER TOWEL
PW / PLY. WD.	PLYWOOD
RE:	REFER
REQ'D.	REQUIRED
RM.	ROOM
S.B.	SPLASH BLOCK
SCHED.	SCHEDULE
STD.	STANDARD
STL.	STEEL
S.J.	SAWJOINT
T.C.	TOP OF CURB
T.P.H.	TOILET PAPER HOLDER
TYP.	TYPICAL
U.N.O.	UNLESS NOTED OTHERWISE
VTR.	VENT THROUGH ROOF
W/	WITH
W.C.	WATERCLOSET
WD.	WOOD
WWF.	WELDED WIRE FABRIC

MATERIALS LEGEND

FOR PLANS AND DETAILS

- MASONRY VENEER
- C.M.U.
- CONCRETE
- FRAME PARTITION, METAL STUDS

FOR DETAILS

- GYPSUM BOARD
- PARTICLE BOARD
- RIGID INSULATION
- WOOD BLOCKING / FRAMING, CONTINUOUS
- WOOD BLOCKING, DISCONTINUOUS
- FINISH WOOD
- SMALL SCALE STRUCTURAL STEEL / MISCELLANEOUS METAL
- LARGE SCALE STRUCTURAL STEEL
- BATT INSULATION
- ACOUSTICAL CEILING TILE
- EARTH FILL

SYMBOLS LEGEND

- 1152 — EXISTING SPOT ELEVATION
- 1152 — FINISH SPOT ELEVATION
- 1152 — EXISTING GRADE CONTOUR
- 1152 — FINISH GRADE CONTOUR
- 18" ELM — EXISTING TREE TO BE PROTECTED
- 15" OAK — EXISTING TREE TO BE REMOVED
- PROJECT LIMITS
- CHAINLINK FENCE
- BARBED WIRE FENCE
- CONCRETE PAVING
- ASPHALT PAVING
- CONCRETE SIDEWALK
- EXISTING PAVING/SIDEWALK TO REMAIN
- EXISTING PAVING TO BE REMOVED
- NEW BUILDING
- EXISTING BUILDING - NO WORK
- 3 — ROOM NUMBER
- 3 RE: 4A7 — ROOM NUMBER/ LARGE SCALE PLAN REFERENCE
- 3 2A6 — ROOM NUMBER/INTERIOR ELEVATION REFERENCE
- 2A7 — WALL SECTION/DETAIL CUT MARK
- 5A1 — LARGE SCALE DETAIL MARK
- A / 1 — STRUCTURAL GRID COORDINATES
- 1A4 — BUILDING SECTION CUT MARK
- 6 — DOOR NUMBER
- C — WINDOW MARK
- B — FRAME MARK
- G2 — GLAZING MATERIAL MARK
- 4 — EQUIPMENT MARK
- *A18 — EXTERIOR ELEVATION MARK
- #4 — TEST HOLE
- ELEV. 1152 — BENCH MARK/BUILDING ELEVATION (SECTION)

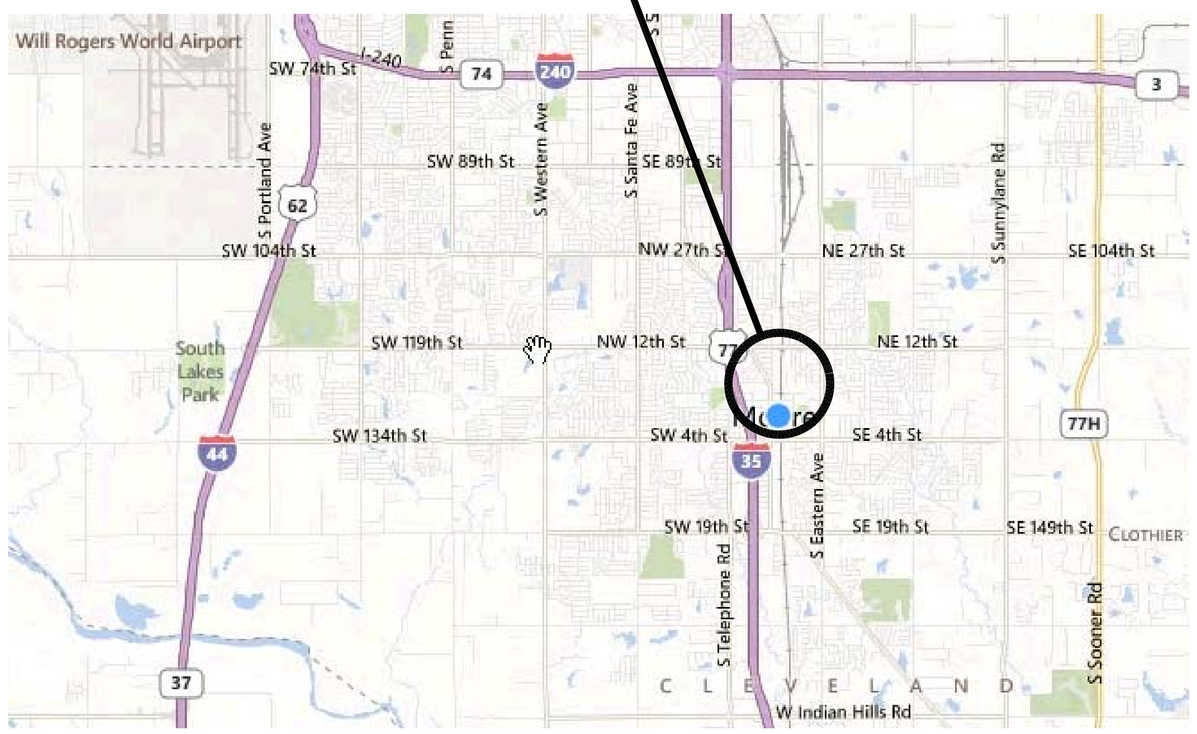
GENERAL NOTES:

1. ALL REQUIRED HANDICAP ACCESSIBLE ITEMS TO COMPLY WITH AMERICANS WITH DISABILITIES ACT AND ARCHITECTURAL BARRIERS ACT ACCESSIBILITY GUIDELINES.
2. THE CONTRACTOR SHALL NOT USE ANY LEAD-BASED PAINT OR ASBESTOS CONTAINING MATERIAL ON THIS PROJECT
3. THESE CONTRACT DOCUMENTS INCLUDING BUT NOT LIMITED TO THE DRAWINGS, PROJECT MANUAL AND ANY SUBSEQUENT ADDENDA ARE ISSUED AS A "WHOLE" AND SHALL BE BID AS SUCH. EACH DISCIPLINE / SUBCONTRACTOR SHALL REVIEW THE ENTIRE SET OF CONTRACT DOCUMENTS AND INCLUDE APPLICABLE WORK IN THEIR BID REGARDLESS OF LOCATION WITHIN THE CONTRACT DOCUMENTS. REVIEWING ONLY PORTION OF THE CONTRACT DOCUMENTS SHALL NOT ABSOLVE THE CONTRACTOR OR SUBCONTRACTOR OF THE REQUIREMENT TO PERFORM THE WORK OF THEIR RESPECTIVE DISCIPLINES.
4. LOCATIONS OF EXISTING BUILDINGS, SITE FEATURES, & UNDERGROUND UTILITIES HAVE BEEN OBTAINED FROM EXISTING AVAILABLE SOURCES. THE CONTRACTOR IS TO FIELD VERIFY EXISTING LOCATIONS PRIOR TO STARTING CONSTRUCTION AND NOTIFY THE ARCHITECT IMMEDIATELY IF ANY EXISTING BUILDING &/OR SITE FEATURE CONFLICTS W/ THE NEW CONSTRUCTION.
5. THE CONTRACTOR SHALL VERIFY ALL EXISTING SITE UTILITIES AND PROTECT DURING CONSTRUCTION. COORDINATE NEW UTILITY REQUIREMENTS WITH APPLICABLE UTILITY COMPANIES (WATER, GAS ELECTRICITY, SANITARY SEWER, TELEPHONE, CABLE, SITE DRAINAGE AND OTHERS AS REQUIRED). COMPLY WITH ALL APPLICABLE REGULATIONS. INCLUDE ALL CONNECTION FEES AND OTHER CHARGES IN BID.
6. REFER TO CIVIL, MECHANICAL AND ELECTRICAL DRAWINGS FOR UTILITY INFORMATION.
7. REFER TO CIVIL, MECHANICAL AND ELECTRICAL DRAWINGS FOR ADDITIONAL REQUIREMENTS AND CONCRETE TO BE PROVIDED BY CONTRACTOR.
8. GENERAL CONTRACTOR TO VERITY LOCATIONS OF EASEMENTS, ENCUMBRANCES AND SET BACKS PRIOR TO STARTING CONSTRUCTION
9. CONFLICTS BETWEEN DRAWINGS AND SPECIFICATIONS SHALL BE BROUGHT TO ARCHITECT'S ATTENTION. FAILURE TO BID ITEM(S) NOTED ON DRAWINGS AND OMITTED FROM SPECIFICATIONS DOES NOT REMOVE RESPONSIBILITY TO PROVIDE AND INSTALL SUCH.

GENERAL NOTES (CON'T):

10. CONSTRUCTION STAGING AREA & VEHICLE ACCESS SHALL BE CONFIRMED WITH OWNER, AND CONSTRUCTION MANAGER IF APPLICABLE, PRIOR TO CONSTRUCTION.
11. FINISH GRADE AT BUILDING PERIMETERS SHALL BE 6" BELOW FINISH FLOOR UNLESS SPECIFICALLY NOTED OTHERWISE ON CIVIL DRAWINGS. DEVELOP POSITIVE DRAINAGE AWAY FROM NEW AND/OR EXISTING BUILDING(S).
12. ALL GRID LINES IDENTIFIED BY A LETTER OR NUMBER ARE PARALLEL UNLESS OTHERWISE NOTED.
13. SIZES OF HOUSEKEEPING PADS AND BASES FOR MECHANICAL EQUIPMENT ARE APPROXIMATE. CONTRACTOR SHALL VERIFY EXACT LOCATION AND REQUIRED SIZE OF ALL CONCRETE PADS AND BASES WITH EQUIPMENT MANUFACTURERS BEFORE POURING. ALL PADS (& ASSOCIATED BOLLARDS @ EXTERIOR LOCATIONS) TO BE PROVIDED BY THE CONTRACTOR.
14. CONTRACTOR SHALL COORDINATE THE INSTALLATION OF THE VARIOUS TRADE ITEMS WITHIN THE SPACE ABOVE THE CEILINGS (INCLUDING, BUT NOT LIMITED TO STRUCTURAL MEMBERS AND SPRAY-ON INSULATION OR FIREPROOFING, MECHANICAL DUCTS AND BATT INSULATION, CONDUITS, RACEWAY, SPRINKLER SYSTEMS, LIGHT FIXTURES, CEILING SYSTEMS, AND ANY SPECIAL STRUCTURAL SUPPORTS REQUIRED) AND SHALL BE RESPONSIBLE FOR MAINTAINING THE FINISH CEILING HEIGHT ABOVE THE FINISH FLOOR INDICATED IN THE DRAWINGS AND FINISH SCHEDULE.
15. ALL METAL STUDS WALLS WHERE PLUMBING OCCURS OR STRUCTURAL COLUMNS ARE LOCATED SHALL BE MINIMUM 6" METAL STUDS. NOTIFY ARCHITECT OF ANY DISCREPANCIES OR CONFLICTS.
16. PROVIDE AND INSTALL ACCESS PANELS, WHERE REQUIRED BY BUILDING CODE OR FOR THE PROPER OPERATION OF MECHANICAL OR ELECTRICAL EQUIPMENT, AND AS SHOWN ON THE DRAWINGS. CONTRACTOR SHALL COORDINATE SIZE, LOCATION, AND TYPE OF ACCESS PANEL WITH OTHER CONTRACTORS' WORK AND RECEIVE APPROVAL OF THE ARCHITECT. ACCESS PANEL SHALL BE AS SPECIFIED.
17. 3/4" FIRE-RETARDANT TREATED PLYWOOD BACKING 8'-0" HIGH SHALL BE PROVIDED AND INSTALLED ON ALL WALLS OF TELEPHONE AND ELECTRICAL ROOMS UNLESS SPECIFICALLY SHOWN OTHERWISE ON ELECTRICAL DRAWINGS.
18. ALL WOOD WITHIN THIS PROJECT (I.E. PLYWOOD, BLOCKING, ETC.) SHALL BE FIRE-RETARDANT TREATED.
19. FOR ILLUSTRATION AND DEFINITION OF TYPICAL SYMBOLS USED ON THE ARCHITECTURAL DRAWINGS, SEE "SYMBOLS AND ABBREVIATIONS" SHEET. ADDITIONAL SYMBOLS NOT SHOWN OR DEFINED THERE MAY OCCUR AND ARE DEFINED ON OTHER DRAWINGS.
20. REFER TO SPECIFICATIONS FOR ADDITIONAL PAINT ITEMS NOT SHOWN ON ROOM FINISH SCHEDULE.
21. THE SPECIFICATIONS AND ALL CONSULTANT DRAWINGS ARE SUPPLEMENTAL TO THE ARCHITECTURAL DRAWINGS. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO COORDINATE WITH THE ARCHITECTURAL DRAWINGS BEFORE THE INSTALLATION OF ANY OF THE CONSULTANTS' WORK AND TO BRING ANY DISCREPANCIES OR CONFLICTS TO THE ARCHITECT'S ATTENTION FOR CLARIFICATION. IMPROPERLY INSTALLED WORK SHALL BE CORRECTED BY THE CONTRACTOR AT NO EXPENSE TO THE ARCHITECT, HIS CONSULTANTS, OR THE OWNER.
22. THE ARCHITECTURAL DRAWINGS ARE A PART OF A LARGER SET OF DRAWINGS WHICH, WHEN COMPLETE, CONSISTS OF ALL DRAWINGS LISTED BY THE INDEX OF DRAWINGS. THE WORK DESCRIBED BY THE DRAWINGS OF ANY ONE DISCIPLINE MAY BE AFFECTED BY THE WORK DESCRIBED ON DRAWINGS OF ANOTHER DISCIPLINE AND MAY REQUIRE REFERENCE TO DRAWINGS OF ANOTHER DISCIPLINE. PARTIAL SETS OF DRAWINGS SHALL NOT BE DISTRIBUTED AND UTILIZED BY THE CONTRACTOR. IT IS THE CONTRACTOR'S RESPONSIBILITY TO REVIEW AND COORDINATE THE WORK OF ALL SUBCONTRACTORS, TRADES, AND SUPPLIERS WITH THE REQUIREMENTS OF THE CONTRACT BEFORE COMMENCING CONSTRUCTION AND TO ASSURE THAT ALL PARTIES ARE AWARE OF ALL REQUIREMENTS, REGARDLESS OF WHERE THE REQUIREMENTS OCCUR IN THE CONTRACT DOCUMENTS.
23. THE ARCHITECTURAL DRAWINGS ESTABLISH AND COORDINATE THE FINISHED APPEARANCE AND EXACT LOCATIONS OF ALL EXPOSED ELEMENTS OF THE WORK, INCLUDING THAT WORK WHICH IS ILLUSTRATED PRIMARILY ON DRAWINGS OF OTHER DISCIPLINES. LOCATIONS SHOWN ON OTHER DRAWINGS ARE SCHEMATIC, UNLESS OTHERWISE NOTED ON THE ARCHITECTURAL DRAWINGS. THE ARCHITECTURAL DRAWINGS TAKE PRECEDENCE FOR THE FINISHED APPEARANCE AND EXACT LOCATION OF ALL PARTS OF THE WORK. [EXCEPTIONS: DIMENSIONED LOCATIONS SHOWN ON DRAWINGS OF OTHER DISCIPLINES SHALL GOVERN ONLY WHERE: (A) SPECIFICALLY AND INDIVIDUALLY INDICATED BY SYMBOL, KEYED NOTE, OR NOTATION ON THE ARCHITECTURAL DRAWINGS. (B) OCCURRING WITHIN A ROOM OR OTHER IDENTIFIED SPACE FOR WHICH ARCHITECTURAL SHEET OR SCHEDULE NOTES INDICATE THAT DIMENSIONS PROVIDED ELSEWHERE SHALL GOVERN.]
24. WORK NOT SPECIFICALLY INDICATED ON A PART OF THE DRAWINGS BUT REASONABLY IMPLIED TO BE SIMILAR TO WORK SHOWN ON THE DRAWINGS IN CORRESPONDING AND OTHER PLACES SHALL BE CONSTRUCTED SIMILARLY.
25. PROVIDE FIRE EXTINGUISHERS WITH A RATING OF NOT LESS THAN 2A WITHIN 75 FOOT TRAVEL DISTANCE TO ALL PORTIONS OF THE BUILDING. PROVIDE PORTABLE FIRE EXTINGUISHERS AS THE BUILDING IS CONSTRUCTED.
26. FOR THIS PROJECT, THE TERM "CONTRACTOR" SHALL BE UNDERSTOOD TO REFER TO THE "CONSTRUCTION MANAGER / MANAGEMENT COMPANY"
27. CONTRACTOR SHALL COORDINATE / SCHEDULE ALL CONSTRUCTION WITH THE OWNERS REQUIREMENTS FOR ALL ACADEMICS TO REMAIN ACTIVE DURING CONSTRUCTION.

PROJECT LOCATION



CENTRAL JUNIOR HIGH SCHOOL
400 NORTH BROADWAY
MOORE, OKLAHOMA 73160

NORTH

VICINITY MAP

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STATE OF OKLAHOMA
MICHAEL L. ABLA
2639
REGISTERED ARCHITECT
4/25/25

CG
drawn by

MA
checked by

APRIL 2025
date

revisions

MOORE PUBLIC SCHOOLS

MOORE PUBLIC SCHOOLS
BOARD OF EDUCATION
MOORE, OKLAHOMA

CLASSROOM ADDITION
CENTRAL JUNIOR
HIGH SCHOOL

sheet no:

G100

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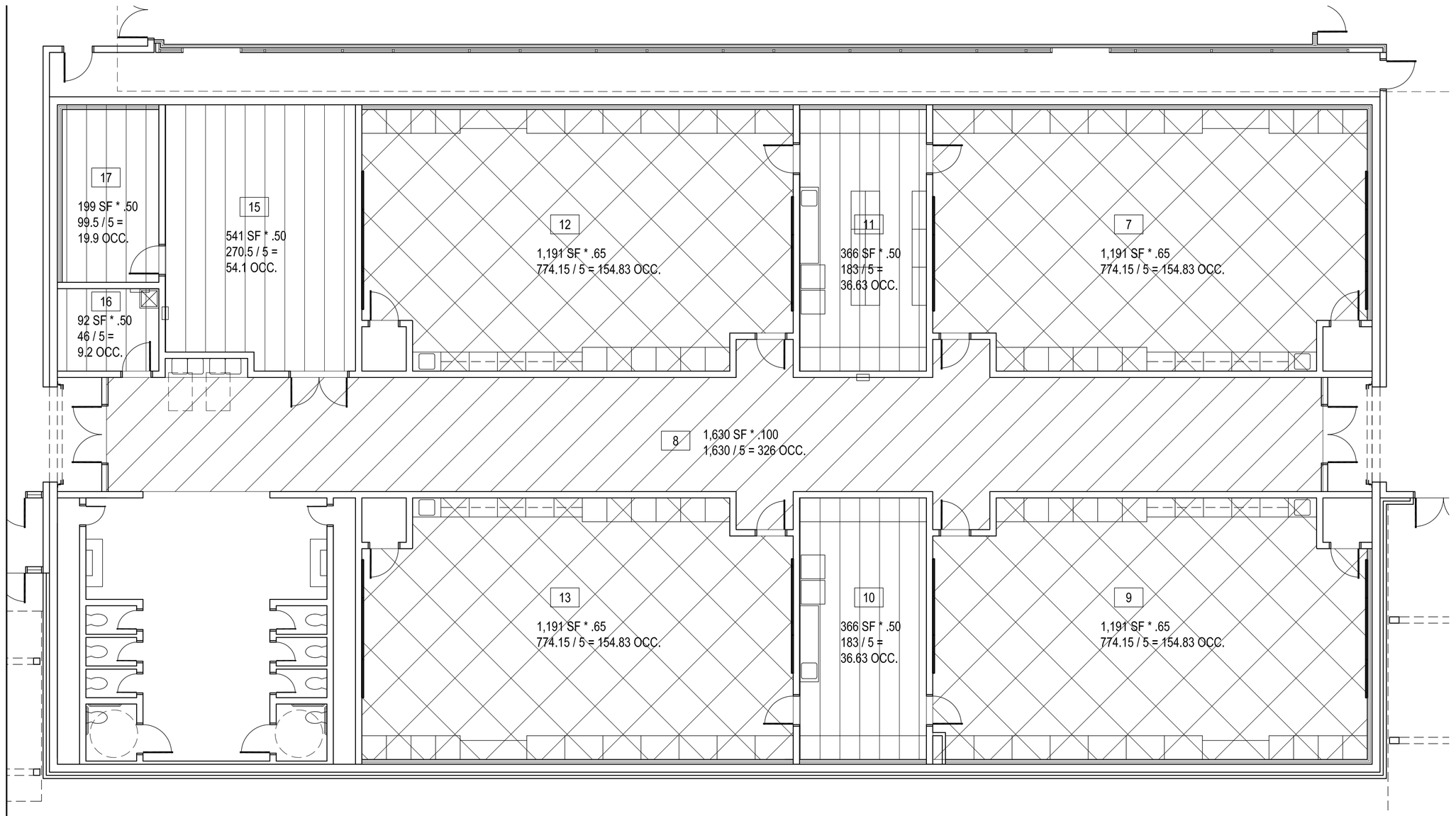


NORTH

1 SHELTER CALCULATION PLAN

1/8" = 1'-0"

GENERAL NOTES :

INDICATES AREA USED TO CALCULATE
USABLE SHELTER FLOOR AREA - 65% X 4,764 S.F. = 3,096.6 S.F.

INDICATES AREA USED TO CALCULATE
USABLE SHELTER FLOOR AREA - 100% X 1,630 S.F. = 1,630 S.F.

INDICATES AREA USED TO CALCULATE
USABLE SHELTER FLOOR AREA - 50% X 1,564 S.F. = 782 S.F.

PLUMBING FIXTURE REQUIREMENTS FOR ICC 500 2014
PLUMBING FIXTURES SHELTER CALCULATIONS :

TOTAL OCCUPANT LOAD = 1,101

TOTAL REQUIRED:	TOTAL PROVIDED:
WATER CLOSETS = 3	WATER CLOSETS = 8
LAVATORIES = 3	LAVATORIES = 10

TOTAL CALCULATION OF USABLE FLOOR AREA (ADJUSTED TO INCL. H.C.) = 5,508 S.F. / 5 = 1,095.6 OCCUPANTS + 6 H.C. = 1,101 TOTAL OCCUPANTS

Tornado Storm Shelter Construction:

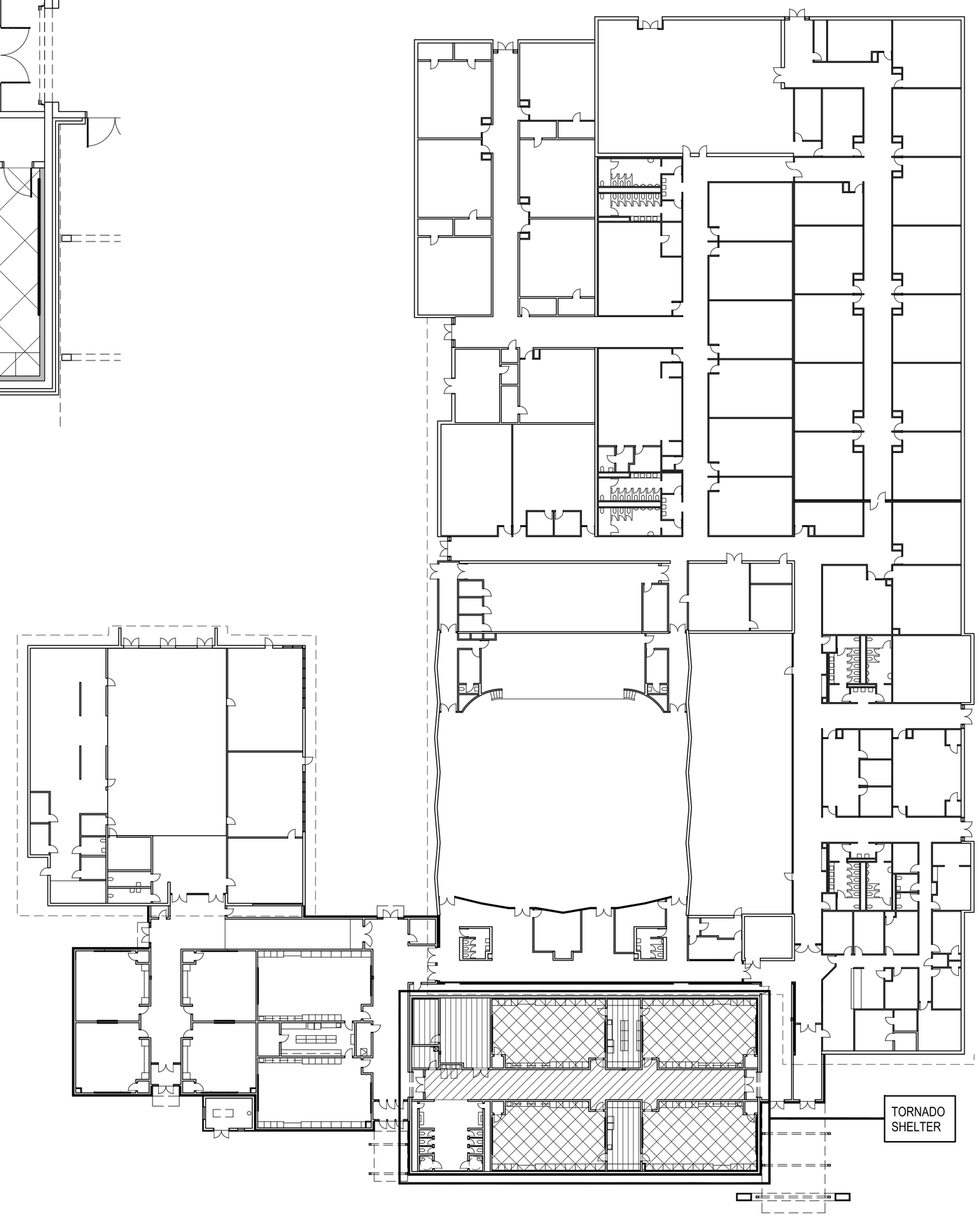
A. Storm shelter has been designed and engineered to meet all applicable codes and standards including the following:
   1. ICC 500-2014 (International Code Council), ICC / NSSA Standard for the Design and Construction of Storm Shelters, American National Standard.

B. All construction shall comply with the above standards and guidelines including ICC-500 Section 107.2.1:
   1. Tornado - Community
   2. Re: Structural
   3. Re: Structural
   4. Re: Structural
   5. Re: Structural
   6. Re: Structural
   7. Re: Structural
   8. The storm shelter is not located within an area susceptible to flooding.
   9. Not applicable
   10. components meet pressure & missile impact test requirements.
   ** refer specifications, structural drawings & mechanical drawings
   11. Re: sheet G101
   12. Re: Sheet A301
   13. Finish floor elevation - Re: Sheet C300
   14. occupant load of shelter = 1,095 + 6 handicap
   15. useable shelter floor area = 5,508 s.f.
   16. Re: mechanical drawings
   17. Re: sheet G101
   18. Re: Structural
   19. Not applicable
   20. Not applicable
   21. Not applicable
   22. Not applicable

C. First aid kit shall be provided by owner & stored in the shelter & accessible by occupants

PROVIDE ONE (1) SIGN WITH THE NAME OF THE MANUFACTURER OR CONTRACTOR OF THE SHELTER AND THE STORM TYPE AND RESPECTIVE DESIGN WIND SPEED. THE SIGN SHALL REMAIN LEGIBLE AND VISIBLE - LOCATE AS PER ARCHITECT'S INSTRUCTIONS

SAMPLE OMNI CONSTRUCTION LLC



NORTH

2 SHELTER LOCATION PLAN

NO SCALE

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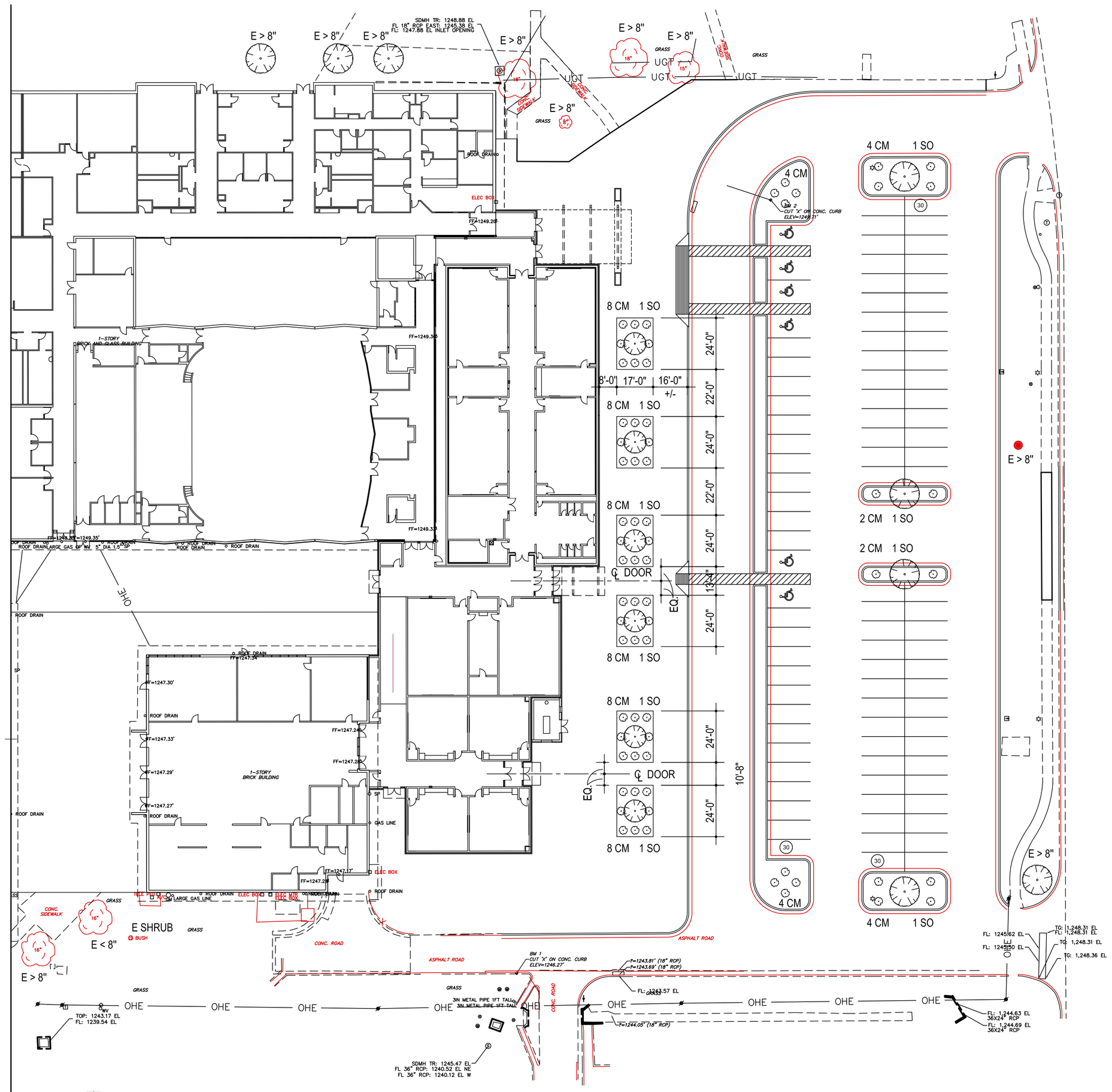


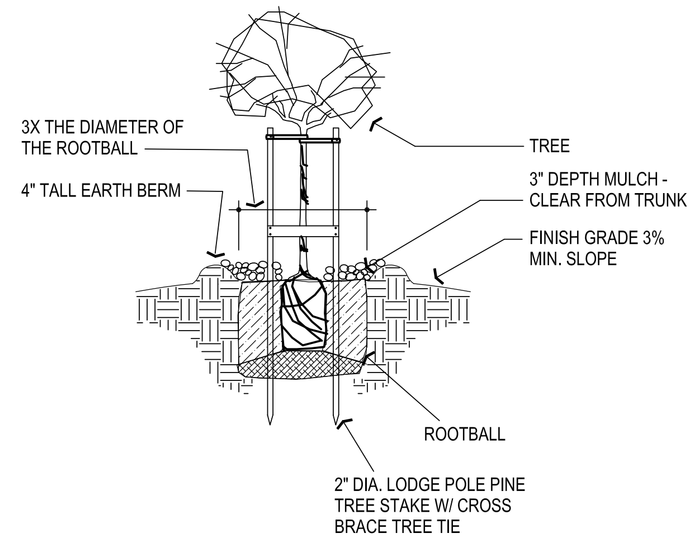
NORTH

1 LANDSCAPE PLAN

1" = 30'-0"

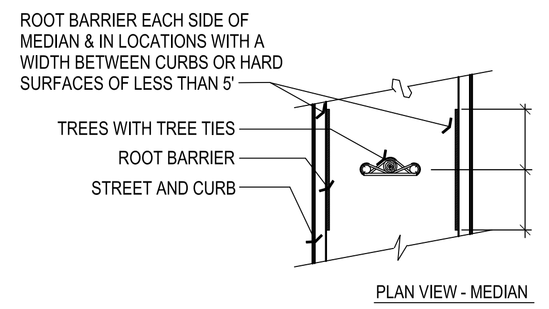
PLANTING SHEET NOTES :

1. NO CHANGES SHALL BE MADE TO THE PLANT MATERIAL LIST WITHOUT WRITTEN APPROVAL OF THE ARCHITECT.
2. ALL WORK SHALL BE PERFORMED BY LICENSED LANDSCAPE CONTRACTORS AND EXPERIENCED WORKERS.
3. LANDSCAPE CONTRACTOR SHALL NOTIFY THE ARCHITECT 24 HOURS BEFORE CONSTRUCTION COMMENCES. ANY DESCREPANCIES BETWEEN THE PLAN AND FIELD CONDITIONS SHALL BE BROUGHT TO THE ARCHITECT ATTENTION IMMEDIATELY.
4. THE CONTRACTOR SHALL BE RESPONSIBLE FOR FINE GRADING ALL PLANTED AREAS AND TO ENSURE POSITIVE DRAINAGE AWAY FROM BUILDINGS, REFER CIVIL.
5. ALL AMENDMENTS SHALL BE THOROUGHLY INCORPORATED INTO THE PLANTING AREAS. PLANTING AREAS SHALL BE RAKED CLEAN OF ALL DEBRIS, ROCKS, STICKS, AND ROOTS GREATER THAN 1" DIA.
6. LOCATIONS FOR ALL PLANT MATERIAL SHALL BE APPROVED BY THE ARCHITECT AT THE SITE PRIOR TO PLANTING.
7. PLANT CROWNS SHALL BE 1-1/2" ABOVE FINISH GRADE AND PLUMB AFTER WATERING AND SETTLING.
8. ALL TREES SHALL BE PLANTED AS PER PLANTING DETAILS.
9. LOCATIONS FOR ALL PLANT MATERIAL SHALL BE APPROVED BY THE ARCHITECT AT THE SITE PRIOR TO PLANTING.
10. WATER PLANTS AFTER PLANTING AND WASH ALL FERTILIZER FROM LEAVES.
11. CONTRACTOR SHALL LOCATE AND MARK ALL UTILITIES PRIOR TO CONSTRUCTION AND SHALL AVOID ANY DISTURBANCE TO UTILITIES.



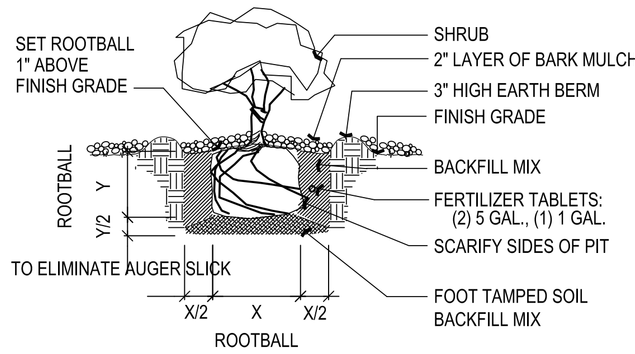
3 TREE PLANTING DETAIL

NOT TO SCALE



4 TREE PLANTING DETAIL

NOT TO SCALE



5 SHRUB PLANTING DETAIL

NOT TO SCALE

LANDSCAPING NOTES: (CALCULATION FORM AVAILABLE UPON WRITTEN REQUEST FROM AHJ)

224,380 S.F. TOTAL OF LOT
22,438 S.F.OPEN SPACE REQUIRED

37 TRESS REQUIRED MINUS (6 TREES FROM PARKING SPACES)
MINUS 6 / +8" CALP. TREES (18 TOTAL)
MINUS 5 / -8" CALP. TREES (10 TOTAL)
10 NEW TREES TOTAL REQUIRED (10 PROVIDED)

56 SHRUBS REQUIRED (68 PROVIDED)

PROVIDE BERMUDA TURF SOD @ ALL EXPOSED DIRT AREAS AFTER PLANTING OF TREES & SHRUBS & CONSTRUCTION OF NEW ADDITION

PLANT SCHEDULE

SYM.	QTY.	BOTANICAL NAME	COMMON NAME	SIZE	COND.	SPCG.	ROOT BALL SIZE	TREE PIT SIZE	NOTES
		TREES							
SO	10	QUERCUS SHUMARDII	SHUMARD OAK	3" CAL.	BB/C	AS	24"-26"	32" - 38"	UNIFORM BRANCHING HABITS.
		SHRUBS							
CM	68	LAGERSTROEMIA INDICA	CRAPE MYRTLE	8' HT., MT.	BB/C	AS	24"-26"	32" - 38"	3 TRUNK MINIMUM - 1.5" TO 2" CAL.
		GROUND COVERS							
BG	--	BERMUDA SOD							

AS = AS SHOWN, BB = BALLED AND BURLAPPED, C = CONTAINER, CAL. = CALIPER, GAL. = GALLON, HT = HEIGHT, MT = MULTI-TRUNK, N.A. = NOT APPLICABLE, O.C. = ON CENTER, S.F.= SQUARE FEET

2 LANDSCAPE MATERIAL SCHEDULE

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CLASSROOM ADDITION
CENTRAL JUNIOR HIGH SCHOOL

sheet no:

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LANDSCAPE PLAN

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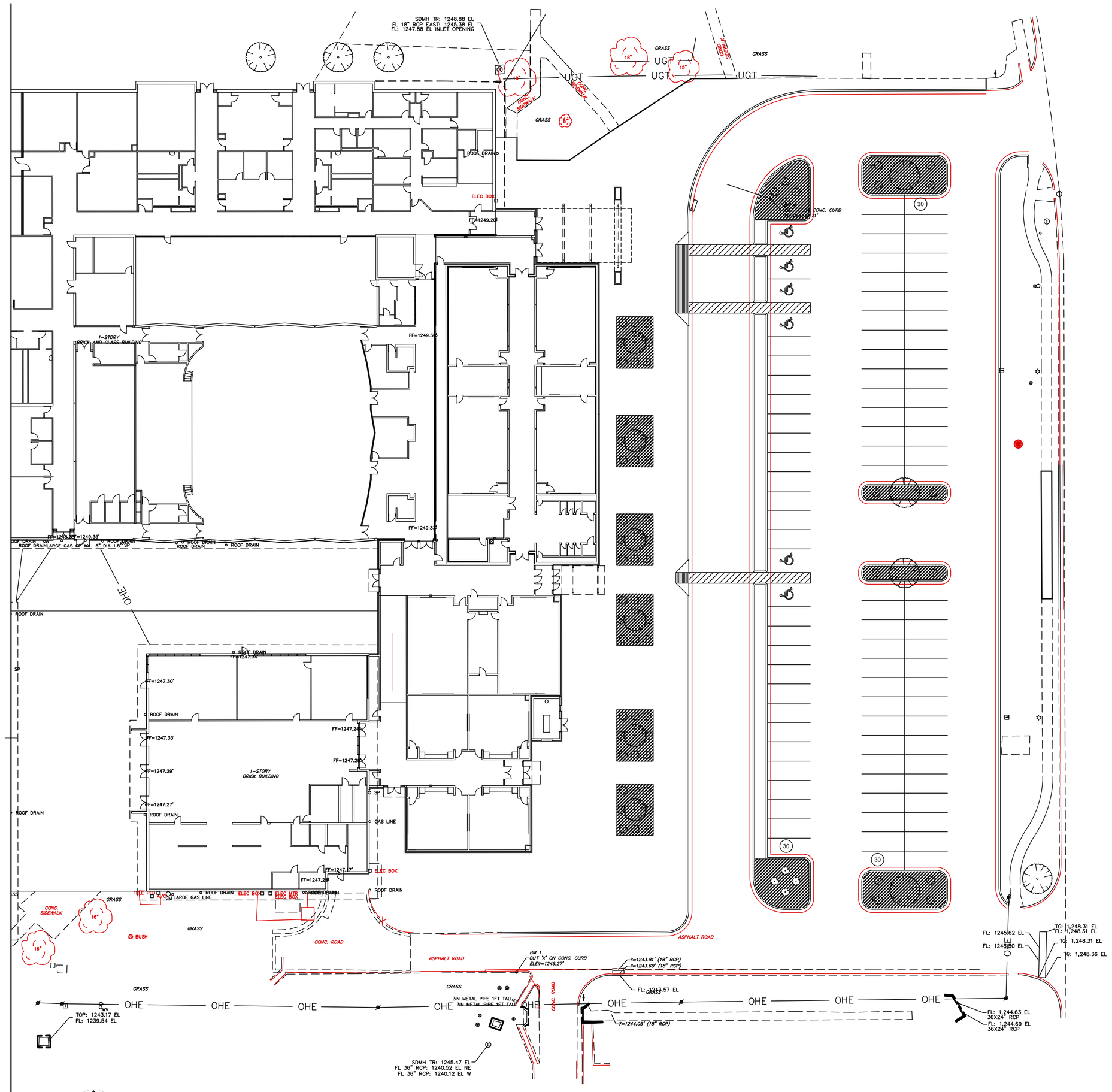

NORTH

1 IRRIGATION PLAN

1" = 30'-0"

IRRIGATION SHEET NOTES:

1. THE IRRIGATION SYSTEM SHALL BE INSTALLED IN ACCORDANCE WITH ALL LOCAL CODES AND ORDINANCES AND ALL PERMITS SHALL BE OBTAINED BY THE CONTRACTOR AND ALL FEES REQUIRED SHALL BE PAID BY CONTRACTOR.
2. NO CHANGES IN MATERIALS SHALL BE ALLOWED WITHOUT PRIOR WRITTEN APPROVAL OF THE ARCHITECT.
3. THE IRRIGATION SYSTEM IS TO BE DESIGNED FROM PERFORMANCE SPEC'S & APPROVED BY THE ARCHITECT PRIOR TO COMMENCING WORK REFER SECTION 02811. AREAS TO RECEIVE DIFFERENT TYPES OF IRRIGATION SYSTEMS AS PER THIS DRAWING & THE SPECIFICATIONS.
4. THE CONTRACTOR SHALL FAMILIARIZE HIMSELF WITH ALL GRADE DIFFERENCES, LOCATION OF ALL CONSTRUCTED ITEMS, BUILDINGS, DIFFERENCES IN ACTUAL AND DRAWN SITE DIMENSIONS, UNDERGROUND SERVICES, ETC., PRIOR TO STARTING WORK
5. THE CONTRACTOR SHALL INSTALL THE IRRIGATION SYSTEM AS SPECIFIED, AND SHALL ENSURE COMPLETE SPRINKLER COVERAGE FOR ALL PLANTING AREAS. THE CONTRACTOR SHALL ADJUST THE IRRIGATION HEADS TO ALLOW FULL AND COMPLETE COVERAGE. FLUSH AND ADJUST HEADS TO ENSURE NO OVERTHROW ONTO STREETS, WALLS OR WALKS.
6. THE CONTRACTOR SHALL MAINTAIN THE IRRIGATION SYSTEM DURING THE MAINTENANCE PERIOD.
7. INSTALL BACKFLOW PREVENTER IN ACCORDANCE WITH APPLICABLE CODES.
8. SCREEN BACKFLOW PREVENTER BY SHRUBS WHERE LOCATED IN A SHRUB BED AND AS PER PLANTING PLAN.
9. COVERAGE OVER PIPES SHALL BE AS PER THE SPECIFICATIONS.
10. STAKE ALL UTILITIES INCLUDING SEWER AND DRAINAGE PRIOR TO ANY EXCAVATION FOR IRRIGATION WORK.
11. VALVE BOX SHALL BE INSTALLED A MINIMUM OF 12" FROM ALL WALKS, WALLS OR OTHER STRUCTURES & PAVEMENT.
12. COORDINATE LOCATION OF SPRINKLER CONTROLLER LOCATION W/ ARCHITECT PRIOR TO INSTALLATION.

IRRIGATION LEGEND:

IRRGATED AREA - POP-UP MIST

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STATE OF OKLAHOMA
MICHAEL L. ABLA
2639
OKLAHOMA CITY, OKLAHOMA
REGISTERED ARCHITECT

4/25/25

CG
drawn by

MA
checked by

APRIL 2025
date

revisions

MOORE PUBLIC SCHOOLS
PUBLIC SCHOOLS

MOORE PUBLIC SCHOOLS
BOARD OF EDUCATION
MOORE, OKLAHOMA

CLASSROOM ADDITION
CENTRAL JUNIOR
HIGH SCHOOL

sheet no:

L101

IRRIGATION PLAN

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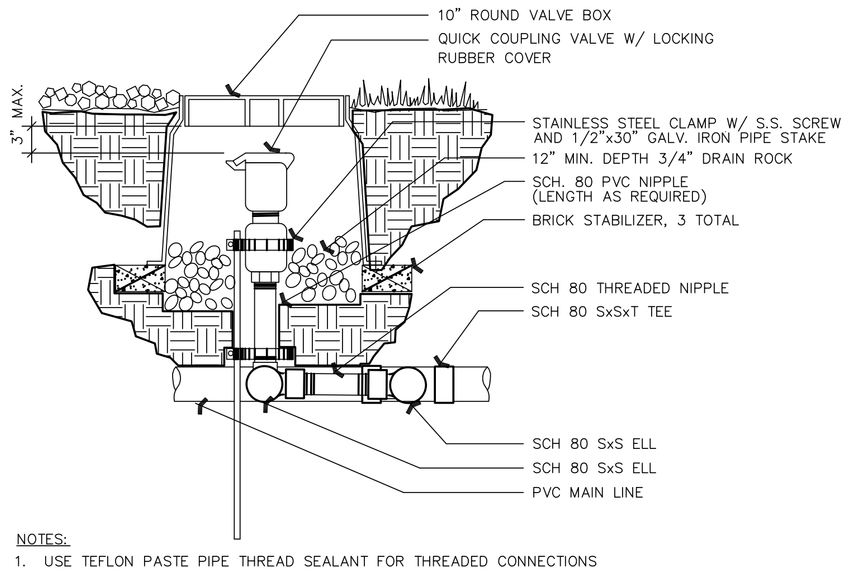
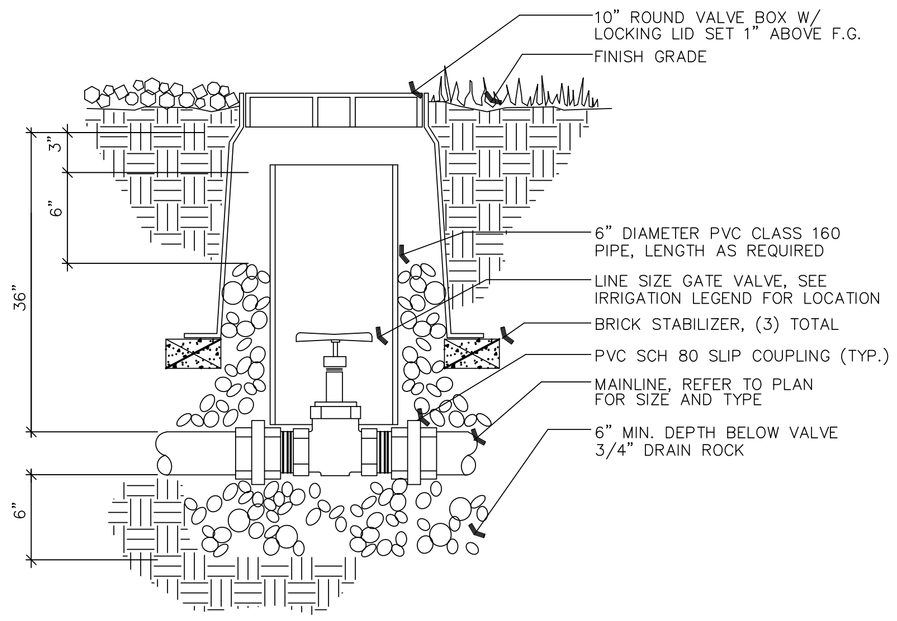
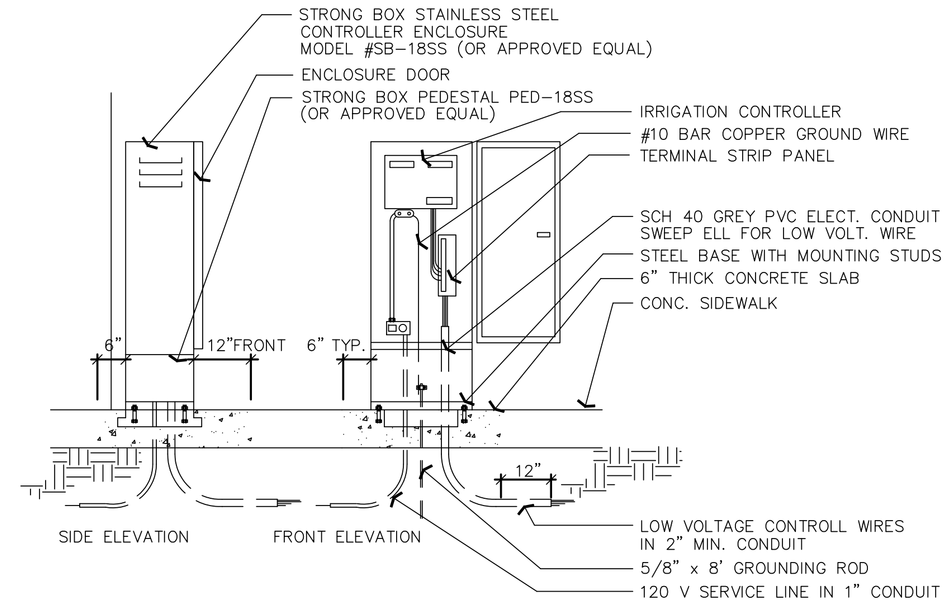


NOTES:
1. USE TEFLON PASTE PIPE THREAD SEALANT FOR THREADED CONNECTIONS

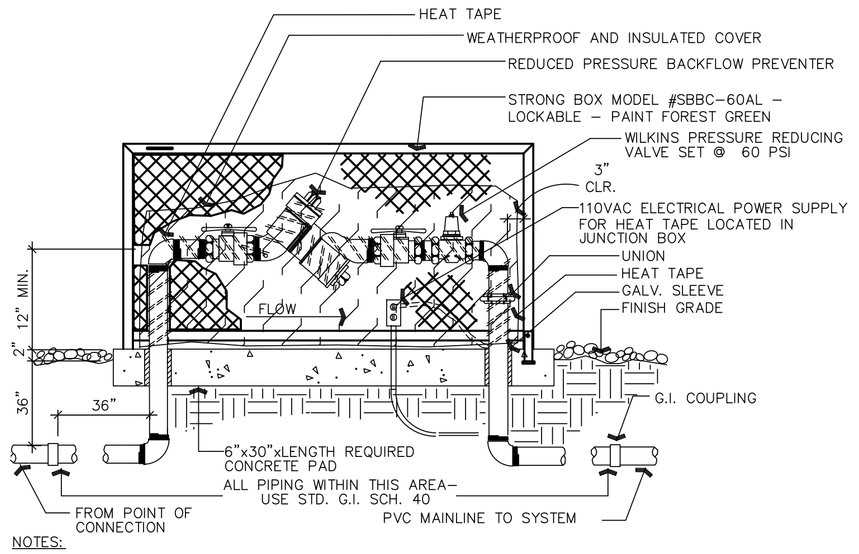
1 QUICK COUPLING VALVE DETAIL
NOT TO SCALE



2 MANUAL SHUT-OFF GATE VALVE DETAIL
NOT TO SCALE

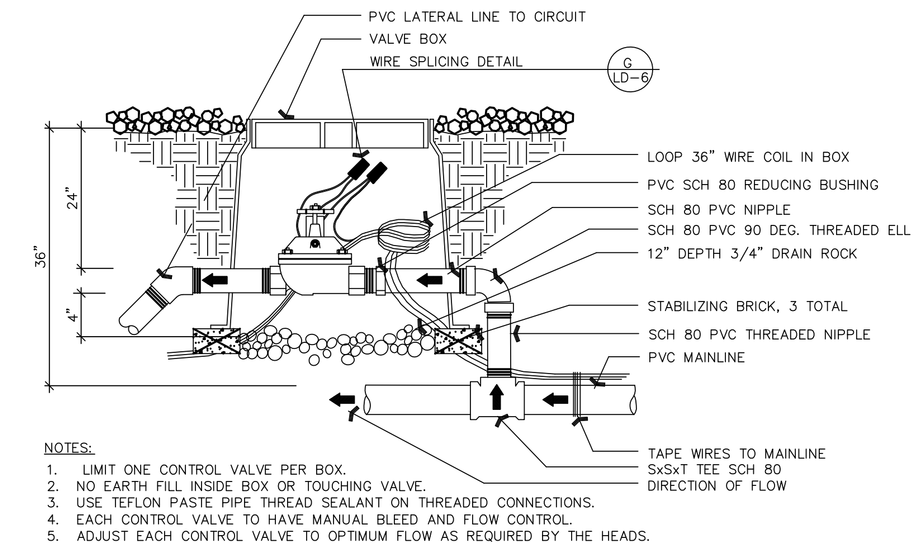


3 CONTROLLER DETAIL
NOT TO SCALE



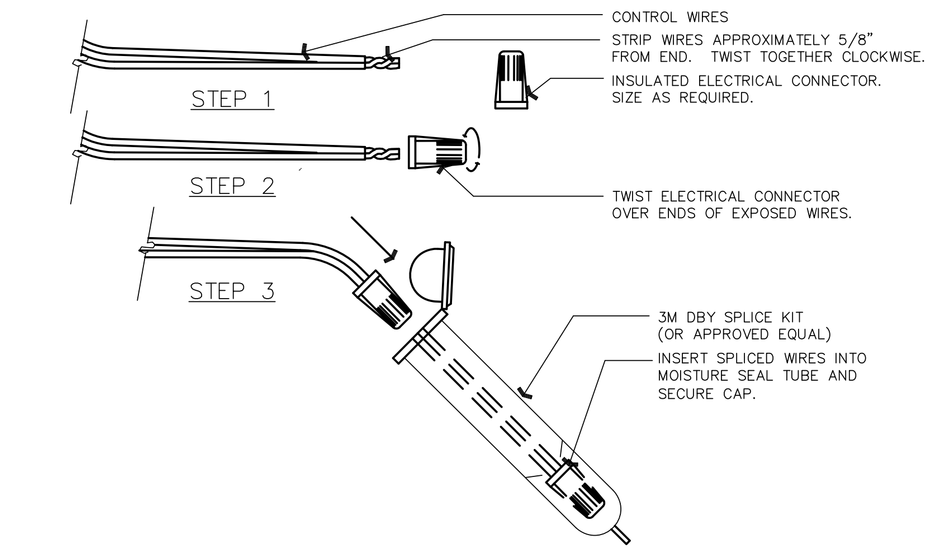
NOTES:
1. INSTALL 18" CLEAR FROM CURB, EDGE, ETC.
2. PAINT ALL ABOVE GRADE MATERIALS W/ 2 COATS RUSTOLEUM FLAT BLACK PAINT
3. WRAP ALL BELOW GRADE METAL PIPE W/ .010" x 2" P.E. TAPE.
4. USE TEFLON PASTE PIPE THREAD SEALANT FOR ALL THREADED CONNECTIONS.
5. WRAP ELECTRIC HEAT TAPE AROUND ALL EXPOSED PIPE
6. WRAP ENTIRE BACKFLOW PREVENTION DEVICE WITH WEATHERPROOF, INSULATED MATERIAL

4 BACKFLOW PREVENTER DETAIL
NOT TO SCALE

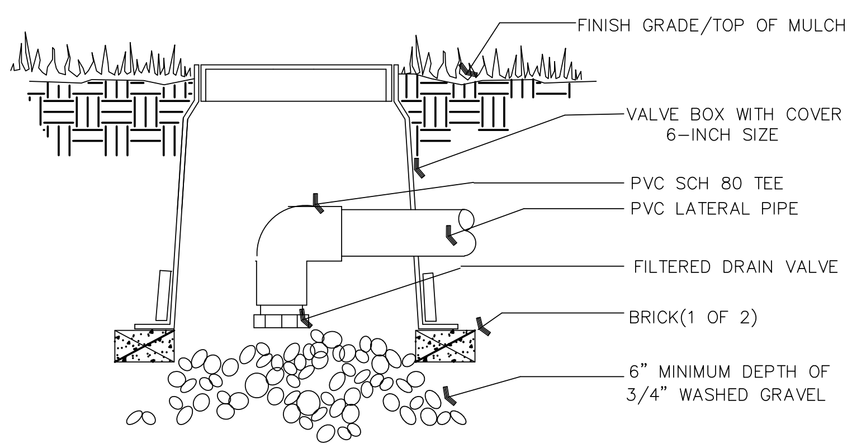


NOTES:
1. LIMIT ONE CONTROL VALVE PER BOX.
2. NO EARTH FILL INSIDE BOX OR TOUCHING VALVE.
3. USE TEFLON PASTE PIPE THREAD SEALANT ON THREADED CONNECTIONS.
4. EACH CONTROL VALVE TO HAVE MANUAL BLEED AND FLOW CONTROL.
5. ADJUST EACH CONTROL VALVE TO OPTIMUM FLOW AS REQUIRED BY THE HEADS.

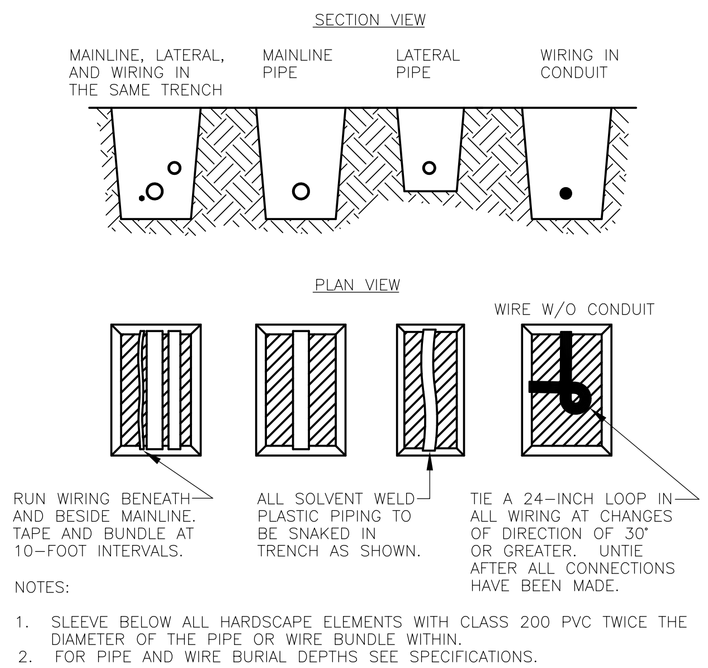
5 ELECTRIC REMOTE CONTROLLED VALVE DETAIL
NOT TO SCALE



6 WIRE CONNECTION DETAIL
NOT TO SCALE

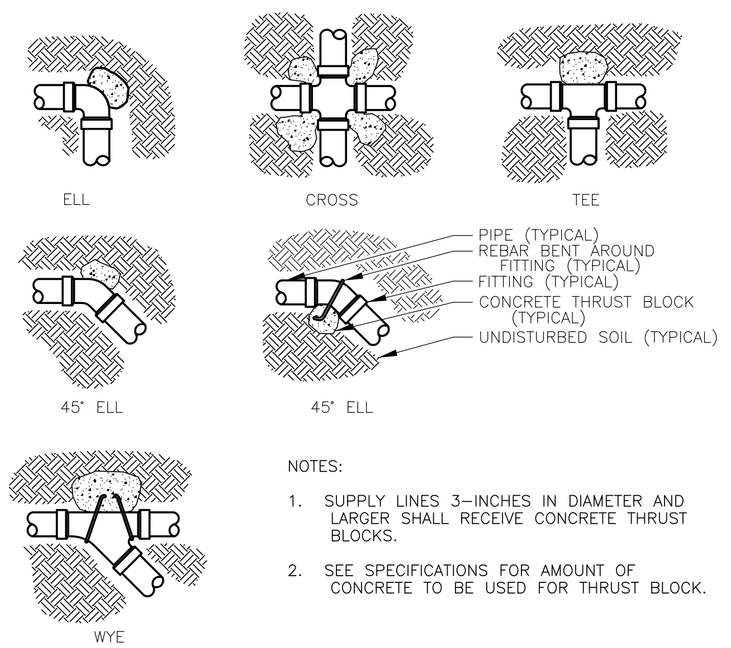


7 DRAIN VALVE DETAIL
NOT TO SCALE



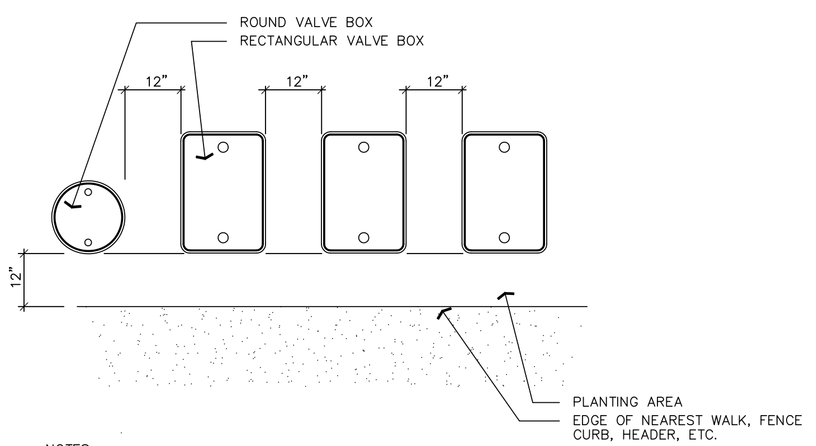
NOTES:
1. SLEEVE BELOW ALL HARDSCAPE ELEMENTS WITH CLASS 200 PVC TWICE THE DIAMETER OF THE PIPE OR WIRE BUNDLE WITHIN.
2. FOR PIPE AND WIRE BURIAL DEPTHS SEE SPECIFICATIONS.

8 JOINT IRRIGATION TRENCH DETAIL
NOT TO SCALE



NOTES:
1. SUPPLY LINES 3-INCHES IN DIAMETER AND LARGER SHALL RECEIVE CONCRETE THRUST BLOCKS.
2. SEE SPECIFICATIONS FOR AMOUNT OF CONCRETE TO BE USED FOR THRUST BLOCK.

9 THRUST BLOCK DETAIL
NOT TO SCALE



NOTES:
1. SET BOXES PARALLEL AND PERPENDICULAR TO NEAREST EDGE AND EACH OTHER.
2. CENTER BOXES OVER ENCLOSED VALVES.
3. AVOID HEAVILY COMPACTING SOIL AROUND BOXES TO PREVENT DAMAGING BOX.

10 VALVE BOX LAYOUT DETAIL
NOT TO SCALE

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MOORE PUBLIC SCHOOLS

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BOARD OF EDUCATION
MOORE, OKLAHOMA

CLASSROOM ADDITION
CENTRAL JUNIOR HIGH SCHOOL

sheet no:

L102

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ADDENDUM NO. 1
July 22, 2025 – Revised July 23, 2025

This addendum applicable to work designated herein, shall be understood to be an Addendum, and as such shall be included in the Contract Agreement.

Receipt of this Addendum shall be acknowledged by the Construction Management Firm notifying this office in writing, and by any applicable subcontractor to the CM.

This addendum consists of three (3) pages with attachments of one hundred seventy-eight (178) 8.5″x11″ pages and twenty-five (25) 24″x36″ sheets.

A. Drawings:

General

No changes.

Civil

Refer to attached revised drawing C3.00.

1, Notice: Construction Manager and all applicable Subcontractor(s) shall use any means necessary (i.e. potholing, etc.) to locate all underground utilities at the construction site prior to starting demolish/construction especially at the courtyard area between the buildings. Utilities include – but, are not limited to – electrical main to existing transformer, existing sanitary sewer from existing cafeteria, etc.

Structural

Refer to attachments.

Architectural

1. Sheet AD100, Detail #1 and Demolition Notes: added clarification for removal of existing glazing from existing storefront frames to remain. Refer to attached replacement drawing.

2. Sheet A104, Detail #1, Floor Plan – Area "A": removed note referencing existing doors to be replaced at existing auditorium areas. Refer to attached drawing.

3. Sheet A107, Detail 1, Reflected Ceiling Plan – Area "A": add the replacement of acoustical ceilings at existing auditorium lobby restrooms and support areas as indicated on attached drawing.

4. Sheet A111, Detail 1, LVT & Carpet Design Plan – Area "A": removed replacement of flooring and wall base at the existing auditorium Lobby Room #6 as indicated on attached drawing. Replace / repair flooring and wall base (match existing) ONLY at new wall to cover existing window frames to remain. Provide transition strips at new door entrances. Refer to attachment.

5. Sheet A201, Detail 2, South Elevation: revise Door #12 as per attached drawing.

6. Sheet A202, Detail 1, West Elevation: revise Door #13 as per attached drawing.

7. Sheet A202, Details 2 & 3, Canopy Details: added Details #2 and 3 in their entirety. Refer to attached revised sheet A202.

8. Sheet A602, Detail 1, Door Schedule: revised location for Doors #41 & 42 to Room #25 in lieu of Room #19. Refer to attachment.

Mechanical, Electrical, and Plumbing

Refer to attachments.

B. Specifications:

1. Table of Contents: revised as per attachment.

2. Special Conditions: added section "CONFLICTS BETWEEN DRAWINGS AND SPECIFICATIONS" as per attachment.

3. Revised Geotechnical Engineering Letter Report: refer to attached letter addressing Pavement Design requirements and guidelines.

4. Section 08700-2.02, Finish Hardware: revise Hardware Set No. 007 as per attached revised set. Refer to attachment.

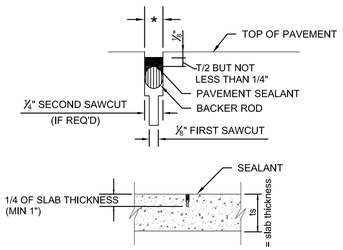
5. Section 10400-2.03 & 2.04, Interior Signage: revised / added signs and locations. Refer to attachments.

6. Section 10420-2.01, Letters and Plaques: added additional letters (OFFICE) and revised colors, etc. Refer to attachments.

7. Section 10731 – Prefinished Metal Canopies: add section in its entirety. Refer to attachments.

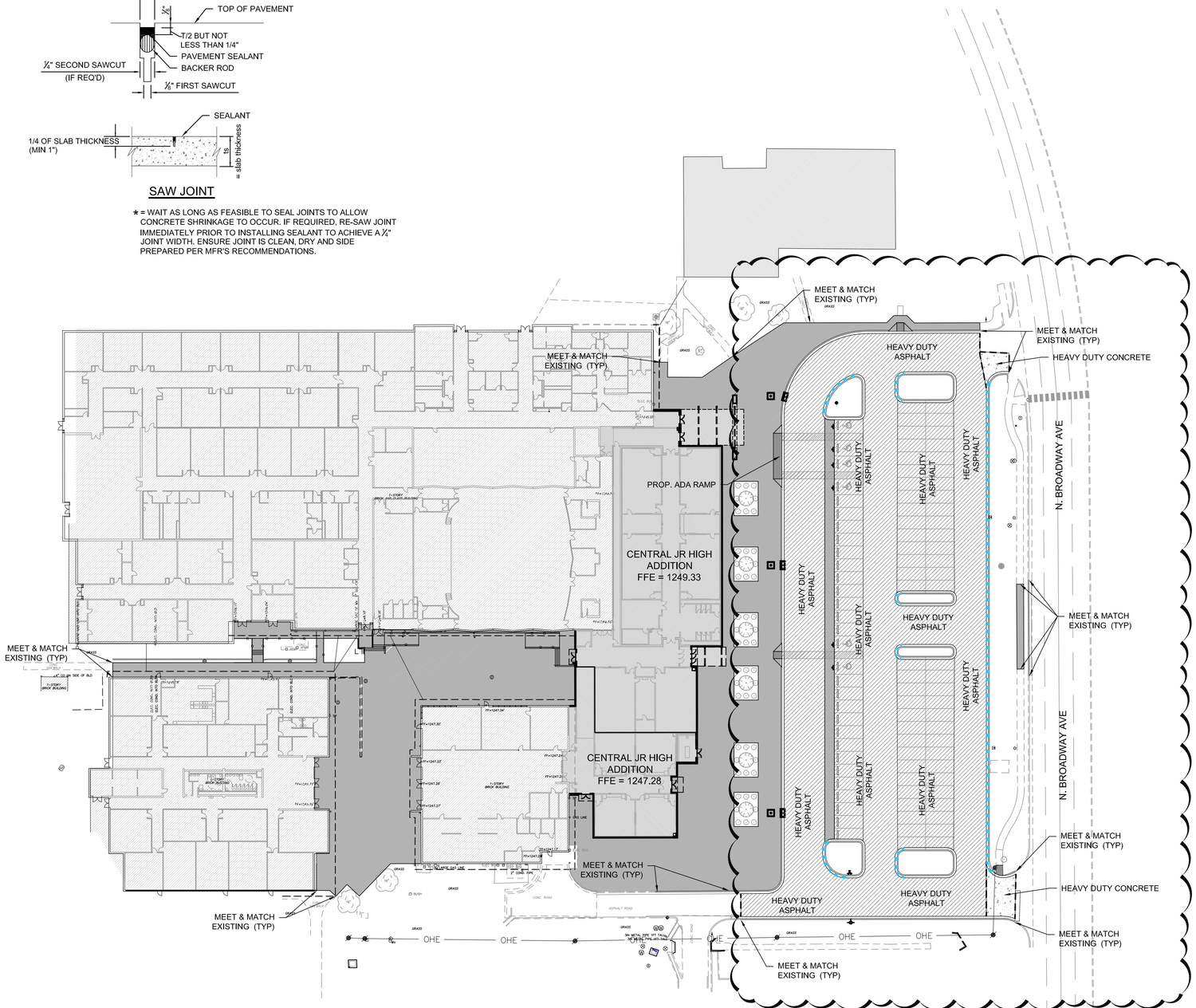
8. Added Civil Specifications: refer to attachments.

END OF ADDENDUM NO. 1



SAW JOINT

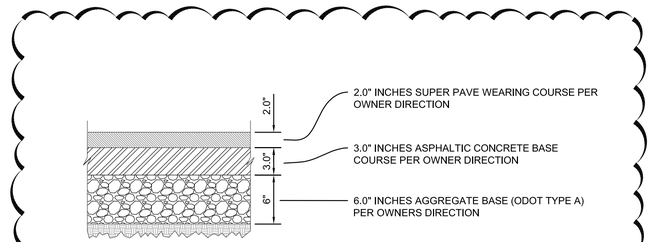
* = WAIT AS LONG AS FEASIBLE TO SEAL JOINTS TO ALLOW CONCRETE SHRINKAGE TO OCCUR. IF REQUIRED, RE-SAW JOINT IMMEDIATELY PRIOR TO INSTALLING SEALANT TO ACHIEVE A ¼" JOINT WIDTH. ENSURE JOINT IS CLEAN, DRY AND SIDE PREPARED PER MFR'S RECOMMENDATIONS.



PAVING LEGEND

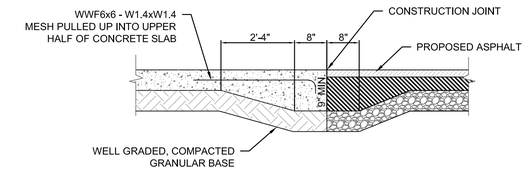
- SIDEWALK PAVEMENT
- HEAVY DUTY DUMPSTER CONCRETE PAVEMENT
- HEAVY DUTY ASPHALT PAVEMENT
- LIGHT DUTY ASPHALT PAVEMENT
- ASPHALT TO CONCRETE THICKENED EDGE
- OMIT GUTTER VALLEY

NOTE: PAVING SECTIONS SHOWN ON CIVIL PLANS ARE FOR INFORMATIONAL PURPOSES ONLY. GEOTECHNICAL REPORT AND RECOMMENDATIONS SHALL GOVERN. CONTRACTOR SHALL CONTACT ENGINEER IF THERE IS A CONFLICT BETWEEN GEOTECHNICAL RECOMMENDATIONS AND CIVIL PLANS.



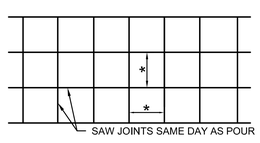
HEAVY DUTY ASPHALT PAVEMENT SECTION

NOT TO SCALE



CONCRETE TO ASPHALT THICKENED EDGE

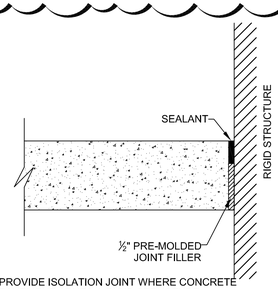
NOT TO SCALE



* = 30 x SLAB THICKNESS

CONCRETE PAVEMENT

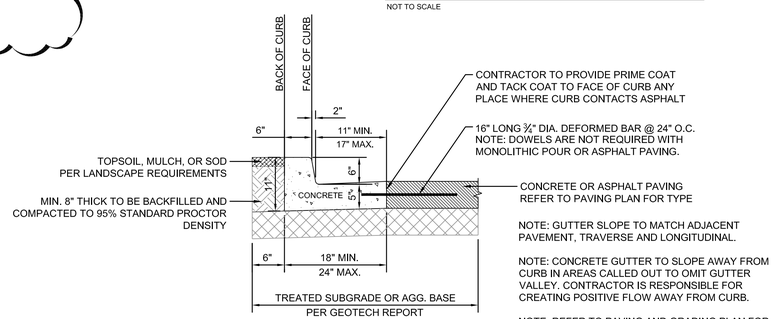
PLAN VIEW



PROVIDE ISOLATION JOINT WHERE CONCRETE PAVEMENT ABUTS A RIGID STRUCTURE

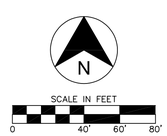
ISOLATION JOINT

NOT TO SCALE



CURB & GUTTER DETAIL

NOT TO SCALE



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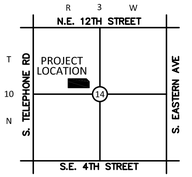
EXP. 06/30/26

LOCATION MAP:



PROJECT:

CENTRAL JUNIOR HIGH CLASSROOM ADDITION

400 N. BROADWAY ST.
MOORE, OKLAHOMA

PROJECT NUMBER: 25031
DRAWING DATE: 06.02.25
ISSUE DATE: 06.02.25

SEAL:

SUBMITTAL:

PERMIT SET

REVISIONS:

MARK	DATE	DESCRIPTION
1	07.01.25	ADDENDUM 01

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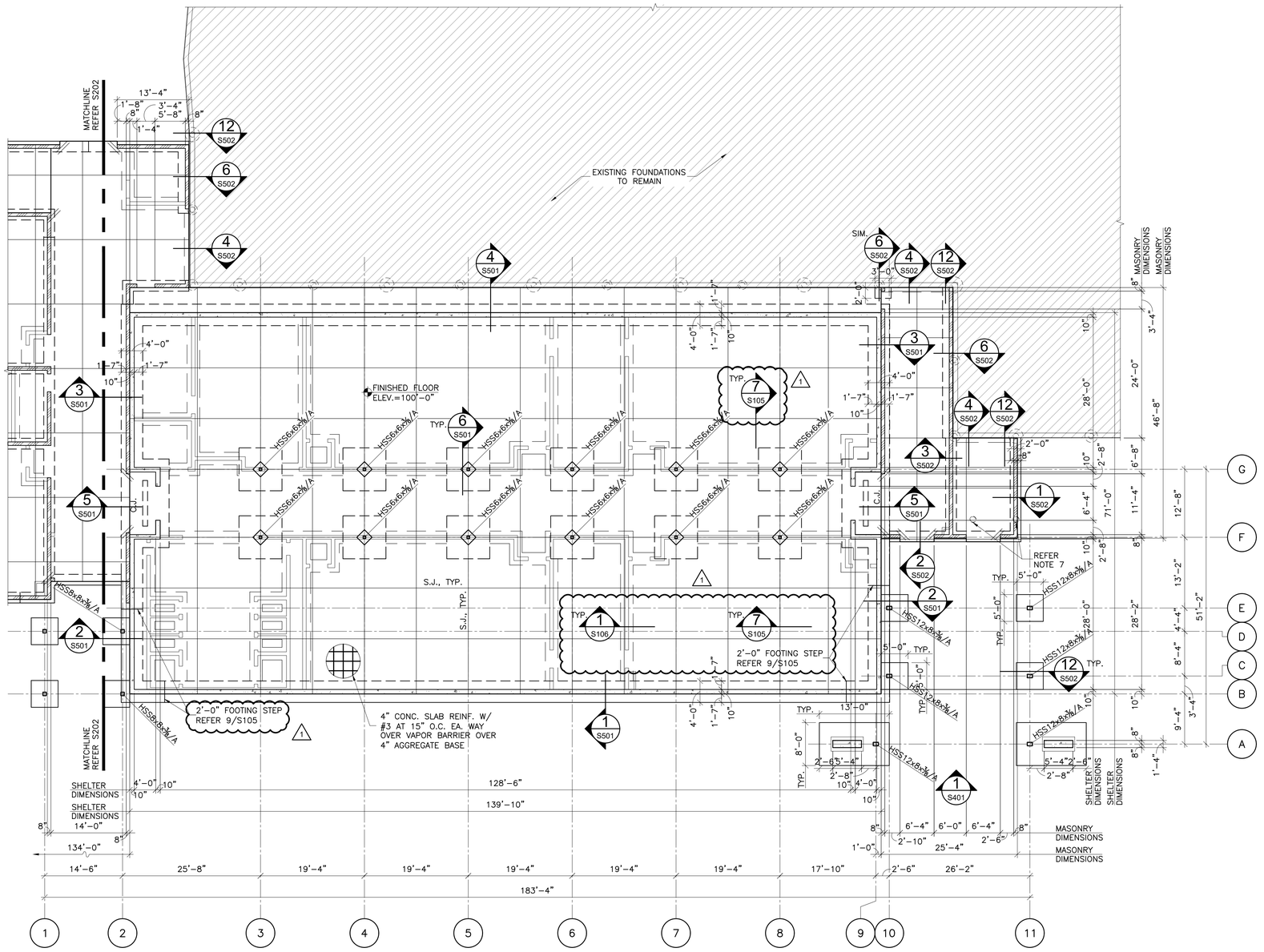
DRAWING TITLE:

PAVING PLAN

SHEET:

C3.00



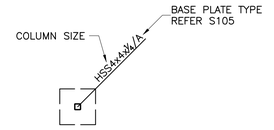
NORTH

1 FOUNDATION PLAN - AREA "A"

S201

SCALE: 3/32"=1'-0"

FOUNDATION PLAN LEGEND:

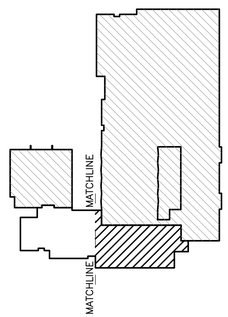


= LOAD BEARING MASONRY WALLS

= NON-LOAD BEARING MASONRY WALLS

FOUNDATION PLAN NOTES:

1. FOUNDATION AND SLAB SUBGRADE SHALL BE PREPARED AS OUTLINED IN THE STRUCTURAL GENERAL NOTES.
2. REFERENCE ELEVATION OF 100'-0" EQUALS DATUM FINISHED FLOOR ELEVATION OF 1249.33 FEET FOR THE NEW BUILDING.
3. EXCEPT WHERE SHOWN OTHERWISE, SLABS-ON-GRADE SHALL BE 4" THICK CONCRETE REINFORCED WITH #3 BARS AT 15" ON CENTER EACH WAY OVER A 15 MIL VAPOR RETARDER OVER A 4" AGGREGATE BASE COURSE. REINFORCING BARS SHALL BE PLACED 1½" CLEAR FROM TOP OF SLAB USING CHAIRS OR SLAB BOLSTERS COMPLYING WITH CRSI'S "MANUAL OF STANDARD PRACTICE".
4. SLABS-ON-GRADE SHALL BE WATER CURED FOR A MINIMUM OF 7 DAYS BY PONDING, SPRAYING, SPRINKLING OR BY USE OF SATURATED COVERINGS. THE USE OF CURING COMPOUNDS FOR SLABS-ON-GRADE IS PROHIBITED.
5. SAWED JOINTS (SJ) AND REQUIRED CONSTRUCTION JOINTS (CJ) ARE SHOWN ON THE DRAWINGS. AT THE CONTRACTOR'S OPTION, ADDITIONAL CONSTRUCTION JOINTS MAY BE PLACED AT LOCATIONS INDICATED TO BE SAWED JOINTS.
6. // INDICATES (2)#4 BARSx4'-0" TO BE PLACED IN SLAB-ON-GRADE AT ALL RE-ENTRANT CORNERS. RE-ENTRANT CORNERS ARE DEFINED AS INTERIOR CORNERS WHERE JOINTS DO NOT OCCUR IN BOTH DIRECTIONS. SIMILAR BARS SHALL BE PLACED AT ANY DISCONTINUOUS ENDS OF SAWED JOINTS OR CONSTRUCTION JOINTS.
7. REMOVE EXISTING PIERS THAT CONFLICT WITH NEW FOUNDATIONS
8. REFER MECHANICAL FOR FLOOR DRAIN (F.D.) INFORMATION.



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07/16/2025

CJC
drawn by

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FEBRUARY 2025
date

revisions
1 ADD #1 07/16/2025

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MOORE Public Schools
LEARNING FOR LIFE

CLASSROOM ADDITION
CENTRAL JUNIOR HIGH SCHOOL

sheet no:

S201

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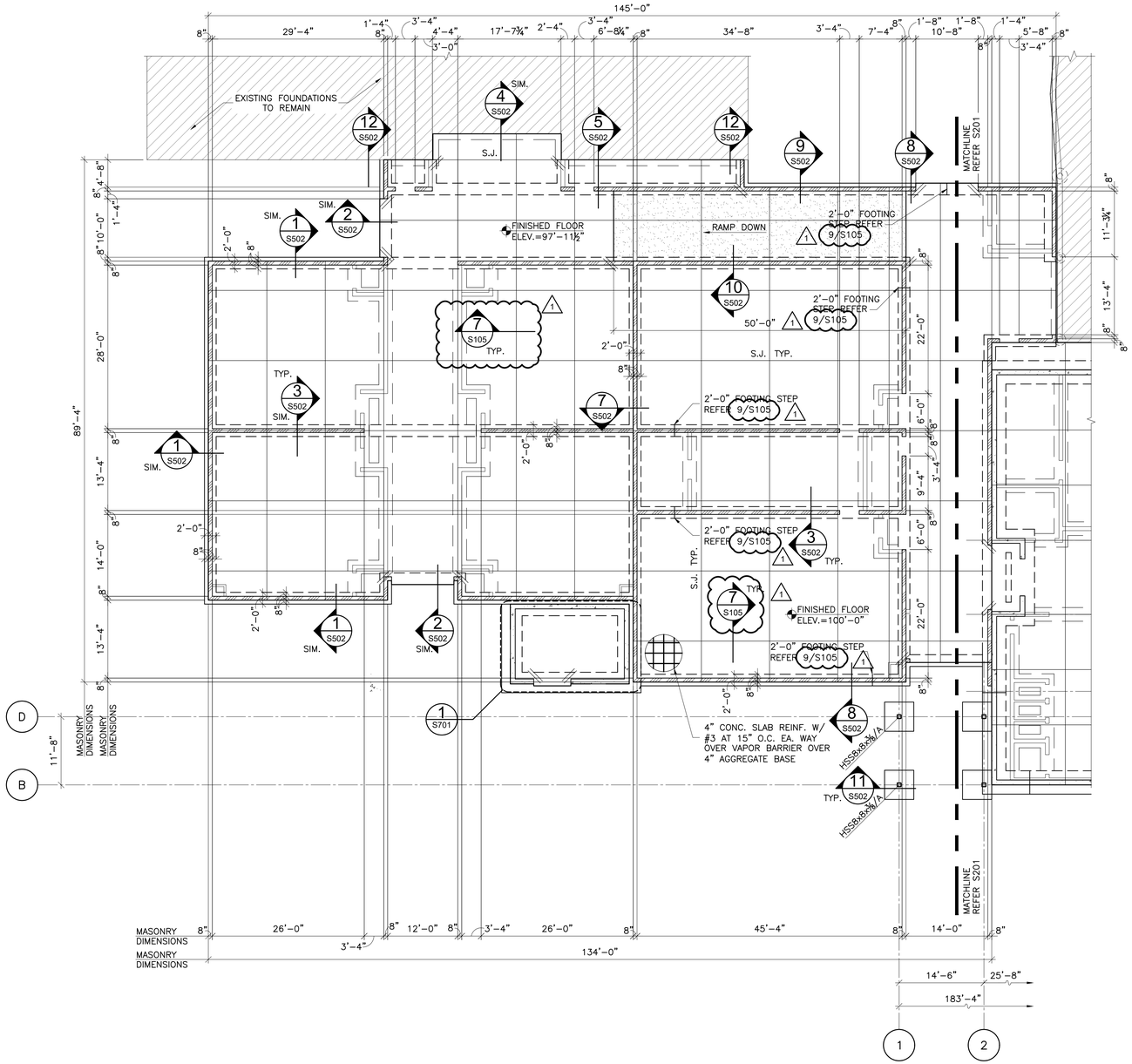
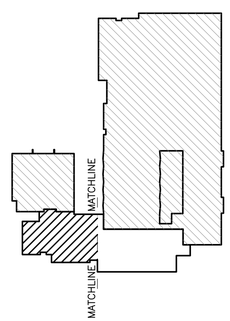


NORTH 1 S202 FOUNDATION PLAN - AREA "B"

SCALE: 3/32"=1'-0"

NOTE:
REFER S201 FOR FOUNDATION PLAN NOTES AND LEGEND



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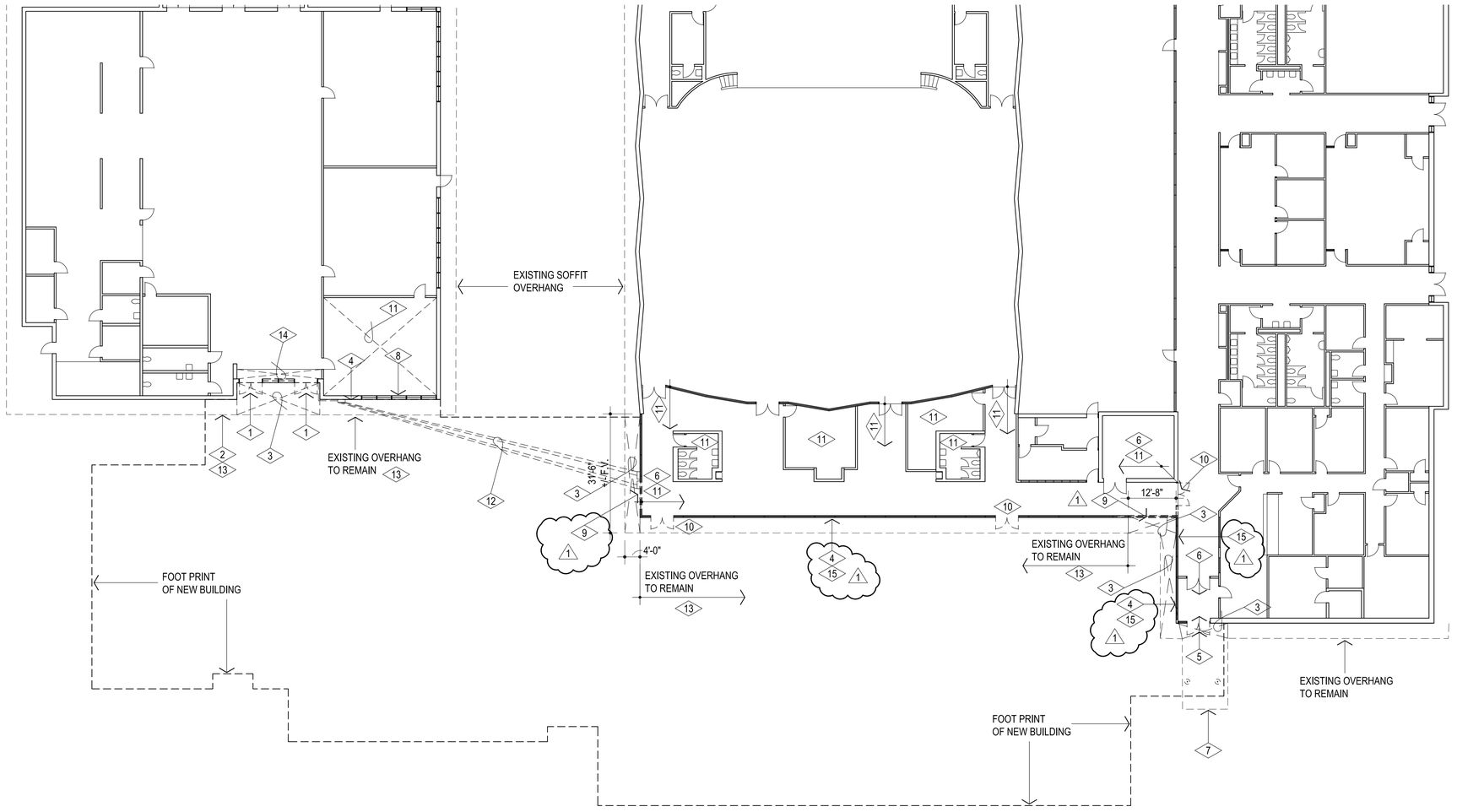

NORTH

1 DEMOLITION PLAN

1/16" = 1'-0"

(RE: CIVIL SHEETS FOR ADDITIONAL DEMOLITION INFORMATION)

GENERAL NOTES:

1. FILL, GRADE, & PREPARE ALL EXCAVATED AREAS TO RECEIVE NEW SITE FEATURES.
2. CONTRACTOR TO VISIT SITE PRIOR TO PREPARING BID, & VERIFY ALL ITEMS TO BE DEMOLISHED. ANY ADDITIONAL ITEMS REQUIRING DEMOLITION THAT ARE NOT INCLUDED IN THESE DOCUMENTS SHOULD BE BROUGHT TO THE IMMEDIATE ATTENTION OF THE ARCHITECT AND INCLUDED IN THE BASE BID.
3. EXISTING UNDERGROUND UTILITY LOCATIONS & CONTOUR INFORMATION HAVE BEEN OBTAINED FROM THE BEST AVAILABLE SOURCES. THE CONTRACTOR SHALL FIELD VERIFY ALL EXISTING CONDITIONS PRIOR TO COMMENCING WORK & COORDINATE W/ ARCHITECT.
4. CONTRACTOR IS TO FIELD VERIFY ALL EXISTING ELEVATIONS PRIOR TO STARTING EARTHWORK - AND ADJUST ACCORDINGLY AS DIRECTED BY THE ARCHITECT.
5. DURING ALL EXISTING UTILITY REVISIONS - TEMPORARY SERVICE IS TO BE PROVIDED @ ALL EFFECTED BUILDINGS.
6. ALL SALVAGEABLE ITEMS TO REMAIN OWNER'S PROPERTY & SHALL BE STORED OR DISPOSED OF AS PER OWNER'S INSTRUCTIONS.
7. CONSTRUCTION SHALL MEET ALL APPLICABLE CODES, ORDINANCES, REGULATIONS & STANDARDS REQUIRED BY THE CITY OF MOORE, OKLAHOMA.
8. CONSTRUCTION SHALL MEET ALL APPLICABLE REQUIREMENTS OF THE AMERICANS W/ DISABILITIES ACT INCLUDING ANY SUPPLEMENTAL REQUIREMENTS BY THE CITY OF MOORE, OKLAHOMA.
9. CONTRACTOR SHALL COORDINATE ACCESS TO SITE W/ OWNER PRIOR TO STARTING WORK. OBTAIN APPROVAL FROM OWNER FOR ON-SITE MATERIAL STORAGE, ETC. CONTRACTOR SHALL PROVIDE PROPER SEPARATION BTWN. WORK & STUDENTS.

DEMOLITION NOTES:

1. REMOVE EXISTING DOORS & FRAME - PREPARE OPENING TO RECEIVE NEW FIRE RATED DOORS & FRAMES & STUD IN-FILL
2. REMOVE EXISTING GUTTERS AND DOWNSPOUTS AS REQUIRED FOR NEW ADDITION. MODIFY GUTTERS TO REMIAN AS REQUIRED FOR PROPER OPERATION
3. REMOVE EXISTING SOFFIT PANEL & EXISTING STRUCTURE AS NECESSARY TO INSTALL NEW CEILING - RE: 1A107 & 1A108
4. REMOVE ALL EXISTING WALL MOUNTED ITEMS TO BE SALVAGED. RE: ELECTRICAL & COORDINATE W/ ARCHITECT & OWNER.
5. REMOVE EXISTING DOORS & FRAME - PREPARE OPENING TO RECEIVE NEW WOOD TRIM. REMOVE EXISTING CEILING AS NECESSARY TO INSTALL NEW CEILING - RE: 1A107 & 1A108
6. REMOVE EXISTING FLOORING & WALL BASE AS REQUIRED FOR NEW FLOORING & WALL BASE - RE: 1A111
7. REMOVE EXISTING ENTRY CANOPY ASSOCIATED COLUMNS & FOOTINGS AS REQUIRED FOR NEW ADDITION.
8. REMOVE EXISTING WINDOW FRAME - PREPARE OPENING TO RECEIVE 6" METAL STUDS @ 16" O.C.W/ BATT INSULATION W/ 5/8" FIRE RATED GYP EACH SIDE. ON EXISTING CLASSROOM SIDE, PAINT ENTIRE WALL
9. REMOVE EXISTING WALL & WINDOW FRAME SYSTEM - REMOVE WINDOW SYSTEM TO NEAREST VERTICAL FRAME PAST NEW OPENING IN EXISTING WALL. RE: SHEET A104
10. REMOVE EXISTING DOORS & FRAME AND SIDE LIGHT AS REQUIRED. RE: SHEET A104
11. REMOVE EXISTING CEILING SYSTEM AS REQUIRED FOR NEW CEILING SYSTEM. RE: MECHANICAL & ELECTRICAL FOR ADDITIONAL WORK.
12. IDENTIFY EXISTING CONDUIT WIRING AND COORDINATE TEMPORARY SERVICE TO REMAIN ACTIVE. REMOVE EXISTING CONDUITS & JUNCTION BOXES RE: ELECTRICAL & TECHNOLOGY FOR NEW WORK. COORDINATE WORK WITH MPS PERSONAL.
13. REMOVE EXISTING SOFFIT PANEL & EXISTING WOOD FRAMING AS NECESSARY TO INSTALL NEW STUD FRAMING W/ GYP. BD. EACH SIDE ABOVE EXISTING WALL SYSTEM TO CLOSE OUT TO DECK ABOVE - REFER WALL SECTIONS.
14. REMOVE EXISTING DOORS & FRAME - PREPARE OPENING TO RECEIVE NEW FIRE RATED DOORS & FRAMES.
15. REMOVE EXISTING GLAZING @ FRAMES TO REMAIN & PREPARE TO RECEIVE NEW ENCLOSURE PARTITIONS

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STATE OF OKLAHOMA
MICHAEL L. ABLA
2639
REGISTERED ARCHITECT

4/25/25

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date

revisions
1 ADDENDUM #1

MOORE PUBLIC SCHOOLS

MOORE PUBLIC SCHOOLS
BOARD OF EDUCATION
MOORE, OKLAHOMA

CLASSROOM ADDITION
CENTRAL JUNIOR
HIGH SCHOOL

sheet no:

AD100

DEMOLITION PLAN

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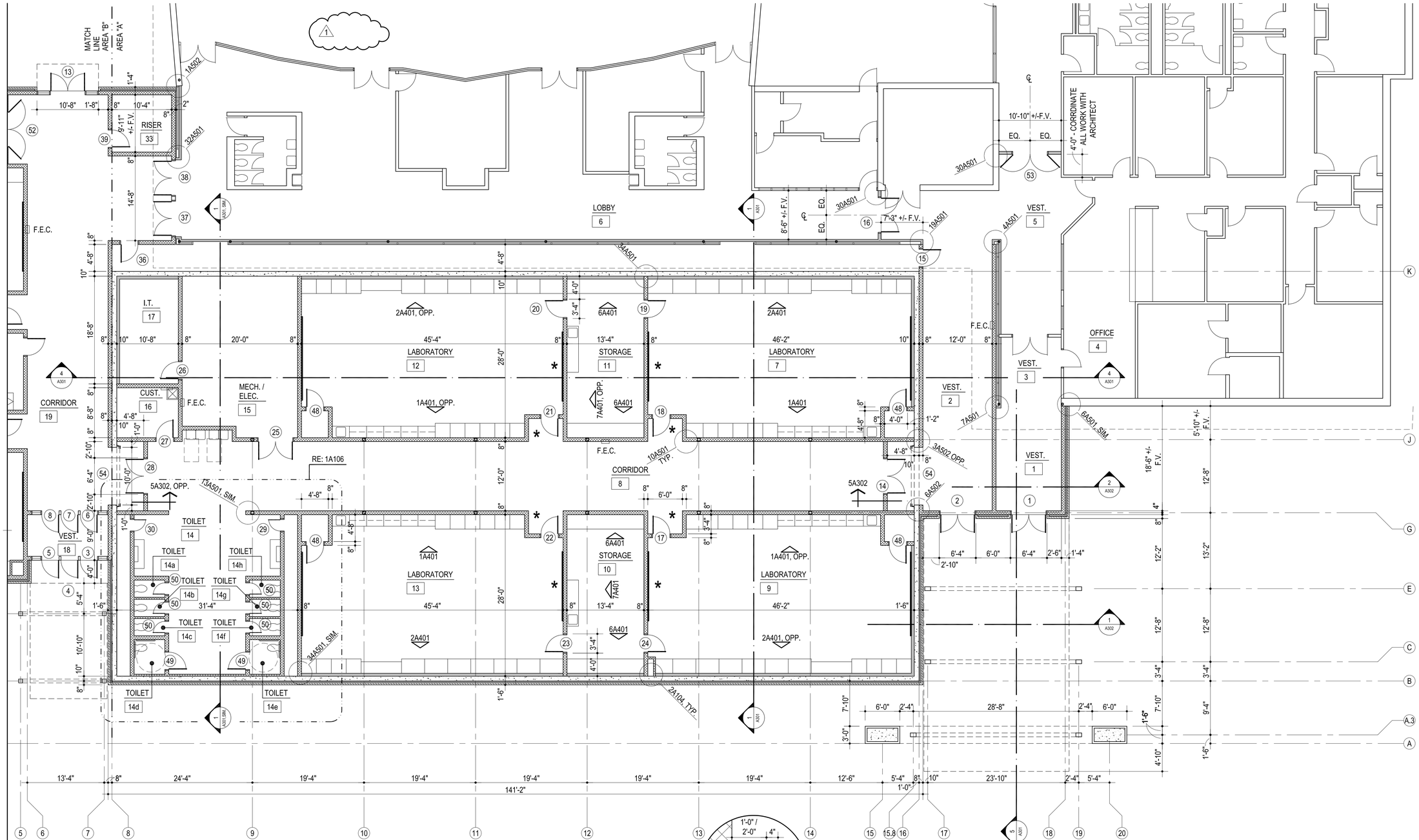


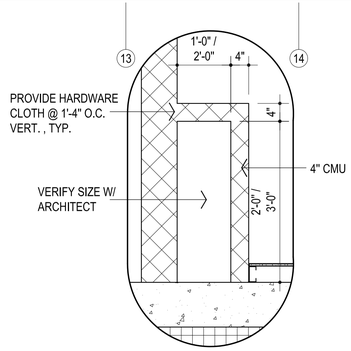
1 FLOOR PLAN - AREA "A"

1/8" = 1'-0"

MISCELLANEOUS NOTES:

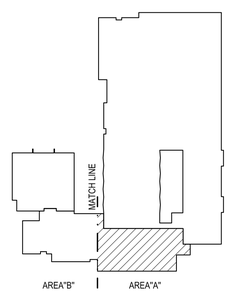
1. F.E.C. - FIRE EXTINGUISHER AND CABINET
2. REFER A111 & A112 FOR FLOORING FINISH LAYOUT
3. ✱ INDICATES ROOM WALLS & RECESS WALLS PAINTED ACCENT COLOR
4. PROVIDE BULLNOSE @ ALL EXPOSED CMU CORNERS & ENDS (b.n.)
5. DO NOT SCALE DRAWINGS TO OBTAIN MATERIAL QUANTITIES. USE DRAWINGS WHICH ARE DIMENSIONED OR COORDINATE W/ EXISTING CONDITIONS &/OR ARCHITECT & ENGINEERS.

DENOTES ROOM NAME
DORM ROOM
102
DENOTES ROOM NUMBER
102
DENOTES DOOR NUMBER



2 CHASE

3/4" = 1'-0"



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1 ADDENDUM #1

MOORE PUBLIC SCHOOLS
BOARD OF EDUCATION
MOORE, OKLAHOMA

CLASSROOM ADDITION
CENTRAL JUNIOR HIGH SCHOOL

sheet no:

A104

FLOOR PLAN

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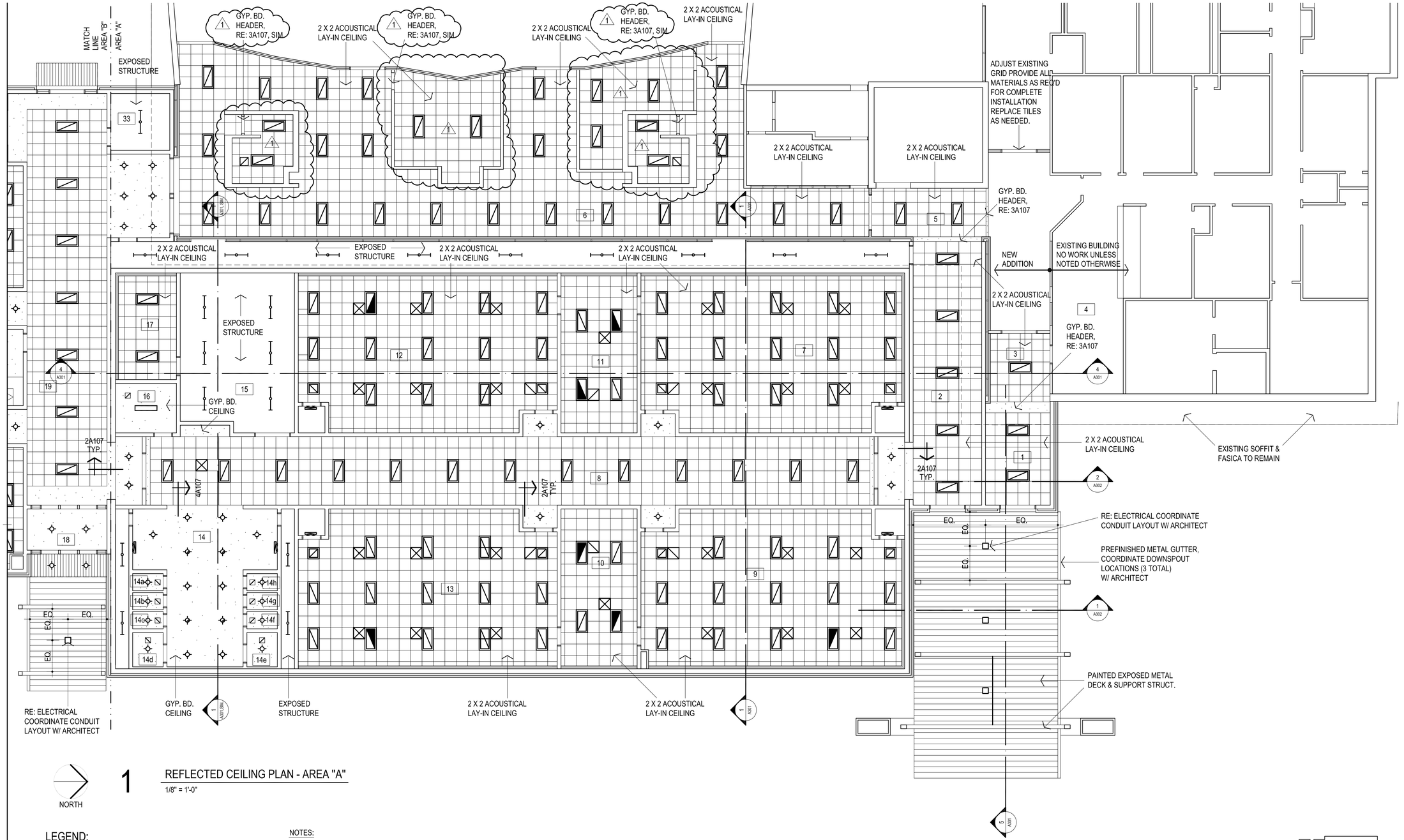


1 REFLECTED CEILING PLAN - AREA "A"

1/8" = 1'-0"

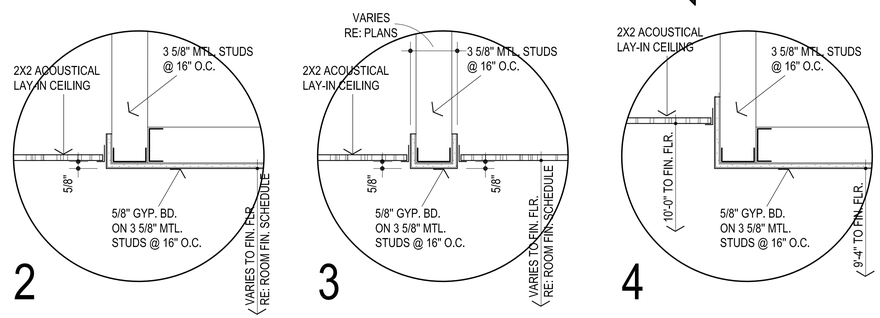
NORTH

LEGEND:

- MECHANICAL OPENINGS
- ELECTRICAL FIXTURES
- CEILING MOUNTED SMOKE DETECTOR, RE: ELEC
- INDICATES AREA / ROOM TO RECEIVE GYP. BD.. CEILING
- INDICATES AREA / ROOM TO RECEIVE 2X2 LAY-IN CEILING

NOTES:

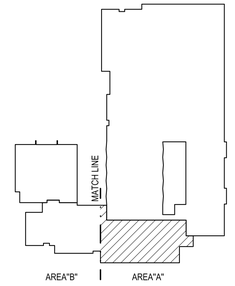
1. REFER MECHANICAL & ELECTRICAL FOR ANY ADDITIONAL CEILING MOUNTED FIXTURES
2. REFER TO SHEET A100 FOR LOCATIONS OF FIRE-RATED WALLS
3. DO NOT SCALE DRAWINGS TO OBTAIN MATERIAL QUANTITIES. USE DRAWINGS WHICH ARE DIMENSIONED OR COORDINATE W/ EXISTING CONDITIONS &/OR ARCHITECT & ENGINEERS.



2

3

4



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1 ADDENDUM #1

MOORE PUBLIC SCHOOLS

MOORE PUBLIC SCHOOLS
BOARD OF EDUCATION
MOORE, OKLAHOMA

CLASSROOM ADDITION
CENTRAL JUNIOR
HIGH SCHOOL

sheet no:

A107

REFLECTED CEILING PLAN

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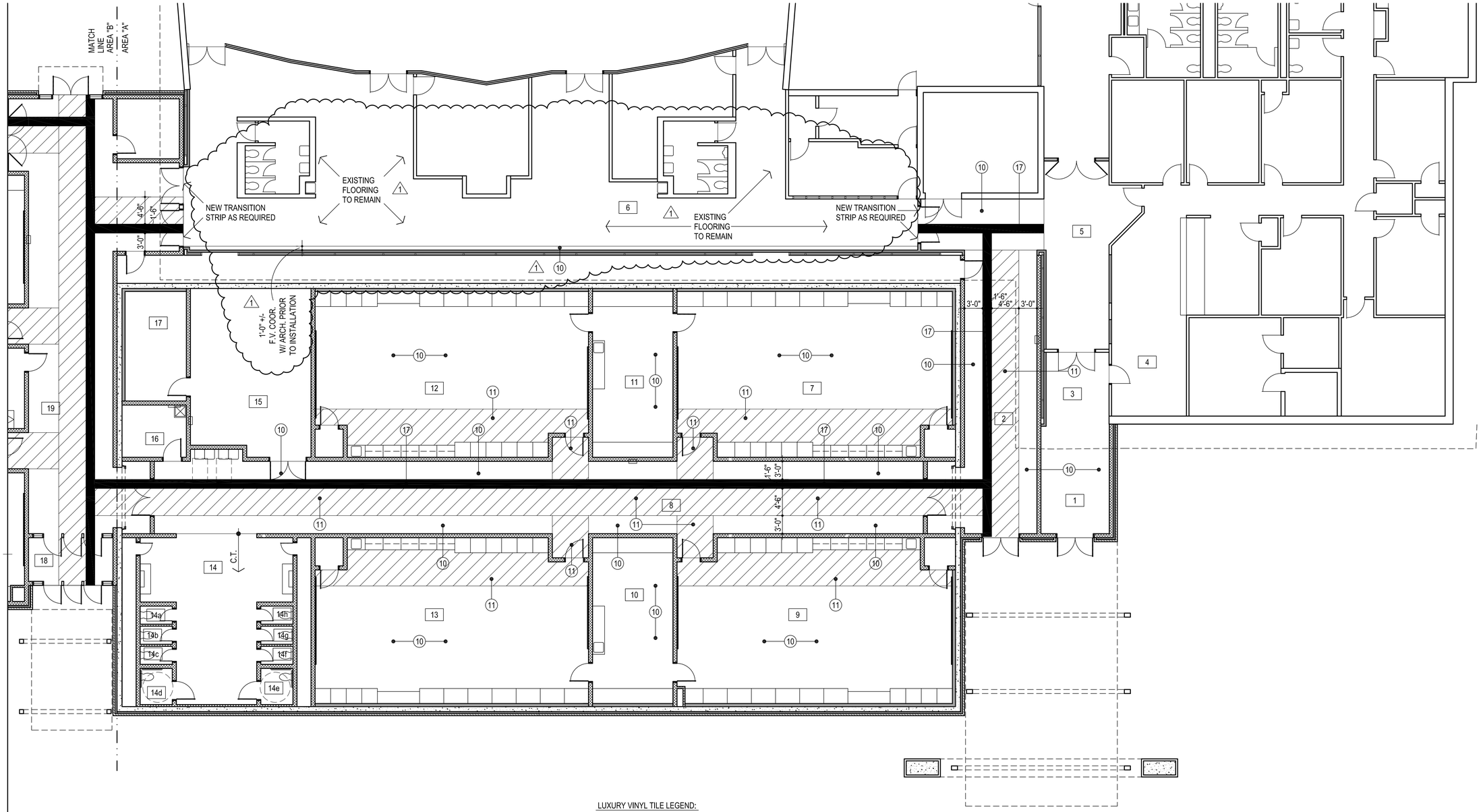


NORTH

1 LVT & CARPET DESIGN PLAN - AREA "A"

1/8" = 1'-0"

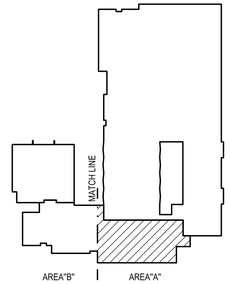
MISCELLANEOUS NOTES:

1. DO NOT SCALE DRAWINGS TO OBTAIN MATERIAL QUANTITIES. USE DRAWINGS WHICH ARE DIMENSIONED OR COORDINATE W/ EXISTING CONDITIONS &/OR ARCHITECT & ENGINEERS.

LUXURY VINYL TILE LEGEND:

- INTERFACE STUDIO SET COLOR - SILVER LIGHT (10)
- INTERFACE STUDIO SET COLOR - PEPPER (11)
- INTERFACE STUDIO SET COLOR - ROYAL BLUE (17)

REFER TO ROOM FINISH SCHEDULE FOR ADDITIONAL LOCATIONS OF LVT



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A111

LVT / CARPET PLAN

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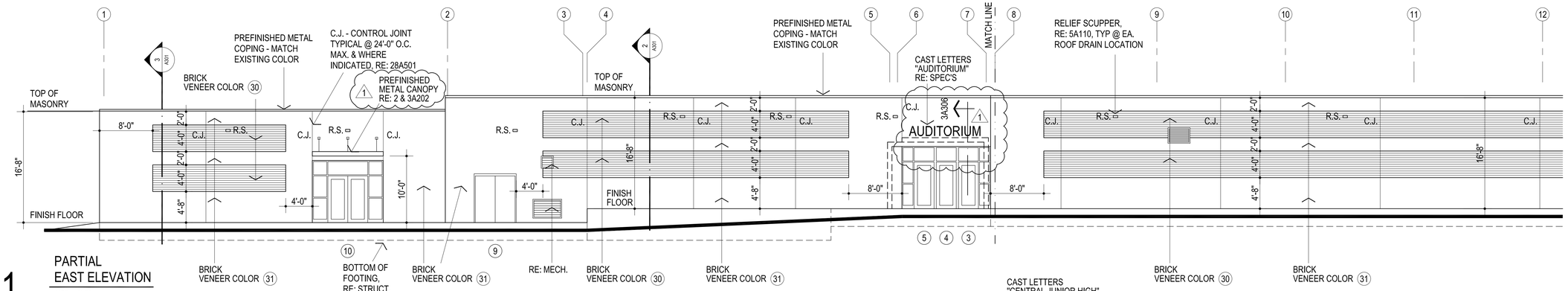
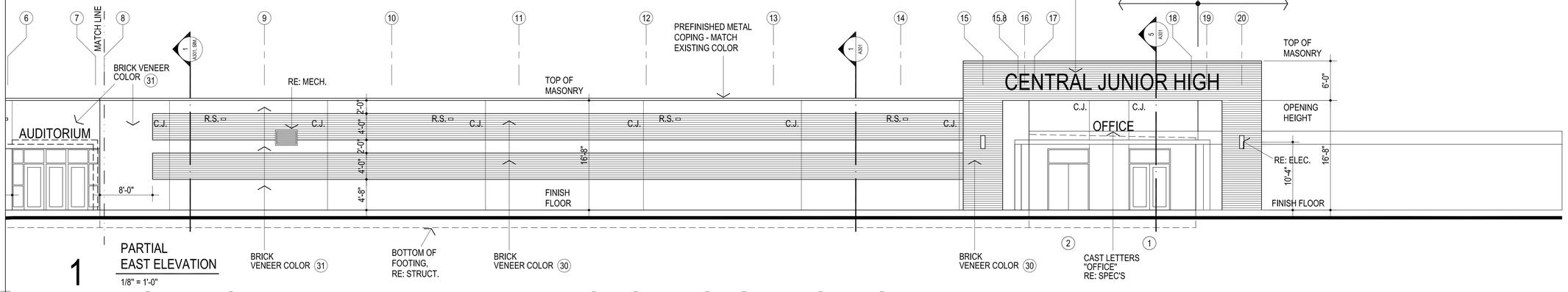


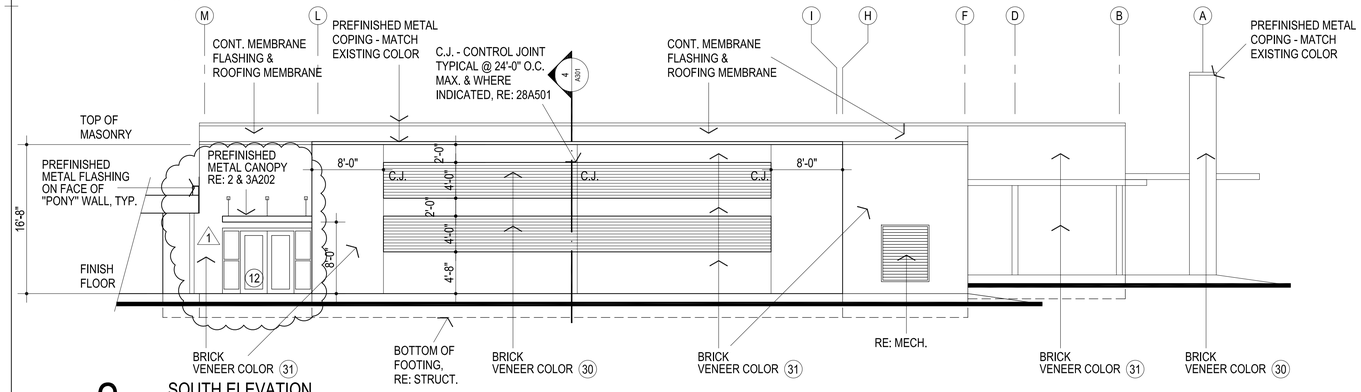
1 PARTIAL EAST ELEVATION

1/8" = 1'-0"



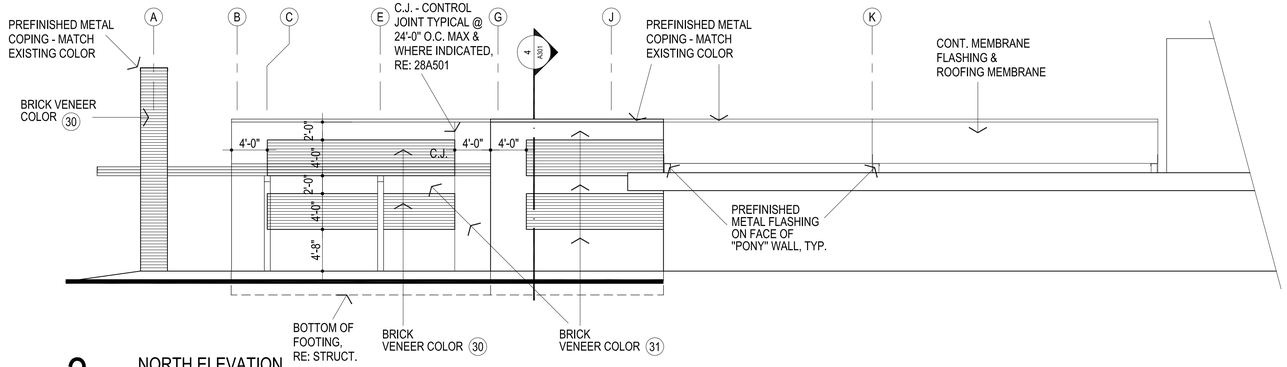
1 PARTIAL EAST ELEVATION

1/8" = 1'-0"



2 SOUTH ELEVATION

1/8" = 1'-0"

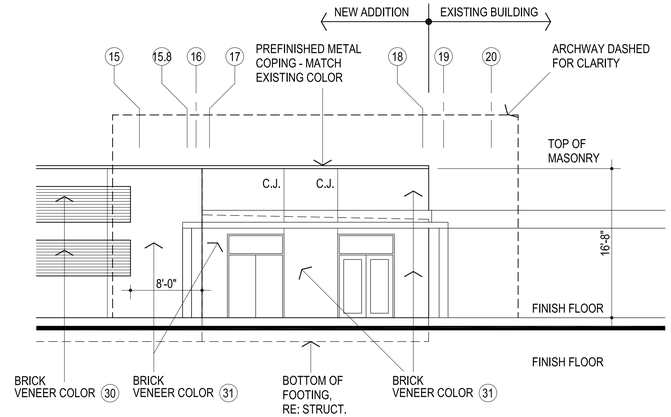


3 NORTH ELEVATION

1/8" = 1'-0"

GENERAL NOTES:

1. REFER STRUCTURAL DRAWINGS FOR TOP OF FOOTING ELEVATIONS - PROVIDE ALL MATERIALS REQUIRED FOR WALL SYSTEM TO EXTEND TO TOP OF FOOTING
2. DO NOT SCALE DRAWINGS TO OBTAIN MATERIAL QUANTITIES. USE DRAWINGS WHICH ARE DIMENSIONED OR COORDINATE W/ EXISTING CONDITIONS &/OR ARCHITECT & ENGINEERS.



4 PARTIAL EAST ELEVATION

1/8" = 1'-0"

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MOORE, OKLAHOMA

CLASSROOM ADDITION
CENTRAL JUNIOR
HIGH SCHOOL

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A201

OVERALL FLOOR PLAN

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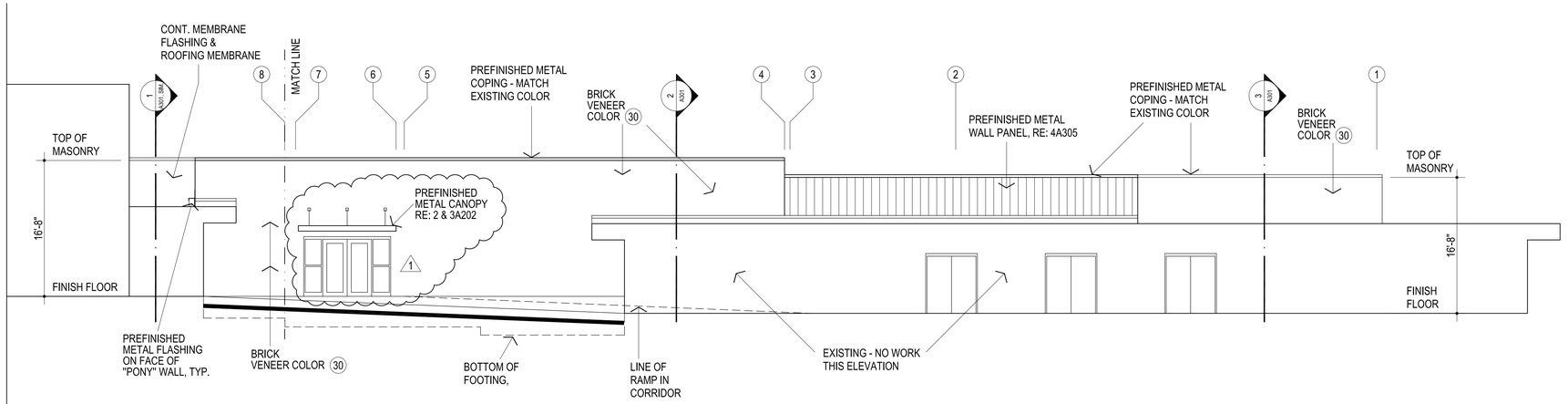
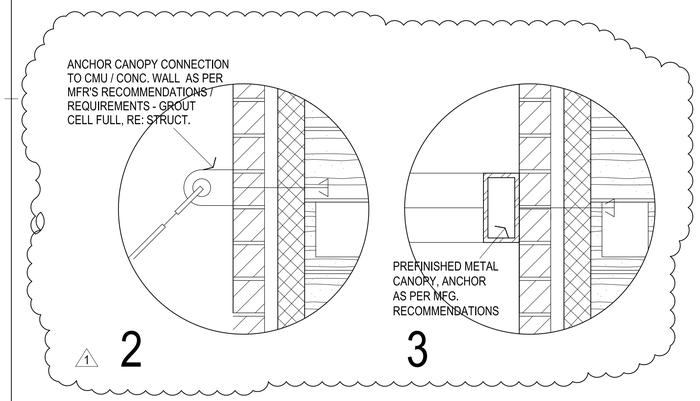


1 WEST ELEVATION

1/8" = 1'-0"

GENERAL NOTES:

1. REFER STRUCTURAL DRAWINGS FOR TOP OF FOOTING ELEVATIONS - PROVIDE ALL MATERIALS REQUIRED FOR WALL SYSTEM TO EXTEND TO TOP OF FOOTING
2. DO NOT SCALE DRAWINGS TO OBTAIN MATERIAL QUANTITIES. USE DRAWINGS WHICH ARE DIMENSIONED OR COORDINATE W/ EXISTING CONDITIONS &/OR ARCHITECT & ENGINEERS.



1 2

3

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1 ADDENDUM #1

MOORE PUBLIC SCHOOLS

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MOORE, OKLAHOMA

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CENTRAL JUNIOR
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A202

OVERALL FLOOR PLAN

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DOOR NO.	LOCATION FROM	LOCATION TO	DOOR ELEV.	DOOR MAT'L	DOOR SIZE WIDTH	DOOR SIZE HEIGHT	DOOR SIZE TH' K	FRAME ELEV.	DOOR DETAILS HEAD	DOOR DETAILS SILL	DOOR DETAILS JAMB	DOOR DETAILS JAMB	REMARKS	HDWR. SET NO.
1	1	EXT.	D	ALUM.	PR. 3'-0"	7'-0"	1 3/4"	H	31A501	15A501	24A501	24A501		1
2	2	EXT.	B	H.M.	PR. 3'-0"	〃	〃	J	1A501	〃	8A501	8A501		12
3	18	EXT.	D	ALUM.	3'-0"	〃	〃	B	17A501		24A501	24A501	DOORS 3, 4 & 5 ARE IN ONE FRAME	2
4	18	EXT.	D	〃	〃	〃	〃	B	〃	〃	24A501	24A501		2
5	18	EXT.	D		〃	〃	〃	B		15A501	24A501	24A501		2
6	19	18	D		〃	〃	〃	B		16A501	9A501	9A501	DOORS 6, 7 & 8 ARE IN ONE FRAME	6
7	19	18	D	〃	〃	〃	〃	B	〃	16A501	9A501	9A501		6
8	19	18	D	ALUM.	3'-0"	〃	〃	B	17A501	16A501	9A501	9A501		6
9	28	EXT.	B	STL.	PR. 3'-0"	〃	〃	A	11A501	15A501	18A501	18A501	STORM SHELTER DR. & FRAME	T1
10	29	EXT.	D	ALUM.	〃	〃	〃	C	17A501	15A501	24A501	24A501		1
11	30	29	D	ALUM.				C	17A501	16A501	24A501 SIM.	24A501 SIM.		4
12	25	EXT.	D	ALUM.				D	31A501	15A501	24A501	24A501		1
13	19	EXT.	D	ALUM.	〃	〃	〃	E	31A501	15A501	24A501	24A501		1
14	8	2	B	WD.	PR. 3'-0"	〃	〃	A	2A501	16A501	9A501	9A501	90 MIN. DOOR & FRAME	7
15	CHS	2	B	〃	3'-0"	〃	〃	〃	2A501	〃	9A501	9A501	20 MIN. DOOR & FRAME	3
16	6	2	A		PR. 3'-0"	〃	〃		22A501		29A501	29A501	90 MIN. DOOR & FRAME	7
17	9	8	A		3'-0"	〃	〃		2A501		9A501	9A501		8
18	7	8	A		〃	〃	〃		〃		〃	〃		8
19	11	7	A											10
20	11	12	A											10
21	12	8	A											8
22	13	8	A											8
23	10	13	A		〃	〃	〃							10
24	10	9	A		3'-0"	〃	〃							10
25	15	8	B		PR. 3'-0"	〃	〃						20 MIN. DOOR & FRAME	3
26	15	17	B		3'-0"	〃	〃							3
27	8	16	B		3'-0"	〃	〃						20 MIN. DOOR & FRAME	3
28	8	19	B		PR. 3'-0"	〃	〃							7
29	CHS	14	B		2'-0"	〃	〃							5
30	CHS	14	B		2'-0"	〃	〃							5
31	21	19	A		3'-0"	〃	〃							8
32	21	22	A		〃	〃	〃							10
33	24	22	A											10
34	24	19	A											8
35	20	19	B		〃	〃	〃	〃						3
36	19	CHS	B		3'-0"	〃	〃	A					20 MIN. DOOR & FRAME	3
37	6	19	A		PR. 3'-0"	〃	〃	G					DOORS 37 & 38 ARE IN ONE FRAME	7
38	6	19	A		PR. 3'-0"	〃	〃	G					90 MIN. DOOR & FRAME	7
39	19	33	B		3'-0"	〃	〃	A	〃		〃	〃	20 MIN. DOOR & FRAME	3
40	25	CHS	B		3'-0"	〃	〃	A	2A501		9A501	9A501	20 MIN. DOOR & FRAME	3
41	EXIST	25	A		PR. 3'-0"	〃	〃	A	22A501		29A501	29A501	90 MIN. DOOR & FRAME	12
42	EXIST	25	A		PR. 3'-0"	〃	〃	A	22A501		29A501	29A501	90 MIN. DOOR & FRAME	12
43	19	CHS	B		3'-0"	〃	〃	A	2A501		9A501	9A501	20 MIN. DOOR & FRAME	3
44	32	30	A		〃	〃	〃	〃	〃		〃	〃		8
45	31	30	A											8
46	26	30	A											8
47	27	30	A											8
48	---	---	B		〃	〃	〃						8 LOCATIONS	5
49	---	---	C		3'-0"	〃	〃						2 LOCATIONS	11
50	---	---	C		2'-0"	〃	〃						6 LOCATIONS	11
51	23	22	B		3'-0"	〃	〃	〃	〃	〃	〃	〃		3
52	25	19	A	〃	3'-0"	〃	〃	〃	〃	〃	〃	〃		7
53	EXIST	8	A	WD.	3'-0"	7'-0"	1 3/4"	A	2A501	16A501	9A501	9A501		7
54	----	----	E	STL.	10'-0"	10'-0"	----	----	7A502	16A501 SIM.	8A502	8A502	2 LOCATIONS	

1 DOOR SCHEDULE

G1 7/8" NOM. TEMPERED INSULATING GLASS

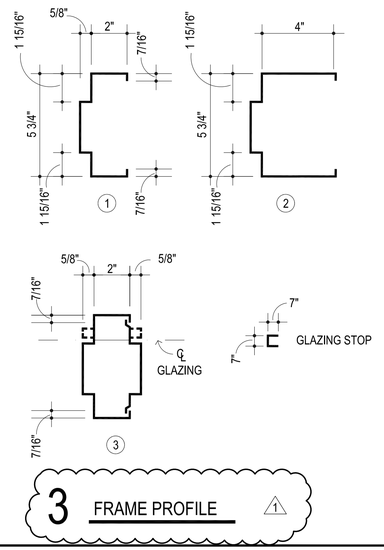
G2 1/4" CLEAR TEMPERED GLASS

G3 1/4" FIRE RATED GLASS

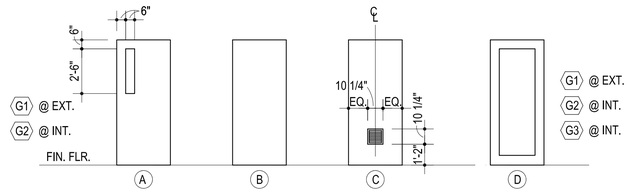
G4 1/4" IMPACT RESISTANT GLASS

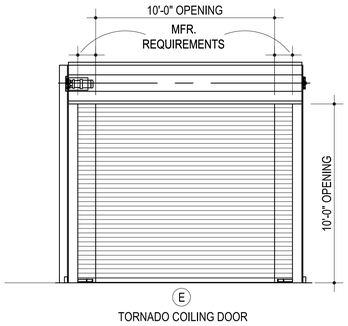
G5 7/8" IMPACT RESISTANT INSULATING GLASS

2 GLAZING SCHEDULE

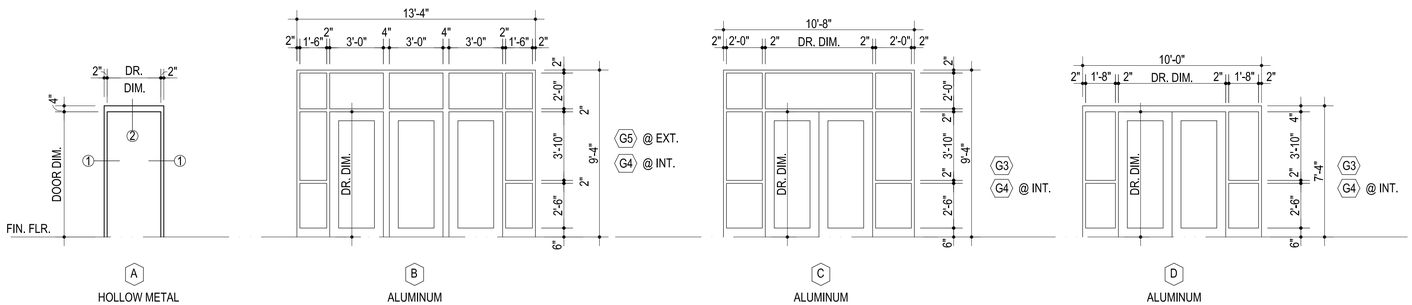


3 FRAME PROFILE 1





4 DOOR ELEVATIONS



5 DOOR FRAME ELEVATIONS

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CEDAR CREEK
CIVIL

KFC ENGINEERING
STRUCTURAL

SALAS O'BRIEN
MECHANICAL / ELECTRICAL

STATE OF OKLAHOMA
MICHAEL L. ABLA
2639
REGISTERED ARCHITECT
4/25/25

CG
drawn by

MA
checked by

APRIL 2025
date

revisions
1 ADDENDUM #1

MOORE PUBLIC SCHOOLS

MOORE PUBLIC SCHOOLS
BOARD OF EDUCATION
MOORE, OKLAHOMA

CLASSROOM ADDITION
CENTRAL JUNIOR
HIGH SCHOOL

sheet no:

A602

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ADDENDUM 01

Issue Date: June 27, 2025

Project Information

Client: Abla Griffin Partnership
Project Name: Central JH STEM & Saferoom Additio
Project Location: Moore, OK
Owner: Moore Public Schools
Engineer: Salas O'Brien, LLC

Project No. 2550-00564-00

To Prospective Bidders

This Addendum forms a part of the Contract Documents and modifies the Bidding Documents dated May 15, 2025, (and previous Addenda), with amendments and additions noted below.

This Addendum consists of (3) pages and (16) attachments.

- Index of Attachments
  - Earthsmart Controls Proposal
  - F101 E201 E603
  - T201 E202 M101
  - T602 E204 M102
  - E101 E502 M201
  - E102 E601 M601

Acknowledge receipt of this Addendum in the space provided on the Bid Form. Failure to do so may disqualify Bidder.

CHANGES TO BIDDING REQUIREMENTS

The attached Earthsmart Temperature Control proposal shall be included as part of the mechanical bid for this project.

CHANGES TO THE DRAWINGS

Revisions have been made to the following drawings and are issued in the form of full-size plans. Edits are indicated by a revision delta and a cloud surrounding the affected portion of the drawing.

F101 – FIRE PROTECTION PLAN – AREA A

- Refer to clouds and deltas on plan.

T201 – TECHNOLOGY FLOOR PLAN – AREA A

- Refer to clouds and deltas on plan.

T602 – TECHNOLOGY SPECIFICATIONS PLAN

- Refer to clouds and deltas on plan.

E101 – ELECTRICAL LIGHTING PLAN – AREA A

- Refer to clouds and deltas on plan.

E102 – ELECTRICAL LIGHTING PLAN – AREA B

- Refer to clouds and deltas on plan.

E201 – ELECTRICAL POWER PLAN – AREA A

- Refer to clouds and deltas on plan.

E202 – ELECTRICAL POWER PLAN – AREA B

- Refer to clouds and deltas on plan.

E204 – ELECTRICAL ROOF PLAN – AREA A

- Refer to clouds and deltas on plan.

E502 – ELECTRICAL DETAILS SHEET

- Refer to clouds and deltas on plan.

E601 – ELECTRICAL SCHEDULES

- Refer to clouds and deltas on plan.

E603 – ELECTRICAL SCHEDULES

- Refer to clouds and deltas on plan.

M101 – MECHANICAL FLOOR PLAN – AREA A

- Refer to clouds and deltas on plan.

M102 – MECHANICAL FLOOR PLAN – AREA B

- Refer to clouds and deltas on plan.

M201 – MECHANICAL ROOF PLAN

- Refer to clouds and deltas on plan.

M601 – MECHANICAL SCHEDULES

- Refer to clouds and deltas on plan.

END OF ADDENDUM [01]

EARTHSMART CONTROLS

5305 N Santa Fe Avenue
Oklahoma City, OK 73118
www.earthsmartcontrols.com
Phone: (405) 778-8008
Fax: (866) 676-5602

To: Moore Central JR High STEM Bidders **May 30, 2025**
Attn: Estimator

This is a proposal to provide controls for the Moore Central Junior High School STEM project.

Split Systems (10)

- Provide and install Honeywell controls.
- Install communication, controller, supply air sensor, fan status, compressor status, digital space temperature sensor and CO2 sensor to control outside air damper (damper actuator provided by EarthSmart Controls).
- Commission the units to ensure proper operation.

GPS Ionizers (10)

- Provide and install 10 new GPS-FC48-AC ionizers.
- Commission the unit to ensure proper operation.

Honeywell WEBS N4 Frontend

- Tie to existing WEB-8000 onsite and integrate N4 supervisor station (graphical user interface).
- Provide a 25 Device JACE to allow for future expansion.
- Provide 4 hours of user training.
- ***Provide 1-year parts and labor warranty.***
- Provide graphical representations of equipment listed above.
- Provide custom trending and alarming.
- Provide scheduling capabilities and remote access.

****
****

We thank you for the opportunity to bid and look forward to working with you soon.

If you have any questions, please feel free to contact us at (405) 778-8008.

Exclusions for total job: Any wiring above 24V, carbon monoxide sensors, smoke detectors and anything not mentioned in this proposal.

Continued on next page…

5305 N Santa Fe Avenue
Oklahoma City, OK 73118
www.earthsmartcontrols.com
Phone: (405) 778-8008
Fax: (866) 676-5602

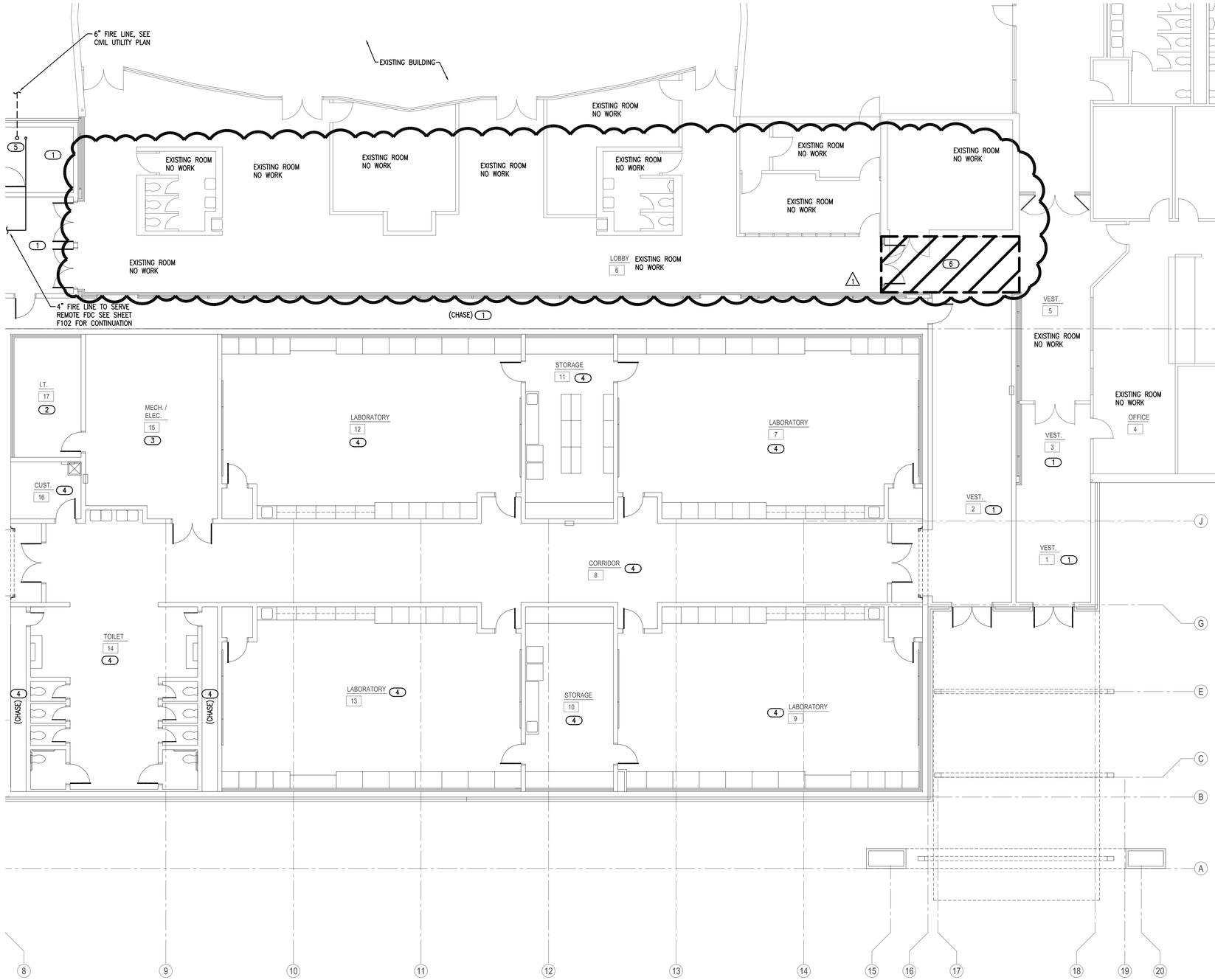
The total price for the control work above is: $60,078.00
Sixty Thousand and Seventy-Eight Dollars

Erin Bevill
Controls Manager
EarthSmart Controls, LLC

Company:_____ Signature: _____

Date:_____ Printed Name: _____

Title:_____ PO #: _____



1 FIRE PROTECTION PLAN - AREA A

SCALE: 1/8" = 1'-0"

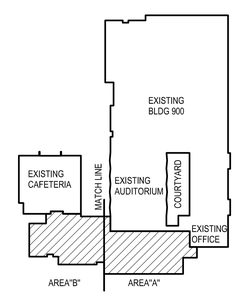
NORTH

GENERAL NOTES

1. COORDINATE WORK WITH ALL OTHER TRADES ON SITE.
2. REFER TO GENERAL NOTES ON SHEET F000.
3. FIELD VERIFY EXISTING CONDITIONS PRIOR TO COMMENCING WORK.
4. SEMI-RECESSED PENDANT SPRINKLER HEADS IN LAY-IN AND HARD CEILINGS SHALL HAVE WHITE FINISH. EXPOSED UPRIGHT HEADS SHALL BE BRASS WITH WIRE GUARDS.
5. FIRE SEAL ALL PENETRATIONS THRU RATED STRUCTURES TO MAINTAIN FIRE RATING.
6. COORDINATE FIRE DEPARTMENT CONNECTION LOCATIONS WITH LOCAL FIRE DEPARTMENT OR AHJ.
7. COORDINATE INSPECTORS TEST DRAIN LOCATION WITH ALL TRADES ON SITE.
8. CONTRACTOR SHALL COORDINATE ALL STORM SHELTER WALL AND ROOF PENETRATIONS WITH STRUCTURAL. REFER TO STRUCTURAL DETAIL SHEET FOR PENETRATION PROTECTION FOR RECTANGULAR OPENINGS GREATER THAN 3.5 SQUARE INCHES AND CIRCULAR OPENINGS GREATER THAN 2.125 INCHES PER 2014 ICC-500.

KEYED NOTES

1. LIGHT HAZARD – NEW ADDITION AREA. REFER TO ARCHITECTURAL PLANS FOR CEILING TYPE.
2. LIGHT HAZARD – IT ROOM – PROVIDE INTERMEDIATE TEMPERATURE TYPE HEADS. COORDINATE HEAD LOCATION WITH IT DEPARTMENT. IN SAFEROOM AREA.
3. ORDINARY HAZARD GROUP 1 – REFER TO ARCHITECTURAL PLANS FOR CEILING TYPE. IN SAFEROOM AREA.
4. LIGHT HAZARD AREA – REFER TO ARCHITECTURAL PLANS FOR CEILING TYPE. IN SAFEROOM AREA.
5. 6" FIRE SPRINKLER RISER. SEE DETAIL 1/F000. SEE PLUMBING PLAN P101 FOR CONTINUATION OF FIRE LINE INTO BUILDING.
6. LIGHT HAZARD – HATCHED AREAS – NEW CEILING LAYOUT IN EXISTING SPACE. MODIFY EXISTING SPRINKLER HEADS AS REQUIRED FOR NEW LAYOUT. COORDINATE HEAD PLACEMENT WITH ELECTRICAL, TECHNOLOGY AND MECHANICAL. REFER TO ARCHITECTURAL PLANS FOR CEILING TYPE.



KEYPLAN

NO SCALE

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MOORE PUBLIC SCHOOLS
BOARD OF EDUCATION
MOORE, OKLAHOMA

MOORE Public Schools
LEARNING FOR LIFE

CLASSROOM ADDITION
CENTRAL JUNIOR
HIGH SCHOOL

sheet no:

F101

Salas O'Brien
2900 S. Telephone Road, Suite 120
Moore, OK 73160
Salas O'Brien Registration: CA# 7058
Expiration Date : 6/30/2025
Salas O'Brien Project Number: 2550-00564-00

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SAFEROOM NOTE

PER ICC 500-2014, 309.1:

PENETRATIONS THROUGH THE STORM SHELTER ENVELOPE THAT ARE LARGER THAN:
1. 3.5 SQUARE INCHES IN AREA FOR RECTANGULAR OPENINGS, OR
2. 2 1/16" IN DIAMETER

SHALL BE CONSIDERED AN OPENING AND SHALL BE PROVIDED WITH AN OPENING PROTECTIVE DEVICE (SHROUD). REFERENCE STRUCTURAL DRAWINGS FOR A SAMPLE SHROUD DETAIL. THIS INCLUDES PENETRATIONS FOR BUNDLES OF CONDUIT.

ACTIVE DAS HYBRID SYSTEM NOTE

CONTRACTOR TO PROVIDE AND INSTALL A COMPLETE AND FUNCTIONING DAS SYSTEM IN THE STORM SHELTER PORTION OF THE BUILDING.

CONTRACTOR SHALL PROVIDE AND INSTALL A CEL-FI QUATRA 4000c SYSTEM BY NEXTIVITY.

REQUIREMENT THAT SYSTEM SHALL BOOST CELL SERVICE FOR VERIZON, T-MOBILE AND AT&T AND SUPPORT A MINIMUM OF 50 USERS.

KEYED NOTES

1. DATA OUTLET RESERVED FOR 3D PRINTER NETWORK CONNECTION. COORDINATE FINAL LOCATION WITH OWNER.
2. NOT USED.
3. CONTRACTOR TO TIE MAGNETIC DOOR HOLD OPENS INTO FIRE ALARM SYSTEM.

TECHNOLOGY ENLARGED PLAN KEYED NOTES

1. INDICATES THE LOCATION OF A 8' TALL, 3/4" FIRE RATED PLYWOOD CONTRACTOR TO PROVIDE AND INSTALL PLYWOOD AND ALL REQUIRED MOUNTING HARDWARE. PLYWOOD SHALL BE PAINTED WHITE WITH FIRE RATED PAINT. TYPICAL FOR ALL SHOWN ON DRAWING.
2. INDICATES THE LOCATION OF A NEW WALL MOUNTED TELECOMMUNICATION GROUND BUS BAR (TGBB). CABLING CONTRACTOR TO PROVIDE BUS BAR AND ALL REQUIRED MATERIAL TO MOUNT AT THE LOCATION SHOWN. TGBB TO BE MOUNTED AT +93" A.F.F.
3. PROVIDE AND INSTALL A 12" WIDE, UNIVERSAL LADDER TRAY AND ALL REQUIRED MOUNTING HARDWARE. LADDER TRAY SHALL BE BLACK IN COLOR. TYPICAL FOR ALL SHOWN ON ENTIRE PROJECT.
4. PROVIDE AND INSTALL ONE (1) 2-POST, FLOOR MOUNTED, 7' RELAY RACK (BLACK IN COLOR). PROVIDE BONDING WASHERS, BOLTS, AND NUTS AT ALL MECHANICALLY CONNECTED LOCATIONS OF THE RACK TO ENSURE THAT ALL PIECES OF THE RACK ARE COMPLETELY BONDED. SCRAPING PAINT FROM RACKS TO MAKE A BOND WILL NOT BE ACCEPTED. ALL RACK MOUNTED COMPONENTS SHALL BE MOUNTED WITH BONDING SCREWS AND THE CONTRACTOR SHALL PROVIDE THE OWNER WITH (50) ADDITIONAL BONDING SCREWS FOR THE INSTALLATION OF OWNER EQUIPMENT. NO DAISY CHAINING GROUNDS FROM RACK TO CABLE TRAY OR TO OTHER RACKS WILL BE ACCEPTED. ALL GROUNDS SHALL BE HOME RUN TO THE TELECOMMUNICATIONS GROUND BUS BAR (TGBB). TYPICAL FOR ALL SHOWN ON THE ENTIRE PROJECT.
5. PROVIDE AND INSTALL ONE (1) 7'X6", FRONT AND REAR MANAGED, VERTICAL CABLE MANAGER (BLACK IN COLOR). CABLE MANAGERS SHALL BE INSTALLED ON EACH END OF THE RACK SYSTEMS AND BETWEEN EACH RACK. CABLE MANAGERS SHALL HAVE A SINGLE, SOLID, FULL HEIGHT HINGED DOOR IN THE FRONT AND WIDE SPACED CABLE RINGS WITH SPIN-OPEN LATCHES IN THE REAR. TYPICAL FOR ALL SHOWN IN THE ENTIRE PROJECT.
6. APPROXIMATE HEAD END LOCATION OF ACTIVE DAS HYBRID SYSTEM.

GENERAL NOTES

A. FIRE: REPLACE EXISTING SILENT KNIGHT 5820XL WITH NEW 6820XL (6820 EVS IF VOICE EVAC IS REQUIRED). REPLACE ALL SD PROTOCOL DEVICES WITH SK. SEE SPECS FOR PARTS LIST AND SYSTEM REQUIREMENTS. MAIN BUILDING, AUDITORIUM, CAFE BUILDING, 800 BUILDING AND ENROLLMENT BUILDINGS TO BE UPDATED TO SK PROTOCOL DEVICES.

B. SECURITY ALARM: CONNECT ALL NEW SECURITY DEVICES TO EXISTING DSC ZONE EXPANDER AND POWER SUPPLY.

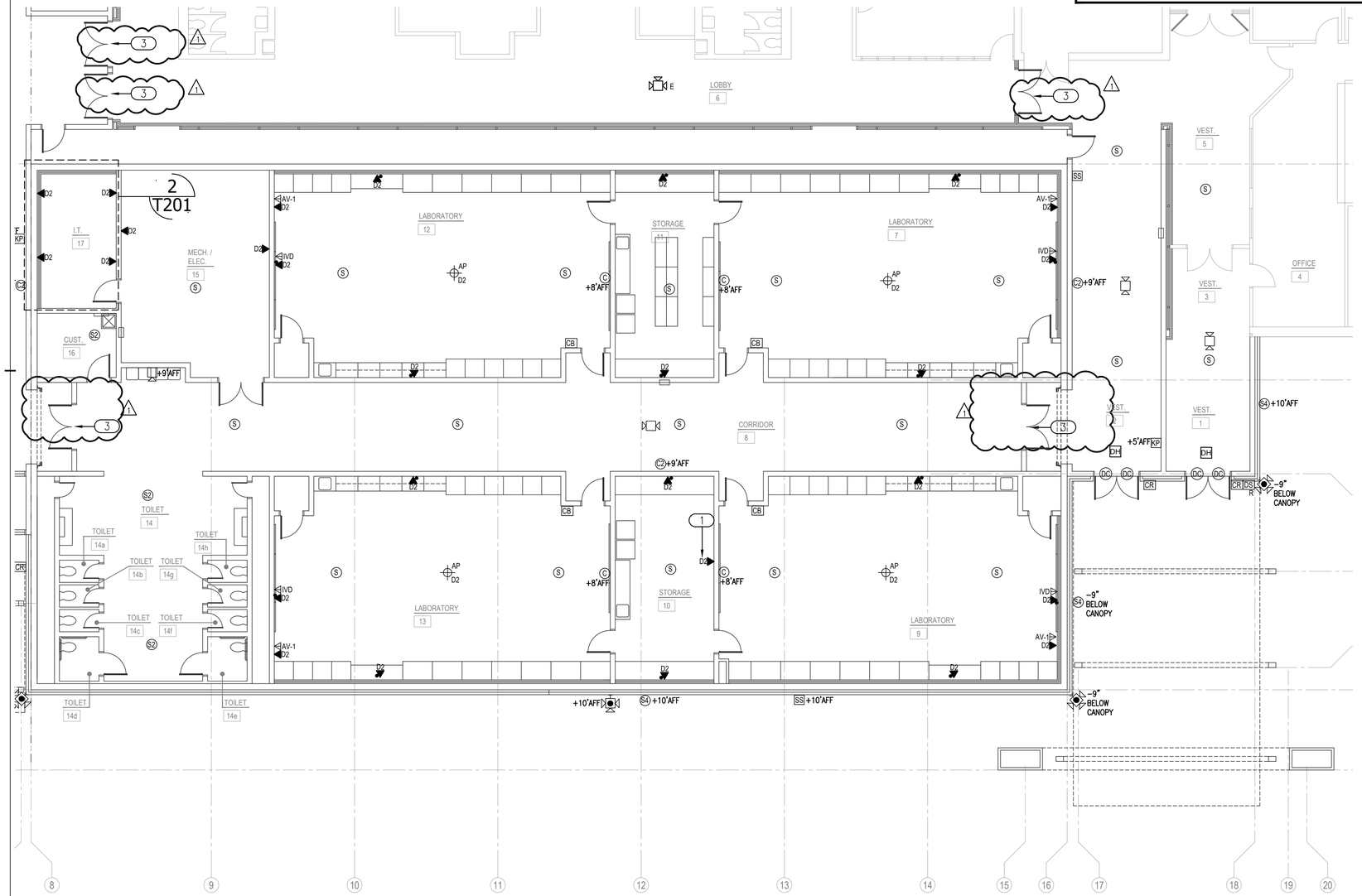
C. INTERCOM: CONNECT ALL NEW INTERCOM DEVICES TO EXISTING TELECOR INTERCOM SYSTEM. PROVIDE ALL LINE CARDS, ETC., NEEDED.

D. CLOCKS: CLOCKS SHALL BE PRIMEX DIGITAL CLOCKS. CONNECT NEW CLOCKS TO EXISTING PRIMEX CLOCK DRIVER. SUPPLY ALL REPEATERS, ETC., NEEDED.

E. ACCESS CONTROL: CONNECT ALL NEW ACCESS CONTROL DEVICES TO NEW CONTROLLER. SUPPLY CONTROLLER, READERS, STRIKES, ETC.

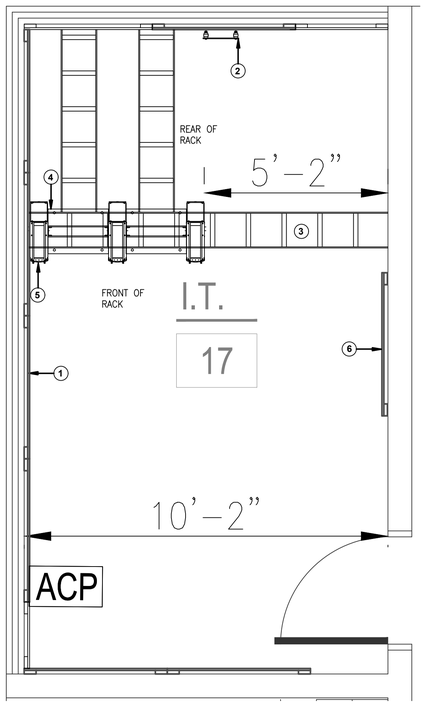
F. CONNECT NEW CAMERAS TO NEW IDF.

G. CONNECT NEW DATA, WIFI, CAMERA DROPS TO NEW IDF.CONNECT NEW IDF TO EXISTING MDF VIA FIBER & CAT-6. SEE NETWORK SPECIFICATIONS FOR FIBER OPTIC CABLE AND CAT 6 INFORMATION.



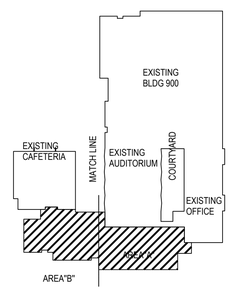
1 TECHNOLOGY FLOOR PLAN - AREA A
SCALE: 1/8" = 1'-0"

NORTH



2 TECHNOLOGY ENLARGED PLAN - I.T. 17
SCALE: 1/2" = 1'-0"

NORTH



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Salas O'Brien Registration: CA# 7058
Expiration Date : 6/30/2025
Salas O'Brien Project Number: 2550-00564-00

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UPDATED JUNE 2025

SYSTEMS SPECIFICATIONS

Moore Public Schools Clock System Specifications cont.

1.02 Systems Installation

- All devices shall be mounted according to the manufacture's specifications.
- All Ceiling mounted devices shall be mounted on non-stainable ceiling tiles
- All devices shall be properly adjusted and tested prior to job completion.
- All extra wire taps shall be insulated.
- Protective grommets shall be installed on all conduits to protect wire.
- All wire shall be run in J hooks above ceiling with a minimum space of 4" from ceiling deck. All wire shall be in separate pathways 6" from other system wiring. No wire ties allowed.
- All wire ran between building shall be in conduit and shall be direct burial cable. It shall be a minimum of 5 conductor 18 AWG copper and shall have lightning suppression installed at building entry.
- Installer shall supply the electrical and or masonry contractors with specialty back boxes such as clock recessed back boxes etc. and coordinate with them to ensure that all necessary conduits, back boxes, etc. are installed in the proper locations.
- Follow and adhere to installation practices specified by NFPA-70 National Electric Code, Edition 2008.
- Follow and adhere to installation practices specified by the Manufacturers.

1.03Quality Assurance

1.03.01 Qualifications

- Install all components as directed by Manufacturer's installation guidelines.
- All products shall bear the mark of UL or ETL for performance level.
- System installation shall meet all applicable Local/State codes and safety requirements where project is located.
- All products shall be new and un-used in original packaging.

1.03.02 Bidder/Installer Qualifications

- Bidding contractor shall have a minimum of 5 years experience installing school intercom systems.
- Bidding contractor shall be able to provide insurance at the request of the owner.

1.04Delivery, Storage, and Protection

- Contractor shall ensure that materials delivery to work area shall be coordinated with construction site manager responsible for materials distribution to all trades.
- Contractor is responsible for all materials, tools and vehicles left on the job site.
- Follow Manufacturer's recommendations for handling of materials.

1.05 Scheduling

- Contractor shall provide a detailed construction schedule with hard dates for completion of roughing in cables, terminations and testing once scheduling sequence has been determined to the Owner's Project Manager.

1.06 Warranty

- Contractor shall provide a 1 year parts and labor warranty against defective workmanship and/or system component failure.

Part 3 - Execution

3.01 Field Quality Control

- Contractor shall make available all ceiling and termination work for inspection by Manufacturer's representative or owner's representative.
- Contractor shall replace all defective components.

3.02 Adjusting

- No additional work outside of the contract scope of work shall be completed without the approval of the Owner or Owner's representative.

3.03 Protection

- It is the responsibility of the Contractor to ensure equipment is protected from dust and water during the project with appropriate materials.
- Remove all protective covers and protective materials from equipment prior to turnover to Owner.

3.04 Schedules

- Coordinate work with Owner's project manager and follow scheduling sequence as established by Owner's project manager.
- It is recommended that the Contractor schedule closely with any other systems contractor to ensure turnover date is met.
- Contractor bidding will supply the electrical and or masonry contractors with any specialty back boxes such as clock recessed back boxes etc. and coordinate with them to ensure that all necessary conduits, back boxes, etc. are installed in the proper locations.

End of Section

1.04 Submittals

1.04.01 Prior to installation

- Show compete map of system design for approval by Owner.

End of Section

Clock System Installation Completion Check List

Part 1 - General

1.01Section Includes

- Clock System Completion Check List

1.02 Completion Check List

- All Clocks have been tested for proper operation and synchronization.

End of Section

Moore Public Schools Security System Specifications

Part 1 - General

2.01 Manufacturers

- Security System Manufacturer shall be DSC or DMP. See plans for the specific manufacturer required. (No Substitutions)
- Installer shall be certified by manufacturer to install & program the specified systems. (No Substitutions)
- Peripheral device Manufacturers shall be according to equipment list. (No Substitutions)
- Cable Manufacturer shall be Genesis. (Or Equivalent)

Security Systems Equipment

- Security alarm control shall be DSC Model # PC4020 or DMP Model # XR550NL-G. (No Substitutions)
- Security alarm control communicator shall be DSC Model # T-LinkTL250. DPM N/A. (No Substitutions)
- Security alarm keypad shall be DSC Model # LCD4501 or DMP Model # 7873. (No Substitutions)
- Security alarm keypad for all kitchen locations shall be DSC Model # LCD4501 or DMP Model # 7073. (No Substitutions)
- Security alarm 8 zone hardwire expander shall be DSC Model # PC4108 or DMP Model # 714-8. (No Substitutions)
- Security alarm 16 zone hardwire expander shall be DSC Model # PC4116 or DMP Model # 714-16. (No Substitutions)
- Security alarm power supply shall be DSC Model # PC4204 or DMP systems = Altronix Model # SMP3PMCTX. (No Substitutions)
- Security alarm power supply cabinet shall be DSC Model # PC4051C. DMP N/A. (No Substitutions)
- Security alarm cabinet locks shall be DSC Model # L1 or DMP Model # 301. (No Substitutions)
- Security alarm wireless receiver shall be DMP Model # 1100XH, DSC N/A
- Security alarm wireless transmitter shall be DMP Model # 1103, DSC N/A
- Security alarm 35'x35' motion detector shall be Honeywell Model # DT-8035. (No Substitutions)
- Security alarm 50'x60' motion detector shall be Honeywell Model # DT-8050. (No Substitutions)
- Security alarm window glass break sensor shall be Honeywell Model # FG-730. (No Substitutions)
- Security alarm hold-up button shall be Potter HUSK-20
- Security alarm door contact shall be GE Model # 1076D-M. Double Pole Double Throw for all doors (No Substitutions)
- Each single door or double door shall be wired with 4 conductor wire.
- DMP systems shall be wired with 2 zones per single door or double door. One zone for Security alarm and one zone for "Door Held Open Alert"
- Security alarm C channel door magnets shall be GRI Model # MC180
- Security alarm surface window contact shall be Aleph Model # PS-1541. (Or equivalent approved by MPS)
- Security alarm overhead door & roof hatch contact shall be Amseco Model # ODC-59A or for rail mount applications Interlogix GE2315AL. (No Substitutions)
- Security alarm indoor siren shall be Ademco Model # Wave2EX. (No Substitutions)
- Security alarm outdoor siren shall be ATW Model # DS301SET. (No Substitutions)
- Security alarm outdoor strobe shall be Amseco Model # SL401C. (No Substitutions)

1.01 Systems Installation

- Keypad zones shall not be used. All zones shall wire to the main control or zone expanders.
- Installer shall be certified by manufacturer to install & program the specified systems.
- Installer shall perform all programming required to complete the installation. Moore Public Schools shall not be required to assist in any part of the installation or programming.
- All alarm junctions and or splices shall be soldered and insulated.
- All circuits and wiring shall be labeled at all terminating ends.
- All devices shall be mounted according to the manufacture's specifications.
- All devices shall be properly adjusted and tested prior to job completion.
- All DSC 4108 & 4116 zone expanders shall be installed with a DSC PC4204 power supply and DSC PC4051C with L1 lock
- All DMP 714-8 & 714-16 zone expanders shall be installed with a power supply Altronix Model # SMP3PMCTX keyed with DMP Model # 301.
- All cabinets shall be labeled outside with their corresponding module and zone numbers and installed with lock.
- All cabinets shall be labeled inside with module number by the corresponding module and zone list definitions.
- If a new DSC main control panel is required, it shall have a T-LinkTL250 installed
- All new DSC or DMP main control panels shall have a Cat 6 cable ran back to the nearest IDF for network connectivity.
- Each expansion cabinets shall have two non-sheilded16 gauge 4 conductor cables ran from the main control to the expansion cabinet.
- All keypads shall be wired individually back to new power supply.
- All sirens shall be wired individually and connected to new power supply.
- All devices such as door contact (double doors wire as one), motion detectors, glass break detectors, etc. shall be hardwired individually on separate zones with end of line resistors at the devices.
- All devices such as motion detectors, glass break detectors, door contacts, keypads, sirens, etc. shall be labeled with their corresponding module and or zone number. Label shall be visible from the floor.
- All motion detectors shall be sealed to prevent air and insects from entering.
- All steel doors shall have wide gap contacts installed.
- All door contacts shall be recessed, and door magnets shall be glued in place.
- All holdup buttons shall be connected via wireless.
- Protective grommets shall be installed on all conduits and enclosures to protect wire.
- All devices shall be wired with **NON-shielded** cable.
- All panels, power supplies and modules shall be grounded.
- All roof hatches shall have an alarm contact installed and connected to the alarm system.
- All wire shall be run in J hooks above ceiling with a minimum space of 4" from ceiling deck. All wire shall be in separate pathways 6" from other system wiring. No wire ties allowed. No wire shall be run between the red iron and roof deck.
- All wire visible from the finished floor shall be covered in decorative wire molding.
- All wire ran between building shall be in conduit and shall be **non-shielded** direct burial cable. It shall be a minimum of 4 conductor 16 AWG copper and shall have lightning suppression installed at building entry.
- Installer shall have a commercial burglar technician on the job site at all times during installation.
- Installer will work closely with the electrical and or masonry contractors to ensure conduit, back boxes, door frame access conduit, etc. are in the proper locations and accessible.
- Follow and adhere to installation practices specified by NFPA-70 National Electric Code, Edition 2008.
- Follow and adhere to installation practices specified by the Manufacturers.

1.02 Products Installed but not Supplied Under This Section

- All conduit and EMT required for Fire cabling pathway in/out of closets and in/out of wall cavities at the work area. EMT or Conduit for pathways shall have no more than two 90 degree sweeps and no continuous section over 100'.
- All core holes and poke through devices in the floor for the installation of Fire cabling.
- All core holes and EMT sleeves between floors for the routing of Fire cabling.
- Back boxes for the mounting of Fire Devices.
- Drag line or pull string at the back boxes fished through EMT or conduit to the other end for installing Fire Cabling.

1.03 Quality Assurance

1.03.01 Qualifications

- Install all components as directed by Manufacturer's installation guidelines.
- All products shall bear the mark of UL or ETL for performance level.
- System installation shall meet all applicable Local/State codes and safety requirements where project is located.
- All products shall be new and un-used in original packaging.

1.03.02 Bidder/Installer Qualifications

- Bidding contractor shall be a local licensed Commercial Burglar Alarm Company with licensed Commercial Burglar Alarm technician(s) on staff.
- Bidding contractor shall be certified by manufacturer to install & program the specified systems.
- Bidding contractor shall perform all programming required to complete the installation. Moore Public Schools shall not be required to assist in any part of the installation or programming.
- Bidding contractor shall have at least one year experience installing DSC/DMP equipment.
- Bidding contractor shall have a minimum of 5 years experience installing commercial burglar alarms.
- Bidding contractor shall be able to provide insurance at the request of the owner.
- Bidding contractor shall have a commercial burglar technician on the job site at all times during installation.

1.04 Delivery, Storage, and Protection

- Contractor shall ensure that materials delivery to work area shall be coordinated with construction site manager responsible for materials distribution to all trades.
- Contractor is responsible for all materials, tools and vehicles left on the job site.
- Follow Manufacturer's recommendations for handling of materials.

1.05 Project Conditions

1.05.01 Environmental Requirements

- Contractor shall ensure that any pollutants produced during the Work are disposed off according to local, state or national regulations. Follow the most stringent guidelines.
- It is preferred that the Contractor recycle any used or un-used components during the course of the construction project.

1.06 Sequencing

- Contractor shall coordinate with Owner's project manager on sequencing of various trades and construction teams for the lifecycle of the project.

1.07 Scheduling

- Contractor shall provide a detailed construction schedule with hard dates for completion of roughing in cables, terminations and testing once scheduling sequence has been determined to the Owner's Project Manager.

1.08 Warranty

- Contractor shall provide a 1 year parts and labor warranty against defective workmanship and/or system component failure. (1 year warranty shall begin at job completion)

Part 2 - Products

2.02 *Source Quality Control*

- Materials shall be purchased from Distributors authorized by system Manufacturers to sell new and unused components.

Part 3 -

3.01 Field Quality Control

- Contractor shall make available all ceiling and termination work for inspection by Manufacturer's representative or owner's representative.
- Contractor shall replace all defective components.

3.02 Adjusting

- No additional work outside of the contract scope of work shall be completed without the approval of the Owner or Owner's representative.

3.03 Cleaning

- Contractor shall sweep and mop the floors of all equipment rooms or connection point closets prior to turnover to the Owner.

3.04 Protection

- It is the responsibility of the Contractor to ensure equipment is protected from dust and water during the project with appropriate materials.
- Remove all protective covers and protective materials from equipment prior to turnover to Owner.

3.05 Schedules

- Coordinate work with Owner's project manager and follow scheduling sequence as established by Owner's project manager.
- It is recommended that the Contractor schedule closely with any other systems contractor to ensure turnover date is met.
- Contractor bidding will work closely with the electrical and or masonry contractors to ensure conduit, back boxes, door frame access conduit, etc. are in the proper locations and accessible.

End of Section

1.02 Submittals

1.03.01 Prior to installation

- Show compete map of system design for approval by Owner.

Security System Installation Completion Check List

Part 1 - General

1.01 Section Includes

- Security System Completion Check List

1.02 Completion Check List

- A map of the entire system showing device numbers and wire routes has been left inside the main control panel and a copy has been given to Jack Phillips with MPS.
- All panel programming has been checked and is correct.
- Panel(s) has been tested for proper operation.
- All zones have been tested to verify proper description at keypad.
- All zones have been tested to verify proper reporting to the monitoring station.
- All zones have been tested to verify they are in their proper partition(s).
- All sirens and strobes have been tested for proper operation.
- All motion detectors have been adjusted for proper sensitivity and have been walk tested.
- All motion detectors have been sealed to prevent air and insects from entering.
- All glass break detectors have been adjusted for proper sensitivity and tested.
- All cabinets are labeled on the outside with module numbers and zone numbers.
- All cabinets are labeled on the inside with module numbers by the corresponding module and zone descriptions.
- All user codes have been programmed and tested for proper partition access.
- The monitoring station has the correct account information such as call list, zone descriptions etc.

End of Section

1.09 References

- NFPA-70 National Electrical Code 2008 edition
- NFPA-72 National Fire Alarm Code
- UL 1666 - Standard for Safety of Flame Propagation Height
- NFPA 262 - Flame Travel and Smoke of Wires and Cables
- *Local Authority Having Jurisdiction*

1.10 Definitions

AWG - American Wire Gauge

BICSI - Building Industry Consulting Service International

EIA - Electronics Industry Alliance

FCC - Federal Communications Commission

NECA - National Electrical Contractors Association

NFPA - National Fire Protection Agency

UL - Underwriters Laboratory

Access Control System Specifications

Access Control Equipment
Part 1 - Manufacture

- Access Control Manufacturer shall be Keyscan. (No Substitutions)
- Peripheral device Manufacturers shall be according to equipment list. (No Substitutions)
- Cable Manufacturer shall be Genesis. (Or Equivalent)

1.01 Access Control Equipment Description

- Access Control System Manufacture shall be Keyscan (No Substitutions)
- Access Control Management Software = Aurora (This software is already installed and in use. It is listed for information purposes only)
- Reader Control Panels shall be (No Substitutions)
  Keyscan CA 4500 = 4 Door
  Keyscan CA 8500 = 8 Door
- Each Reader Control Panel shall be equipped with (2) 16VAC 40VA Transformer
- Each Reader Control Panel shall be equipped with (1) 12V 7AH Battery
- One reader control panel per building shall be equipped with (1) Keyscan Netcom2p module. If the building has an existing 2,4 or 8 Door Control Panel with a Netcom2P already installed, then CIM modules shall be installed to connect the new Control Panel to the existing Control Panel.
- All Reader Control Panels shall be linked together with CIM modules.
- Each new Reader Control Panel shall be capable of 4 doors minimum

Card Readers shall be (No Substitutions)

- HID 40NKS00000000 Signo Wall Mount reader (for use in all locations except where mullion mount reader size is required to fit)
- HID 20NKS00000000 Signo 20 Mullion Reader (For use on mullion mount locations where single gang reader is too large.
- ALL READERS REQUIRE 22/6 STR OAS WIRE.

Access Control Strikes and locks shall be (No Substitutions unless approved by Moore Public Schools)
RCI 0163X32D ½ inch Rim(ONLY USE IF ¾ INCH RIM WILL NOT FIT)
RCI 0162X32D ¾ inch Rim
RCI F0162X32D ¾ inch Rim Fire Rated
RCI F2164 RECESSED ALL-IN-ONE STRIKE

- Where storm doors are installed, install compatible power motor and power supply to activate door hardware unless installed by door contractor.
- Egress Motions shall be (No Substitutions)
  BOSCH DS160 OR HONEYWELL IS310
- Door Contacts shall be GE Model # 1076D-M Double Pole Double Throw (To be utilized for Access Control and Security Alarm) (See security alarm specs)
- DOOR LOCK RELEASE BUTTON SHALL BE (NO SUBSTITUTIONS)
  RCI PART # 909S ROCKER SWITCH
- Power Supply for locking hardware
  **Power supply in Keyscan Controller is for the Control and Readers only.
- Power Supplies shall be sized to meet requirements of Strikes and locks with a maximum of 80% amp load.
- Power Supply shall have form "C" contacts for supervision that is connected to Keyscan Control Aux Input.
- 25 VDC Shortran Access Power Controller or equal
- Each Power supply shall have a minimum of 7ah battery installed.

2.01 Systems Installation

- All junctions and or splices shall be soldered and insulated.
- All circuits and wiring shall be labeled at all terminating ends.
- All devices shall be mounted in accordance to the manufactures specifications.
- All devices shall be properly adjusted and tested prior to job completion.
- All controllers shall be labeled outside with their corresponding modules and installed with lock.
- All controllers shall have a Cat 6 network cable Blue in color ran from the nearest network cabinet and labeled with drop number.
- All card readers shall be labeled with their corresponding reader number.
- All doors with access control shall have contacts installed for door status indication. Steel doors shall have wide gap door contacts installed.
- All doors with access control shall have egress motions installed to allow system to detect proper egress. (including doors with panic exit hardware.)
- Protective grommets shall be installed on all conduits to protect wire.
- All panels, power supplies and modules shall be grounded.
- All wire shall be run in J hooks above ceiling with a minimum space of 6" from ceiling deck. All wire shall be in separate pathways 6" from other system wiring. No wire ties allowed. No wire shall be run between the red iron and roof deck.
- All wire visible from the finished floor shall be covered in decorative wire molding.
- All wire ran between building shall be in conduit and shall be direct burial cable.
- Installer shall have a licensed Access Control technician on the job site at all times during installation.
- Installer will work closely with the electrical and or masonry contractors to ensure conduit, back boxes, door frame access conduit, etc. are in the proper locations and accessible.
- Follow and adhere to installation practices specified by NFPA-70 National Electric Code, Edition 2008.
- Follow and adhere to installation practices specified by the Manufacturers.

3.01 Bidder/Installer Qualifications

- Bidding contractor shall be a local licensed Access Control Company with licensed Access Control technician(s) on staff.
- Bidding contractor shall have at least one year experience installing Keyscan Access Control Systems.
- Bidding contractor shall have a minimum of 5 years experience installing commercial Access Control Systems.
- Bidding contractor shall be able to provide insurance at the request of the owner.
- Bidding contractor shall have a commercial Access Control technician on the job site at all times during installation.

3.01.1 Submittals

3.01.2 Prior to installation

- Show compete map of system design for approval by Owner.

3.01.3 Prior to final acceptance

- Provide a soft CAD copy As-Built showing layout of Controller Panel, Card Readers, Power Supplies and all mounted equipment upon Substantial Completion.
- Ensure all warranties specify that the Owner is entitled to all rights guaranteed by the warranty for various components.

3.02 Quality Assurance

3.02.1 Qualifications

- Install all components as directed by Manufacturer's installation guidelines.
- All products shall bear the mark of UL or ETL for performance level.
- System installation shall meet all applicable Local/State codes and safety requirements where project is located.
- All products shall be new and un-used in original packaging.

Access Control Installation Completion Check List

Part 4 - General

4.01 Section Includes

- Access Control System Completion Check List

4.02 Completion Check List

- A map of the entire system showing device numbers and wire routes has been left inside the main controller panel and a copy has been given to Rodney Cobb with MPS.
- All system programming has been checked and is correct.
- Panel(s) has been tested for proper operation.
- All card readers are labeled with reader number and have been tested to verify proper operation.
- All user card and key fobs have been programmed into system and tested to verify proper operation.
- All egress motion detectors have been adjusted for proper sensitivity and have been walk tested.
- All controllers are labeled on the outside with module numbers.
- All controllers are labeled on the inside with module numbers by the corresponding module.

Moore Public Schools Video Intercom Door System Specifications
MANUFACTURE
AVIGILON (NO SUBSTITUTIONS).
AVIGILON REQUIRED EQUIPMENT

3.0CH4VIRO1-IR
3.0 MP; H4 Video Intercom; WDR:LightCatcher; Day/Night; 1.83mm
f/2.4; Integrated IR; Recessed Mount

H4VI-AC-RELY1
Safety Relay for H4 Video Intercom

H4VI-MT-SURF1
Surface mount adapter for H4 Video Intercom

ACC7-ENT
ACC 7 Enterprise camera channel license

INSTALLATION

- Video Intercom system requires a Cat 6 network drop ran to the nearest IDF
- Video Intercom system requires an 18 gauge 4 conductor cable ran between the video intercom station and the entry door Keyscan controller unit. **MPS to have final determination of camera location and field of view) (Call Jack Phillips for final location and view phone 473-5225)**
- Each installed Video Intercom System requires a license.
- All network drops shall be connected with patch cords to a switch at each rack location.
- No Substitutions.

Horizontal Cabling
Requirements

- See MPS Structured Cabling Specifications for camera network cabling installation, labelling and testing requirements.

Warranty

- Contractor shall provide a 1 year parts and labor warranty against defective workmanship and/or system component failure.
- Contractor shall execute a Lifetime Applications Assurance Warranty for parts and labor to support stated applications from the connectivity Manufacturer.

End of Section

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Salas O'Brien Registration: CA# 7058
Expiration Date : 6/30/2025
Salas O'Brien Project Number: 2550-00564-00

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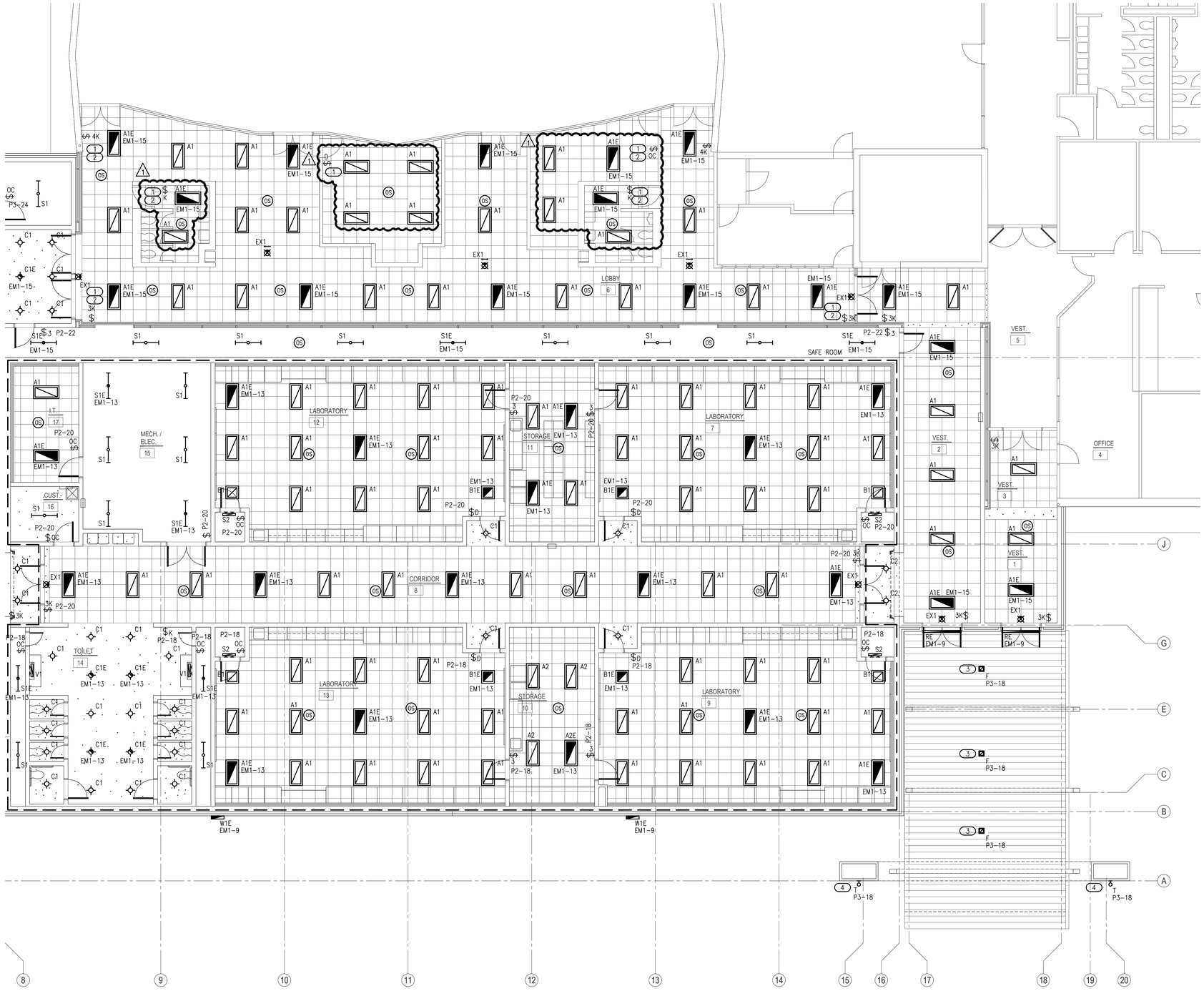


1 ELECTRICAL LIGHTING PLAN - AREA A

SCALE: 1/8" = 1'-0"

NORTH

LIGHTING GENERAL NOTES

1. OCCUPANCY SENSOR LOCATIONS SHOWN ARE FOR DESIGN INTENT ONLY. LOCATE OCCUPANCY SENSORS PER MANUFACTURER'S WRITTEN INSTALLATION INSTRUCTIONS.
2. CONNECT BATTERY PACKS TO UNSWITCHED HOT OF LOCAL LIGHTING CIRCUIT.
3. COORDINATE WITH ALL ASSOCIATED TRADES FOR THE EXACT LOCATIONS OF LIGHT FIXTURES WITH HVAC EQUIPMENT AND OTHER DEVICES/EQUIPMENT.
4. COORDINATE WITH THE ARCHITECT, OWNER, AND ASSOCIATED TRADES FOR THE EXACT HEIGHT/LOCATION OF EXTERIOR MOUNTED LIGHTING FIXTURES PRIOR TO ROUGH-IN.
5. LABEL SWITCH PLATES AND J-BOXES WITH CIRCUIT PER SPECS.
6. COORDINATE LIGHT SWITCHES WITH THERMOSTATS AND OTHER WALL MOUNT DEVICES.
7. EXTERIOR LIGHTING SHALL BE CONTROLLED BY RELAY TO INTERLOCK WITH EXISTING EXTERIOR LIGHTING CONTROLS. EC SHALL FIELD INVESTIGATE AND REPORT ANY ANOMILIES TO THE ARCHITECT AND ENGINEER PRIOR TO PROCEEDING.

SAFEROOM GENERAL NOTES

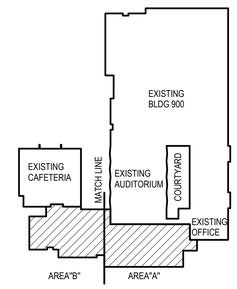
PER ICC 500-2014, 309.1:

PENETRATIONS THROUGH THE STORM SHELTER ENVELOPE THAT ARE LARGER THAN:
1. 3.5" SQUARE INCHES IN AREA FOR RECTANGULAR OPENINGS, OR
2. 2 1/16" IN DIAMETER

SHALL BE CONSIDERED AN OPENING AND SHALL BE PROVIDED WITH AN OPENING PROTECTIVE DEVICE (SHROUD). REFERENCE STRUCTURAL DRAWINGS FOR A SAMPLE SHROUD DETAIL. THIS INCLUDES PENETRATIONS FOR BUNDLES OF CONDUIT.

KEYED NOTES

1. PANEL FEEDING EXISTING LIGHTING CIRCUITS TO BE REPLACED. PROVIDE NEW WIRING AND CONDUIT FOR ALL NEW LIGHTING. EXISTING WIRING AND CONDUIT MAY BE REUSED WHERE IN SERVICEABLE CONDITION. ANY WIRING TO BE REUSED SHALL BE WARRANTED AS IF NEW.
2. EMERGENCY LIGHTING TO BE CIRCUITED TO NEW PANEL 'EM1' AS INDICATED. UL924 DEVICES, AS INDICATED IN LIGHT FIXTURE SCHEDULE, SHALL BE USED TO CONTROL EMERGENCY LIGHTS WITH EXISTING LIGHTING CIRCUITS AS INDICATED IN KEYED NOTE #1 ABOVE.
3. COORDINATE LIGHT FIXTURE LOCATION AND CONDUIT ROUTING WITH ARCHITECT PRIOR TO ROUGH-IN.
4. COORDINATE MOUNTING HEIGHT WITH ARCHITECT PRIOR TO ROUGH-IN.



KEYPLAN

NO SCALE

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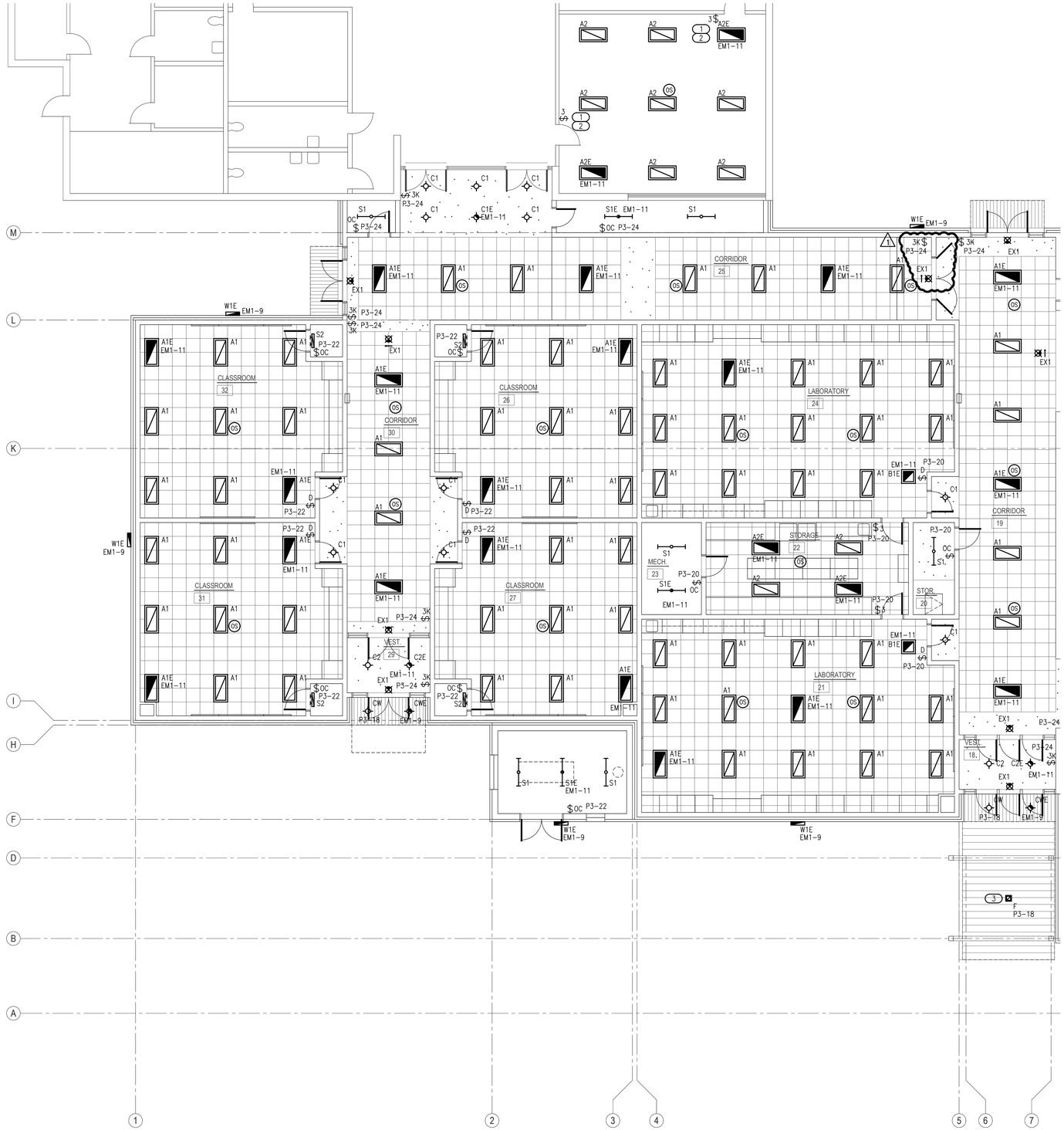


1 ELECTRICAL LIGHTING PLAN - AREA B

SCALE: 1/8" = 1'-0"

NORTH

LIGHTING GENERAL NOTES

1. OCCUPANCY SENSOR LOCATIONS SHOWN ARE FOR DESIGN INTENT ONLY. LOCATE OCCUPANCY SENSORS PER MANUFACTURER'S WRITTEN INSTALLATION INSTRUCTIONS.
2. CONNECT BATTERY PACKS TO UNSWITCHED HOT OF LOCAL LIGHTING CIRCUIT.
3. COORDINATE WITH ALL ASSOCIATED TRADES FOR THE EXACT LOCATIONS OF LIGHT FIXTURES WITH HVAC EQUIPMENT AND OTHER DEVICES/EQUIPMENT.
4. COORDINATE WITH THE ARCHITECT, OWNER, AND ASSOCIATED TRADES FOR THE EXACT HEIGHT/LOCATION OF EXTERIOR MOUNTED LIGHTING FIXTURES PRIOR TO ROUGH-IN.
5. LABEL SWITCH PLATES AND J-BOXES WITH CIRCUIT PER SPECS.
6. COORDINATE LIGHT SWITCHES WITH THERMOSTATS AND OTHER WALL MOUNT DEVICES.
7. EXTERIOR LIGHTING SHALL BE CONTROLLED BY RELAY TO INTERLOCK WITH EXISTING EXTERIOR LIGHTING CONTROLS. EC SHALL FIELD INVESTIGATE AND REPORT ANY ANOMILIES TO THE ARCHITECT AND ENGINEER PRIOR TO PROCEEDING.

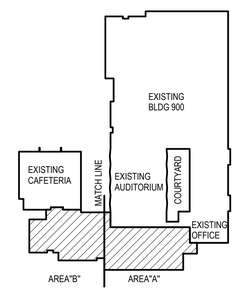
SAFEROOM GENERAL NOTES

PER ICC 500-2014, 309.1:

PENETRATIONS THROUGH THE STORM SHELTER ENVELOPE THAT ARE LARGER THAN:
1. 3.5" SQUARE INCHES IN AREA FOR RECTANGULAR OPENINGS, OR
2. 2 1/16" IN DIAMETER
SHALL BE CONSIDERED AN OPENING AND SHALL BE PROVIDED WITH AN OPENING PROTECTIVE DEVICE (SHROUD). REFERENCE STRUCTURAL DRAWINGS FOR A SAMPLE SHROUD DETAIL. THIS INCLUDES PENETRATIONS FOR BUNDLES OF CONDUIT.

KEYED NOTES

1. LIGHT FIXTURES IN THIS AREA, EXCLUDING EMERGENCY LIGHTING SHALL BE CONNECTED TO EXISTING CIRCUITING. EXTEND WIRING AND CONDUIT AS NEEDED.
2. EMERGENCY LIGHTING TO BE CIRCUITED TO NEW PANEL 'EM1' AS INDICATED. UL924 DEVICES, AS INDICATED IN LIGHT FIXTURE SCHEDULE, SHALL BE USED TO CONTROL EMERGENCY LIGHTS WITH EXISTING LIGHTING CIRCUITS AS INDICATED IN KEYED NOTE #1 ABOVE.
3. COORDINATE LIGHT FIXTURE LOCATION AND CONDUIT ROUTING WITH ARCHITECT PRIOR TO ROUGH-IN.



KEYPLAN
NO SCALE

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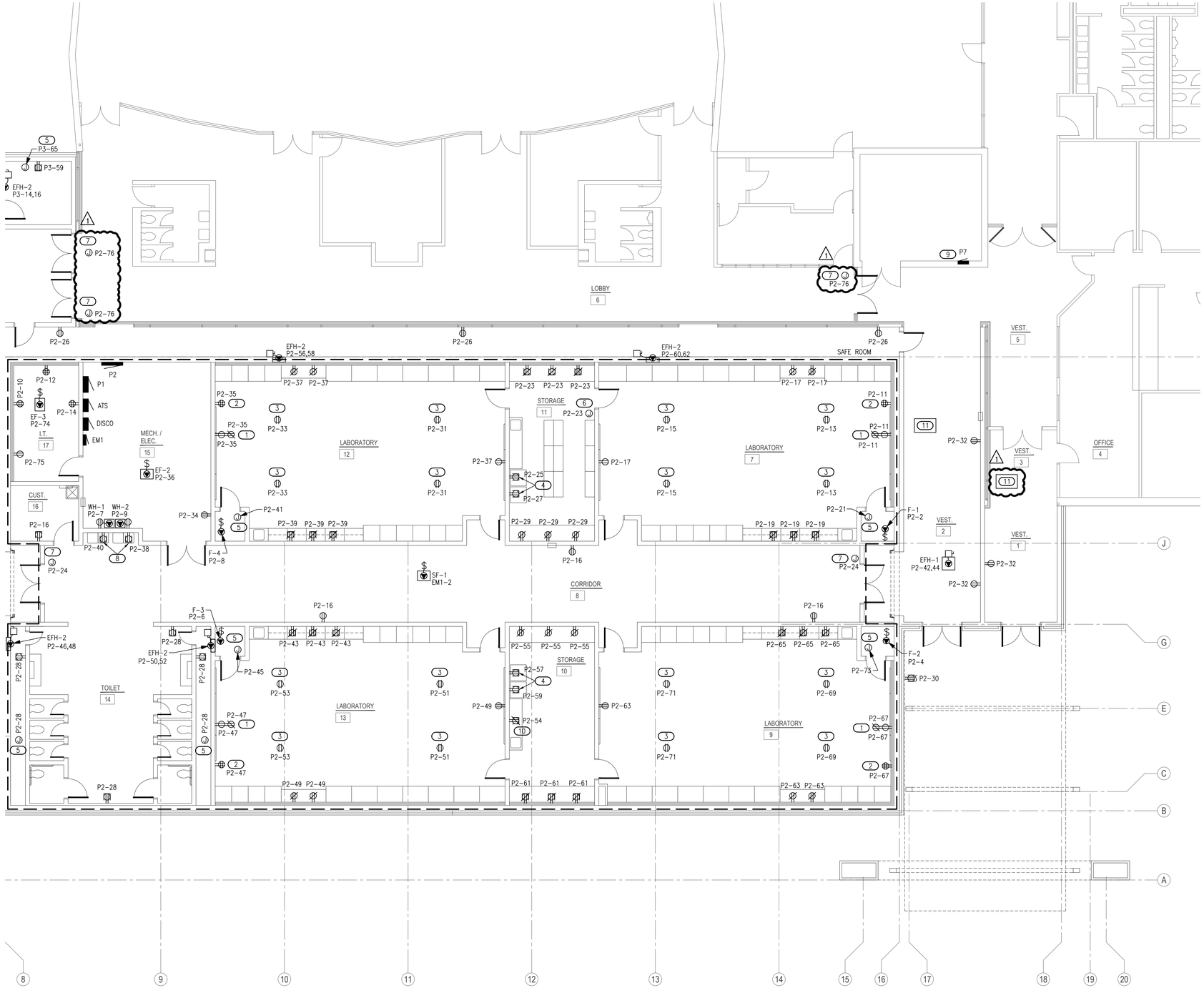


1 ELECTRICAL POWER PLAN - AREA A

SCALE: 1/8" = 1'-0"

NORTH

POWER GENERAL NOTES

1. COORDINATE EXACT LOCATIONS OF DEVICES SHOWN WITH OTHER EQUIPMENT. COORDINATE EXACT LOCATION OF CEILING MOUNTED DEVICES WITH LIGHTS, HVAC EQUIPMENT, AND OTHER DEVICES.
2. COORDINATE WITH MECHANICAL CONTRACTOR AND PROVIDE ALL RELAYS, CONNECTIONS, AND ALL DEVICES NECESSARY TO INTERLOCK EXHAUST FANS, DAMPERS, ETC WITH PROPER CONTROL DEVICES.
3. COORDINATE EXACT LOCATION OF MECHANICAL EQUIPMENT WITH MECHANICAL CONTRACTOR. REFER TO MECHANICAL PLANS AND MANUFACTURER FOR ADDITIONAL INFORMATION.
4. COORDINATE EXACT LOCATION OF PLUMBING EQUIPMENT WITH PLUMBING CONTRACTOR. REFER TO PLUMBING PLANS AND MANUFACTURER FOR ADDITIONAL INFORMATION.
5. ALL RECEPTACLES LOCATED AT COUNTERTOP HEIGHT SHALL BE ORIENTED HORIZONTALLY.
6. FIRE STOP ALL PENETRATIONS IN FIRE AND SMOKE RATED WALLS. REFER TO ARCHITECTURAL PLANS FOR LOCATIONS AND ADDITIONAL INFORMATION.
7. ALL EXISTING PANELS AND ASSOCIATED BRANCH CIRCUITING BELIEVED TO BE MISSING GROUNDING ELECTRODE CONDUCTOR AND/OR EQUIPMENT GROUNDING CONDUCTORS. FOR PANELS BEING REPLACED, CONTRACTOR TO INVESTIGATE EXISTING CONDITIONS AND PROVIDE NEW GROUNDING WIRES AS REQUIRED. REFER TO KEYED NOTE 9 FOR ADDITIONAL INFORMATION.

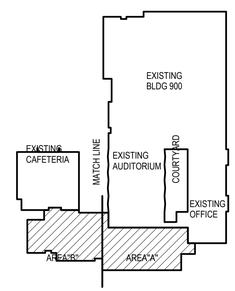
SAFEROOM GENERAL NOTES

PER ICC 500-2014, 309.1:

PENETRATIONS THROUGH THE STORM SHELTER ENVELOPE THAT ARE LARGER THAN:
1. 3.5" SQUARE INCHES IN AREA FOR RECTANGULAR OPENINGS, OR
2. 2 1/16" IN DIAMETER
SHALL BE CONSIDERED AN OPENING AND SHALL BE PROVIDED WITH AN OPENING PROTECTIVE DEVICE (SHROUD). REFERENCE STRUCTURAL DRAWINGS FOR A SAMPLE SHROUD DETAIL. THIS INCLUDES PENETRATIONS FOR BUNDLES OF CONDUIT.

KEYED NOTES

1. PROVIDE 120V CONNECTION FOR SMARTBOARD. COORDINATE FINAL LOCATION AND REQUIREMENTS WITH THE OWNER/ARCHITECT PRIOR TO ROUGH-IN. REFER TO DETAIL 'E502/1' FOR ADDITIONAL INFORMATION.
2. APPROXIMATE LOCATION OF TEACHERS DESK. COORDINATE FINAL LOCATION AND REQUIREMENTS WITH THE OWNER/ARCHITECT PRIOR TO ROUGH-IN. REFER TO DETAIL 'E502/1' FOR ADDITIONAL INFORMATION.
3. PROVIDE 120V DROP CORD RECEPTACLE FOR GENERAL USE. COORDINATE FINAL LOCATION AND REQUIREMENTS WITH THE OWNER/ARCHITECT PRIOR TO ROUGH-IN. REFER TO DETAIL 'E502/2 FOR ADDITIONAL INFORMATION.
4. PROVIDE DEDICATED 120V RECEPTACLES FOR REFRIGERATOR & FREEZER. COORDINATE FINAL LOCATIONS AND REQUIREMENTS WITH THE ARCHITECT/OWNER PRIOR TO ROUGH-IN.
5. PROVIDE 120V CONNECTION FOR TRAP PRIMER. COORDINATE FINAL LOCATION AND REQUIREMENTS WITH PLUMBING CONTRACTOR PRIOR TO ROUGH-IN.
6. PROVIDE EMERGENCY NATURAL GAS SHUT-OFF SWITCH INTERLOCKED WITH NATURAL GAS SOLENOID VALVE. COORDINATE EXACT LOCATION WITH PLUMBING CONTRACTOR PRIOR TO ROUGH-IN.
7. PROVIDE 120V CONNECTION FOR DOOR HOLD-OPEN SYSTEM. COORDINATE EXACT LOCATION AND REQUIREMENTS WITH LOW VOLTAGE CONTRACTOR.
8. PROVIDE 120V WATER COOLER CONNECTION. COORDINATE EXACT LOCATION AND REQUIREMENTS WITH THE ARCHITECT, OWNER, AND PLUMBING CONTRACTOR PRIOR TO ROUGH-IN.
9. EXISTING BRANCH CIRCUITS TO BE RECONNECTED TO NEW PANEL. PROVIDE NEW WIRING AND CONDUIT AS REQUIRED TO EXTEND CIRCUITS AS NEEDED. REFER TO GENERAL NOTES ABOVE, UPDATE GROUND WIRING AS REQUIRED.
10. PROVIDE 120V DEDICATED CONNECTION FOR 3D PRINTER. COORDINATE EXACT LOCATION WITH THE OWNER ON SITE.
11. MINI SPLIT INDOOR UNIT TO BE POWERED FROM OUTDOOR UNIT. COORDINATE EXACT REQUIREMENTS WITH MECHANICAL CONTRACTOR ON SITE.



KEYPLAN

NO SCALE

Salas O'Brien
2900 S. Telephone Road, Suite 120
Moore, OK 73160
Salas O'Brien Registration: CA# 7058
Expiration Date : 6/30/2025
Salas O'Brien Project Number: 2550-00564-00

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the Abla Griffin Partnership L.L.C.
313 S. E. 5th Street
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1 06/27/2025 AD 01

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CLASSROOM ADDITION
CENTRAL JUNIOR
HIGH SCHOOL

sheet no:

E201

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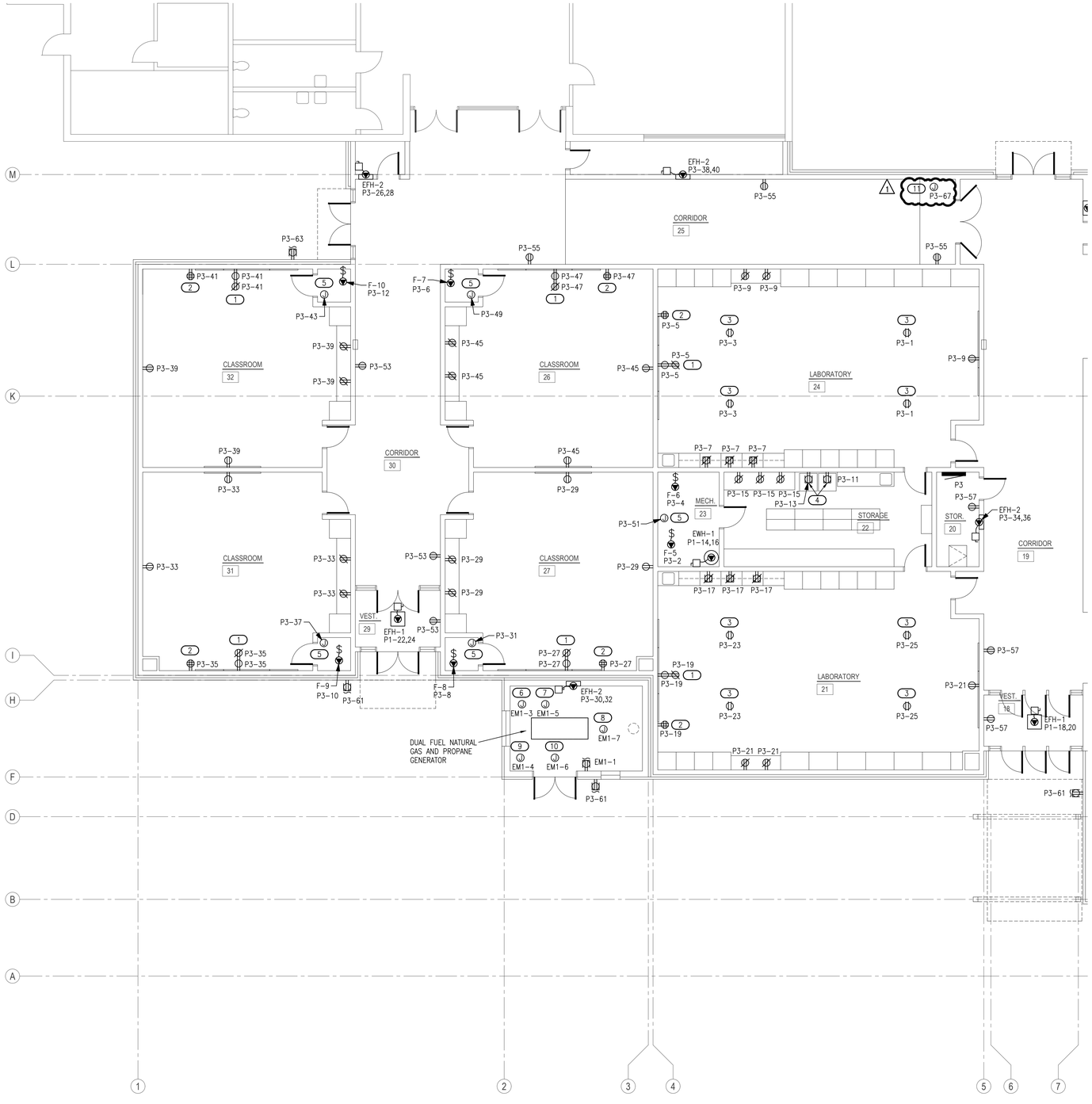


1 ELECTRICAL POWER PLAN - AREA B

SCALE: 1/8" = 1'-0"

NORTH

POWER GENERAL NOTES

1. COORDINATE EXACT LOCATIONS OF DEVICES SHOWN WITH OTHER EQUIPMENT. COORDINATE EXACT LOCATION OF CEILING MOUNTED DEVICES WITH LIGHTS, HVAC EQUIPMENT, AND OTHER DEVICES.
2. COORDINATE WITH MECHANICAL CONTRACTOR AND PROVIDE ALL RELAYS, CONNECTIONS, AND ALL DEVICES NECESSARY TO INTERLOCK EXHAUST FANS, DAMPERS, ETC WITH PROPER CONTROL DEVICES.
3. COORDINATE EXACT LOCATION OF MECHANICAL EQUIPMENT WITH MECHANICAL CONTRACTOR. REFER TO MECHANICAL PLANS AND MANUFACTURER FOR ADDITIONAL INFORMATION.
4. COORDINATE EXACT LOCATION OF PLUMBING EQUIPMENT WITH PLUMBING CONTRACTOR. REFER TO PLUMBING PLANS AND MANUFACTURER FOR ADDITIONAL INFORMATION.
5. ALL RECEPTACLES LOCATED AT COUNTERTOP HEIGHT SHALL BE ORIENTED HORIZONTALLY.
6. FIRE STOP ALL PENETRATIONS IN FIRE AND SMOKE RATED WALLS. REFER TO ARCHITECTURAL PLANS FOR LOCATIONS AND ADDITIONAL INFORMATION

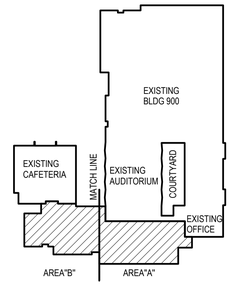
SAFEROOM GENERAL NOTES

PER ICC 500–2014, 309.1:

PENETRATIONS THROUGH THE STORM SHELTER ENVELOPE THAT ARE LARGER THAN:
1. 3.5" SQUARE INCHES IN AREA FOR RECTANGULAR OPENINGS, OR
2. 2 1/16" IN DIAMETER
SHALL BE CONSIDERED AN OPENING AND SHALL BE PROVIDED WITH AN OPENING PROTECTIVE DEVICE (SHROUD). REFERENCE STRUCTURAL DRAWINGS FOR A SAMPLE SHROUD DETAIL. THIS INCLUDES PENETRATIONS FOR BUNDLES OF CONDUIT.

KEYED NOTES

1. PROVIDE 120V CONNECTION FOR SMARTBOARD. COORDINATE FINAL LOCATION AND REQUIREMENTS WITH THE OWNER/ARCHITECT PRIOR TO ROUGH-IN. REFER TO DETAIL 'E502/1' FOR ADDITIONAL INFORMATION.
2. APPROXIMATE LOCATION OF TEACHERS DESK. COORDINATE FINAL LOCATION AND REQUIREMENTS WITH THE OWNER/ARCHITECT PRIOR TO ROUGH-IN. REFER TO DETAIL 'E502/1' FOR ADDITIONAL INFORMATION.
3. PROVIDE 120V DROP CORD RECEPTACLE FOR GENERAL USE. COORDINATE FINAL LOCATION AND REQUIREMENTS WITH THE OWNER/ARCHITECT PRIOR TO ROUGH-IN. REFER TO DETAIL 'E502/2 FOR ADDITIONAL INFORMATION.
4. PROVIDE DEDICATED 120V RECEPTACLES FOR REFRIGERATOR & FREEZER. COORDINATE FINAL LOCATIONS AND REQUIREMENTS WITH THE ARCHITECT/OWNER PRIOR TO ROUGH-IN.
5. PROVIDE 120V CONNECTION FOR TRAP PRIMER. COORDINATE FINAL LOCATION AND REQUIREMENTS WITH PLUMBING CONTRACTOR PRIOR TO ROUGH-IN.
6. PROVIDE 120V GENERATOR BLOCK HEATER CONNECTION.
7. PROVIDE 120V GENERATOR BATTERY HEATER CONNECTION.
8. PROVIDE 120V GENERATOR BATTERY CHARGER CONNECTION.
9. PROVIDE 120V CONNECTION FOR LP GAS SENSOR PANEL. COORDINATE EXACT LOCATION AND REQUIREMENTS WITH PLUMBING CONTRACTOR ON SITE.
10. PROVIDE 120V CONNECTION FOR LP GAS SOLENOID VALVE. COORDINATE EXACT LOCATION AND REQUIREMENTS WITH PLUMBING CONTRACTOR ON SITE.
1. 06/27/2025 AD 01
11. PROVIDE 120V CONNECTION FOR DOOR HOLD-OPEN SYSTEM. COORDINATE EXACT LOCATION AND REQUIREMENTS WITH LOW VOLTAGE CONTRACTOR.



KEYPLAN

NO SCALE

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CENTRAL JUNIOR HIGH SCHOOL

sheet no:

E202

Salas O'Brien
2900 S. Telephone Road, Suite 120
Moore, OK 73160
Salas O'Brien Registration: CA# 7058
Expiration Date : 6/30/2025
Salas O'Brien Project Number: 2550-00564-00

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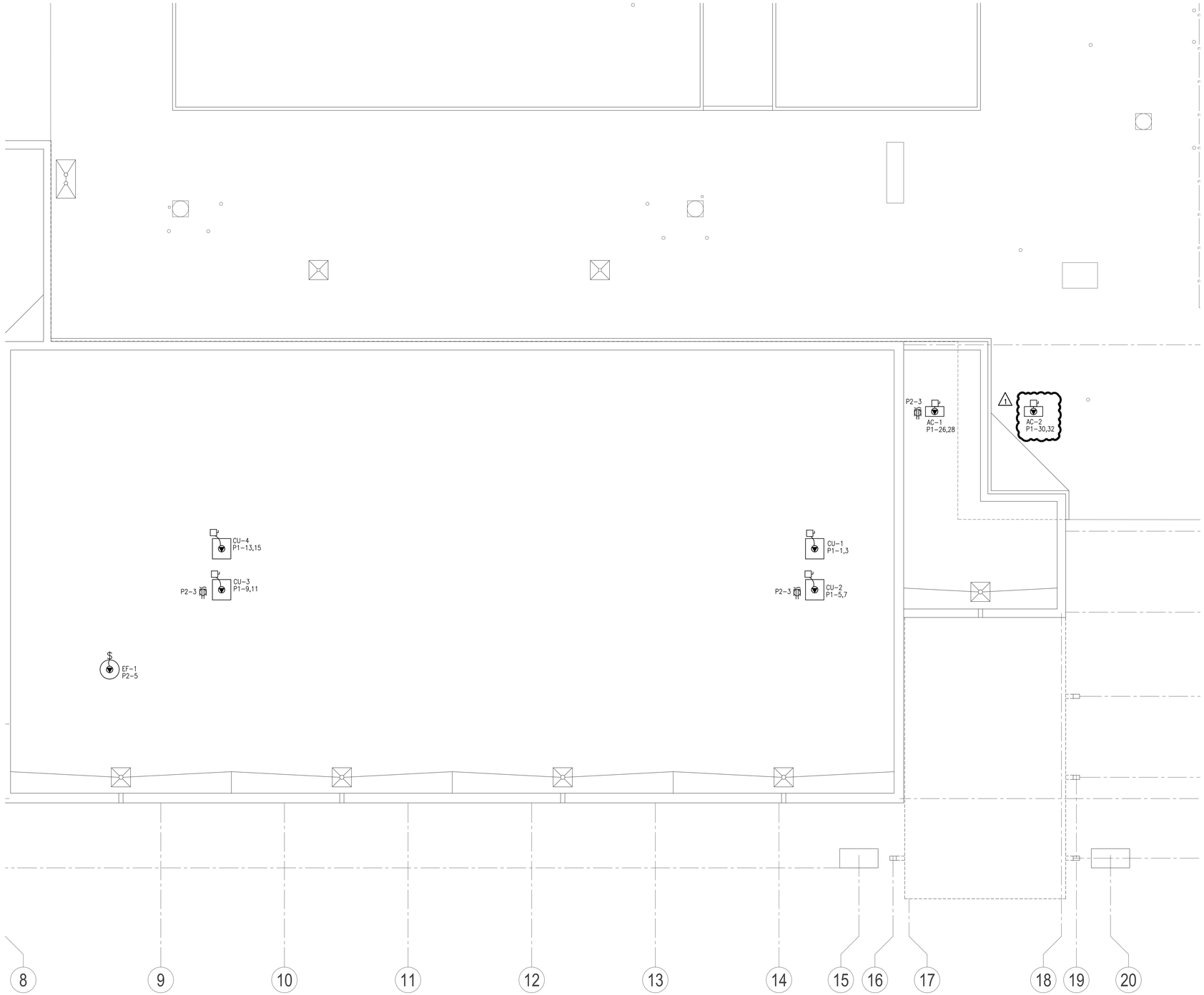

ROOF POWER GENERAL NOTES

1. COORDINATE EXACT LOCATIONS OF DEVICES SHOWN WITH OTHER EQUIPMENT.
2. COORDINATE WITH MECHANICAL CONTRACTOR AND PROVIDE ALL RELAYS, CONNECTIONS, AND ALL DEVICES NECESSARY TO INTERLOCK EXHAUST FANS, DAMPERS, ETC WITH PROPER DEVICES.
3. COORDINATE EXACT LOCATIONS OF MECHANICAL EQUIPMENT WITH MECHANICAL CONTRACTOR.
4. FIRMLY MOUNT WEATHERPROOF 120V CONVENIENCE OUTLET ON UNISTRUT/KINDORF. COORDINATE WITH OTHER TRADES PRIOR TO ROUGH-IN. REDUNDANT RECEPTACLES WHETHER STAND-ALONE OR INTEGRAL TO A UNIT, MAY BE OMITTED SO LONG AS ALL OF THE REQUIREMENTS OF NEC 210.63 ARE SATISFIED.

SAFEROOM GENERAL NOTES

PER ICC 500-2014, 309.1:

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1. 3.5" SQUARE INCHES IN AREA FOR RECTANGULAR OPENINGS, OR
2. 2 1/16" IN DIAMETER
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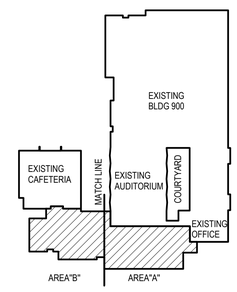

KEYPLAN
NO SCALE

1 ELECTRICAL ROOF PLAN - AREA A
SCALE: 1/8" = 1'-0"

NORTH

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CENTRAL JUNIOR
HIGH SCHOOL

sheet no:

E204

Salas O'Brien
2900 S. Telephone Road, Suite 120
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Salas O'Brien Registration: CA# 7058
Expiration Date : 6/30/2025
Salas O'Brien Project Number: 2550-00564-00

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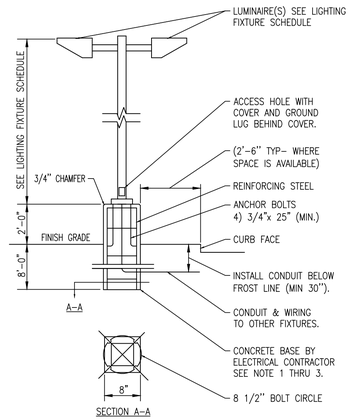
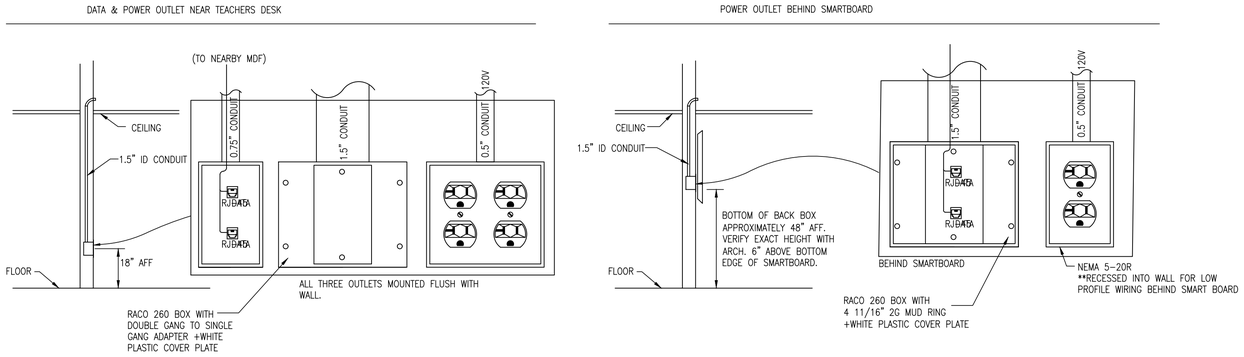


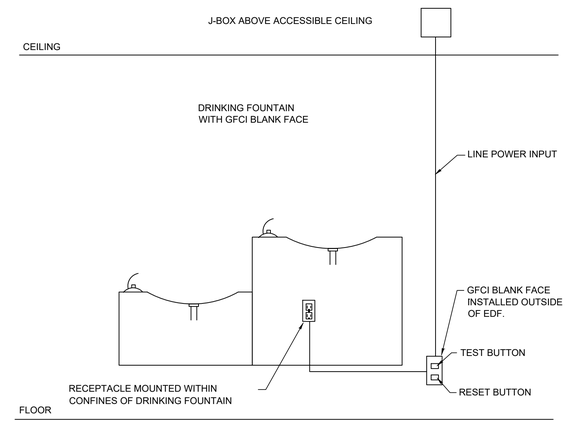
NOTES:

1. PROVIDE CROWN ON TOP OF CONCRETE BASE TO COMPLETELY SHED WATER. IF WATERSHED IS NOT PROVIDED, THEN GROUTING WITH NON-SHRINK GROUT IS REQUIRED. GROUT UNDER BASE PLATE.
2. PROVIDE A 3/4"X10'-0" LONG COPPER GROUND ROD FOR EACH LIGHTING STANDARD WHERE REQUIRED BY APPLICABLE CODES.
3. PAINT CONCRETE BASE TRAFFIC YELLOW WHERE LOCATED IN PAVED AREAS.
4. POLE, LUMINAIRE(S), BASE ASSEMBLY AND ANCHOR BOLTS TO BE CAPABLE OF WITHSTANDING A MINIMUM OF 90 MPH WIND WITH AN ADDITIONAL GUST FACTOR OF 30%. DEFLECTION NOT TO EXCEED 5%.

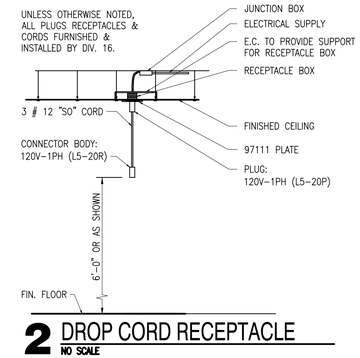
4 LIGHTING STANDARD ELEVATION
NO SCALE



1 TEACHERS DESK & SMART BOARD WIRING DETAIL
NO SCALE



3 TYP. ELECTRICAL DRINKING FOUNTAIN DETAIL
NO SCALE



2 DROP CORD RECEPTACLE
NO SCALE

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CENTRAL JUNIOR HIGH SCHOOL

sheet no:

E502

Salas O'Brien
2900 S. Telephone Road, Suite 120
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Salas O'Brien Registration: CA# 7058
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Salas O'Brien Project Number: 2550-00564-00

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Panel P3

ROOM
MOUNTING SURFACE
FED FROM P1
NOTE [DOUBLE TUB]

VOLTS 208Y/120V 3P 4W
BUS AMPS 225
NEUTRAL 100%

AIC 65,000
MAIN BKR 225
LUGS STANDARD

CKT #	CKT BKR	LOAD KVA	CIRCUIT DESCRIPTION		CKT #	CKT BKR	LOAD KVA	CIRCUIT DESCRIPTION
1	20/1	0.36	RM 24 RECEPTACLE	a	2	20/1	1.92	F-5
3	20/1	0.36	RM 24 RECEPTACLE	b	4	20/1	1.66	F-6
5	20/1	0.72	RM 24 RECEPTACLE, SMARTBOARD, TEACHER DESK	c	6	20/1	1.18	F-7
7	20/1	0.54	RM 24 RECEPTACLE	a	8	20/1	1.18	F-8
9	20/1	0.54	RM 24 RECEPTACLE	b	10	20/1	1.18	F-9
11	20/1	0.8	RM 22 FREEZER	c	12	20/1	1.18	F-10
13	20/1	0.8	RM 22 REFRIGERATOR	a	14	20/2	2	EFH-2
15	20/1	0.54	RM 22 RECEPTACLE	b	16	|	|	
17	20/1	0.54	RM 21 RECEPTACLE	c	18	20/1	0.4	LIGHTING
19	20/1	0.72	RM 21 RECEPTACLE, SMARTBOARD, TEACHER DESK	a	20	20/1	1.29	LIGHTING
21	20/1	0.54	RM 21 RECEPTACLE	b	22	20/1	1.41	LIGHTING
23	20/1	0.36	RM 21 RECEPTACLE	c	24	20/1	0.883	LIGHTING
25	20/1	0.36	RM 21 RECEPTACLE	a	26	20/2	2	EFH-2
27	20/1	0.72	RM 27 RECEPTACLE, SMARTBOARD, TEACHER DESK	b	28	|	|	
29	20/1	0.72	RM 27 RECEPTACLE	c	30	20/2	2	EFH-2
31	20/1	0.1	TRAP PRIMER	a	32	|	|	
33	20/1	0.72	RM 31 RECEPTACLE	b	34	20/2	2	EFH-2
35	20/1	0.72	RM 31 RECEPTACLE, SMARTBOARD, TEACHER DESK	c	36	|	|	
37	20/1	0.1	TRAP PRIMER	a	38	20/2	2	EFH-2
39	20/1	0.72	RM 32 RECEPTACLE	b	40	|	|	
41	20/1	0.72	RM 32 RECEPTACLE, SMARTBOARD, TEACHER DESK	c	42	20/1	0	SPACE
43	20/1	0.1	TRAP PRIMER	a	44	20/1	0	SPACE
45	20/1	0.72	RM 26 RECEPTACLE	b	46	20/1	0	SPACE
47	20/1	0.72	RM 26 RECEPTACLE, SMARTBOARD, TEACHER DESK	c	48	20/1	0	SPACE
49	20/1	0.1	TRAP PRIMER	a	50	20/1	0	SPACE
51	20/1	0.1	TRAP PRIMER	b	52	20/1	0	SPACE
53	20/1	0.54	CORRIDOR 30 RECEPTACLE, RM 29 RECEPTACLE	c	54	20/1	0	SPACE
55	20/1	0.54	CORRIDOR 25 RECEPTACLE	a	56	20/1	0	SPACE
57	20/1	0.54	CORRIDOR 19 RECEPTACLE, RM 18 RECEPTACLE, RM 20 RECEPTACLE	b	58	20/1	0	SPACE
59	20/1	0.18	FIRE ALARM CONTROL PANEL	c	60	20/1	0	SPACE
61	20/1	0.54	EXTERIOR RECEPTACLE	a	62	20/1	0	SPACE
63	20/1	0.18	EXTERIOR RECEPTACLE	b	64	20/1	0	SPACE
65	20/1	0.1	TRAP PRIMER	c	66	20/1	0	SPACE
1 67	20/1	0.01	DOOR HOLD-OPEN SYSTEM	a	68	20/1	0	SPACE
69	20/1	0	SPACE	b	70	20/1	0	SPACE
71	20/1	0	SPACE	c	72	20/1	0	SPACE
73	20/1	0	SPACE	a	74	20/1	0	SPACE
75	20/1	0	SPACE	b	76	20/1	0	SPACE
77	20/1	0	SPACE	c	78	20/1	0	SPACE
79	20/1	0	SPACE	a	80	20/1	0	SPACE
81	20/1	0	SPACE	b	82	20/1	0	SPACE
83	20/1	0	SPACE	c	84	20/1	0	SPACE

	CONN KVA	CALC KVA			CONN KVA	CALC KVA	
LIGHTING	3.98	4.98	(125%)	MOTORS	8.28	8.28	(100%)
LARGEST MOTOR	1.92	0.48	(25%)	RECEPTACLES	16.1	13	(50%>10)
				HEATING	10	10	(100%)
				TOTAL LOAD		36.8	
				BALANCED 3-PHASE LOAD		102 A	
				PHASE A		99.2%	
				PHASE B		109%	
				PHASE C		91.8%	

Panel P2

ROOM
MOUNTING SURFACE
FED FROM P1
NOTE [DOUBLE TUB]

VOLTS 208Y/120V 3P 4W
BUS AMPS 225
NEUTRAL 100%

AIC 65,000
MAIN BKR MLO
LUGS STANDARD

CKT #	CKT BKR	LOAD KVA	CIRCUIT DESCRIPTION		CKT #	CKT BKR	LOAD KVA	CIRCUIT DESCRIPTION
1	20/1	0.54	ROOFTOP RECEPTACLE	a	2	20/1	1.66	F-1
3	20/1	0.54	ROOFTOP RECEPTACLE	b	4	20/1	1.92	F-2
5	20/1	0.24	EF-1	c	6	20/1	1.92	F-3
7	20/1	0.1	WH-1	a	8	20/1	1.66	F-4
9	20/1	0.1	WH-2	b	10	20/1	0.36	I.T. RECEPTACLE
11	20/1	0.72	RM 7 RECEPTACLE, SMARTBOARD, TEACHER DESK	c	12	20/1	0.36	I.T. RECEPTACLE
13	20/1	0.36	RM 7 RECEPTACLE	a	14	20/1	0.36	I.T. RECEPTACLE
15	20/1	0.36	RM 7 RECEPTACLE	b	16	20/1	0.72	CORRIDOR 8 RECEPTACLE, RM 16 RECEPTACLE
17	20/1	0.54	RM 7 RECEPTACLE	c	18	20/1	1.5	LIGHTING
19	20/1	0.54	RM 7 RECEPTACLE	a	20	20/1	1.84	LIGHTING
21	20/1	0.1	TRAP PRIMER	b	22	20/1	0.21	LIGHTING
23	20/1	0.59	GAS SOLENOID VALVE, RM 11 RECEPTACLE	c	24	20/1	0.02	DOOR HOLD-OPEN SYSTEM
25	20/1	0.8	RM 11 FREEZER	a	26	20/1	0.54	CHASE RECEPTACLE
27	20/1	0.8	RM 11 REFRIGERATOR	b	28	20/1	0.92	PLUMBING CHASE RECEPTACLE, RM 14 RECEPTACLE, TRAP PRIMER
29	20/1	0.54	RM 11 RECEPTACLE	c	30	20/1	0.18	EXTERIOR RECEPTACLE
31	20/1	0.36	RM 12 RECEPTACLE	a	32	20/1	0.54	RECEPTACLE, RM 1 RECEPTACLE, RM 2 RECEPTACLE
33	20/1	0.36	RM 12 RECEPTACLE	b	34	20/1	0.18	RM 15 RECEPTACLE
35	20/1	0.72	RM 12 RECEPTACLE, SMARTBOARD, TEACHER DESK	c	36	20/1	0.24	EF-2
37	20/1	0.54	RM 12 RECEPTACLE	a	38	20/1	0.5	WATER COOLER
39	20/1	0.54	RM 12 RECEPTACLE	b	40	20/1	0.5	WATER COOLER
41	20/1	0.1	TRAP PRIMER	c	42	20/2	2	EFH-1
43	20/1	0.54	RM 13 RECEPTACLE	a	44	|	|	
45	20/1	0.1	TRAP PRIMER	b	46	20/2	2	EFH-2
47	20/1	0.72	RM 13 RECEPTACLE, SMARTBOARD, TEACHER DESK	c	48	|	|	
49	20/1	0.54	RM 13 RECEPTACLE	a	50	20/2	2	EFH-2
51	20/1	0.36	RM 13 RECEPTACLE	b	52	|	|	
53	20/1	0.36	RM 13 RECEPTACLE	c	54	20/1	1.2	3D PRINTER
55	20/1	0.54	RM 10 RECEPTACLE	a	56	20/2	2	EFH-2
57	20/1	0.8	RM 10 FREEZER	b	58	|	|	
59	20/1	0.8	RM 10 REFRIGERATOR	c	60	20/2	2	EFH-2
61	20/1	0.54	RM 10 RECEPTACLE	a	62	|	|	
63	20/1	0.54	RM 9 RECEPTACLE	b	64	20/2	0.798	LIGHTING
65	20/1	0.54	RM 9 RECEPTACLE	c	66	|	|	
67	20/1	0.72	RM 9 RECEPTACLE, SMARTBOARD, TEACHER DESK	a	68	20/2	0.665	LIGHTING
69	20/1	0.36	RM 9 RECEPTACLE	b	70	|	|	
71	20/1	0.36	RM 9 RECEPTACLE	c	72	20/1	0.3	LIGHTING
73	20/1	0.1	TRAP PRIMER	a	74	20/1	0.168	EF-3
75	20/1	0.18	ACP	1 b	76	20/1	0.03	DOOR HOLD-OPEN SYSTEM
77	20/1	0	SPACE	c	78	20/1	0	SPACE
79	20/1	0	SPACE	a	80	20/1	0	SPACE
81	20/1	0	SPACE	b	82	20/1	0	SPACE
83	20/1	0	SPACE	c	84	20/1	0	SPACE

	CONN KVA	CALC KVA			CONN KVA	CALC KVA	
LIGHTING	5.31	6.64	(125%)	MOTORS	8	8	(100%)
LARGEST MOTOR	1.92	0.48	(25%)	RECEPTACLES	23.6	16.8	(50%>10)
				HEATING	10	10	(100%)
				TOTAL LOAD		41.9	
				BALANCED 3-PHASE LOAD		116 A	
				PHASE A		114%	
				PHASE B		87.8%	
				PHASE C		98.2%	

Panel P1

ROOM
MOUNTING SURFACE
FED FROM UTILITY
NOTE

VOLTS 208Y/120V 3P 4W
BUS AMPS 600
NEUTRAL 100%

AIC 65,000
MAIN BKR 600
LUGS STANDARD

CKT #	CKT BKR	LOAD KVA	CIRCUIT DESCRIPTION		CKT #	CKT BKR	LOAD KVA	CIRCUIT DESCRIPTION
1	45/2	4.66	CU-1	a	2	225/3	46.9	PANEL P2
3	|	|		b	4	|	|	
5	50/2	5.32	CU-2	c	6	|	|	
7	|	|		a	8	225/3	38.3	PANEL P3
9	50/2	5.32	CU-3	b	10	|	|	
11	|	|		c	12	|	|	
13	45/2	4.66	CU-4	a	14	30/2	4.5	EWH-1
15	|	|		b	16	|	|	
17	50/2	5.32	CU-5	c	18	20/2	2	EFH-1
19	|	|		a	20	|	|	
21	45/2	4.66	CU-6	b	22	20/2	2	EFH-1
23	|	|		c	24	|	|	
25	35/2	3.49	CU-7	a	26	20/2	2.33	AC-1
27	|	|		b	28	|	|	
29	35/2	3.49	CU-8	1 c	30	20/2	2.33	AC-2
31	|	|		a	32	|	|	
33	35/2	3.49	CU-9	b	34	20/1	0	SPACE
35	|	|		c	36	20/1	0	SPACE
37	35/2	3.49	CU-10	a	38	20/1	0	SPACE
39	|	|		b	40	20/1	0	SPACE
41	20/1	0	SPACE	c	42	20/1	0	SPACE

	CONN KVA	CALC KVA			CONN KVA	CALC KVA	
LIGHTING	9.29	11.6	(125%)	MOTORS	69.4	69.4	(100%)
LARGEST MOTOR	5.32	1.33	(25%)	RECEPTACLES	39.6	24.8	(50%>10)
				HEATING	24	24	(100%)
				TOTAL LOAD		131	
				BALANCED 3-PHASE LOAD		364 A	
				PHASE A		108%	
				PHASE B		99.1%	
				PHASE C		92.8%	

Panel EM1

ROOM
MOUNTING SURFACE
FED FROM UTILITY
NOTE

VOLTS 208Y/120V 3P 4W
BUS AMPS 125
NEUTRAL 100%

AIC 65,000
MAIN BKR 125
LUGS STANDARD

CKT #	CKT BKR	LOAD KVA	CIRCUIT DESCRIPTION		CKT #	CKT BKR	LOAD KVA	CIRCUIT DESCRIPTION
1	20/1	0.18	RECEPTACLE	a	2	20/1	1.06	SF-1
3	20/1	0.5	BLOCK HEATER	b	4	20/1	0.1	LP GAS SENSOR PANEL
5	20/1	0.5	BATTERY HEATER	c	6	20/1	0.05	LP GAS SOLENOID VALVE
7	20/1	0.5	BATTERY CHARGER	a	8	20/1	0	SPACE
9	20/1	0.266	LIGHTING	b	10	20/1	0	SPACE
11	20/1	1.23	LIGHTING	c	12	20/1	0	SPACE
13	20/1	1.09	LIGHTING	a	14	20/1	0	SPACE
15	20/1	0.713	LIGHTING	b	16	20/1	0	SPACE
17	20/1	0	SPACE	c	18	20/1	0	SPACE
19	20/1	0	SPACE	a	20	20/1	0	SPACE
21	20/1	0	SPACE	b	22	20/1	0	SPACE
23	20/1	0	SPACE	c	24	20/1	0	SPACE
25	20/1	0	SPACE	a	26	20/1	0	SPACE
27	20/1	0	SPACE	b	28	20/1	0	SPACE
29	20/1	0	SPACE	c	30	20/1	0	SPACE
31	20/1	0	SPACE	a	32	20/1	0	SPACE
33	20/1	0	SPACE	b	34	20/1	0	SPACE
35	20/1	0	SPACE	c	36	20/1	0	SPACE
37	20/1	0	SPACE	a	38	20/1	0	SPACE
39	20/1	0	SPACE	b	40	20/1	0	SPACE
41	20/1	0	SPACE	c	42	20/1	0	SPACE

	CONN KVA	CALC KVA			CONN KVA	CALC KVA	
LIGHTING	3.3	4.13	(125%)	MOTORS	1.06	1.06	(100%)
LARGEST MOTOR	1.06	0.264	(25%)	RECEPTACLES	1.83	1.83	(50%>10)
				TOTAL LOAD		7.28	
				BALANCED 3-PHASE LOAD		20.2 A	
				PHASE A		137%	
				PHASE B		76.5%	
				PHASE C		86.4%	

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MOORE PUBLIC SCHOOLS
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MOORE Public Schools
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CLASSROOM ADDITION
CENTRAL JUNIOR
HIGH SCHOOL

sheet no:

E601

Salas O'Brien
2900 S. Telephone Road, Suite 120
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Expiration Date : 6/30/2025
Salas O'Brien Project Number: 2550-00564-00

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MECHANICAL EQUIPMENT SCHEDULE

CALLOUT	DESCRIPTION	VOLTS	HP	KVA	MCA	MOCP	CIRCUIT	WIRE CALLOUT	DISCONNECT	DISC PROV BY	DISC INST BY
AC-1	MINI SPLIT	208V 2P 2W		2.33	14	20	P1-26,28	3/4"C,2#10,#10G	NON-FUSED	EC	EC
AC-2	MINI SPLIT	208V 2P 2W		2.33	14	20	P1-30,32	3/4"C,2#10,#10G	NON-FUSED	EC	EC
CU-1	CONDENSING UNIT	208V 2P 2W		4.66	28	45	P1-1,3	3/4"C,2#8,#10G	NON-FUSED	EC	EC
CU-2	CONDENSING UNIT	208V 2P 2W		5.32	32	50	P1-5,7	3/4"C,2#8,#10G	NON-FUSED	EC	EC
CU-3	CONDENSING UNIT	208V 2P 2W		5.32	32	50	P1-9,11	3/4"C,2#8,#10G	NON-FUSED	EC	EC
CU-4	CONDENSING UNIT	208V 2P 2W		4.66	28	45	P1-13,15	3/4"C,2#10,#10G	NON-FUSED	EC	EC
CU-5	CONDENSING UNIT	208V 2P 2W		5.32	32	50	P1-17,19	3/4"C,2#8,#10G	NON-FUSED	EC	EC
CU-6	CONDENSING UNIT	208V 2P 2W		4.66	28	45	P1-21,23	3/4"C,2#10,#10G	NON-FUSED	EC	EC
CU-7	CONDENSING UNIT	208V 2P 2W		3.49	21	35	P1-25,27	3/4"C,2#10,#10G	NON-FUSED	EC	EC
CU-8	CONDENSING UNIT	208V 2P 2W		3.49	21	35	P1-29,31	3/4"C,2#10,#10G	NON-FUSED	EC	EC
CU-9	CONDENSING UNIT	208V 2P 2W		3.49	21	35	P1-33,35	3/4"C,2#10,#10G	NON-FUSED	EC	EC
CU-10	CONDENSING UNIT	208V 2P 2W		3.49	21	35	P1-37,39	3/4"C,2#10,#10G	NON-FUSED	EC	EC
EF-1	EXHAUST FAN	120V 1P 2W		0.24			P2-5	3/4"C,1#10,#10N,#10G	TOGGLE SWITCH	EC	EC
EF-2	EXHAUST FAN	120V 1P 2W		0.24			P2-36	3/4"C,1#12,#12N,#12G	TOGGLE SWITCH	EC	EC
EF-3	EXHAUST FAN	120V 1P 2W		0.17			P2-74	3/4"C,1#12,#12N,#12G	TOGGLE SWITCH	EC	EC
EFH-1	ELECTRIC FAN FORCED HEATER	208V 2P 2W		2			P2-42,44	3/4"C,2#10,#10G	NON-FUSED	EC	EC
EFH-1	ELECTRIC FAN FORCED HEATER	208V 2P 2W		2			P1-18,20	3/4"C,2#12,#12G	NON-FUSED	EC	EC
EFH-1	ELECTRIC FAN FORCED HEATER	208V 2P 2W		2			P1-22,24	3/4"C,2#10,#10G	NON-FUSED	EC	EC
EFH-2	ELECTRIC FAN FORCED HEATER	208V 2P 2W		2			P3-14,16	3/4"C,2#12,#12G	NON-FUSED	EC	EC
EFH-2	ELECTRIC FAN FORCED HEATER	208V 2P 2W		2			P2-46,48	3/4"C,2#12,#12G	NON-FUSED	EC	EC
EFH-2	ELECTRIC FAN FORCED HEATER	208V 2P 2W		2			P2-50,52	3/4"C,2#12,#12G	NON-FUSED	EC	EC
EFH-2	ELECTRIC FAN FORCED HEATER	208V 2P 2W		2			P3-26,28	3/4"C,2#10,#10G	NON-FUSED	EC	EC
EFH-2	ELECTRIC FAN FORCED HEATER	208V 2P 2W		2			P2-56,58	3/4"C,2#12,#12G	NON-FUSED	EC	EC
EFH-2	ELECTRIC FAN FORCED HEATER	208V 2P 2W		2			P2-60,62	3/4"C,2#10,#10G	NON-FUSED	EC	EC
EFH-2	ELECTRIC FAN FORCED HEATER	208V 2P 2W		2			P3-34,36	3/4"C,2#12,#12G	NON-FUSED	EC	EC
EFH-2	ELECTRIC FAN FORCED HEATER	208V 2P 2W		2			P3-38,40	3/4"C,2#10,#10G	NON-FUSED	EC	EC
EFH-2	ELECTRIC FAN FORCED HEATER	208V 2P 2W		2			P3-30,32	3/4"C,2#10,#10G	NON-FUSED	EC	EC
EWH-1	ELECTRIC WATER HEATER	208V 2P 2W		4.5			P1-14,16	3/4"C,2#10,#10G	NON-FUSED	EC	EC
F-1	GAS FURNACE	120V 1P 2W	3/4 HP	1.66			P2-2	3/4"C,1#10,#10N,#10G	TOGGLE SWITCH	EC	EC
F-2	GAS FURNACE	120V 1P 2W	1 HP	1.92			P2-4	3/4"C,1#10,#10N,#10G	TOGGLE SWITCH	EC	EC
F-3	GAS FURNACE	120V 1P 2W	1 HP	1.92			P2-6	3/4"C,1#12,#12N,#12G	TOGGLE SWITCH	EC	EC
F-4	GAS FURNACE	120V 1P 2W	3/4 HP	1.66			P2-8	3/4"C,1#12,#12N,#12G	TOGGLE SWITCH	EC	EC
F-5	GAS FURNACE	120V 1P 2W	1 HP	1.92			P3-2	3/4"C,1#12,#12N,#12G	TOGGLE SWITCH	EC	EC
F-6	GAS FURNACE	120V 1P 2W	3/4 HP	1.66			P3-4	3/4"C,1#12,#12N,#12G	TOGGLE SWITCH	EC	EC
F-7	GAS FURNACE	120V 1P 2W	1/2 HP	1.18			P3-6	3/4"C,1#10,#10N,#10G	TOGGLE SWITCH	EC	EC
F-8	GAS FURNACE	120V 1P 2W	1/2 HP	1.18			P3-8	3/4"C,1#10,#10N,#10G	TOGGLE SWITCH	EC	EC
F-9	GAS FURNACE	120V 1P 2W	1/2 HP	1.18			P3-10	3/4"C,1#10,#10N,#10G	TOGGLE SWITCH	EC	EC
F-10	GAS FURNACE	120V 1P 2W	1/2 HP	1.18			P3-12	3/4"C,1#10,#10N,#10G	TOGGLE SWITCH	EC	EC
SF-1	SUPPLY FAN	120V 1P 2W		1.06			EM1-2	3/4"C,1#10,#10N,#10G	TOGGLE SWITCH	EC	EC
WH-1	WATER HEATER	120V 1P 2W		0.1			P2-7	3/4"C,1#12,#12N,#12G	DUPLEX RECEPTACLE	EC	EC
WH-2	WATER HEATER	120V 1P 2W		0.1			P2-9	3/4"C,1#12,#12N,#12G	DUPLEX RECEPTACLE	EC	EC

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SALAS O'BRIEN
MECHANICAL / ELECTRICAL

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CLASSROOM ADDITION
CENTRAL JUNIOR
HIGH SCHOOL

sheet no:

E603

Salas O'Brien
2900 S. Telephone Road, Suite 120
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Salas O'Brien Registration: CA# 7058
Expiration Date : 6/30/2025
Salas O'Brien Project Number: 2550-00564-00

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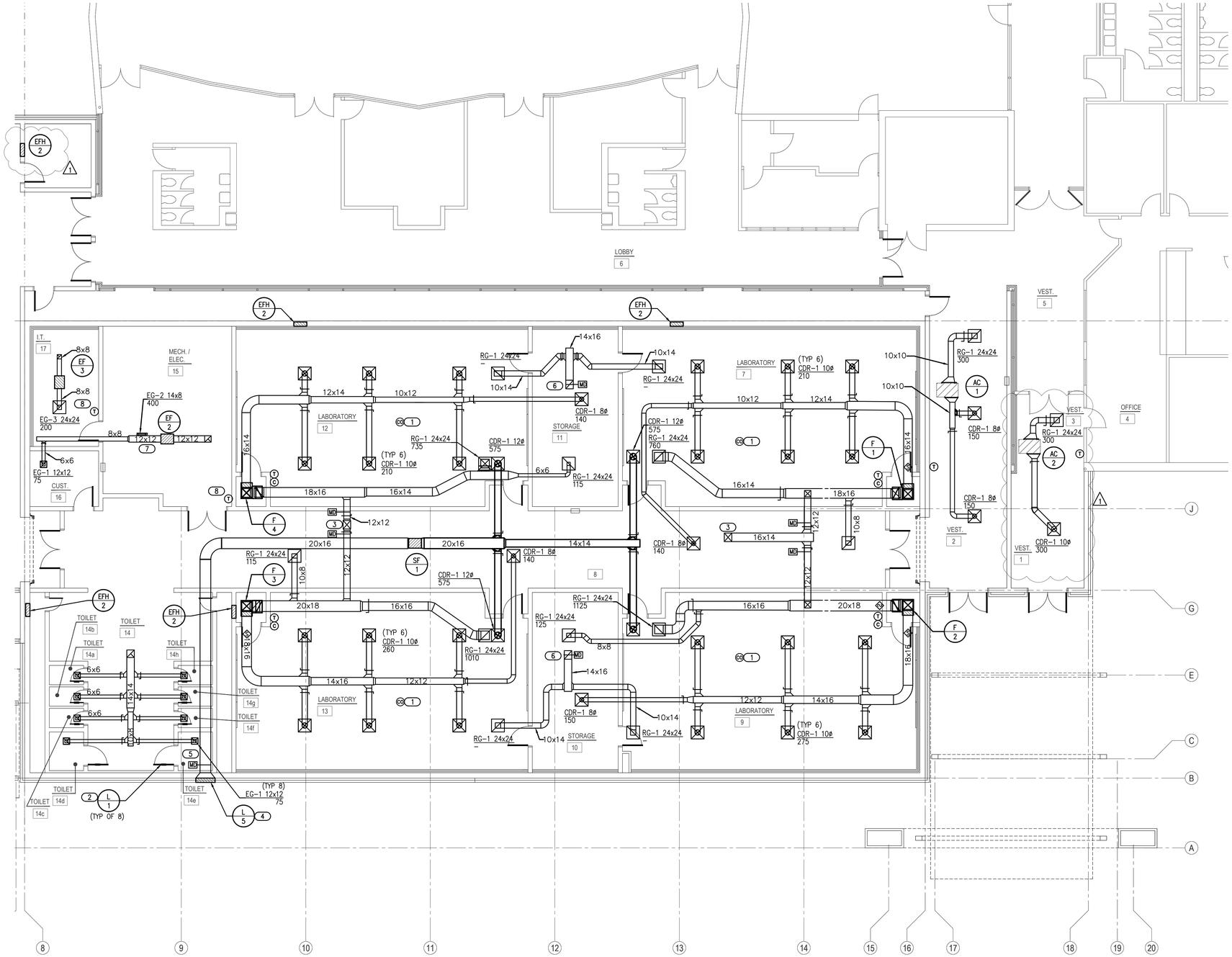


GENERAL NOTES

1. COORDINATE INSTALLATION OF EQUIPMENT AND DUCTWORK WITH ALL TRADES.
2. COORDINATE LOCATION OF THERMOSTATS WITH E.C. ROUGH-IN BY E.C.
3. COORDINATE CARBON DIOXIDE SENSOR LOCATION WITH EARTHSMART PRIOR TO INSTALLATION.
4. M.C. SHALL PROVIDE CARBON MONOXIDE SENSORS WHERE NEEDED PER CODE FOR EXISTING EQUIPMENT THROUGHOUT THE ENTIRE BUILDING. M.C. IS RESPONSIBLE FOR SURVEYING ENTIRE BUILDING AND LOCATING FUEL BURNING HVAC EQUIPMENT FOR SENSOR LOCATIONS. COORDINATE WITH E.C FOR POWER CONNECTIONS.
5. ALL PENETRATIONS OVER 3 1/2 SQUARE INCHES OR 2 1/16 INCHES IN DIAMETER IN/OUT OF SHELTER REQUIRE SHROUD. REFER TO STRUCTURAL FOR ALL SHROUD DETAILS.
6. M.C. IS RESPONSIBLE TO ALL STRUCTURAL REQUIRED PENETRATION PROTECTION ITEMS FOR ALL MECHANICAL SYSTEMS PENETRATING THE SHELTER.
7. E.C. TO PROVIDE, LOCATE, AND INSTALL SWITCH FOR EMERGENCY VENTILATION FAN. M.C. SHALL PROVIDE CALL OUT LETTERING "EMERGENCY VENTILATION" ON PLACARD ABOVE SWITCH WITH 3/4" LETTERING FOR INSTALLATION BY G.C. COORDINATE WITH G.C. AND E.C.

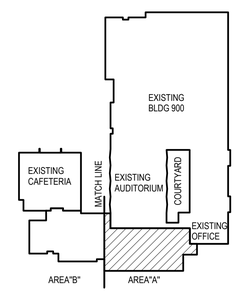
KEYED NOTES

1. CARBON MONOXIDE DETECTOR TO BE INSTALLED ACCORDING TO ALL APPLICABLE CODES. DETECTOR SHALL BE INSTALLED CENTRALLY ON CEILING. ALSO INCLUDE BATTERY BACKUP IN EVENT PRIMARY POWER IS INTERRUPTED. ALARM SIGNAL SHALL BE ROUTED TO ADMINISTRATION OFFICE. COORDINATE WITH E.C. WITH PRIMARY POWER CONNECTION AND SYSTEM CONNECTION.
2. PLACE LOUVER 8" FROM BOTTOM OF DOOR.
3. DUCT UP 16X16 TO CONNECT TO THROAT OPENING OF ROOF HOOD.
4. LOUVER IS PART OF EMERGENCY VENTILATION SYSTEM. DUCT UP 20X16 TO TRANSITION INTO LOUVER.
5. MOTORIZED DAMPER TO BE 120V CONNECTED TO EMERGENCY POWER. DAMPER SHALL OPEN WHEN SUPPLY FAN TURNS ON.
6. ROOF HOOD PART OF THE EMERGENCY VENTILATION SYSTEM TO PROVIDE RELIEF AIR. MOTORIZED DAMPER SHALL OPERATE ON INVERTER. INTERLOCK WITH SF-1. DUCT DOWN TO 16X12.
7. ROUTE DUCT TO AVOID ELECTRICAL CONDUITS OR PANEL AREA CLEARANCES. COORDINATE WITH ELECTRICAL CONTRACTOR.
8. PROVIDE REVERSE ACTING THERMOSTAT TO BE SET BY OWNER.

1 MECHANICAL FLOOR PLAN - AREA A

SCALE: 1/8" = 1'-0"

NORTH



KEYPLAN

NO SCALE

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SALAS O'BRIEN
MECHANICAL / ELECTRICAL

OKLAHOMA PROFESSIONAL ENGINEER — Kenneth Fuqua — 23082 — 06/27/25

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APRIL 2025
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HIGH SCHOOL

sheet no:

M101

Salas O'Brien
2900 S. Telephone Road, Suite 120
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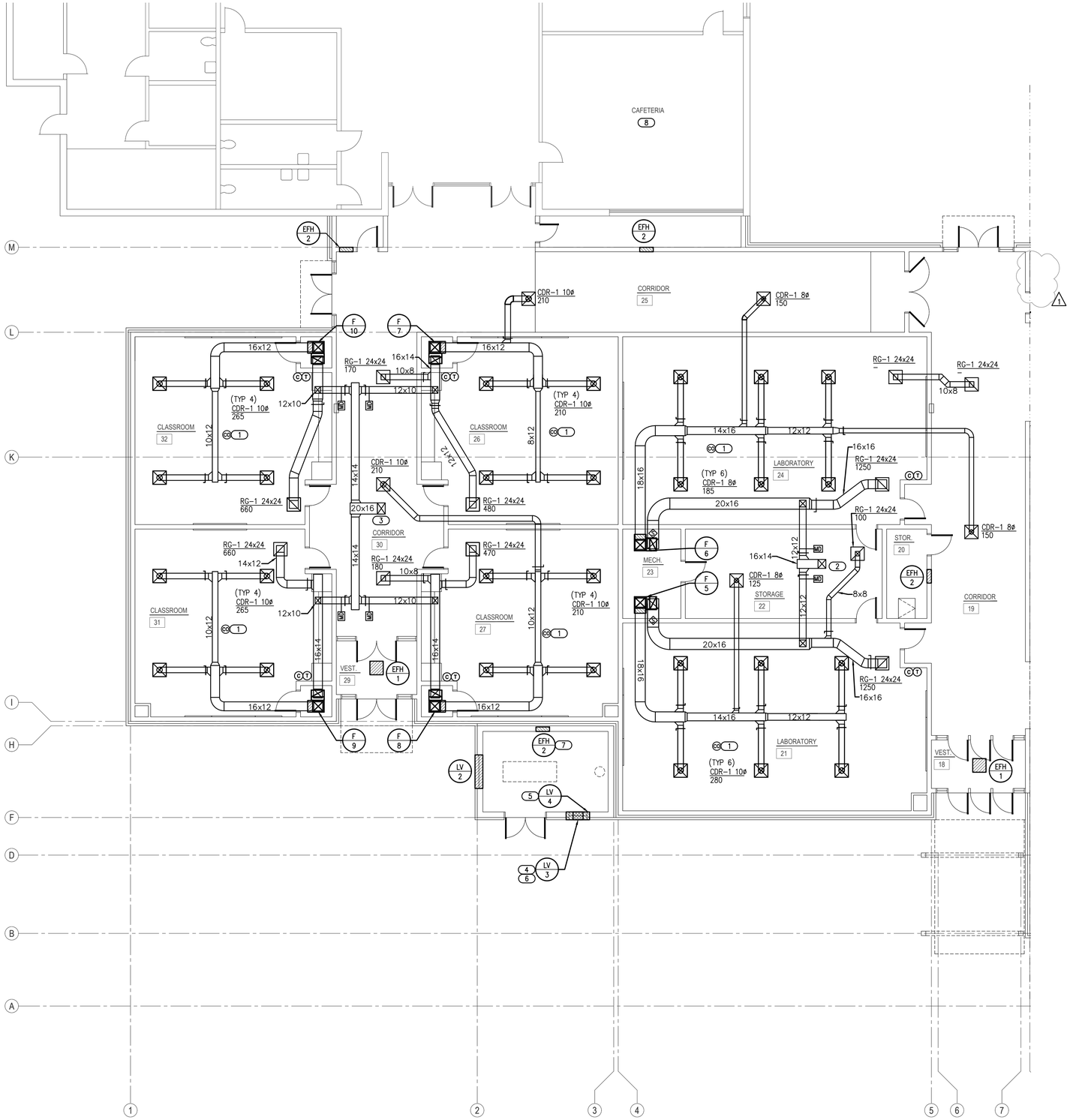


1 MECHANICAL FLOOR PLAN - AREA B

SCALE: 1/8" = 1'-0"

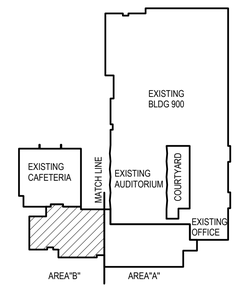
NORTH

GENERAL NOTES

1. COORDINATE INSTALLATION OF EQUIPMENT AND DUCTWORK WITH ALL TRADES.
2. COORDINATE LOCATION OF THERMOSTATS WITH E.C. ROUGH-IN BY E.C.
3. COORDINATE CARBON DIOXIDE SENSOR LOCATION WITH EARTHSMART PRIOR TO INSTALLATION.
4. M.C. SHALL PROVIDE CARBON MONOXIDE SENSORS WHERE NEEDED PER CODE FOR EXISTING EQUIPMENT THROUGHOUT THE ENTIRE BUILDING. M.C. IS RESPONSIBLE FOR SURVEYING ENTIRE BUILDING AND LOCATING FUEL BURNING HVAC EQUIPMENT FOR SENSOR LOCATIONS. COORDINATE WITH E.C FOR POWER CONNECTIONS.

KEYED NOTES

1. CARBON MONOXIDE DETECTOR TO BE INSTALLED ACCORDING TO ALL APPLICABLE CODES. DETECTOR SHALL BE INSTALLED CENTRALLY ON CEILING. ALSO INCLUDE BATTERY BACKUP IN EVENT PRIMARY POWER IS INTERRUPTED. ALARM SIGNAL SHALL BE ROUTED TO ADMINISTRATION OFFICE. COORDINATE WITH E.C. WITH PRIMARY POWER CONNECTION AND SYSTEM CONNECTION.
2. DUCT UP 16X16 TO CONNECT TO THROAT OPENING OF ROOF HOOD.
3. DUCT UP 20X16 TO CONNECT TO THROAT OPENING OF ROOF HOOD.
4. MOUNT BOTTOM OF LOUVER MINIMUM 60" ABOVE LV-4. LOUVER CONNECTION FOR ENGINE EXHAUST.
5. MOUNT BOTTOM OF LOUVER MINIMUM 18" AFF. LOUVER CONNECTION FOR RADIATOR EXHAUST.
6. PROVIDE EXHAUST DUCT TO GENERATOR RADIATOR CONNECTION. COORDINATE DUCT SIZE WITH GENERATOR MANUFACTURER DRAWINGS.
7. MOUNT HEATER MINIMUM OF 24" AFF.
8. EXISTING AIR DEVICES IN CAFETERIA ARE TO BE REUSED. CLEAN AIR DEVICES AND ENSURE IT IS IN GOOD WORKING ORDER. RECONNECT AIR DEVICES TO DUCTWORK AND ALIGN WITH NEW CEILING GRID.



KEYPLAN

NO SCALE

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OKLAHOMA PROFESSIONAL ENGINEER
Dwayne Michael Donavan
M.A. 30822
06/27/25

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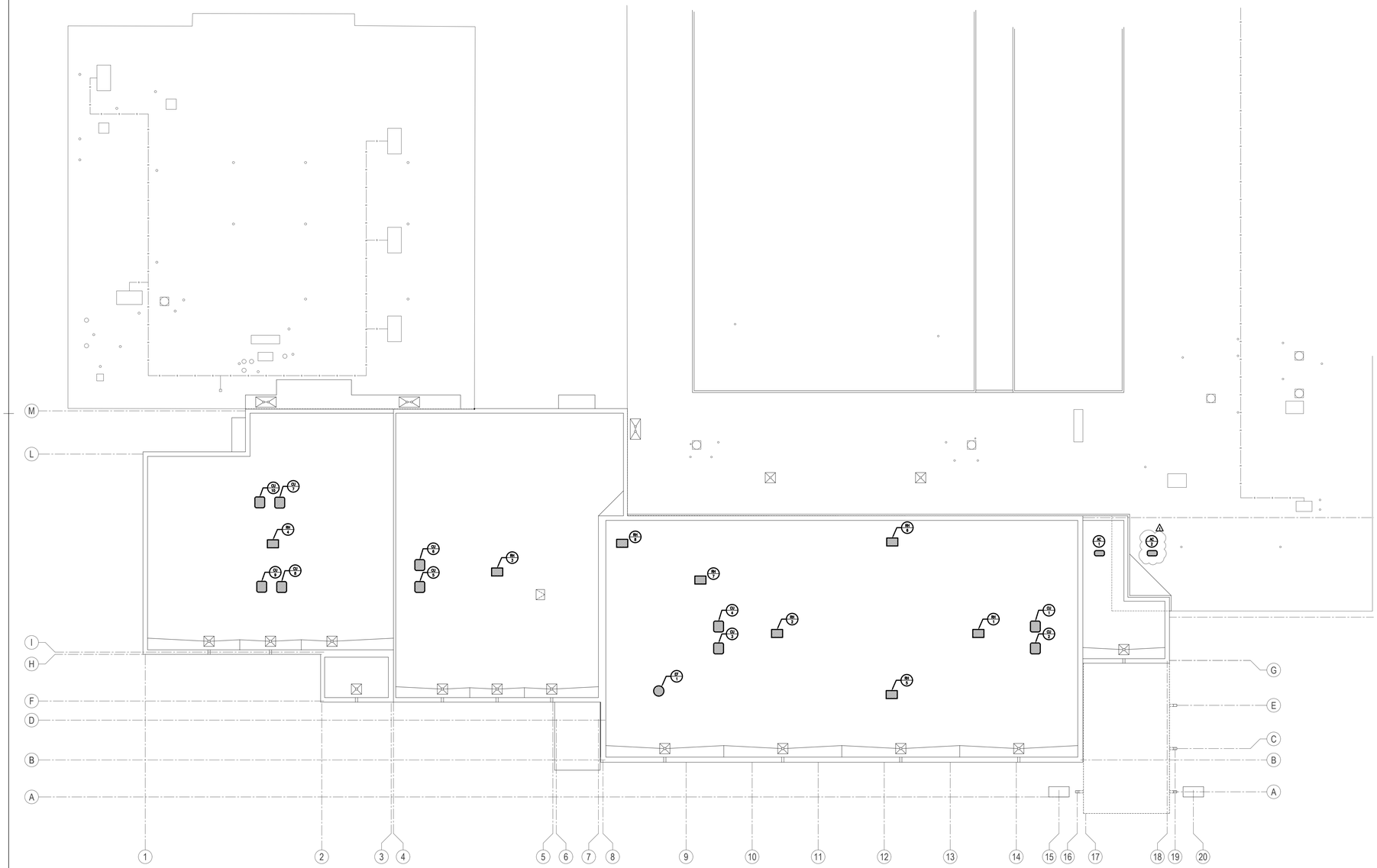
GENERAL NOTES

1. ALL ROOF TOP EQUIPMENT TO BE LOCATED A MINIMUM 10'-0" AWAY FROM ROOF EDGE.
2. MAINTAIN A MINIMUM OF 10'-0" HORIZONTAL CLEARANCE BETWEEN ALL EXHAUST OUTLETS AND ANY FRESH AIR INTAKES.
3. ALL ROOF SUPPORT SYSTEMS ARE TO BE MANUFACTURED FOR THE ROOF MATERIAL/SYSTEM TO BE INSTALLED. REFER TO ARCHITECTURAL PLANS FOR THE ROOF SYSTEM, CURB INSTALLATION TO BE WARRANTED BY ROOFING CONTRACTOR.



1 MECHANICAL ROOF PLAN

SCALE: 1/16" = 1'-0"

NORTH

AGP
the Abla Griffin Partnership L.L.C.

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CEDAR CREEK
CIVIL

KFC ENGINEERING
STRUCTURAL

SALAS O'BRIEN
MECHANICAL / ELECTRICAL

OKLAHOMA PROFESSIONAL ENGINEER
Mary Donald
30822
06/27/25

KF
drawn by

DG
checked by

APRIL 2025
date

revisions
1 06/27/25 AD 01

MOORE PUBLIC SCHOOLS
BOARD OF EDUCATION
MOORE, OKLAHOMA

MOORE Public Schools
LEARNING FOR LIFE

CLASSROOM ADDITION
CENTRAL JUNIOR
HIGH SCHOOL

sheet no:

M201

Salas O'Brien
2900 S. Telephone Road, Suite 120
Moore, OK 73160
Salas O'Brien Registration: CA# 7058
Expiration Date : 6/30/2025
Salas O'Brien Project Number: 2550-00564-00

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ELECTRIC FAN FORCED HEATER SCHEDULE

EFH #	ROOM NO.	CFM	WALL OR CEILING	KW	MOUNTING	ELECTRICAL CHAR	AMPS	SPEEDS	CONTROL	RPM	MANUFACTURER & MODEL NUMBER	NOTES
1	VEST	300	CEILING	2	RECESSED	208 / 1	9.6	1	INT STAT	1400	BERKO FFCH-548	1,2,3,5
2	RISER	100	WALL	2	RECESSED	208 / 1	9.6	1	INT STAT	–	BERKO FRC-4020	1-5

NOTES: M.C. IS RESPONSIBLE FOR PROVIDING ANY AND ALL NECESSARY DIMENSIONAL, ELECTRICAL, MECHANICAL, AND STRUCTURAL ALTERATIONS NECESSITATED BY PROVIDING ALTERNATE EQUIPMENT.

1. PROVIDE INTERNAL THERMOSTAT.
2. RECESSED MOUNTED UNIT. PROVIDE RECESSED MOUNTING KIT.
3. PROVIDE BUILT-IN DISCONNECT.
4. WALL MOUNTING HEIGHT AFF AT A MINIMUM OF 18" OR PER MANUFACTURER'S RECOMMENDATION.
5. VERIFY QUANTITY OF HEATERS WITH FLOORPLAN.

GAS FURNACE SCHEDULE

F #	TYPE	INPUT MBH	OUTPUT MBH	CFM	MIN F.A.	EXT. S.P.	HEAT EXCH. MTL	BLOWER SIZE	BLOWER DRIVE	BLOWER H.P.	BLOWER ELEC. CHAR	PILOT	VENT	FILTER MERV & MIN.	MANUFACTURER & MODEL NO.	NOTES
1	VERT	80	77	1400	550	0.6	ALUMINIZED STL	11X11	DIRECT	.75	120/1	HOT S	3"	2" TA	YORK TM9V080C16MP12C	1-3
2	VERT	120	115	1800	550	0.6	ALUMINIZED STL	11X11	DIRECT	1	120/1	HOT S	3"	2" TA	YORK TM9V120D20MP12C	1-4
3	VERT	120	115	1800	550	0.6	ALUMINIZED STL	11X11	DIRECT	1	120/1	HOT S	3"	2" TA	YORK TM9V120D20MP12C	1-4
4	VERT	80	77	1400	550	0.6	ALUMINIZED STL	11X11	DIRECT	.75	120/1	HOT S	3"	2" TA	YORK TM9V080C16MP12C	1-3
5	VERT	120	115	1800	550	0.6	ALUMINIZED STL	11X11	DIRECT	1	120/1	HOT S	3"	2" TA	YORK TM9V120D20MP12C	1-3
6	VERT	80	77	1400	550	0.6	ALUMINIZED STL	11X11	DIRECT	.75	120/1	HOT S	3"	2" TA	YORK TM9V080C16MP12C	1-3
7	VERT	60	58	1050	400	0.6	ALUMINIZED STL	11X11	DIRECT	.5	120/1	HOT S	3"	2" TA	YORK TM9V060B12MP12C	1-3
8	VERT	60	58	1050	400	0.6	ALUMINIZED STL	11X11	DIRECT	.5	120/1	HOT S	3"	2" TA	YORK TM9V060B12MP12C	1-3
9	VERT	60	58	1060	400	0.6	ALUMINIZED STL	11X11	DIRECT	.5	120/1	HOT S	3"	2" TA	YORK TM9V060B12MP12C	1-3
10	VERT	60	58	1060	400	0.6	ALUMINIZED STL	11X11	DIRECT	.5	120/1	HOT S	3"	2" TA	YORK TM9V060B12MP12C	1-3

NOTES: M.C. IS RESPONSIBLE FOR PROVIDING ANY AND ALL NECESSARY DIMENSION, ELECTRICAL, MECHANICAL, AND STRUCTURAL ALTERATIONS NECESSITATED BY PROVIDING ALTERNATE EQUIPMENT.

1. PROVIDE CONCENTRIC VENT. INSTALL PER MANUFACTURER INSTRUCTIONS. MAINTAIN MINIMUM CLEARANCES: 36" BETWEEN VENTS, 10'-0" FROM ANY FRESH AIR INTAKE.
2. PROVIDE CO_2 SENSOR, INSTALLATION BY CONTROLS CONTRACTOR. INTERLOCK CO_2 SENSOR WITH MOTORIZED DAMPER IN OUTSIDE AIR DUCT.
3. PROVIDE FURNACE WITH 2 STAGE HEATING.
4. DUCT SMOKE DETECTOR AND REMOTE TEST STATION PROVIDED BY AND INSTALLED BY E.C. REMOTE TEST STATION TO BE LOCATED IN OCCUPIED SPACE AND CONNECTION TO FIRE ALARM SYSTEM BY E.C. COORDINATE WITH E.C.

CONDENSING UNIT SCHEDULE

CU #	CONDENSING UNIT NOMINAL TONNAGE	CONDENSING UNIT ELEC. CHAR	CONDENSING UNIT MCA	CONDENSING UNIT MOCP	CONDENSING UNIT S.E.E.R	CONDENSING UNIT WEIGHT (LBS)	CONDENSING UNIT MANUFACTURER& MODEL NO.	EVAPORATOR UNIT CFM	EVAPORATOR UNIT MAX S.P.	EVAPORATOR UNIT BLOWER MOTOR	EVAPORATOR UNIT ELEC. CHAR	EVAPORATOR UNIT MCA	EVAPORATOR UNIT MANUFACTURER & MODEL NO.	NOTES
1	4	208/1	28	45	16	295	YORK YXT48B21S	1400	0.3	– SEE FURNACE SCHEDULE –			YORK XAFC48FBCN1	1-7
2	5	208/1	32	50	15.5	295	YORK YXT60B21S	1800	0.3	– SEE FURNACE SCHEDULE –			YORK XAFD60GBCN1	1-7
3	5	208/1	32	50	15.5	295	YORK YXT60B21S	1800	0.3	– SEE FURNACE SCHEDULE –			YORK XAFD60GBCN1	1-7
4	4	208/1	28	45	16	295	YORK YXT48B21S	1400	0.3	– SEE FURNACE SCHEDULE –			YORK XAFC48FBCN1	1-7
5	5	208/1	32	50	15.5	295	YORK YXT60B21S	1800	0.3	– SEE FURNACE SCHEDULE –			YORK XAFD60GBCN1	1-7
6	4	208/1	28	45	16	295	YORK YXT48B21S	1400	0.3	– SEE FURNACE SCHEDULE –			YORK XAFC48FBCN1	1-7
7	3	208/1	21	35	15.75	265	YORK YXT36B21S	1050	0.3	– SEE FURNACE SCHEDULE –			YORK XAFB36DBCN1	1-7
8	3	208/1	21	35	15.75	265	YORK YXT36B21S	1050	0.3	– SEE FURNACE SCHEDULE –			YORK XAFB36DBCN1	1-7
9	3	208/1	21	35	15.75	265	YORK YXT36B21S	1060	0.3	– SEE FURNACE SCHEDULE –			YORK XAFB36DBCN1	1-7
10	3	208/1	21	35	15.75	265	YORK YXT36B21S	1060	0.3	– SEE FURNACE SCHEDULE –			YORK XAFB36DBCN1	1-7

NOTES: M.C. IS RESPONSIBLE FOR PROVIDING ANY AND ALL NECESSARY DIMENSIONAL, ELECTRICAL, MECHANICAL, AND STRUCTURAL ALTERATIONS NECESSITATED BY PROVIDING ALTERNATE EQUIPMENT.

1. E.C. TO PROVIDE AND INSTALL POWER DISCONNECT FOR UNIT. COORDINATE WITH M.C.
2. M.C. TO INCLUDE PRE-CHARGED LINE KIT. INSULATE SUCTION LINE.
3. TWO STAGE COOLING.
4. FOR LINE LENGTH EXCEEDING 50', M.C. MUST PROVIDE FACTORY DESIGNED AND FACTORY OR FIELD FABRICATED REFRIGERANT PIPING.
5. MOUNT UNITS ON CONDENSING UNIT SUPPORTS RE: 10/M501 FOR MORE INFORMATION.
6. INSULATE SUCTION LINE WITH 5/8" AP ARMAFLEX INSULATION OR EQUAL. SEAL ALL JOINTS WATER TIGHT TO PREVENT CONDENSATE IN THE CEILING.
7. PROVIDE UNIT WITH HAIL GUARD.

MINI SPLIT HEAT PUMP SCHEDULE - INDOOR & OUTDOOR UNIT

AC #	NOMINAL TON	OUTDOOR UNIT ELEC. CHAR	SEER	MCA	MOCP	COMPRESSOR TYPE	MANUFACTURER & MODEL NUMBER	INDOOR UNIT COOLING/ HEATING	CFM	MCA	MOCP	TYPE	CONDENSATE PUMP	MANUFACTURER & MODEL NUMBER	NOTES
1	1	208/1	17	14	24	INVERTER	TRANE NTXSKH12A112AA	BOTH	300	1	N/A	DUCTED	YES	TRANE NTXDKS12112AA	ALL
2	1	208/1	17	14	24	INVERTER	TRANE NTXSKH12A112AA	BOTH	300	1	N/A	DUCTED	YES	TRANE NTXDKS12112AA	ALL

NOTES: M.C. IS RESPONSIBLE FOR PROVIDING ALL NECESSARY DIMENSION, ELECTRICAL, MECHANICAL, AND STRUCTURAL ALTERATIONS NECESSITATED BY PROVIDING ALTERNATE EQUIPMENT.

1. M.C. PROVIDE DISCONNECTS FOR INSTALLATION BY E.C.
2. PROVIDE AND INSTALL CONDENSATE PUMP. ROUTE CONDENSATE TO NEAREST OPEN SITE.
3. PROVIDE CONDENSER COIL HAIL GUARD.
4. M.C. SHALL PROVIDE HARD WIRED THERMOSTAT.
5. INDOOR UNIT POWERED BY OUTDOOR UNIT.

DUCTWORK/INSULATION SCHEDULE

SYSTEM	LOW PRESSURE MAX. PRES.	LOW PRESSURE SEAL A	LOW PRESSURE SEAL B	LOW PRESSURE SEAL C	MED. PRESS MAX PRES.	MED. PRESS SEAL A	HIGH PRESS. MAX PRES.	HIGH PRESS. SEAL A	INSULATION INTERNAL	INSULATION THICKNESS	INSULATION EXTERNAL	INSULATION THICKNESS	NOTES
SUPPLY AIR WITHIN 10' OF UNIT	2"	X	–	–	–	–	–	–	YES	1"	NO	–	–
SUPPLY AIR BEYOND 10' OF UNIT	2"	X	–	–	–	–	–	–	NO	–	YES	2" FSK	–
RETURN AIR WITHIN 10' OF UNIT	2"	–	X	–	–	–	–	–	YES	1"	NO	–	–
RETURN AIR BEYOND 10' OF UNIT	2"	–	X	–	–	–	–	–	NO	–	YES	2" FSK	–
OUTSIDE AIR/MIXED AIR	2"	–	X	–	–	–	–	–	NO	–	YES	3" FSK	–
EXHAUST AIR	2"	–	X	–	–	–	–	–	NO	–	YES	2" FSK	–

NOTES:

GRILLE, REGISTER, AND DIFFUSER SCHEDULE

PLAN SYMBOL	DESCRIPTION	MANUFACTURER & MODEL NO.	MATERIAL	FINISH	NOISE CRITERIA
CDR-1	SQUARE FACE, ROUND NECK, 4-WAY DEFLECTION CEILING DIFFUSER, SPRING LOCK INNER CORE, FOR LAY-IN CEILING INSTALLATION.	PRICE SCD (4C)	STEEL	WHITE	–
RG-1	SQUARE PATTERN GRILLE, FIXED CORE OF 1/2"X1/2"X1/2" FABRICATED ALUMINUM SQUARES, FLAT FRAME WITH 1 1/4" MARGIN, FOR LAY-IN CEILING INSTALLATION.	PRICE 80	ALUMINUM	WHITE	–
EG-1	SQUARE PATTERN GRILLE, FIXED CORE OF 1/2"X1/2"X1/2" FABRICATED ALUMINUM SQUARES, FLAT FRAME WITH 1 1/4" MARGIN, FOR SURFACE MOUNT INSTALLATION.	PRICE 90	ALUMINUM	WHITE	–

NOTES:

SEE AIR BALANCE SCHEDULE ON M-101 THRU M-104 FOR QUANTITY AND SIZES.
M.C. TO FIELD VERIFY CEILING TYPE FOR ALL GRD BEFORE PURCHASING EQUIPMENT. PROVIDE REQUIRED MOUNTING.

ROOF HOOD SCHEDULE

RH #	THROAT SIZE DIMENSION (IN)	THROAT AREA (FT^2)	DAMPER BDD OR MOD	CONSTRUCTION	MANUFACTURER & MODEL NO.	COMMENTS	NOTES
1	16X20	2.22	MOD	ALUMINUM	GREENHECK FGI	COLOR BY ARCHITECT	1-3
2	16X20	2.22	MOD	ALUMINUM	GREENHECK FGI	COLOR BY ARCHITECT	1-3
3	16X20	2.22	MOD	ALUMINUM	GREENHECK FGI	COLOR BY ARCHITECT	1-3
4	16X20	2.22	MOD	ALUMINUM	GREENHECK FGI	COLOR BY ARCHITECT	1-3
5	16X16	1.78	BDD	ALUMINUM	GREENHECK FGI	COLOR BY ARCHITECT	1,2
6	16X16	1.78	BDD	ALUMINUM	GREENHECK FGI	COLOR BY ARCHITECT	1,2
7	12X12	1.0	–	ALUMINUM	GREENHECK FGI	COLOR BY ARCHITECT	1,2
8	12X12	1.0	–	ALUMINUM	GREENHECK FGI	COLOR BY ARCHITECT	1,2

NOTES: M.C. IS RESPONSIBLE FOR PROVIDING ANY AND ALL NECESSARY DIMENSIONAL, ELECTRICAL, MECHANICAL, AND STRUCTURAL ALTERATIONS NECESSITATED BY PROVIDING ALTERNATE EQUIPMENT.

1. M.C. TO PROVIDE ROOF HOOD WITH ALUMINUM BIRDSCREEN.
2. M.C. SHALL PROVIDE ROOF CURB. CURB INSTALLATION BY G.C.
3. M.C. SHALL PROVIDE LOW VOLTAGE MOTORIZED DAMPER.

FAN SCHEDULE

– #	LOCATION	SYSTEM	CFM	SP	FAN RPM	MOTOR H.P.	ELEC CHAR	AMPS	DAMPER BDD OR MOD	DRIVE	FAN TYPE	INTERLOCK/ CONTROL	WEIGHT	MANUFACTURER & MODEL NUMBER	NOTES
EF-1	ROOF	EXHAUST	675	0.25	1633	0.1	120/1	2	MOD	DIRECT	CENT	LIGHTS	50	GREENHECK G-090-VG	1-4
EF-2	ELEC	EXHAUST	475	0.50	1230	0.13	120/1	–	MOD	DIRECT	CEILING	THERMOSTAT	30	GREENHECK SP-A700-VG	1,4
EF-3	IT	EXHAUST	200	0.25	1221	01	120/1	1.4	MOD	DIRECT	INLINE	THERMOSTAT	45	GREENHECK SQ-80-VG	1,2,4
SF-1	HALL	SUPPLY	2300	0.5	1027	0.75	120/1	8.8	MOD	DIRECT	INLINE	SWITCH	145	GREENHECK SQ-160-VG	4-7

NOTES: M.C. IS RESPONSIBLE FOR PROVIDING ANY AND ALL NECESSARY DIMENSIONAL, ELECTRICAL, MECHANICAL, AND STRUCTURAL ALTERATIONS NECESSITATED BY PROVIDING ALTERNATE EQUIPMENT.

1. PROVIDE ELECTRONIC SPEED CONTROL MOUNTED ABOVE ACCESSIBLE CEILING.
2. M.C. SHALL PROVIDE LOW VOLTAGE MOTORIZED DAMPER.
3. OPERATION OF DEVICE ON OCCUPIED MODE OF RTU OR SWITCH WITH LIGHTS. SEE INTERLOCK/CONTROL COLUMN FOR TYPE.
4. PROVIDE UNIT MOUNTED DISCONNECT.
5. FAN AND MOTORIZED DAMPER ARE PART OF EMERGENCY POWER SYSTEM. COORDINATE ALL CIRCUITS WITH E.C.
6. ALL WIRING TO FAN AND DAMPER SHALL BE BY E.C.
7. PROVIDE 120V DAMPER.

LOUVER SCHEDULE

L #	CONNECTED TO	SIZE (IN) (WXH)	MINIMUM FREE AREA	FLANGE	CONSTRUCTION	INCLUDE MOD	MANUFACTURER AND MODEL NUMBER	COMMENTS	NOTES
1	WC DOOR	8.5X8.5	0.28	YES	STEEL	NO	AIR CONDITIONING PRODUCTS SDL	SIGHT PROOF DOOR LOUVER	1-2
2	GEN ENCLOSURE	60X48	9.6	YES	ALUMINUM	–	GREENHECK AFL-501	5" FEMA RATED LOUVER – PROVIDE ADDITIONAL DRAINABLE LOUVER (GREENHECK ESD-403)	1-2
3	GEN ENCLOSURE	18X18	1.55	YES	ALUMINUM	–	GREENHECK AFL-501	5" FEMA RATED LOUVER – PROVIDE ADDITIONAL DRAINABLE LOUVER (GREENHECK ESD-403)	1-2
4	GEN ENCLOSURE	42X36	4.75	YES	ALUMINUM	–	GREENHECK AFL-501	5" FEMA RATED LOUVER – PROVIDE ADDITIONAL DRAINABLE LOUVER (GREENHECK ESD-403)	1-2
5	SF-1	36X24	2.47	YES	ALUMINUM	–	GREENHECK AFL-501	5" FEMA RATED LOUVER – PROVIDE ADDITIONAL DRAINABLE LOUVER (GREENHECK ESD-403)	1-2

NOTES: M.C. IS RESPONSIBLE FOR PROVIDING ANY AND ALL NECESSARY DIMENSIONAL, ELECTRICAL, MECHANICAL, AND STRUCTURAL ALTERATIONS NECESSITATED BY PROVIDING ALTERNATE EQUIPMENT.

1. PROVIDE PAINTED KYNAR FINISH. COLOR BY ARCHITECT.
2. PROVIDE SLIP FIT COLLAR.

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SPECIAL CONDITIONS ADDENDUM NO. 1

TIME FOR COMPLETION AND LIQUIDATED DAMAGES:

A. Upon execution of the contract agreement between the Owner and the Contractor, it shall become an obligation of the contractor to complete all work to be performed under this agreement for the Construction of the new Central Junior High School STEM Classroom Addition to be located at 400 North Broadway, Moore, OK - **within 365 Calendar Days.**

B. Penalty for noncompliance by the above date shall be cessation of all further periodical payments until the work is completed and can be fully used for the purpose intended.

PAYMENTS:

A. The Owner's payment schedule indicating the payment dates established by Moore Public Schools shall be provided to the contractor to establish a monthly payment schedule.

B. **Certificates of payment shall be submitted to the Architect on or before 7 days prior to Owner's cut-off date.**

C. Until the Work is 50 percent complete, the Owner will pay 95 percent of the amount due the Contractor on account of progress payments. At the time the Work is 50 percent complete, any **remaining** partial payments shall be paid at 97.5 percent of amount due. The retainage shall be retained until the project is completed.

INSURANCE AND BONDS:

A. Insurance provided shall be with a company or companies licensed to do business in the state of Oklahoma.

B. Policies shall be provided in the following types and amounts:

1. a. Workmen's Compensation-Statutory
   b. Employer's Liability-$500,000 each accident.

2. Comprehensive General Liability:
   a. Bodily Injury - $1,000,000 each occurrence.
   b. Personal Injury - $1,000,000
   c. Property Damage - $1,000,000 each occurrence

3. Automobile Liability:
   a. Bodily Injury - $500,000 each person/$1,000.000 each occurrence

b. Such Comprehensive Automobile Liability Insurance shall include all owned and non-owned hired motor vehicles.

4. Owner's Protective Liability - Same limits as above.

5. Products and Completed Operations - Same limits as above.

6. Contractual Liability - Same limits as above.

C. Furnish one copy of Certificates herein required for each copy of the Agreement; specifically set forth evidence of all coverage required by Subparagraphs 11.1 and 11.2. Furnish to the Owner copies of any endorsements that are subsequently issued amending coverage or limits.

D. T**he Contractor shall provide property insurance in the amount of the initial contract sum as well as subsequent modifications thereto for the entire Work at the site on a replacement cost basis without voluntary deductibles. This insurance coverage shall be the "all-risk" form for completed value.**

TEMPORARY SERVICES:

A. Sanitary Facilities: The Contractor shall provide and maintain necessary sanitary conveniences for the use of those employed on/or about the work. The sanitary facilities shall be properly secluded from public observation and shall be such locations as shall be approved by the Owner, and their use shall be strictly enforced.

SHOP DRAWINGS and SUBMITTALS:

A. Unless otherwise specified, the shop drawings and product data shall be submitted **electronically**. Physical samples of materials shall be submitted to the Architect as required.

B. Construction Manager is responsible for obtaining and distributing required prints of shop drawings to his subcontractors and material suppliers after as well as before final approval.

C. Shop drawings and samples shall be dated and marked to show the names of the Project, Architect, CM, originating Sub-Contractor, manufacturer or supplier, and separate detailer if pertinent.

Shop drawings shall completely identify Specifications section and locations at which materials or equipment are to be installed. Reproduction of Contract Drawings are acceptable as Shop Drawings only when specifically authorized in writing by the Architect &/or applicable Engineer/Consultant.

D. If materials or specified items other than those specified in these Contract Documents are supplied - and approved by the Architect - it shall be the Construction Manager's responsibility to provide **ALL** additional materials, accessories, substrates, utility connection, etc. for a complete and operational installation at **NO** additional cost to the Owner.

CHANGES IN THE WORK:

A. Cost shall be limited to the following: cost of materials, including sales tax and cost of delivery; cost of labor, including social security, old age and unemployment insurance, and fringe benefits under collective bargaining agreements; workmen's compensation insurance; bond premiums; and rental value of power tools and equipment. Overhead shall include the following; supervision, superintendence, wages of timekeepers, watchmen and clerks, hand tools, incidentals, general office expense, and all other expenses not included in "cost".

B. Subcontractor Change Order markups shall be limited to 10% overhead and 10% profit.

Constructor Manager markups shall be limited to 7% profit UNLESS a time extension has been approved by the Owner and the Architect allowing for an increase of G.C.s as per original base agreement times the number of approved additional days. No other markups shall be allowed.

AS BUILT DRAWINGS:

A. Provide and maintain in proper order and in good, clean condition in the field office at the project site, one complete full-size set of all working drawings. On this set of drawing prints, in red ink, neatly and accurately inscribe any and all changes in the work.

B. Upon completion of work, the Contractor shall furnish one set of **"as built"** drawings. These drawings shall be contract drawings corrected in **red ink** to show any differences between contract

drawings and actual construction. All changes made during construction shall be noted. Each drawing showing changes in dimensions, details, or containing supplemental information shall be plainly marked **"As Built"** and shall contain the signature of both the Architect and the Contractor.

CLOSEOUT SUBMITTALS:

Prepare project data in the form of an instructional manual supplied electronically on media as requested by Owner (CD or flash drive). The following information shall be included and arranged under a Table of Contents:

1. Directory listing names, addresses, and telephone numbers of the Architect/Engineer(s), General Contractor, Subcontractors, and major material/equipment suppliers.
2. Operation and Maintenance Instructions arranged by system and subdivided by specification section. For each category, identify names, addresses, and telephone numbers of Subcontractors and Suppliers. Include equipment, parts list for each, operating instructions, maintenance instructions for equipment, special finishes, etc.
3. Project documents and certificates, including shop drawings and product data, air and water balance reports, photocopies of warranties.
4. Record As-Built Drawings as described above.
5. Completed Non-Asbestos Affidavit.

DEBRIS DISPOSAL:

Waste disposal shall be the responsibility of the Contractor. The Contractor shall make arrangements with the local authorities having jurisdiction for accommodation of all waste disposal. If local facilities are not available, the contractor shall be responsible for all other arrangements for waste disposal.

SUPPLEMENTARY CONDITIONS AND SPECIAL CONDITIONS:

In the following sections where the term "General Conditions" is used, it shall include the "Supplementary Conditions" and/or "Special Conditions" bound in this project manual.

MISCELLANEOUS PROVISIONS:

A. TESTS AND INSPECTIONS

Add the following clarification: **Regardless of how it is**

described elsewhere in the drawings and specifications, the CM shall engage all testing laboratories / subcontractors as approved by the Architect; and, pay for ALL testing as required by the drawings and specifications. The CM shall pay for any additional testing due to defective work. The Owner shall pay for any additional testing requested and found to be non-defective.

B. EQUAL OPPORTUNITY

The Contractor shall maintain policies of employment as follows:

The Construction Manager and all Subcontractors shall not discriminate against any employee or applicant for employment because of race, religion, color, sex, or national origin. The Contractor shall take affirmative action to ensure that applicants are employed, and that employees are treated fairly during employment without regard to their race, religion, color, sex, or national origin. Such action shall include, but not be limited to the following: employment, upgrading, demotion, or transfer; recruitment advertising; layoff or termination; rates of pay or any other forms of compensation; and selection for training, including apprenticeship. The CM agrees to post in conspicuous places, available to employees and applicants for employment, notices setting forth the policies of non-discrimination.

C. COOPERATION WITH BUILDING OFFICIALS

Cooperate with applicable Federal, State, City or other governmental officials and inspectors at all times. If such officials or inspectors deem special inspections are necessary, provide assistance and facilities that will expedite their inspection.

Construction Manager shall be responsible for obtaining and paying for ALL building permits required for this project. This cost shall be included in the Construction Manager's General Conditions.

D. MEASUREMENTS

Before doing any work or ordering any materials, the Contractor shall verify all measurements of existing and new work and shall be responsible for their correctness.

Quantities obtained during bidding &/or construction shall

not be from the scaling of the drawings. Only dimensions obtained from dimensioned documents &/or existing on-site conditions shall be utilized for quantities determination, pricing, and ordering. Any scaling of the Construction Documents will be at the bidder’s risk and any discrepancies shall be corrected by and paid for by the bidder.

If differences are found, they shall be submitted to the Architect for consideration and verification before proceeding with the work.

E. MANUFACTURER'S SPECIFICATIONS AND INSTRUCTIONS

Install all manufactured items of materials or equipment in strict accordance with manufacturer's recommended specifications, except that the specifications herein, where more stringent, shall be complied with.

At the completion of the project and prior to final acceptance by the Owner, provide the Owner with three complete sets of operating and maintenance instructions, and demonstrate to him the procedures for proper operation and maintenance of all equipment.

F. JOB MAINTENANCE

During the course of their work, all crafts and trades shall protect all work which preceded theirs from damage, and they shall make repairs or replacements to any damage caused either directly or indirectly by them.

G. COMPLIANCE WITH STATE AND FEDERAL LAWS

Construction Manager assumes full responsibility for the payment of all contributions and payroll taxes (state and federal) as to all subcontractors and employees engaged in the performance of work pursuant hereto and further agrees to check and meet all requirements that might be specified under regulations of the administrative officials or board charged with the enforcement of any state or federal act on the subject referred. CM agrees to furnish Owner, upon request, a certificate or other evidence of compliance therewith.

H. OCCUPATIONAL SAFETY AND HEALTH ACT OF 1970 (OSHA)

The Construction Manager shall comply with the latest edition and revision of The Federal Occupational Safety and Health Act of 1970 for construction.

I. GUARANTY BONDS

1. Prior to the Owner signing the contract agreement, they will require the Construction Manager to furnish performance and payment bonds covering the faithful performance of the entire construction contract agreement. The performance bond and the payment bond shall each be made out in one hundred percent (100%) of the contract sum and shall be in a company or companies against which the Owner has no reasonable objection.

2. Bonds shall be signed by an official of the bonding company and shall be accompanied by the bonding agent's written power-of-attorney in order that one copy may be attached to each copy of the contract agreement.

3. The Construction Manager shall include in his proposal amount the total premiums for all required bonds.

4. The Contractor does hereby warrant and/or guarantee against defects in all workmanship and materials performed or furnished by him directly or by his subcontractors for a period of one (1) year from the date of completion, as evidenced by the date of the Final Certificate or final acceptance of the project. Said warranty and/or guarantee shall be in the form of a good and sufficient bond in a sum equal to one hundred percent (100%) of the contract price.

CONFLICTS BETWEEN DRAWINGS AND SPECIFICATIONS: ADDENDUM NO. 1

Conflicts between the drawings and specifications shall be brought to the immediate attention of the Architect. Failure to bid items(s) noted on the drawings and omitted from the specifications **does not** remove responsibility from the Construction Manager and applicable Subcontractor(s) to provide and install such with no additional cost to the Owner.

These Contract Documents – including but not limited to the Drawings, Project Manual, and any subsequent Addenda – are issued as a "whole" and shall be bid as such. Each discipline / subcontractor shall review the entire set of Contract Documents and include applicable work in their bid **regardless of location within the Contract Documents.** Reviewing only a portion of the Contract Documents shall not absolve the construction manager or subcontractor of the requirements to perform the work of their respective disciplines and/or trade.

End of Special Conditions

Professional Services Industries, Inc.
11825 S. Portland Avenue
Oklahoma City, Oklahoma 73170
Office – (405) 735-6052

June 25, 2025

AGP – The Abla Griffin Partnership, LLC
201 North Broadway, Suite 210
Moore, OK 73160

Attn: Mr. Michael L. Abla, AIA
mabla@theAGP.net

Re: *Revised* Geotechnical Engineering Letter Report
Proposed Moore Public Schools Pre-Planning Services
Central Junior High School – Classroom Addition
SWC NW 5th Street and N Broadway Street
Moore, Oklahoma
PSI Project No. 05462142-2

Professional Service Industries, Inc. (PSI), an Intertek company, is pleased to submit this Geotechnical Engineering Letter Report for the referenced project. This letter report includes the pavement design recommendations of both heavy duty and light duty asphalt pavement for this project. Please note, PSI performed subsurface exploration and geotechnical engineering analyses for this project site (PSI Report No. 05462142-2 dated April 22, 2020). This letter report should be attached to the original geotechnical report.

PAVEMENT DESIGN

It is our understanding that the existing pavements at this site are planned to be stripped off and be replaced with a new pavement section as shown in Exhibit A. The PSI scope of services did not include extensive sampling or CBR testing of the existing subgrade or potential sources of imported fill for the specific purpose of detailed pavement analysis. Instead, PSI has estimated pavement related design parameters that are considered to be typical for the area and soil types. PSI understands that asphaltic pavement is the preferred pavement type for the construction. PSI has also provided rigid pavement design for the client's information, if required.

PAVEMENT SUBGRADE PREPARATION

Medium stiff to stiff highly plastic fat clay or fill soil materials are encountered at the surface and near surface depths in the explored borings. Based on subsurface soil information, to support the pavement system, PSI recommends that the exposed subgrade below the pavement should be proof rolled. Soils that are observed to rut or deflect under the moving load should be undercut and replaced with properly compacted select fill.

Modification or chemical treatment of the pavement subgrade using lime agent is recommended. The upper 8 inches of pavement subgrade is required to be treated/modified by lime agent. Chemical treatment should extend at least one (1) foot outside the perimeter of the pavement. Chemical treatment of subgrade as well as placement and compaction of fills are described in PSI original report (PSI Report No. 05462142-2 dated April 22, 2020). In lieu of 8 inches of lime treatment, 12 inches of select fill can be provided below the pavement materials. Chemically treated subgrade or select fill subgrade should be compacted as provided in PSI original report.

PAVEMENT SECTION

According to AASHTO design methodology, the pavement design thickness primarily depends on strength of the subgrade soils and type of traffic. Traffic includes several types of vehicles with various magnitudes of axle loads that may be subjected to the pavement during its service life. The design involves a traffic analysis that converts various types of vehicles with various magnitudes axle loads to a number of 18-kip equivalent single axle load (ESAL) repetitions. The design engineer should perform the traffic analyses to compute the number of ESALs repetitions that would be subjected to the pavement during its service life or design life. Based on the computed ESALs, an economical and appropriate pavement can be designed accordingly.

Based on AASHTO Guide for Design of Pavement Structures 1993, and previous experience, pavement thickness for both a rigid and a flexible pavement system are estimated. The input parameters for our pavement design calculations are provided below:

Average CBR of the Subgrade= 3%

Resilient Modulus = 5,100 psi

Modulus of Subgrade = 110 pci

Reliability= 85%

Standard Deviation = 0.35 for Concrete and 0.45 for asphalt

Design Serviceability Loss = 2.0 for Concrete and 2.2 for asphalt

Load Transfer Factor (J Factor) = 4.2

The 18-kip equivalent single axle load (ESAL) for three (3) levels of traffic (low, medium and high) are provided below.

- Low traffic condition: Parking areas expected to receive only passenger vehicles and light pickup truck traffic. (15,000 ESALs)
- High traffic condition: Drive areas with heavy traffic, trash pickup areas, main access driveways, and 18-wheeler loading/unloading. (50,000 ESALs)

PSI has based its recommendation on subgrade soils prepared to achieve a minimum CBR value of 3, with proper proof-rolling and the site not being wet at the time of construction. Based on the above, it is possible to design a locally typical "standard" pavement section consisting of the following:

TABLE 1: MINIMUM RIGID PAVEMENT SECTION

Pavement Material(s)	Design Thickness	
	Low	High
Portland Cement Concrete	5 inches	6 inches
ODOT Type A Aggregate Base (Optional)	4 inches	
Stabilized Pavement Subgrade	As discussed in Pavement Subgrade Preparation	

TABLE 2: MINIMUM FLEXIBLE PAVEMENT SECTION

Pavement Material(s)	Design Thickness	
	Low	High[1]
Hot Mix Asphalt Concrete (Type D or S4)	1½ inches	2 inches
Asphaltic Base Course (Type C or S3)	2½ inches	3 inches
ODOT Type A Aggregate Base (Required)	6 inches	
Stabilized Pavement Subgrade	As discussed in Pavement Subgrade Preparation	

[1] If desired, two (2) 2.5-inch thick lifts of "Type C" asphaltic concrete pavement, placed over a 6-inch thick ODOT Type A aggregate base, may be used as an alternative to the provided pavement section.

The final pavement sections should be adjusted by the project Civil Engineer based on the actual design traffic loading criteria for the project when that information becomes available. PSI can assist with the final pavement section design if requested.

Large front-loading garbage trucks frequently impose concentrated front-wheel loads on pavements during loading. This type of loading typically results in rutting of the pavement and ultimately, pavement failures. Therefore, it is recommended that the pavement in trash pickup areas consist of a minimum 7-inch thick, reinforced concrete slab.

During the construction phase of this project, site grading should be kept in such a way that the water drains freely off the site.

Proper finishing of concrete pavements requires the use of sawed and sealed joints. Construction joints should be designed in accordance with current Portland Cement Association guidelines. Joints should be sealed to reduce the potential for water infiltration into pavement joints and subsequent infiltration into the supporting soils. Joint spacing is recommended at 15-foot intervals for plain concrete. Dowel bars should be used to transfer loads at the transverse joints. Normal periodic maintenance will be required.

The design of steel reinforcement should be in accordance with accepted codes. The concrete should have a minimum compressive strength of 4,000 psi at 28 days. The concrete should also be designed with 6 ± 1.5 percent entrained air to improve workability and durability. Pavement materials and construction procedures should conform to ODOT or appropriate city and county requirements.

Utilizing prime coat and tack coat in asphaltic pavement construction plays a critical role in enhancing the durability and performance of the pavement structure. The prime coat is applied to the base layer before laying down the asphalt layer. It serves several key functions such as sealing the base, promoting bonding, and strengthening the base. The tack coat is applied between layers of asphalt pavement which promote bonding between layers, enhance structural integrity, and minimize water penetration.

Surface water infiltration to the pavement subgrade layers may soften the subgrade soils. Considering several factors in the pavement design can reduce surface infiltration. The following are some of the factors that need to be emphasized in order to maintain proper drainage.

1) Appropriate slopes should be provided to drain the water freely from the pavement surface.
2) Joints should be properly sealed and maintained.
3) Side drains or sub drains along a pavement section may be provided.
4) Proper pavement maintenance programs such as sealing surface cracks, and immediate repair of distressed pavement areas should be adopted.

5) During and after the construction, site grading should be kept in such a way that the water drains freely off the site and off any prepared or unprepared subgrade soils. Excavations should not be kept open for a long period of time.

Pavements can be expected to crack due to environmental factors and require periodic maintenance to reduce damage to the pavement structure should be planned throughout the life of the pavement. During the paving life, maintenance to seal surface cracks within concrete or asphalt paving and to reseal joints within concrete pavement should be undertaken to achieve the desired paving life. Perimeter drainage should be controlled to prevent or retard influx of surface water from areas surrounding the paving. Water penetration leads to paving degradation. Water penetration into base or subgrade materials, sometimes due to irrigation or surface water infiltration leads to pre-mature paving degradation. Curbs should be used in conjunction with asphalt paving to reduce potential for infiltration of moisture into the base course. Curbs should extend the full depth of the base course and should extend at least 3 inches into the underlying subgrade. The base layer should be tied into the area inlets to drain water that may collect in the base.

This letter is provided for solely for the benefit of the above listed client and does not impact in any way the rights and obligations of third parties, including contractors and subcontractors who may have provided other materials and/or construction services tested or observed. No portion of this report may be reproduced, distributed, or used for any other purpose without the prior written consent of PSI.

The recommendations submitted in this Letter report are based on the information provided to us and are within the standard of care for similar projects and are subject to the report limitations presented in PSI's original Report No. 05462142-2. We trust the recommendations provided above meet your project needs at this time.

If there are questions pertaining to this report, or if PSI may be of further service, please contact us at your convenience.

Respectfully submitted,
Professional Services Industries, Inc.
Certificate of Authorization No. 1111; Expires 06/30/2025

Sumanth Kumar
Staff Geotechnical Engineer

Arad Nickan, P.E.
Branch Manager

ADDENDUM NO. 1 –

SECTION 08700 – FINISH HARDWARE

Hardware Group No. 007 REVISED: Provide each PR door(s) with the following:

Quantity		Description	Model Number	Finish	Mfr
6	EA	HINGE	5BB1HW 4.5 X 4.5	652	IVE
1	SET	AUTO FLUSH BOLT	FB31P OR FB41P AS REQUIRED	630	IVE
1	EA	COORDINATOR	COR X FL X MTG BRKTS X HW PREPS X LENGTH AS REQ	628	IVE
1	SET	ASTRAGAL	9605A HEIGHT AS REQ	AL	NGP
2	EA	FIRE EXIT HARDWARE	99L-F-626-03N / 996L-BE-F-626-03N-499F LENGTH AS REQ'D	626	VON
3	EA	CLASSIC CORE	23-030	626	SCH
2	EA	SURFACE CLOSER	4041 OR P4041 MTG BRKTS, SPCRS & PLATES AS REQ	689	LCN
2	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
2	EA	STOP	WS407CCV OR FS436 AS REQ	628	IVE
1	SET	SEALS	5050B H & J	BLK	NGP
2	EA	MAGNETIC HOLD OPEN DEVICES DOORS #14, 16, 28, 37, 38, & 52	SEM 7800 AL x VOLTAGE & TRANSFORMER REQ'D @	AL	LCN
2	EA	FLOOR STOP / HOLD OPEN	FS41 @ DOOR 53 ONLY		

Provide ALL connections required to the fire alarm and electrical systems necessary for a fully functioning device meeting all applicable codes.

DIVISION 10 - SPECIALTIES

SECTION 10400 - INTERIOR SIGNAGE

ADDENDUM NO. 1

Part 1 - General

1.01 Work Included:
- A. All materials, labor, services and incidentals necessary for the completion of this entire section of the work.

1.02 Quality Assurance:
- A. Standards:
  1. UFAS Fed. Std. 795-Requirements for the physically handicapped.
  2. MIL Spec. L-P-387a, type NDP, rated self-extinguishing, for sign materials.

1.03 Submittals:
- A. Provide manufacturer's catalog cut and data sheets, complete parts list and installation requirements for each item specified.
- B. Schedules: Indicate location and placement for all graphic items.

1.04 Product Delivery, Storage and Handling:
- A. Handle and store all items with care to prevent damage and injury to finish surfaces.

Part 2 - Products

2.01 Products of the manufacturers listed below have been specified herein to simplify descriptions of design, construction, and materials only. All items have been selected for visual and performance design quality which shall serve as a basis for acceptance of equivalent products by other manufacturers.

2.02 Signage System:
- A. Material: 1/8 inch thick, type ES melamine plastic.
- B. Size: 8" x 8" x 1/8", with 1/2" radius corners. Custom design - refer to 2.04 for text and symbols.
- C. Mounting: All graphics shall be permanently mounted to wall or door surface with tamper resistant screws except where mounting to glazing is required. Provide adhesive for mounting and provide blank plates at opposite side of glass. Coordinate with Architect.
- D. Color: refer to Color Schedule, submit color samples with submittals, prior to approval. **Colors will be a factor in product acceptance.**
- E. Letter Style: Helvetica Medium.
- F. Standard Grade 2 braille shall be below all copy, all signs.
- G. All graphic material shall meet the requirements of UFAS Fed. Std. 795, and MIL spec L-P-387a.
- H. Acceptable Manufacturer: Series 200A, Type D format, Mohawk Sign systems.

2.03 Plaque Groupings Required (letter designation refers to 2.04):

Quantity	Plaque	Mounting Location

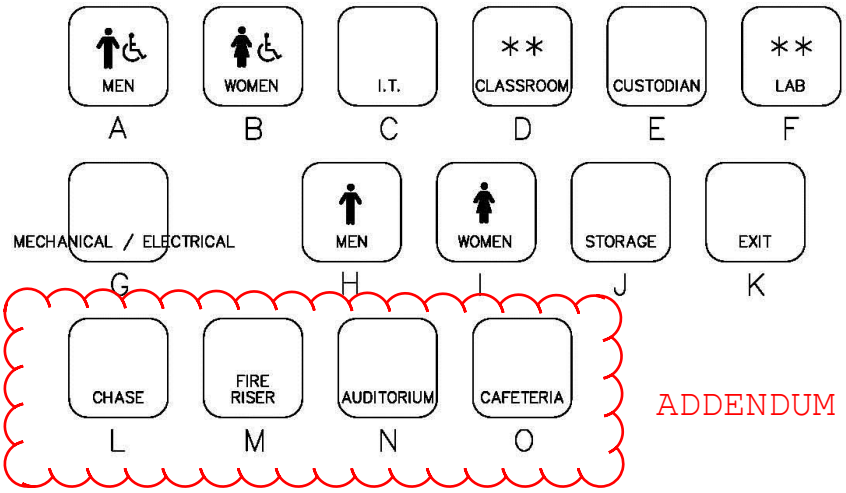
**Coordinate location with Architect

Plaque	**Quantity**	**Location**
A	1	@ room no. 14d
B	1	@ room no. 14e
C	1	@ door no. 26
D	4	@ doors no. 44, 45, 46, & 47
E	1	@ door no. 27
F	6	@ doors no. 17, 18, 21, 22, 31, & 34
G	2	@ door no. 25 & 48
H	3	@ rooms no. 14a, 14b, & 14c
I	3	@ rooms no. 14f, 14g, & 14h
J	1	@ door no. 35
K	9	@ doors no. 2, 5, 8, 10, 11, 12, 13, 16, & 37
L	4	@ doors no. 15, 36, 40, & 43
M	1	@ door no. 39
N	2	@ doors no. 16 & 37
O	2	@ doors no. 41 & 42

ADDENDUM NO. 1

SECTION 10400 - INTERIOR SIGNAGE

2.04 Signage Plaques Required:

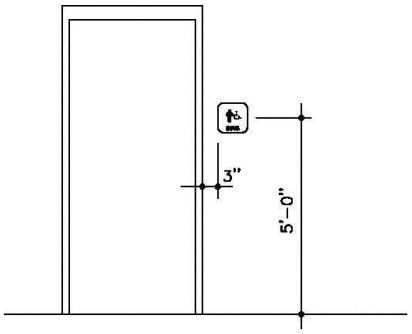


ADDENDUM NO. 1

** INDICATES ROOM NUMBER TO BE COORDINATED WITH ARCHITECT AND OWNER

Note: all signage plaques shall have grade 2 braille translations under text.

2.05 Typical Mounting:



Mounting Height

Typical Wall Location

Verify location with architect.

SECTION 10400 - INTERIOR SIGNAGE

Part 3 - Execution

3.01 Installation:

A. Comply with manufacturer's installation instructions and details on the Drawings. Set all units plumb and level in location indicated on the Drawings or as directed.

B. Provide all necessary accessories: Items to support or attach Identifying Devices to result in a complete installation.

C. Protect all signage plaques to prevent damage after installation.

End of Section

DIVISION 10 - SPECIALTIES

SECTION 10420 - LETTERS AND PLAQUES ADDENDUM NO. 1

Part 1 General

1.01 Work Included:
A. All materials, labor, services, and incidentals necessary for the completion of this entire section of the work.

1.02 Submittals:
A. Shop Drawings: Indicate details and dimensions of fabrication and installation including layouts and assemblies. Begin fabrication only after receiving approved shop Drawings.
B. Manufacturer's Literature: Descriptive literature and installation instructions.

1.03 Product Delivery, Storage, and Handling:
A. Handle and store all items with care to prevent damage and injury to finish surfaces.

Part 2 - Products

2.01 Cast Letters at exterior locations:
A. Finish / Color: see below.
B. Letter Style: **OPTIMA FONT.**
C. Size: height – see below.
D. Mounting: coordinate with Architect.
E. Quantity: Sufficient letters to spell out the following (quantities in parentheses):

1. **CENTRAL JUNIOR HIGH** (X 1 / 30” TALL / WALL MOUNTED / COLOR - BLACK)
2. **AUDITORIUM** (X 1 / 18” TALL / MOUNT TO TOP OF STEEL TUBE AS PER DRAWINGS / COLOR - WHITE)
3. **OFFICE** (X 1 / 18” TALL / MOUNT TO TOP OF STEEL TUBE AS PER DRAWINGS / COLOR - WHITE)

F. Verify exact spelling/punctuation with Architect.
G. Location: refer to the Drawings.
H. Acceptable Manufacturer: A.R.K. Ramos, Oklahoma City.

2.02 Cast Metal Plaque at interior location:

A. Castings shall be free from pits, scale, sand holes, or other defects. Comply with requirements specified for metal, border style, background texture, and finish, and with requirements shown for thickness, size, shape, and copy. Hand-tool and buff borders and raised copy to produce the manufacturer’s standard satin polished finish. Coordinate final design with Architect.
1. Metal: aluminum.

2. Border Style: Type 504.
3. Background Texture: manufacturer's standard No. 2 black pebble texture.
4. Letter Style: Helvetica upper case – raised satin aluminum finish.
5. Mounting Method: No. 4 concealed fasteners.
6. Finish: manufacturer's satin aluminum finish.
7. Size: 20 inches x 24 inches.
8. Content:

CENTRAL JUNIOR HIGH
STEM CLASSROOM ADDITION
MOORE PUBLIC SCHOOLS

SUPERINTENDENT OF SCHOOLS:
DR. ROBERT ROMINES

BOARD OF EDUCATION:

MANDY KINCANNON	PRESIDENT
ERIN MORRISON	VICE PRESIDENT
MATT PURSER	MEMBER
STACI PRUETT	MEMBER
JENNY NGUYEN-STATLER	MEMBER

ASSISTANT SUPERINTENDENT – OPERATIONS:
JEFF HORN

ARCHITECT:
AGP – THE ABLA GRIFFIN PARTNERSHIP LLC
MOORE, OKLAHOMA

CONTRACTOR:
OMNI CONSTRUCTION LLC
MOORE, OKLAHOMA

9. Type Example: ARK-Ramos Manufacturing Company, Inc.

Part 3 - Execution

3.01 Installation:

A. Install units plumb and level in locations indicated on the Drawings, following manufacturer's recommendations.
B. Provide all necessary accessories: Items to support or attach metal letters to result in a complete installation.

C. Protect all finishes to prevent damage before, during and after installation.

End of Section

DIVISION 10 - SPECIALTIES

SECTION 10731 - PREFINISHED METAL CANOPIES

ADDENDUM NO. 1

Part 1 - General

1.01 Work Included:
- A. Work in this section includes the furnishing and installation of roll-formed aluminum overhead hanger rod style canopies.
- B. Metal trim, accessories, fasteners, and sealants related to the canopy system.

1.02 Quality Assurance:
- A. Manufacturer shall demonstrate a minimum of five years of experience in the specified products and applications.
- B. Products must meet the minimum standards established by this specification. Materials, accessories, testing, and processes specified shall establish the minimum level of quality, performance, dimension, and appearance required of any substitution.
- C. Proposed substitutions shall include a complete description of the proposed substitution including testing, samples, and other information necessary to demonstrate the equivalency of the substitute.

1.03 Related Items and Considerations:
- A. Flashing of various designs may be required. Generic flashing shall be supplied by canopy manufacturer and installed by canopy installer.
- B. Determine wall construction, make-up, and thickness.
- C. Ensure adequate wall condition to carry canopy loads where required.

1.04 Field Measurements and Submittals:
- A. Confirm dimensions prior to preparation of shop drawings prior to fabrication of canopies.
- B. Provide manufacturer=s product data and specifications for canopies.
- C. Provide shop drawings indicating structural component locations / positions, material dimensions, and details of construction and assembly.

1.05 Performance Requirements:
- A. Canopy must conform to all applicable / local building codes.
- B. Confirm specific load requirements have been established for canopies and provide stamped calculations if required by the Jurisdiction Having Authority.

1.06 Warranty:
- A. Manufacturer shall warrant for a minimum period of one year that the canopies, trim, and accessories furnished by the manufacturer will be free from defects in materials and factory workmanship.

SECTION 10731 - PREFINISHED METAL CANOPIES

1.07 Delivery, Storage, and Handling:
A. Deliver and store all canopy components in protected areas.

1.08 **Products of certain manufacturers are specified herein to simplify descriptions of design, construction, and/or materials only. Proprietary names are not intended to imply that products of named manufacturer are required to the exclusion of equivalent products of other manufacturers.**

Part 2 - Products

2.01 Acceptable Manufacturer:
A. Lumishade Canopy with prefinished Hanger Rods w/ turnbuckles as manufactured by:
Mapes Canopies
Lincoln, Nebraska
Phone: 888-273-1132
Fax: 877-455-6572

2.02 Materials:
A. Decking shall consist of LumiShade interlocking roll-formed (minimum 0.032" aluminum) 2 ½ W-style pan as applicable.
B. Intermediate framing members shall be extruded aluminum, alloy 6063-T6, in profile and thickness required by specified unit.
C. Hanger rods and attachment hardware shall be powder coated.
D. Provide compression sleeves at thru bolts as necessary. Round escutcheon plates shall be provided.
E. Fascia shall be standard 8" extruded "J" style (minimum 0.125 aluminum).

2.03 Finishes:
A. Mapes Two Coat Kynar to meet the requirements of AAMA 2605. Final color to be selected by Architect – Mapes Bronze.

2.04 Fabrication:
A. Canopies shall be shipped in preassembled sections for ease of installation.
B. All connections shall be mechanically assembled utilizing 3/16 inch fasteners with a minimum shear stress of 350 pounds. Pre-welded or factory-welded connections are not acceptable.
C. Decking shall be designed with interlocking roll-formed aluminum members.
D. Where applicable, provide concealed drainage – water shall drain from covered surfaces into intermediate trough and be directed to the rear for ground level

discharge via designated downspouts at each end of canopy.

Part 3 - Execution

3.01 Inspection:

A. Confirm that surrounding area is ready for the canopy installation.

B. Installer shall confirm dimensions and elevations to be as shown on drawings provided by the manufacturer.

C. Erection shall be performed by an approved installer and scheduled after all concrete, masonry, and roofing in the area is completed.

3.02 Installation:

A. Installation shall be in strict accordance with the manufacturer=s approved shop drawings. Particular attention shall be given to protecting the finish during handling and installation.

B. Canopy installer shall demonstrate at least five years of experience installing similar products and applications.

C. After installation is complete, entire system shall be wiped-down and left in a clean condition.

End of Section

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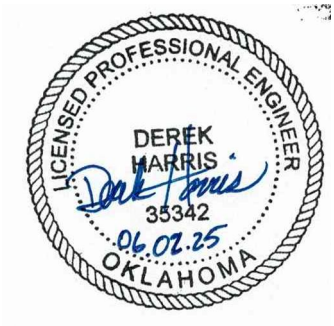
ATTACHMENTS

Construction Drawings – Central Junior High
CCC Project No. 25031, dated June 2nd, 2025

Local and/or State jurisdictional requirements and specifications shall govern if requirements are stricter and different than as stated in these specifications.

PROJECT: 25031 – Central Junior High

PROJECT ENGINEER: Derek Harris, P.E.



(Engineer's Seal & Signature)

SECTION 01 57 13

EROSION AND SEDIMENT CONTROL GENERAL

1.01 RELATED DOCUMENTS.

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and all Specification Sections, apply to this Section.

1.02 SUMMARY

A. Work under this section shall include all labor, materials and equipment necessary to meet all applicable requirements and as specified in the contract.

B. Section Includes:
   1. Installation and maintenance of both temporary and permanent soil erosion and sediment control measures
   2. Slope protection and stabilization practices.
   3. Implementation of the Stormwater Pollution Prevention Plan (SWPPP) to protect surface water quality.

C. Related Sections:
   1. Division 31 Section "Site Clearing" for site stripping, grubbing, stripping and stockpiling topsoil, and removal of above- and below-grade improvements and utilities.
   2. Division 31 Section "Dewatering" for lowering and disposing of ground water during construction.
   3. Division 32 Section "Turf and Grasses" for finish grading in turf and grass areas, including preparing and placing planting soil for turf areas.

1.03 UNIT PRICES

A. Work in this Section is affected by unit prices for erosion and sediment control specified in Division 01 Section "Unit Prices."

1.04 DEFINITIONS

A. Backfill: Soil material or controlled low-strength material used to fill an excavation.

B. Baffles: Porous barriers installed inside a temporary sediment trap, rock dam sediment trap, sediment basin, or skimmer sediment basin used to reduce velocity (turbulent flow) of the water flowing through the measure and facilitate the settling of sediment from the water before discharge.

C. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill

D. Check Dam: A small temporary stone dam constructed across a drainage way (such as a temporary diversion ditch) used to reduce erosion in the channel and trap sediment behind the dam.

E. Construction Sequence: Schedule of work sequenced to control the timing of land disturbing activities and installation of erosion and sediment control measures.

F. Excavation: Removal of material encountered above subgrade elevations and to the limits and dimensions indicated.

G. Fill: Soil materials used to raise existing grades.

H. Inlet Protection: A temporary measure used to prevent sediment from entering inlets and conduit systems during construction. Inlet protection allows protected early use of storm drainage system and provides sediment storage around inlets.

I. Land Grading: Re-shaping the ground surface to designed proposed grades to accommodate development.

J. Landscape Planting: Stabilizing disturbed areas by establishing vegetative cover with trees, shrubs, vines and/or ground cover.

K. Level Spreader: A non-erosive outlet for concentrated runoff constructed to disperse flow uniformly over a long slope.

L. Mulching: Application of a protective blanket of straw, wood chips, shredded bark, gravel or synthetic material to bare soil surface.

M. Outlet Stabilization Structure (Riprap Apron): A structure designed to dissipate energy, reduce velocity and control erosion at the outlet of a pipe or channel.

N. Permanent Seeding: Establishment of permanent perennial vegetative cover with seed to control runoff and minimize erosion.
O. Rolled Erosion Control Products (RECP): Rolled erosion control products are manufactured or fabricated into rolls designed to reduce soil erosion and assist with the growth and establishment of vegetation. Products include mulch control netting, open weave textiles, erosion control blankets, and three dimensional turf reinforcement mats.
P. Sediment (Silt) Fence: A temporary sediment control measure consisting of fabric buried at the bottom, stretched and supported by (sometimes wire and) posts. Measure retains sediment laden flow from small disturbed areas and allows sediment deposition.
Q. Sediment Control Structure: A temporary (or permanent only when used in conjunction with a permanent detention or retention basin) structure used to detain sediment laden water, diminish turbulent flow, and allow sediment to settle. Retains sediment on construction site to prevent sedimentation in receiving waters.
R. Skimmer (Skimmer Sediment Basin): An earthen embankment with a trapezoidal spillway lined with impermeable geotextile or laminated plastic membrane and equipped with a floating skimmer for dewatering. Skimmer basins are designed to provide an area for runoff to pool and settle
S. Sodding: Establishing permanent cover by laying a continuous layer of grass sod.
T. Subgrade: Uppermost surface of an excavation or the top surface of a fill or backfill immediately below subbase, drainage fill, drainage course, or topsoil materials.
U. Subbase Course: Aggregate layer placed between the subgrade and base course for hot-mix asphalt pavement, or aggregate layer placed between the subgrade and a cement concrete pavement or a cement concrete or hot-mix asphalt walk
V. Surface Roughening: Roughening the soil surface on a slope with horizontal grooves cross-slope, stair stepping or tracking with construction equipment.
W. Temporary Diversions: A temporary ridge or excavated channel, or both, constructed across sloping land on a pre-determined grade. Temporary Diversions must extend to sediment control structures.
X. Temporary Gravel Construction Entrance/Exit: A graveled pad located at points where vehicles and equipment leave the construction site.
Y. Temporary Seeding: Planting rapid-growing annual grasses, small grains, or legumes to provide initial, temporary cover for erosion control on disturbed areas.
Z. Temporary Slope Drain: Flexible pipe extending from the top to the bottom of a cut or fill slope used to transport sediment laden water from a temporary diversion into a sediment control structure.
AA. Temporary Sediment Trap: A small, temporary ponding basin, without a pipe outlet structure, formed by an embankment or excavation to capture sediment. Structure detains sediment laden runoff, reduces turbulent flow and allows sediment to drop out to protect receiving waters.
BB. Temporary Sediment Basin: A larger temporary or part of a permanent system, including a controlled outlet structure, used to detain sediment laden water, diminish turbulent flow, and allow sediment to settle. Retains sediment on construction site to prevent sedimentation in receiving waters.
CC. Top-soiling: Preserving and using topsoil to enhance final site stabilization with vegetation.
DD. Tree Preservation: Practices used to preserve and protect trees from damage during construction.
EE. Utilities: On-site underground pipes, conduits, ducts, and cables, as well as underground services within buildings

1.05 SUBMITTALS

A. Qualification Data: For third party 'Qualified Inspector (Professional)' if not provided by the Owner.
B. Off-site Soil Qualification: For each borrow or waste site for soil material proposed for fill and/or waste that is not permitted under the Project site NPDES coverage:
    1. Copy of the site's NPDES Notice of Coverage (or similar coverage/approval document)
    2. Copy of the erosion and sediment control plan including best management practices and stabilization schedules to be used to include the site under the current NPDES Permit coverage.

1.06 QUALITY ASSURANCE

A. Intent: The main concern associated with erosion and sedimentation on the site is movement of sediment to off-site and off-site receiving waters and its affect on water quality. The Owner's intent is that the Contractor install, inspect, maintain and modify sufficient erosion and sediment control practices to retain sediment within the boundaries of the site in addition to complying with all regulatory codes, laws, rules, and ordinances. All erosion and sediment control measures shall conform to the drawings and to the latest requirements imposed by federal, state and local authorities. The Contractor is responsible for any repair and damages and shall be financially responsible for any penalties imposed.

B. Drawing Review: It is the Contractor's responsibility to review the erosion and sediment control drawings and the Storm Water Pollution Prevention Plan (SWPPP) prepared by the engineer prior to implementation. All measures shall be implemented in accordance with this specification, contract drawings and documents and all regulatory authorities having jurisdiction. Where conflicting requirements arise the more restrictive rules shall govern.

C. Contractor Responsibility: Contractor is to provide all temporary and permanent non-structural and structural measures shown on the drawings, and as directed by the Owner or NPDES authority for the duration of the work. SWPPP and Erosion and Sediment Control drawings are guidelines, additional measures not specified may be necessary and shall be implemented to address conditions that may develop during the construction process. Additional measures needed but not specified in the SWPPP or on the drawings shall be at no additional cost to the Owner.

D. Coordination: Temporary structural measures shall be coordinated with permanent measures to the extent practical to assure economical, effective and continuous erosion and sediment control throughout construction and a seamless transition between temporary and permanent post construction operation.

E. Contractor Inspections: Contractor shall inspect all erosion and sediment control measures at least at the beginning and at the end of each day to ascertain all devices are functioning properly during construction. Contractor shall fully and completely inspect the entire site once every seven (7) calendar days and within 24 hours of 0.5 inches (12 mm) of rain or more per 24 hour period, or more often if required by the governing Construction General Permit; these inspection findings must be reported on Form C-1. Any measures found to be unsatisfactory during that inspection shall be corrected within 48 hours of the inspection. The Owner may suspend the performance of any or all other construction work until the unsatisfactory condition has been corrected. Such suspension shall not be the basis of any claim by the Contractor for additional compensation nor for an extension of time to complete the work. Any Notices of Violations (NOV), fines or other corrective actions requested by authorities having jurisdiction or by the Owner shall be the sole responsibility of the Contractor.

F. Contractor Response to Notice of Violation: Should the Contractor receive an inspection report or Notice of Violation from the regulatory authority (NPDES authority, Natural Resources Conservation Service, or other county or city authority) the report or notice shall immediately be forwarded to the Owner's representative. The Contractor shall **not** respond to an inspection or Notice of Violation without first gaining approval for the response from the Owner.

G. Protect Adjacent Properties: Contractor is to protect adjacent properties, watercourses, threatened, endangered and protected species and critical habitats, any identified cultural, archeological or historic resources, and receiving water resources from erosion and sediment damage throughout the time of construction.

H. SWPPP Pre-construction Meeting: Prior to beginning work, a pre-construction SWPPP meeting shall be held by the Owner and the site engineer. The General Contractor and its site work subcontractor must be present at this meeting.

1.07 PROJECT CONDITIONS

A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during earth moving operations.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
2. Provide alternate routes around closed or obstructed traffic ways if required by Owner or authorities having jurisdiction.

B. Improvements on Adjoining Property: Authority for performing earth moving indicated on property adjoining Owner's property will be obtained by Owner before award of Contract.
   1. Do not proceed with work on adjoining property until directed by Owner.
C. Utility Locator Service: Notify utility locator service for area where Project is located before beginning earth moving operations.
D. Do not commence earth moving operations until all Phase I temporary sediment control measures are in place.
E. Do not commence earth moving operations until plant-protection measures specified in Division 01 Section "Temporary Tree and Plant Protection" are in place.
F. The following practices are prohibited within protection zones:
   1. Storage of construction materials, debris, or excavated material.
   2. Parking vehicles or equipment.
   3. Foot traffic.
   4. Erection of sheds or structures.
   5. Impoundment of water.
   6. Excavation or other digging unless otherwise indicated.
   7. Attachment of signs to or wrapping materials around trees or plants unless otherwise indicated.
G. Do not direct vehicle or equipment exhaust towards protection zones.
H. Prohibit heat sources, flames, ignition sources, and smoking within or near protection zones.

PART 2 - PRODUCTS

2.01 SOIL MATERIALS

A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.
B. Riprap: ASTM D 4992-94 evaluation; ASTM D 6092-97e1 standard practice for size specification.
C. Sand: ASTM C 33; fine aggregate.

2.02 GEOTEXTILES

A. Subsurface Drainage Geotextile: Nonwoven needle-punched geotextile, manufactured for subsurface drainage applications, made from polyolefins or polyesters; with elongation greater than 50 percent; complying with AASHTO M 288 and the following, measured per test methods referenced:
   1. Survivability: Class 2; AASHTO M 288.
   2. Grab Tensile Strength: 157 lbf (700 N); ASTM D 4632.
   3. Sewn Seam Strength: 142 lbf (630 N); ASTM D 4632.
   4. Tear Strength: 56 lbf (250 N); ASTM D 4533.
   5. Puncture Strength: 56 lbf (250 N); ASTM D 4833.
   6. Apparent Opening Size: No. 70 (0.212-mm) sieve, maximum; ASTM D 4751.
   7. Permittivity: 0.1 per second, minimum; ASTM D 4491.
   8. UV Stability: 50 percent after 500 hours' exposure; ASTM D 4355.
B. Separation Geotextile: Woven geotextile fabric, manufactured for separation applications, made from polyolefins or polyesters; with elongation less than 50 percent; complying with AASHTO M 288 and the following, measured per test methods referenced:
   1. Survivability: Class 2; AASHTO M 288.
   2. Grab Tensile Strength: 247 lbf (1100 N); ASTM D 4632.
   3. Sewn Seam Strength: 222 lbf (990 N); ASTM D 4632.
   4. Tear Strength: 90 lbf (400 N); ASTM D 4533.
   5. Puncture Strength: 90 lbf (400 N); ASTM D 4833.
   6. Apparent Opening Size: No. 60 (0.250-mm) sieve, maximum; ASTM D 4751.
   7. Permittivity: 0.02 per second, minimum; ASTM D 4491.
   8. UV Stability: 50 percent after 500 hours' exposure; ASTM D 4355.
C. Sediment Fence: Fabric with slit tape yarns in one direction (warp or fill) only. Fabric must have strong rot-proof synthetic fibers formed into either a woven or non-woven fabric.
   1. Fabric may be manufactured with pockets for posts, hems with cord, or with posts pre-attached using staples or button head nails.

2. Fabric to have manufacturer's mark, either with an approved color mark yarn in the fabric or the manufacturer's name and product trade name labeled on the fabric at a minimum of 100 ft (30 m) intervals.
3. Fabric has no treatment or coating that might significantly alter its physical properties after installation.
4. Contains stabilizers and/or inhibitors to make the filaments resistant to deterioration from sun or heat exposure.
5. Makes a pervious sheet of synthetic fibers oriented into a stable network so that the fibers retain relative position with respect to each other under normal handling, installation, and service conditions.
6. Has finished fabric edges to prevent the outer yarn from pulling away from the fabric.
7. Have no defects or flaws that would significantly affect physical and/or functional properties.
8. Has the following physical and dimensional requirements and properties:
    a. Minimum tensile strength in pounds (Newtons): Warp 260 (1155), Fill 180 (800) ASTM D 4632.
    b. Elongation: 40%, ASTM D4632
    c. Apparent opening size (max. sieve size): No. 30 (600 um), ASTM D 4751
    d. Flow rate in gallons per minute per square foot (L/min./m^2): 70 (2850)
    e. Ultraviolet stability (percent of required initial minimum tensile strength): 80% ASTM D4632 and ASTM D4355
    f. Permittivity: 0.1 per second, minimum; ASTM D 4491.
    g. Bursting strength, psi (kPa): 175 (1200), ASTM D 3786
    h. Minimum fabric width: 36" (900 mm)

D. RECP: Rolled Erosion Control Products, woven geo-textile fabric, manufactured for the establishment of vegetation for erosion control including:
1. Mulch Control Netting: Planar woven natural fiber or extruded geo-synthetic mesh used as a temporary degradable RECP to anchor loose fiber mulches. Maximum gradient for slope applications 5:1 ASTM D6459, maximum permissible shear stress channel applications is 0.25 lbs per square foot ASTM D6460, minimum tensile strength 5 lbs/ft ASTM D5035.
2. Open Weave Textile: Temporary degradable RECP composed of processed natural or polymer yarns woven into a matrix, used to provide erosion control and facilitate vegetation establishment. Maximum gradient for slope applications 3:1 ASTM D6459, maximum permissible shear stress channel applications is 1.50 lbs per square foot ASTM D6459, minimum tensile strength 50 lbs/ft ASTM D5035.
3. Erosion Control Blanket: Temporary degradable RECP composed of processed natural or polymer fibers mechanically, structurally or chemically bound together to form a continuous matrix to provide erosion control and facilitate vegetation establishment. Maximum gradient for slope applications 2:1 ASTM D6459, maximum permissible shear stress channel applications is 1.75 lbs per square foot ASTM D6460, minimum tensile strength 75 lbs/ft ASTM D5035.
4. Turf Reinforcement Mat: Long-term non-degradable RECP composed of UV stabilized, non-degradable, synthetic fibers, filaments, nettings, and/or wire mesh processed into three dimensional reinforcement matrices designed for permanent and critical hydraulic applications where design discharges exert velocities and shear stresses that exceed the limits of mature, natural vegetation. TRM provide sufficient thickness, strength and void space to permit soil filling and/or retention and the development of vegetation within the matrix. Maximum gradient for slope applications 1:1 ASTM D6459, maximum permissible shear stress channel applications is 8.0 lbs per square foot ASTM D6460, minimum tensile strength 150 lbs/ft ASTM D5035, minimum thickness 0.25 inches (6.35 mm) ASTM D6525.

2.03 SEDIMENT FABRIC FENCING

A. Woven wire fabric fencing to be used with sediment fabric:
1. Ensure wire fence fabric is at least 32 inches (810 mm) high with at least 6 horizontal wires.
2. Ensure the vertical wires have maximum spacing of 6 inches (78 mm)
3. Ensure the top and bottom wires are at least 10 gauge (2.49 mm) and all other wires are at least 14 gauge (3.48 mm).

B. Posts: Use post sizes and types as determined by the type of fence being installed. Hardwood posts are limited to ash, hickory, or oak, or other approved hardwood or softwood.
   1. Wood Posts: At least 2” (50 mm) in diameter or 2” x 2” (50 x 50 mm) 5 feet (1.5 m) long, and straight enough to provide a fence without a noticeable misalignment. Wood shall be commercial quality lumber of size and shape indicated. Each stake shall be free from decay, splits or cracks longer than the thickness of the stake or other defects that would weaken the stakes and cause the stakes to be structurally unsuitable.
   2. Steel posts to be “U”, “T”, or “C” shaped with a minimum weight of 1.15 pounds per foot (1.7 kg/m), 5 feet (1.5m) long, and have projections for fastening the fence to the posts.
   3. Fasteners for Wood Posts: Wire staples that are at least 17 gauge (1.37 mm), legs at least ½ inch (13 mm) long, and a crown of at least ¾ inch (19 mm) wide.
   4. Nails for Wood Posts: Use nails that are at least 14 gauge (2.03 mm), 1 inch (25 mm) long, with button heads of at least ¾ inch (19 mm).

2.04 SKIMMER

A. Skimmer: The Skimmer is a dewatering device used to slowly dewater sediment basins from the top of the water column. Manufactured by J.W. Faircloth & Son, Post Office Box 757, Hillsborough, NC, 27278. Telephone (919) 732-1244, or approved equal.

PART 3 - EXECUTION

3.01 GENERAL REQUIREMENTS

A. The Contractor shall comply with and fully implement the Stormwater Pollution Prevention Plan (SWPPP) provided in the contract documents.
B. Prior to beginning work, review erosion and sediment control drawings as they apply to the current site conditions. Any deviation from the drawings shall be submitted to the Owner and site engineer at least 72 hours prior to commencing that work.
C. Hold a SWPPP pre-construction meeting prior to beginning work.
D. Where required by the governing Construction General Permit, the General Contractor is to notify NPDES authority, in writing (or as required by local regulations) prior to initial land disturbance.

3.02 PREPARATION

A. Sequence of Construction: The approved construction sequence, as permitted and approved shall be adhered to during the execution of the work. All grading, drainage, best management practices (BMPs) for erosion and sediment control and all stabilization measures shall be constructed in the order presented in the Sequence of Construction. Modifications to the Sequence of Construction may occur only as approved by the Owner (and authority having jurisdiction when required).
   1. PHASE ONE Erosion and Sediment Control: All Phase One erosion and sediment control measures including but not limited to the required NPDES postings at the construction entrance/exit, construction of the temporary gravel construction entrance/exit, installation of perimeter sediment fence, temporary sediment basins and traps, and temporary diversion channels to sediment control structures shall be completed prior to any major land disturbing activity, including grubbing. Land disturbing activity during Phase One will be limited to the areas necessary to install Phase One best management practices only.
   2. PHASE TWO Erosion and Sediment Control: Grading (and mass grading) activity shall commence in Phase Two and includes additional erosion and sediment control measures as indicated on the drawings Contractor is to provide inspection, maintenance and recordkeeping throughout Phase One until Final Stabilization.
   3. PHASE THREE Erosion and Sediment Control: When complexity of project requires additional phases, they shall commence and be adhered to in the order presented on the drawings and in the SWPPP unless modified and approved by the Owner (and authority having jurisdiction when required).
B. Temporary Construction Entrance/Exit and Lay Down Area:
   1. Temporary construction entrance/exit shall be installed and maintained as shown on the drawings. In addition to the entrance/exit shown on the drawings, a temporary gravel construction entrance/exit shall be installed and maintained at any point where construction

vehicles enter a public right-of-way, street or parking area, or exit the site. The pad shall be used to reduce mud tracked from construction vehicles onto public streets. The entrance/exit pad shall be constructed as shown on the drawings. Any sediment tracked onto the public street shall be cleaned immediately.

2. A 30,000 square foot, 6" thick stone base lay down area shall be established at grade and as located on the drawings or as directed by the Owner. A 24 foot gravel drive shall connect the temporary gravel construction entrance/exit and the lay down area, and the lay down area and the building pad. When the job nears completion, this stone may be incorporated into the pavement section provided it is in place and any overlying contaminated material has been removed.

3.03 DRAWING INTENT

A. Implementation of the erosion and sediment control measures shown on the drawings include but may not be limited to the approved measures. Contractor is responsible for providing all measures necessary that may be additional to accomplish the intent of the drawings. The quantity of best management practices shown on the drawings may be affected by actual conditions that occur during construction of the project. Additional sediment fence, diversion channels, sediment traps, inlet protection, and any other measure shown on the drawing may be necessary to provide adequate sediment control.

3.04 DEWATERING

A. Discharge from dewatering operations for the excavated areas shall not be directed to surface waters without first properly removing the suspended sediment from the water. The Contractor shall obtain any required permits associated with dewatering activities.

3.05 STABILIZATION

A. Limit Disturbed Area: Contractor to limit disturbed earthwork operations to the area commensurate with the Contractor's capability in keeping finished grading, seeding, mulching, stone base, and other control measures current and in accordance with the Schedule of Construction Activity. Should seasonal limitations make such coordination unrealistic, as determined by the Owner, temporary erosion control measures (stabilization) shall be provided immediately by the Contractor at no expense to the Owner.

B. Temporary Stabilization: The Contractor shall incorporate all permanent erosion control measures into the project at the earliest practical time to minimize the need for temporary stabilization. Temporary stabilization shall be used where stabilization is needed or required prior to installation of permanent measures due to seasonal concern or NPDES stabilization requirements.

C. Ground Cover Sufficient to Restrain Erosion: Any disturbed area where grading activities have temporarily or permanently ceased for more than 14 days (or a shorter time required by the local NPDES authority) shall be seeded, mulched and watered. Permanent stabilization consists of permanent seeding and landscaping per specification or stone base for paving or building construction. Temporary stabilization may include temporary seeding, mulch, stone base, mulch fiber matrix, or other methods.

D. Slopes: Slopes shall be permanently seeded and mulched as excavation or fill proceeds to the extent possible. Slopes shall be temporarily seeded and mulched as necessary. Any graded slopes steeper than 3:1 shall be protected with erosion control blanket (RECP) as indicated on the drawings.

3.06 OWNER INSPECTION

A. The Owner's representative shall inspect the site and recordkeeping materials at least once per month.

B. If Owner determines that the site is out of compliance with the governing NPDES Permit, the Contractor will have 24 hours to initiate and 48 hours to complete corrective action.

C. The Owner's NPDES Compliance Manager shall visit the site periodically.

D. If the Owner's Compliance Manager determines the site is out of compliance, the Contractor shall make corrective actions within 48 hours and produce any follow-up information requested by the Compliance Manager within the number of days specified in the Compliance Manager's report.

3.07 STORAGE OF SOIL MATERIALS

A. Stockpile borrow soil materials and excavated satisfactory soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
   1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.
   2. Provide temporary cover for soil stockpiles if not active for more than 14 days.
   3. Provide perimeter protection (sediment fence, wattle, or as shown on the drawings) around stockpile to prevent sediment from leaving the area.

3.08 STORM DRAINAGE

A. Inlets: All inlets are to be provided with inlet protection as indicated on the drawings immediately upon construction.

B. Outlets: All storm drainage outlets must be stabilized (velocity dissipation) as shown on the drawings before discharge becomes operational.

END OF SECTION 015713

SECTION 01 71 23

FIELD ENGINEERING

PART 1 - GENERAL

1.01 SUMMARY

A. The Contractor shall provide construction stakeout sufficient to construct the proposed improvement in accordance with the approved construction plans.

B. All stakeout services shall be completed under the direct supervision of a Professional Land Surveyor licensed in the State where the project is located.

C. The Owner shall provide the following prior to the commencement of any stake-out services:
   1. Construction site drawings and associated electronic files.
   2. Copies of the topographic survey that the approved site plans have been based on. The topographic survey shall include at least one benchmark, which shall be used for vertical control; and,
   3. Copies of the boundary survey that the approved site plans have been based on. The boundary survey shall be closed and monumented/ironed. These monuments/irons shall be used for horizontal control related to the site boundary and the dimensional control plan.

D. Contractor shall verify existing grades prior to performing work under this section. If existing grades are at variance with the drawings, notify the Owner and receive instructions prior to proceeding. No additional compensation will be considered resulting from grade variances once site clearing has commenced.

PART 2 - PRODUCTS

2.01 MATERIALS

A. The Contractor/Surveyor shall supply all stakeout materials.

2.02 EQUIPMENT

A. The Contractor/Surveyor shall supply all equipment necessary to accomplish the work.

PART 3 - EXECUTION

3.01 PERFORMANCE STANDARDS

A. Building Layout
   1. Set a minimum of 4 building corners (to be the outer most building limits or as requested by the Contractor) with 2 (10 foot minimum) offsets per corner. A benchmark or a finished floor benchmark will be set within close proximity to the proposed building.

B. Building Pad/Limits Certification
   1. Grade elevations for the building limits (finished floor elevation) shall be provided at a 50 foot grid for subgrade acceptance, stone base acceptance, and prior to slab placement.

C. Detention/Retention Ponds and Storm Drainage
   1. The Contractor shall provide an as-built survey of all constructed detention/retention ponds and associated drainage structures prior to final acceptance, including a written certification verifying the constructed pond volume and inverts of the proposed drainage structures.

D. Curb Layout
   1. Stakes shall be located at a minimum of 25 feet and a maximum of 50 feet intervals and also at points of curvature, points of tangency, radius points, and transitions, high and low points, and deflections. Offsets will be at 4 feet from face of curb, elevations to top of curb, elevations of top of curb to be provided at this 4 foot offset.

E. Storm and Sanitary Manholes

   15 feet and 25 feet offset stakes in the same direction will be set from the centerline opening of structure lath. One offset stake will have an elevation to top of rim and inverts. Intermediate grade stakes to pipe invert elevation will be provided if needed. (Note: These stakes are not to conflict with piping.)

F. Catch Basins

1. Set a centerline of structure lath with 10 foot offset HUB along the face of curb on either side of the lath at face of curb. One offset stake will have an elevation to top of grate and inverts. (Note: These stakes are not to conflict with piping.)

G. Utility Layout
   1. Water – Stakes shall be located at 50 foot intervals along centerline of pipe and at deflections with no offsets. One 10 foot offset stake to the center of hydrant with a grade ring elevation will be provided;
   2. Lighting – Centerline of lighting structure with a 5 foot offset will be staked. Offset stake elevation will be to finished grade; and,
   3. Centerline of pipes will be staked with no offset.

H. Roadway Layout
   1. Grade stakes shall be located at centerline of roadway at 50 foot intervals, including point of curvature, point on curve, point of tangency, and points of vertical curves. Grades shall be at finished grade.

I. Wall Layout
   1. Stakes with 10 feet offset shall be provided at 50 feet intervals, deflections, beginning and end of wall. Additional stakes may be required, depending on wall height and conditions.

J. Limits of Disturbance
   1. Clearing limits shall be staked at 100 feet ± intervals and at all critical areas.

K. Grade Stakes
   1. Stakes will be provided at a 50 foot grid. Grade elevations shall be to finished grade.

3.02 CONTRACTOR VERIFICATION

A. Contractor will field verify the utility location, size and invert elevations at points of connection in area of conflict, prior to construction and protect them from damage.
   1. Finished subgrades shall be verified by the Contractor to ensure proper elevation and conditions for construction above subgrade;
   2. Protect subgrade from excessive construction traffic and wheel loading including concrete and dump trucks; and,

B. Notify Owner if it is necessary to destroy or remove control points and/or benchmarks due to construction. Contractor shall be responsible for the protection of benchmarks, including the cost for relocation as required.

C. Advise Owner of any discrepancies between plans and field layout.

3.03 QUALITY ASSURANCE

A. The survey crew shall discuss all layout procedures with the Contractor's supervisor prior to commencing work.

B. A survey crew daily report detailing that day's work, shall be completed and signed by the Contractor's supervisor at the end of that day's layout.

C. Copies of sketches, cut sheets, etc. shall be provided to the Contractor by the beginning of the next workday.

D. All costs related to re-staking due to construction or Contractors' work resulting in destruction or movement of stakes, shall be paid for by the Contractor and at no additional expense to the Owner.

E. Building dimensions shall be obtained only from the approved architectural/structural drawings. Dimensions are to be obtained only from the appropriate approved (engineering, architectural and structural) drawings. The surveyor shall report any conflicts to the Contractor and Owner.

END OF SECTION 017123

SECTION 024116

DEMOLITION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Specification Sections *31 and 32*, apply to this Section.

1.02 SUMMARY

A. This Section includes the following:
   1. Demolition and removal of buildings and site improvements.
   2. Abandoning in place or removing below-grade construction.
   3. Disconnecting, capping or sealing, and abandoning in-place or removing site utilities.
   4. Salvaging items for reuse by Owner.

B. Related Sections include the following:
   1. Division 2 Section "Summary" for use of the premises and phasing requirements.
   2. Division 2 Section "Construction Progress Documentation" for preconstruction photographs taken before building demolition.
   3. Division 2 Section "Temporary Facilities and Controls" for temporary construction, protection facilities, and environmental-protection measures for building demolition operations.
   4. Division 2 Section "Construction Waste Management and Disposal" for recycling and disposal of nonhazardous demolition wastes and for removal and storage of refrigerant.
   5. Division 2 Sections for demolishing or relocating site plumbing items.
   6. Division 2 Sections for demolishing or relocating site electrical items.
   7. Division 2 Section "Site Clearing" for site clearing and removal of above- and below-grade site improvements not part of building demolition
   8. Division 2 Section “Erosion and Sediment Control” for stabilization and control of discharges from the site.

1.03 DEFINITIONS

A. Demolish: Completely remove and legally dispose of off-site.

B. Recycle: Recovery of demolition waste for subsequent processing in preparation for reuse.

C. Remove and Salvage: Carefully detach from existing construction, in a manner to prevent damage, and deliver to Owner. Include fasteners or brackets needed for reattachment elsewhere.

D. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed, removed and salvaged, or recycled.

1.04 MATERIALS OWNERSHIP

A. Unless otherwise indicated, demolition waste becomes property of Contractor.

B. Historic items, relics, antiques, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, and other items of interest or value to Owner that may be uncovered during demolition remain the property of Owner.
   1. Carefully salvage in a manner to prevent damage and promptly return to Owner.

1.05 SUBMITTALS

A. Qualification Data (when required by Owner or Authorities Having Jurisdiction):
   1. Demolition Firm
   2. Test Control Firm
   3. For Refrigerant Recovery Technician.
   4. Licensed Professional Providing Demolition Oversight.

B. Proposed Protection Measures: Submit informational report, including drawings, that indicates the measures proposed for protecting individuals and property. The drawing shall outline proposed methods for dust control, noise control and maintaining the surrounding streets and

buildings in a clean condition for both demolition operations and during debris removal. Indicate proposed locations and construction of barriers.

1. Adjacent Buildings: Detail special measures proposed to protect adjacent buildings to remain.

C. Schedule of Demolition Activities: Contractor to submit for review and approval a detailed schedule for all proposed work to the Owner with the bid package. Submission shall include:
   1. Detailed sequence of demolition work, with starting and ending dates for each activity.
   2. Step-by-step description of all aspects pertaining to the demolition and protection of existing structures, the surrounding community, labor forces, rubble material management and disposal
   3. Temporary interruption of utility services.
   4. Shutoff and capping or re-routing of utility services.

D. Traffic Control Plan: Contractor shall submit Traffic Control Plan with bid package complying with Division 32 Section 321321 “Traffic Control”

E. Utility Schedule:
   1. Contractor to submit to Owner and all affected utility/service companies a proposed schedule of coordination for all necessary utility/service shut-offs, capping and continuation of utility services as required in the contract bid package.
   2. Contractor to provide Owner with written confirmation for all utility or service companies serving the site that service has been terminated prior to capping, abandoning or removal of any utility and prior to commencement of building demolition.
   3. Contractor shall accurately locate and mark on the contract drawings the location of all underground utility and services that have been capped and those that are to remain within the contract area.

F. Permits:
   1. Prior to submission of a bid package, the Contractor shall investigate all permit requirements and include any cost for these requirements in the bid. Prior to the commencement of work, the Contractor shall obtain all necessary permits and certificates associated with utility disconnections, storage tank removals and building demolition work from any and all Federal, State or regulatory authorities having jurisdiction. The Contractor shall incur all fees and other requirements associated with all permits and certificates. Copies of all permits and certificates obtained including drawing and permit preparation, procurements, revisions and filing fees shall be borne by the Contractor.
   2. All permits and certificates shall be obtained by the Contractor prior to applying for and obtaining general demolition permits. The following permits and certificates shall be obtained by the Contractor if applicable:
      a. Plumbing permit for water shut-off
      b. Water shut-off certificate (original)
      c. Plumbing permit for sewer seal
      d. Building and/or Fire Department permit for underground storage tank removal
      e. Letters from Electric and Gas Utility companies and gas meter shut-offs
      f. Letters from Cable TV companies for cable disconnections and removals
      g. Certificate from Tax Office (taxes paid);
      h. Letter to adjacent Owners of proposed demolition with proof of receipt
      i. Exterminator Certificate
      j. Board of Health approval
      k. Soil Erosion and Sediment Control Permit
      l. Asbestos Abatement Permit
      m. Asbestos Abatement Completion
      n. Demolition Contractor’s License
      o. Any other permit or certificate required to perform the demolition work

G. Building Demolition Plans: Drawings indicating the following:
   1. Locations of temporary protection

H. Inventory: Submit a list of items to be removed and salvaged and deliver to Owner prior to start of demolition.

I. Pre-demolition Video: Show existing conditions of adjoining construction and site improvements, including finish surfaces that might be misconstrued as damage caused by building demolition

operations. Documentation to include condition of on-site and adjacent structures and features including but not limited to curbs, sidewalks, landscapes, pavements, utility structures at grade, light poles, telephone poles, fences, bollards, etc… Comply with Division 1 Section 013200 “Construction Progress Documentation” . Submit before the Work begins.

J. Landfill Records: Indicate receipt and acceptance of hazardous wastes by a landfill facility licensed to accept hazardous wastes. Contractor to provide written permission from property owner on whose property the demolition material is to be disposed. Copies of any agreements shall be furnished to the Owner prior to sending any materials from the demolition site.

K. Hazardous Materials: Contractor to deliver manifest or disposal tickets to Owner and Owner’s Engineer for each truck that exits and enters the project site. Manifests shall include:
   1. Date and time of departure from demolition site.
   2. Type of material removed from site and type of material brought to the site.
   3. Amount of material in tons.
   4. Truck ID number
   5. Final destination of excess material.
   6. Date and time of entry to the demolition material
   7. Date and time of entry to the demolition site.
   8. Amount of material
   9. Source of material brought on-site.

L. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered.

1.06 QUALITY ASSURANCE

A. Refrigerant Recovery Technician Qualifications: Certified by EPA-approved certification program.

B. Statement of Refrigerant Recovery: Statement shall be signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant present was recovered and recovery was performed according to EPA regulations. Include name, address and signature on statement along with the date refrigerant was recovered.

C. Regulatory Requirements: Comply with governing EPA notification regulations before beginning demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

D. Standards: Comply with ANSI A10.6 and NFPA 241.

E. Pre-demolition Conference: Conduct conference at Project site to comply with requirements in *Division 01 Section 013200 "Project Management and Coordination."*. Review methods and procedures related to building demolition including, but not limited to, the following:
   1. Inspect and discuss condition of construction to be demolished.
   2. Review structural load limitations of existing structures.
   3. Review and finalize building demolition schedule and verify availability of demolition personnel, equipment, and facilities needed to make progress and avoid delays.
   4. Review and finalize protection requirements.
   5. Review procedures for noise control and dust control.
   6. Review procedures for protection of adjacent buildings.
   7. Review items to be salvaged and returned to Owner.

F. Progress Meetings: Once demolition work has begun Contractor shall schedule, administer and attend regularly scheduled meetings. Contractor shall include selected subcontractors as necessary to attend Progress Meetings. Contractor to schedule time and frequency of meetings at Owner’s request to maintain optimum degree of communication between all parties involved.

1.07 PROJECT CONDITIONS

A. Buildings to be demolished will be vacated and their use discontinued before start of the Work.

B. Buildings immediately adjacent to demolition area will be occupied. Conduct building demolition so operations of occupied buildings will not be disrupted.
   1. Provide not less than 72 hours' notice of activities that will affect operations of adjacent occupied buildings.
   2. Maintain access to existing walkways, exits, and other facilities used by occupants of adjacent buildings.

a. Do not close or obstruct walkways, exits, or other facilities used by occupants of adjacent buildings without written permission from authorities having jurisdiction.

C. Owner assumes no responsibility for buildings and structures to be demolished.
   1. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.

D. Removal and Relocation of Existing Utilities/Structures: The Contractor shall be responsible for removal and/or relocation of existing utilities/structures, whether shown or not shown on the drawings, at locations where conflicts occur with proposed improvements at no additional cost to the owner.

E. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work unless otherwise indicated in the contract documents.
   1. If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify Owner. Hazardous materials will be removed by Owner under a separate contract.

F. On-site storage or sale of removed items or materials is not permitted.

1.08 COORDINATION

A. Arrange demolition schedule so as not to interfere with Owner's on-site operations or operations of adjacent occupied buildings.

PART 2 - PRODUCTS

2.01 The Contractor shall supply all materials as required for this work.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Review Project Record Documents of existing construction provided by Owner. Owner does not guarantee that existing conditions are same as those indicated in Project Record Documents.

B. Inventory and record the condition of items to be removed and salvaged. Provide video of conditions that might be misconstrued as damage caused by salvage operations. Comply with *Division 01 Section 013200 "Construction Progress Documentation".*

C. Survey condition of existing building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during building demolition operations. Correlate existing conditions with requirements indicated on drawings to help determine extent of work.

D. Verify that hazardous materials have been remediated before proceeding with building demolition operations.

E. Verify that all asbestos containing materials have been removed before proceeding with building demolition operations.

F. Verify all sediment control measures are in place per the Phase I Erosion and Sediment Control Plan and Division 31 Section 311100 "Erosion and Sediment Control" *(forthcoming Division 31 Section 311100)* and the Stormwater Pollution Prevention Plan.

3.02 PREPARATION

A. Refrigerant: Remove refrigerant from mechanical equipment according to 40 CFR 82 and regulations of authorities having jurisdiction before starting demolition.

B. Existing Utilities: Locate, identify, disconnect, and seal or cap off indicated utilities serving buildings and structures to be demolished.
   1. Arrange to shut off indicated utilities with utility companies.
   2. If removal, relocation, or abandonment of utility services will affect adjacent occupied buildings, then provide temporary utilities that bypass buildings and structures to be demolished and that maintain continuity of service to other buildings and structures as acceptable to Owner and authorities having jurisdiction.
   3. Cut off pipe or conduit a minimum of 24 inches (610 mm) below grade. Cap, valve, or plug and seal remaining portion of pipe or conduit after bypassing according to requirements of authorities having jurisdiction.

C. Existing Utilities: Refer to Divisions 22 and 26 Sections for shutting off, disconnecting, removing, and sealing or capping utilities. Do not start demolition work until utility disconnecting and sealing have been completed and verified in writing.

D. Temporary Shoring: Provide and maintain interior and exterior shoring, bracing, or structural support to preserve stability and prevent unexpected movement or collapse of construction being demolished.
   1. Strengthen or add new supports when required during progress of demolition.

E. Salvaged Items: Comply with the following:
   1. Clean salvaged items of dirt and demolition debris.
   2. Pack or crate items after cleaning. Identify contents of containers.
   3. When permitted by Owner items removed may be stored in protected storage location during demolition and returned in original locations after demolition operations are complete. Store items in a secure area until delivery to Owner.
   4. Transport items to storage area designated by Owner or as indicated on Drawings.
   5. Protect items from damage during transport and storage.

3.03 PROTECTION

A. Existing Facilities: Protect adjacent walkways, loading docks, building entries, and other building facilities during demolition operations. Maintain exits from existing buildings.

B. Existing Utilities: Maintain utility services to remain and protect from damage during demolition operations.
   1. Do not interrupt existing utilities serving adjacent occupied or operating facilities unless authorized in writing by Owner and authorities having jurisdiction.
   2. Provide temporary services during interruptions to existing utilities, as acceptable to Owner and authorities having jurisdiction.
      a. Provide at least 72 hours' notice to occupants of affected buildings if shutdown of service is required during changeover.

C. Temporary Protection: Erect temporary protection, such as walks, fences, railings, canopies, and covered passageways, where required by authorities having jurisdiction and as indicated. Comply with requirements in Division 01 Section 015000 "Temporary Facilities and Controls"
   1. Protect adjacent buildings and facilities from damage due to demolition activities.
   2. Protect existing site improvements, appurtenances, and landscaping to remain.
   3. Erect a plainly visible fence around drip line of individual trees or around perimeter drip line of groups of trees to remain.
   4. Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
   5. Provide protection to ensure safe passage of people around building demolition area and to and from occupied portions of adjacent buildings and structures.
   6. Protect walls, windows, roofs, and other adjacent exterior construction that are to remain and that are exposed to building demolition operations.
   7. Erect and maintain dustproof partitions and temporary enclosures to limit dust, noise, and dirt migration to occupied portions of adjacent buildings.

D. Remove temporary barriers and protections where hazards no longer exist. Where open excavations or other hazardous conditions remain, leave temporary barriers and protections in place.

3.04 DEMOLITION, GENERAL

A. General: Demolish indicated existing buildings and site improvements completely as specifically identified on the construction drawings. Use methods required to complete the Work within limitations of governing regulations and as follows:
   1. Do not use cutting torches until work area is cleared of flammable materials. Maintain portable fire-suppression devices during flame-cutting operations.
   2. Maintain fire watch during and hours after flame cutting operations as required by authorities having jurisdiction.
   3. Maintain adequate ventilation when using cutting torches.

4. Locate building demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.

B. Engineering Surveys: During demolition, perform surveys to detect hazards that may result from building demolition activities.

C. Site Access and Temporary Controls: Conduct building demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
   1. Do not close or obstruct streets, walks, walkways, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.
   2. Use water mist and other suitable methods to limit spread of dust and dirt. Comply with governing environmental-protection regulations. Do not use water when it may damage adjacent construction or create hazardous or objectionable conditions, such as ice, flooding, and pollution.

3.05 DEMOLITION BY MECHANICAL MEANS

A. Proceed with demolition of structural framing members systematically, from higher to lower level. Complete building demolition operations above each floor or tier before disturbing supporting members on the next lower level.

B. Remove debris from elevated portions of the building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.
   1. Remove structural framing members and lower to ground by method suitable to minimize ground impact and dust generation.

C. Salvage: Items to be salvaged are indicated on Drawings**.**

D. Below-Grade Construction: Abandon foundation walls and other below-grade construction. Cut below-grade construction flush with grade.

E. Below-Grade Construction: Demolish foundation walls and other below-grade construction that are within footprint of new construction and extending 10 feet (3 m) outside footprint indicated for new construction. Abandon below-grade construction outside this area.
   1. Remove below-grade construction, including basements, foundation walls, and footings, to at least 24 inches (600 mm) below grade or as indicated on drawings or as required to eliminate conflict with new construction.

F. Existing Utilities: Abandon existing utilities and below-grade utility structures. Cut utilities flush with grade.

G. Existing Utilities: Demolish existing utilities and below-grade utility structures that are within 10 feet (3 m) outside footprint indicated for new construction. Abandon utilities outside this area.

1. Fill abandoned utility structures with satisfactory soil materials or recycled pulverized concrete and as indicated on the drawings or directed by Owner and according to backfill requirements in Division 31 Section312000 "Earth Moving"

3.06 DEMOLITION BY EXPLOSIVES

A. Explosives: Perform explosive demolition only as approved by Owner and according to governing regulations.

3.07 SITE RESTORATION

A. Below-Grade Areas: Rough grade below-grade areas ready for further excavation or new construction.

B. Below-Grade Areas: Completely fill below-grade areas and voids resulting from building demolition operations with satisfactory soil materials according to backfill requirements in Division 31 Section 312000"Earth Moving"

C. Site Grading: Uniformly rough grade area of demolished construction to a smooth surface, free from irregular surface changes. Provide a smooth transition between adjacent existing grades and new grades.

3.08 REPAIRS

A. Promptly repair damage to adjacent buildings caused by demolition operations.

B. Where repairs to existing surfaces are required, patch to produce surfaces suitable for new materials.
C. Restore exposed finishes of patched areas and extend restoration into adjacent construction in a manner that eliminates evidence of patching and refinishing.

3.09 DISPOSAL OF DEMOLISHED MATERIALS

A. Remove demolition waste materials from Project site and safely dispose of all items in accordance with applicable EPA, State and local authorities having jurisdiction and all codes and ordinances. *(See Division 01 Section "Construction Waste Management and Disposal" for recycling and disposal of demolition waste.)*
B. All recycling must be conducted in accordance with all currently applicable EPA, State and Local authorities having jurisdiction waste flow regulations. All recycling of demolition debris must be approved by Owner.
   1. Do not allow demolished materials to accumulate on-site.
   2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
C. Do not burn demolished materials.

3.10 CLEANING

A. Clean adjacent structures and improvements of dust, dirt, and debris caused by building demolition operations. Return adjacent areas to condition existing before building demolition operations began.

END OF SECTION 024116

SECTION 31 10 00

SITE CLEARING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and all Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:
   1. Protecting existing vegetation to remain.
   2. Removing existing vegetation.
   3. Clearing and grubbing.
   4. Stripping and stockpiling topsoil.
   5. Removing above- and below-grade site improvements.
   6. Disconnecting, capping or sealing, and removing site utilities abandoning site utilities in place.

B. Related Sections:
   1. Division 01 Section "Field Engineering" for temporary utility services, construction and support facilities, security and protection facilities
   2. Division 02 Section “Demolition" for demolition of buildings, structures, and site improvements.
   3. Division 01 Section “Erosion and Sediment Control”.
   4. Division 31 Section “Earth Moving”.

1.03 DEFINITIONS

A. Subsoil: All soil beneath the topsoil layer of the soil profile, and typified by the lack of organic matter and soil organisms.

B. Surface Soil: Soil that is present at the top layer of the existing soil profile at the Project site. In undisturbed areas, the surface soil is typically topsoil; but in disturbed areas such as urban environments, the surface soil can be subsoil.

C. Topsoil: Top layer of the soil profile consisting of existing native surface topsoil or existing in-place surface soil and is the zone where plant roots grow. Its appearance is generally friable, pervious, and black or a darker shade of brown, gray, or red than underlying subsoil; reasonably free of subsoil, clay lumps, gravel, and other objects more than 2 inches (50 mm) in diameter; and free of subsoil and weeds, roots, toxic materials, or other nonsoil materials.

D. Plant-Protection Zone: Area surrounding individual trees, groups of trees, shrubs, or other vegetation to be protected during construction, and indicated on Drawings.

E. Vegetation: Trees, shrubs, groundcovers, grass, and other plants.

1.04 MATERIAL OWNERSHIP

A. Except for stripped topsoil and other materials indicated to be stockpiled or otherwise remain Owner's property, cleared materials shall become Contractor's property and shall be removed from Project site.

1.05 SUBMITTALS

A. Existing Conditions: Documentation of existing trees and plantings, adjoining construction, and site improvements that establishes preconstruction conditions that might be misconstrued as damage caused by site clearing.
   1. Use sufficiently detailed photographs or include plans and notations to indicate specific wounds and damage conditions of each tree or other plants designated to remain.

B. Record Drawings: Identifying and accurately showing locations of capped utilities and other subsurface structural, electrical, and mechanical conditions.

1.06 QUALITY ASSURANCE

A. Pre-construction meeting: Discuss site clearing and vegetation protection at SWPPP Pre-construction meeting at project site or agreed-upon location prior to site clearing and grading.

1.07 PROJECT CONDITIONS

A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.
   1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
   2. Provide alternate routes around closed or obstructed traffic ways if required by Owner or authorities having jurisdiction.

B. Improvements on Adjoining Property: Authority for performing site clearing indicated on property adjoining Owner's property will be obtained by Owner before award of Contract.
   1. Do not proceed with work on adjoining property until directed by Owner.
   2. All benchmarks and monuments shall be protected during construction. If disturbed or destroyed, they shall be replaced in original position by a licensed surveyor at the Contractor’s expense.
   3. Protect areas outside limits of disturbance from encroachment by construction personnel or equipment, regardless of property ownership. Access shall be by specific written permission or easement only.

C. Contractor shall verify existing grades prior to performing work under this section. If existing grades are at variance with the drawings, notify the Owner and receive instructions prior to proceeding. No additional compensation will be considered resulting from grade variances once site clearing has commenced.

D. Salvable Improvements: Carefully remove items indicated to be salvaged and store on Owner's premises where indicated.

E. Utility Locator Service: Notify utility locator service for area where Project is located before site clearing.

F. Do not commence site clearing operations until temporary sediment control, runoff control and other best management practices including plant protection measures are in place as shown on the Drawings and indicated in the Sequence of Construction.

G. The following practices are prohibited within protection zones:
   1. Storage of construction materials, debris, or excavated material.
   2. Parking vehicles or equipment.
   3. Foot traffic.
   4. Erection of sheds or structures.
   5. Impoundment of water.
   6. Excavation or other earthwork unless otherwise indicated.
   7. Attachment of signs to or wrapping materials around trees or plants unless otherwise indicated.

H. Do not direct vehicle or equipment exhaust towards protection zones.

I. Prohibit heat sources, flames, ignition sources, and smoking within or near protection zones.

J. Soil Stripping, Handling, and Stockpiling: Perform only when the topsoil is dry or slightly moist.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Satisfactory Soil Material: Requirements for satisfactory soil material are specified in Division 31 Section "Earth Moving."
   1. Obtain approved borrow soil material off-site when satisfactory soil material is not available on-site. Borrow material must be obtained from a permitted site.

PART 3 - EXECUTION

3.01 PREPARATION

A. Protect and maintain benchmarks and survey control points from disturbance during construction.

B. Locate and clearly identify trees, shrubs, and other vegetation to remain or to be relocated. Flag each tree trunk at 54 inches (1372 mm) above the ground.
C. Protect existing site improvements to remain from damage during construction.
   1. Restore damaged improvements to their original condition, as acceptable to Owner.

3.02 TEMPORARY EROSION AND SEDIMENTATION CONTROL

A. Provide erosion and sediment control measures to prevent soil erosion and discharge of sediment and other pollutants to surface waters or airborne dust to adjacent properties and walkways, according to erosion and sediment control Drawings and requirements of authorities having jurisdiction.
B. Provide erosion and sediment control measures in accordance with Division 01 Section “Erosion and Sediment Control” , prior to any construction activity (including demolition).
C. At Final Stabilization, remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

3.03 TREE AND PLANT PROTECTION

A. General: Protect existing trees and plants to remain or be relocated on-site according to work shown on the Construction Drawings. All trees and plants to remain shall be barricaded and protected during the construction process
   1. Tree Protection
      a. Erect and maintain a temporary fence directly below the drip line of individual trees or directly below the perimeter drip line of groups of trees to remain. Remove fence when construction is complete.
      b. Do not excavate, for any reason, within the area directly below the drip lines of trees, unless otherwise indicated.
      c. Where excavation for new construction is required within the drip line of trees, hand clear and excavate to minimize damage to root systems. Use narrow-tine spading forks, comb soil to expose roots, and cleanly cut roots as close to excavation as possible.
      d. Repair or replace trees and vegetation indicated to remain that are damaged by construction operations, in a manner approved by the Owner.
B. Limit of clearing is to be staked in accordance with Division 01 Section “Field Engineering”, and verified by Owner prior to removal of any trees.
C. All trees and plants not designated to remain within the area to be graded, shall be cut and the removal of stumps shall comply with Article 3.5 of this Section. Burning on site is not permitted, unless otherwise approved by the Owner and authorities having jurisdiction.
D. Repair or replace trees, shrubs, and other vegetation indicated to remain or be relocated that are damaged by construction operations, in a manner approved by Owner.

3.04 EXISTING UTILITIES

A. Locate, identify, disconnect, and seal or cap utilities indicated to be removed or abandoned in place.
   1. Arrange with utility companies to shut off indicated utilities.
B. Locate, identify, and disconnect utilities indicated to be abandoned in place.
C. Interrupting Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
   1. Notify Owner not less than seven calendar days in advance of proposed utility interruptions.
   2. Do not proceed with utility interruptions without Owner's written permission.
D. Excavate for and remove underground utilities indicated to be removed.

3.05 CLEARING AND GRUBBING

A. Remove obstructions, trees, shrubs, and other vegetation to permit installation of new construction.
   1. Do not remove trees, shrubs, grass, and other vegetation indicated to remain or to be relocated.
   2. Removal includes digging or grinding down stumps and remove roots, obstructions, and debris to a depth of 18 inches (450 mm) below exposed subgrade.

3. In areas outside the building limits where the depth of fill exceeds 8 feet in height, unless otherwise directed by the Owner, sound trees shall be cut at a height of not more than 6 inches above natural ground.
4. Use only hand methods for grubbing within protection zones.
5. Chip removed tree branches and stockpile in areas shown on the Drawings and as approved by Owner. Re-use material as indicated on the Drawings otherwise dispose of off-site.

B. Fill depressions caused by clearing and grubbing operations with satisfactory soil material unless further excavation or earthwork is indicated.
1. Place fill material in horizontal layers not exceeding a loose depth of 8 inches (200 mm), and compact each layer to a density equal to adjacent original ground, and in accordance with Division 31 Section “Earth Moving”.

3.06 TOPSOIL STRIPPING

A. Remove sod and grass before stripping topsoil.

B. Strip topsoil to the full depth encountered in areas indicated to be graded and in a manner to prevent intermingling with underlying subsoil or other waste materials.
1. Remove subsoil and nonsoil materials from topsoil, including clay lumps, gravel, and other objects more than 2 inches (50 mm) in diameter; trash, debris, weeds, roots, and other waste materials.

C. Stockpile sufficient topsoil material to facilitate seeding and landscaping. Stockpile topsoil away from edge of excavations without intermixing with subsoil. Grade and shape stockpiles to drain away from stockpile. Refer to Division 01 Section “Erosion and Sediment Control” or cover to prevent windblown dust and erosion by water.
1. Limit height of topsoil stockpiles to 72 inches (1800 mm).
2. Do not stockpile topsoil within tree protection zones.
3. Dispose of surplus soil material, unsuitable or excess topsoil, obstructions, demolished materials, and waste materials, including trash and debris, and in compliance with all regulations. Surplus topsoil is that which exceeds quantity indicated to be stockpiled or reused.
4. Stockpile surplus topsoil to allow for re-spreading deeper topsoil.

3.07 SITE IMPROVEMENTS

A. Remove existing above- and below-grade improvements as indicated and necessary to facilitate new construction.

3.08 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials including trash and debris, and legally dispose of them off Owner's property.

B. If indicated on the Drawings and/or in the Stormwater Pollution Prevention Plan separate recyclable materials produced during site clearing from other nonrecyclable materials. Store or stockpile without intermixing with other materials and transport them to recycling facilities. Do not interfere with other Project work.

END OF SECTION 311000

SECTION 31 20 00

EARTH MOVING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and all Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:
   1. Cutting, proofrolling, filling, grading and preparing subgrades, required lines, dimensions, contours and elevations for proposed improvements including slabs-on-grade, walks, pavements, turf and grasses, and plants as shown and implied on the drawings or required by these specifications.
   2. Scarifying, compaction, moisture content conditioning and control, and removal of unsuitable materials to ensure proper preparation of areas for the proposed improvements.
   3. Excavating and backfilling for buildings and structures.
   4. Special construction procedures for the site recommended in the geotechnical report for preparation of building and pavement areas.
   5. Drainage course for concrete slabs-on-grade.
   6. Subbase course for concrete walks and pavements.
   7. Subbase course and base course for asphalt paving.
   8. Subsurface drainage backfill for walls and trenches.
   9. Excavating and backfilling trenches for utilities and pits for buried utility structures.

B. Related Sections:
   1. Division 01 Section "Field Engineering" for temporary controls, utilities, and support facilities; also for temporary site fencing if not in another Section.
   2. Division 31 Section "Earth Moving" for site stripping, grubbing, stripping and stockpiling topsoil, and removal of above- and below-grade improvements and utilities.
   3. Division 32 Section “Planting” for finish grading in turf and grass areas, including preparing and placing planting soil for turf areas.
   4. Division 32 Section “Planting” for finish grading in planting areas and tree and shrub pit excavation and planting.

1.03 UNIT PRICES

A. Work of this Section is affected by unit prices for earth moving specified in Division 01 Section "Unit Prices."

B.

C. Rock Measurement: Volume of rock actually removed, measured in original position, but not to exceed the following. Unit prices for rock excavation include replacement with approved materials.
   1. 24 inches (600 mm) outside of concrete forms other than at footings.
   2. 12 inches (300 mm) outside of concrete forms at footings. Additional depth may be required due to local codes or based on the geotechnical engineering study.
   3. Neat outside of minimum required dimensions of concrete cast against grade.
   4. Outside dimensions of concrete walls indicated to be cast against rock without forms or exterior waterproofing treatments.
   5. 6 inches (150 mm) beneath bottom of concrete slabs-on-grade.
   6. 12 inches (300 mm) beneath pipe invert elevation in trenches, and 12 inches (300 mm) wider than outside surface of either side of pipe or conduit. Removal of rock for trench excavation will be paid as part of the corresponding utility items unless stated elsewhere in the contract documents.

1.04 DEFINITIONS

A. Backfill: Soil material or controlled low-strength material used to fill an excavation.
   1. Initial Backfill: Backfill or bedding material backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
   2. Final Backfill: Backfill placed over initial backfill to fill a trench.

B. Base Course: Aggregate layer placed between the subbase course and hot-mix asphalt paving.

C. Bedding Course: Aggregate layer placed over the excavated subgrade in a trench before laying pipe.

D. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill.

E. Drainage Course: Aggregate layer supporting the slab-on-grade that also minimizes upward capillary flow of pore water.

F. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated.
   1. Classified Excavation: Classified excavation shall be defined as the excavation necessary to subgrade lines and grades as shown on the contract drawings, which shall be a lump sum bid. Any and all unsuitable material, undercut excavation, mass rock excavation, trench rock excavation, mechanical rock excavation and soil stabilization shall be paid in addition to the classified excavation lump sum bid, by unit prices measured in-place. In the event the Owner elects to change the lines and grades as shown on the contract drawings, unit process shall be used to increase or decrease the contract amount in accordance with the change.
   2. Unclassified Excavation: Unclassified excavation shall be defined as all material excavated to and below the lines and grades as shown on the contract drawings to provide a firm and unyielding subgrade, regardless of its nature or composition, which includes any and all on-site cut or fill, off-site import or export, topsoil removal, subgrade preparation, unsuitable material, undercut excavation, mass rock excavation, trench rock excavation, mechanical rock excavation, utility and storm drainage trench excavation, and soil stabilization. Unclassified excavation shall be a lump sum bid with a unit price per cubic yard for unclassified excavation. In the event the Owner elects to change the lines and grades as shown on the contract drawings, the unclassified excavation unit price shall be used to increase or decrease the contract amount in accordance with the change.
   3. Authorized Additional Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions as directed by Owner. Authorized additional excavation and replacement material will be paid for according to Contract provisions for unit prices.
   4. Bulk Excavation: Excavation more than 10 feet (3 m) in width and more than 30 feet (9 m) in length.
   5. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions without direction by Owner. Unauthorized excavation, as well as remedial work directed by Owner, shall be without additional compensation.

G. Fill: Soil materials used to raise existing grades.
   1. If necessary, off-site fill (borrow) shall be obtained and provided by the Contractor. The Contractor is responsible for all permits and regulatory requirements associated with offsite borrow sources.

H. Geogrid: A biaxial polymeric grid formed by a regular network of integrally connected tensile elements with apertures of sufficient size to allow interlocking with surrounding soil, rock, or earth to function primarily as a reinforcement.

I. Minimum Average Roll Value (MARV): A value based on testing and determined in accordance with ASTM D4759-92.

J. Rock: Rock material in beds, ledges, unstratified masses, conglomerate deposits, and boulders of rock material that exceed 1 cu. yd. (0.76 cu. m) for bulk excavation or 3/4 cu. yd. (0.57 cu. m) for footing, trench, and pit excavation that cannot be removed by rock excavating equipment

equivalent to the following in size and performance ratings, without systematic drilling, ram hammering, ripping, or blasting, when permitted:

1. Excavation of Footings, Trenches, and Pits: Late-model, track-mounted hydraulic excavator; equipped with a 42-inch- (1065-mm-) wide, maximum, short-tip-radius rock bucket; rated at not less than 138-hp (103-kW) flywheel power with bucket-curling force of not less than 28,700 lbf (128 kN) and stick-crowd force of not less than 18,400 lbf (82 kN) with extra-long reach boom; measured according to SAE J-1179.
2. Bulk Excavation: Late-model, track-mounted loader; rated at not less than 230-hp (172-kW) flywheel power and developing a minimum of 47,992-lbf (213.3-kN) breakout force with a general-purpose bare bucket; measured according to SAE J-732.

K. Rock: Rock material in beds, ledges, un-stratified masses, conglomerate deposits, and boulders of rock material defined as:

1. General Excavation: Any material that cannot be excavated with a single-toothed ripper drawn by a crawler tractor having a minimum draw bar pull rated at not less than 71,000 lbs. (Caterpillar D9N or equivalent), and occupying an original volume of at least 2 cubic yards or more.
2. Trench Excavation: Any material that cannot be excavated with a backhoe having a break out force rated at not less than 44,000 lbs (Caterpillar 235D or equivalent), and occupying an original volume of at least 2 cubic yards.
3. Mechanical Excavation: Any material that must be excavated by a minimum 10,000 lb. mechanical hammer and occupying an original volume of at least 2 cubic yards.

L. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.

M. Subbase Course: Aggregate layer placed between the subgrade and base course for hot-mix asphalt pavement, or aggregate layer placed between the subgrade and a cement concrete pavement or a cement concrete or hot-mix asphalt walk.

N. Subgrade: Uppermost surface of an excavation or the top surface of a fill or backfill immediately below subbase, drainage fill, drainage course, or topsoil materials.

O. Utilities: On-site underground pipes, conduits, ducts, and cables, as well as underground services within buildings.

1.05 SUBMITTALS

A. Product Data: For each type of the following manufactured products required:

1. Geotextiles.
2. Controlled low-strength material, including design mixture.
3. Geofoam.
4. Warning tapes.

B. Samples for Verification: For the following products, in sizes indicated below:

1. Geotextile and Geogrid: Submit product data sheet and certification from Manufacturer the product supplied meets the requirement of this section. Submit Manufacturer’s installation instructions and general recommendations.

C. Qualification Data: For qualified testing agency.

D. Construction Sequence

1. Within 10 days after award of the contract, the Contractor shall submit to the Owner, with his bid package, a schedule detailing the sequence and time of completion of all phases of work under this section.

E. Material Test Reports:

1. At least two (2) weeks in advance of importing material and for each borrow soil material proposed for fill and backfill, the Contractor shall notify the geotechnical engineer of the location of the borrow area. The geotechnical engineer shall furnish reports to the Owner and Contractor information as follows:
    a. Moisture and Density Relationship: ASTM D1557 or D698 as required by the project geotechnical engineering study.
    b. Mechanical Analysis: AASHTO T-88.
    c. Plasticity Index: ASTM D4318.

d. Classification according to ASTM D 2487.
e. 5 pound sample of each type of borrow material in an air tight container for the approval of the geotechnical engineer and Owner.
f. The name of each material supplier and specific type and source of each material. Any change in source or soil type throughout the project will require approval of the geotechnical engineer and Owner.

2. For Trench Excavation and Backfill: Contractor shall contact all utility companies and identify any requirements necessary for the construction of the Project. In addition provide:
   a. Contractor to provide written confirmation on the status of all utility construction approvals and requirements to the Owner at the time of the pre-construction conference or no later than 30 days following the project possession date.
   b. Submit a sample of each type of offsite fill and/or bedding material that is to be used in backfilling trenches.
3. For Aggregate Base Course: at least two weeks in advance of imported aggregate use, the Contractor shall submit the following laboratory test date, in conformance with the specified DOT aggregate materials:
   a. Particle Size Analysis: AASHTO T-88; and,
   b. Density: Modified Proctor Test (ASTM D1557)
   c. Name of aggregate base course material supplier and specific type and source of each material, including relevant DOT compaction or specifications. Any change in source or aggregate base course type throughout the job requires approval of the Owner and the geotechnical engineer.
   d. The geotechnical engineer shall prepare field reports that indicate compaction test location, elevation data, testing results and acceptability. The Owner and Contractor shall be provided with copies of reports within 24 hours of time test was performed.

F. Blasting plan approved by authorities having jurisdiction is to be provided to the Owner at least 14 calendar days prior to commencement of blasting. Blasting plan to include all Federal, State and local permits applicable to the blasting operation. Blasting will be performed in accordance with all applicable laws, regulations, ordinances and industry standards. Plan shall coordinate with grading contractor to insure appropriate safety procedures are followed including signage and signaling devices.

G. Blasting Contractor: All blasting to be performed by an insured, certified and licensed blasting Contractor. Proof of applicable insurance, license and certifications must be provided to the Owner at least 30 days prior to commencement of any blasting work. **Blasting Contractor shall carry the following insurance: Workers Compensation, Comprehensive General Liability, Broad Form Property Damage, Contractual Liability and Explosion, Collapse and Underground Hazard (naming the Owner as additionally insured).** Contractor must indemnify and hold harmless the Owner for all claims for damages arising from the blasting operation.

H. The Blasting Contractor shall furnish a seismic survey report from seismic survey agency. The report will show the number of holes drilled, depth of holes, the burden and spacing, the amount of powder per hole, pound of powder per delay, the delay pattern, seismograph locations, and chronograph locations. The Seismic survey shall provide seismograph recordation of each blast at all adjacent structures. All reports shall be forwarded to the Owner.

I. Contractor shall have the responsibility of furnishing a pre-blast survey of the surrounding area. Survey will include a one-quarter mile radius of the surrounding area.

J. The Contractor shall provide and maintain a post-blast report including the amount of material displaced by each blast, the amount of explosive utilized in each blast, and the number of shots detonated. This report will be forwarded to the Owner.

K. Pre-blast Photographs or Videotape: Show existing conditions of adjoining construction and site improvements, including finish surfaces, which might be misconstrued as damage caused by blasting operations. Submit before blasting begins.

1.06 QUALITY ASSURANCE

A. Blasting: Comply with applicable requirements in NFPA 495, "Explosive Materials Code," and prepare a blasting plan reporting the following:

1. Types of explosive and sizes of charge to be used in each area of rock removal, types of blasting mats, sequence of blasting operations, and procedures that will prevent damage to site improvements and structures on Project site and adjacent properties.
2. Seismographic monitoring during blasting operations.

B. Blasting Requirements;
1. Perform blasting only after receiving written approval from Owner and authorities having jurisdiction.
2. Provide heavy mats as necessary to minimize concussion. Handle, store and use explosives in accordance with the Manual of Accident Prevention in Construction by the Associated General Contractor's of America, Inc., 1978 edition.

C. Seismic Survey Agency: An independent testing agency, acceptable to authorities having jurisdiction, experienced in seismic surveys and blasting procedures to perform the following services:
1. Report types of explosive and sizes of charge to be used in each area of rock removal, types of blasting mats, sequence of blasting operations, and procedures that will prevent damage to site improvements and structures on Project site and adjacent properties.
2. Seismographic monitoring during blasting operations.

D. Contractor Qualifications: The Contractor shall provide at least one supervisory person who shall be present at all times during execution of the work and who is thoroughly familiar with the type of work being performed and its best methods for completion. This person shall have the authority to act on behalf of the Contractor.

E. Geotechnical Engineering Study (Soils Report)
1. The Owner employed a geotechnical engineer to investigate sub-surface soil conditions and make recommendations regarding site work construction procedures. Perform all work in accordance with the recommendations and requirements therein. If conflicts exist between the geotechnical engineering study and the construction drawings and specifications, the more stringent requirements shall apply.

F. Geotechnical Testing Agency Qualifications: A geotechnical engineer shall be familiar with the requirements of the geotechnical engineering study, selected and paid by the Owner, will be retained to perform construction inspection on site based on density testing, visual observation and judgment. These inspections shall not relieve the Contractor from his responsibility to complete the work in accordance with the drawings and specifications.
1. Qualified according to ASTM E 329 and ASTM D 3740 for testing indicated.
2. Provide one compaction test per Table 3.16C for each lift within the pavement area.
3. Provide construction inspection and testing on trench backfilling operations.
4. Provide visual field confirmation and density testing of subgrade preparation and fill placement procedures as part of the construction testing requirements. The Contractor shall be informed as soon as possible of test results.
5. Geotechnical engineer shall prepare field reports that indicate compaction test location, elevation data, testing results and acceptability. The Owner and Contractor shall be provided with written copies of the results within 24 hours of time test was performed.
6. All costs associated with required re-inspection due to failures shall be paid for by the Contractor at no additional expense to the Owner. The Owner reserves the right to direct any inspection that they deem necessary. Contractor shall provide free access to the site for inspection activities.

G. Pre-excavation Conference: Conduct conference at Project site.

H. Geogrid Pre-construction Conference: Contractor to arrange site meeting with material supplier, installer, Owner and Engineer prior to installation of geogrid. Owner and Engineer shall be notified at least seven (7) days prior to the meeting.

I. Project Record Documents: Contractor to accurately record actual locations of all subsurface utilities, structures and obstructions encountered. Accurately record any as-built variation from the construction drawings and specifications. The Contractor shall provide as-built drawings within 30 days of project completion.

1.07 PROJECT CONDITIONS

A. General: The Contractor shall be responsible for removal and/or relocation of existing utilities at locations where conflicts occur with proposed utility improvements whether shown or not shown on the drawings. Removal and/or relocation shall be at no additional cost to the Owner.

B. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during earth moving operations.
   1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
   2. Provide alternate routes around closed or obstructed traffic ways if required by Owner or authorities having jurisdiction.

C. Improvements on Adjoining Property: Authority for performing earth moving indicated on property adjoining Owner's property will be obtained by Owner before award of Contract.
   1. Do not proceed with work on adjoining property until directed by Owner.

D. Utility Locator Service: Notify utility locator service for area where Project is located before beginning earth moving operations.

E. Do not commence earth moving operations until temporary erosion- and sedimentation-control measures, specified in Division 2 Section "Temporary Facilities and Controls," Division 2 Section “Erosion and Sediment Control” and Division 2 Section "Site Clearing," are in place.

F. Do not commence earth moving operations until plant-protection measures specified in Division 2 Section "Temporary Tree and Plant Protection" are in place.

G. The following practices are prohibited within plant-protection zones (if indicated on the Drawings:
   1. Storage of construction materials, debris, or excavated material.
   2. Parking vehicles or equipment.
   3. Erection of sheds or structures.
   4. Impoundment of water.
   5. Excavation or other digging unless otherwise indicated.
   6. Attachment of signs to or wrapping materials around trees or plants unless otherwise indicated.

H. Do not direct vehicle or equipment exhaust towards protection zones.

I. Prohibit heat sources, flames, ignition sources, and smoking within or near protection zones.

PART 2 - PRODUCTS

2.01 SOIL MATERIALS

A. General: Obtain and provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.

B. Satisfactory Soils: Soil Classification Groups consistent with geotechnical report and according to ASTM D 2487; free of rock or gravel larger than 2 inches (50 mm) in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.
   1. Soil materials used for fill shall be clean, well graded granular soil which is non-expansive and non-collapsible and shall have less than 20% by weight passing the #200 sieve. The portion passing the #200 sieve shall be non-plastic. Fill with fewer fines (less than #200) must be approved by the geotechnical engineer. Fill with more than 20% fines may be acceptable only if so indicated in the geotechnical engineering study.
   2. Prior to placement material used for fill shall not contain:
      a. Debris (other than crushed concrete and brick meeting the requirements in 2.1.B.3);
      b. Timber or railroad ties;
      c. Deleterious materials such as steel rails;
      d. Trash or hazardous materials.
      e. Hazardous materials, unsuitable and deleterious materials and debris shall be disposed of off-site in accordance with all applicable regulations.
   3. On-site Soils:
      a. On-site materials for use as fill shall consist of excavated soil from other portions of the site.

b. Contractor to use on-site soil judiciously to facilitate construction schedule including the use of the most readily compactable soil for fill in building areas and fill within 2 feet of pavement sub-grade.
c. Topsoil shall not be utilized as engineered fill.
d. Excavated material containing rock, stone or masonry debris smaller than 2 feet in its largest dimension may be mixed with suitable material and utilized inside the building limits up to 6 feet below proposed subgrade and up to 3 feet below proposed subgrade outside building limits.
e. Excavated material containing rock, stone or masonry debris smaller than 6 inches in the largest dimension may be mixed with suitable material and utilized inside the building limits up to 3 feet below proposed subgrade and up to 18 inches below proposed subgrade outside the building limits.
f. No material greater than 2 inches in its largest dimension may be utilized inside the building limits within 3 feet of the proposed subgrade or within 18 inches of proposed subgrade for all other areas.
g. No material greater than 1-1/2 inches in its largest dimension may be utilized as backfill for storm drainage or utility trenches.

4. Imported Borrow:
   a. Imported fill (borrow) shall meet the requirements of on-site soils and shall be free from all hazardous substances. Certification of compliance, and if requested, test results certifying compliance shall be furnished by the geotechnical engineer.
   b. The Owner reserves the right to test off-site borrow material for conformance with these specifications.

C. Unsatisfactory Soils: Soil identified by the geotechnical engineer according to ASTM D 2487.
   1. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction.

D. Subbase Material: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 90 percent passing a 1-1/2-inch (37.5-mm) sieve and not more than 12 percent passing a No. 200 (0.075-mm) sieve.

E. Base Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 95 percent passing a 1-1/2-inch (37.5-mm) sieve and not more than 8 percent passing a No. 200 (0.075-mm) sieve. All aggregate shall meet the state department of transportation specifications for the state in which the project is located for gradation and other specified material requirements.

F. Recycled Concrete Aggregate Base Course: Recycled concrete aggregate may be approved by the Owner for use in lieu of aggregate base course specified under the following conditions:
   1. The gradation, plasticity, soundness, and abrasion requirements of the material shall meet the governing department of transportation specifications for recycled concrete aggregate or aggregate base course.
   2. The Contractor shall be required to submit a sieve analysis to the Owner for review and approval
   3. The recycled concrete aggregate shall not contain foreign materials, which includes reinforcing steel, wood, and other friable material.
   4. The Contractor shall obtain all required permits and report recycled materials usage as required by the regulatory authorities having jurisdiction.
   5. The Owner reserves the right to not approve use of the recycled concrete aggregate, for both pavement base structure and building pad construction. Approval of the use of recycled concrete aggregate shall only be authorized in writing by the Owner.

G. Recycled Bituminous Concrete Base Course: Bituminous concrete on the site shall be milled or removed prior to placing any fill. Bituminous concrete may be reused under and immediately below the pavement stone base course if so indicated and approved by the geotechnical engineer and Owner.

H. Engineered Fill: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 90 percent passing a 1-1/2-inch (37.5-mm) sieve and not more than 12 percent passing a No. 200 (0.075-mm) sieve.

I. Bedding Materials: As shown on the drawings and specified on the trenching and bedding details and approved by the Owner and/or the geotechnical engineer.
   1. Bedding Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; except with 100 percent passing a 1-inch (25-mm) sieve and not more than 8 percent passing a No. 200 (0.075-mm) sieve.
   2. Bedding Material: As specified on the trenching and bedding details and/or conforming to local codes. Where conflict exists, the more stringent code or specification shall apply.

J. Drainage Course: Narrowly graded mixture of washed crushed stone, or crushed or uncrushed gravel; ASTM D 448; coarse-aggregate grading Size 57; with 100 percent passing a 1-1/2-inch (37.5-mm) sieve and 0 to 5 percent passing a No. 8 (2.36-mm) sieve.

K. Filter Material: Narrowly graded mixture of natural or crushed gravel, or crushed stone and natural sand; ASTM D 448; coarse-aggregate grading Size 67; with 100 percent passing a 1-inch (25-mm) sieve and 0 to 5 percent passing a No. 4 (4.75-mm) sieve.

L. Sand: ASTM C 33; fine aggregate.

M. Impervious Fill: Clayey gravel and sand mixture capable of compacting to a dense state.

2.02 EQUIPMENT

A. Compactor for mass earthwork shall be minimum 5 ton static drum weight vibratory roller or 5 ton static drum weight sheep's footed compactor as appropriate for the type of soil material at the site or other compactor approved by the geotechnical engineer.

B. Compactor for trenches and where access or maneuverability is of limited use, a double drum walk behind roller or "jumping jack" tamper may be used.

2.03 GEOTEXTILES

A. Subsurface Drainage Geotextile: Nonwoven needle-punched geotextile, manufactured for subsurface drainage applications, made from polyolefins or polyesters; with elongation greater than 50 percent; complying with AASHTO M 288 and the following, measured per test methods referenced:
   1. Grab Tensile Strength: 157 lbf (700 N); ASTM D 4632.
   2. Sewn Seam Strength: 142 lbf (630 N); ASTM D 4632.
   3. Tear Strength: 56 lbf (250 N); ASTM D 4533.
   4. Puncture Strength: 56 lbf (250 N); ASTM D 4833.
   5. Apparent Opening Size: No. 60 (0.250-mm) sieve, maximum; ASTM D 4751.
   6. Permittivity: 0.2 per second, minimum; ASTM D 4491.
   7. UV Stability: 50 percent after 500 hours' exposure; ASTM D 4355.

B. Separation Geotextile: Woven geotextile fabric, manufactured for separation applications, made from polyolefins or polyesters; with elongation less than 50 percent; complying with AASHTO M 288 and the geotechnical report.

C. Structural Soil Reinforcement Geogrid: Shall be integrally formed and deployed as a single layer having the following characteristics (all are MARV values unless otherwise noted)

Property	Type 1	Type 2	Type 3	Type 4
Aperture Stability Modulus at 20 cm-kg	0.32 m-N/deg	.065 m-N/deg	.058 m-N/deg	0.75 m-N/deg
Rib Shape	Rectangular or Square	Rectangular or Square	Rectangular or Square	Rectangular or Square
Rib Thickness	.030 in (0.76 mm)	.045 in (1.14 mm)	.050 in (1.27 mm)	.070 in (1.78 mm)

Nominal Aperture Size	1 inch	1 inch	2 inches	1.25 inches
Junction efficiency	93%	93%	93%	93%
Flexural Rigidity	250k mg-cm	750k mg-cm	450k mg-cm	2000k mg-cm
Minimum True Initial Modulus in Use MD	17,140 lb/ft	27,240 lb/ft	24,000 lb/ft	34,270 lb/ft
CMD	27,240 lb/ft	44,550 lb/ft	34,270 lb/ft	42,840 lb/ft

2.04 CONTROLLED LOW-STRENGTH MATERIAL

A. Controlled Low-Strength Material: Self-compacting, flowable concrete material produced from the following:
   1. Portland Cement: ASTM C 150, Type per geotechnical report.
   2. Fly Ash: ASTM C 618, Class C or F.
   3. Normal-Weight Aggregate: ASTM C 33, 3/4-inch (19-mm) nominal maximum aggregate size.
   4. Foaming Agent: ASTM C 869.
   5. Water: ASTM C 94/C 94M.
   6. Air-Entraining Admixture: ASTM C 260.

B. Produce conventional-weight, controlled low-strength material with **80-psi (550-kPa)** compressive strength when tested according to ASTM C 495.

2.05 ACCESSORIES

A. Detectable Warning Tape: Acid- and alkali-resistant, polyethylene film warning tape manufactured for marking and identifying underground utilities, a minimum of 6 inches (150 mm) wide and 4 mils (0.1 mm) thick, continuously inscribed with a description of the utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches (750 mm) deep; colored as follows:
   1. Red: Electric.
   2. Yellow: Gas, oil, steam, and dangerous materials.
   3. Orange: Telephone and other communications.
   4. Blue: Water systems.
   5. Green: Sewer systems.

PART 3 - EXECUTION

3.01 PREPARATION

A. Prior to bidding work within this Section, the Contractor shall become thoroughly familiar with the geotechnical engineering study, existing site conditions, and all portions of the work within this Section.

B. Do not perform any work required by this section prior to completion of all required inspections, tests and approvals.

C. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth moving operations.

D. Protect and maintain benchmarks, property corners, monuments and other reference points from damage or displacement. If a marker must be removed or relocated it shall be performed by a licensed professional land surveyor at no additional cost to the Owner.

E. Notify utility companies to allow removal and/or relocation of any utilities that are in conflict with the proposed improvements. Locate, identify, protect and maintain in operating condition, existing utilities encountered during utility installation. Repair any damage to surface or subsurface improvements encountered or shown on the Drawings.

F. Set all lines, elevations, and grades for utility and drainage system work and maintain for the duration of the work.

G. Verify location, size, elevation, and other pertinent data required to make connections between existing utilities, drainage systems, and proposed construction indicated on the Drawings. Coordinate all building utility connection locations and elevations with architectural drawings.

H. When performing grading operations during periods of prolonged wet or dry conditions, provide adequate measures for surface drainage or ground water and moisture control of the soils (i.e. wetting or drying, scarify and disking) so as to place and compact the soil within the moisture content range of a few percentage points of its optimum water content. Any disturbed areas should be proof rolled at the end of each day.

I. Sloping, shoring, bracing, and fencing shall be installed in accordance with Federal OSHA requirements as well as the requirements of all regulatory authorities having jurisdiction.

J. Protect and maintain all erosion control, sediment control, and runoff control and materials management measures during earth moving operations. Refer to erosion and sediment control drawings for staging earthwork operations and for measures that must be implemented prior to the commencement of earthwork.

K. Protect subgrades and foundation soils from freezing temperatures and frost. Remove temporary protection before placing subsequent materials.

L. Remove from the site any material encountered during grading operation that in the opinion of the Owner or geotechnical engineer is unsuitable or undesirable for backfilling in pavement or building areas. Do not allow debris and unsuitable material to accumulate on-site. Dispose of excess materials from the site.

M. Any material exported or imported from or to the Project site shall be hauled from or to a site that has coverage under NPDES or a State Construction General Permit (or Individual Permit). Coverage may either be under a separate Notice, or included in coverage under the Project Notice. If the borrow or waste site has NPDES or State Construction General Permit coverage a copy of the Notice of Intent and Notice of Coverage (or equal) shall be placed in the SWPPP Ledger.

3.02 DEWATERING

A. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.

B. Install dewatering systems that will be required to construct the Project. Water pumped out of excavations shall be disposed of onsite, and will not be discharged to the municipal storm drainage system or to surface waters unless approval to do so has been documented in writing by the Contractor.

C. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.

1. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.

3.03 EXPLOSIVES

A. Explosives: Obtain written permission from authorities having jurisdiction before bringing explosives to Project site. Perform blasting by using explosives on Project site only after receiving written approval from the Owner. .

1. Perform blasting without damaging adjacent structures, property, or site improvements.
2. Perform blasting without weakening the bearing capacity of rock subgrade and with the least-practicable disturbance to rock to remain.
3. Handle, store and use explosives in accordance with the Manual of Accident Prevention in Construction by the Associated General Contractors of America, Inc., 1978 edition.
4. Obtain all required Federal, State and Local permits applicable to the blasting operations.

5. Coordinate with grading Contractor to insure appropriate safety procedures are followed including signage and signaling devices.
6. Drill and blast such that rock will be suitable for use on the site as fill per this specification.

3.04 EXCAVATION, GENERAL

A. General
1. The building limits shall be as identified on the construction drawings. The building subgrade shall be constructed to include a minimum of 10 feet beyond the building limits, or as directed by the Owner;
2. Structures include buildings, footings, foundations, retaining walls, embankment berms for storm water detention basins, slabs, tanks, curbs, mechanical and electrical appurtenances or other man-made stationary features constructed above or below the ground surface;
3. The building pad subgrade shall be prepared in strict accordance with the geotechnical engineering study and these specifications, whichever is more stringent; and,
4. The Contractor shall cut or fill to the proposed subgrade elevations based on finished grades and the pavement thicknesses as shown on the drawings. Subgrade elevations shall be constructed to within 0 to minus ½ inch of the proposed grades specified.

B. Unclassified Excavation: Excavate to subgrade elevations regardless of the character of surface and subsurface conditions encountered. Unclassified excavated materials may include rock, soil materials, and obstructions. No changes in the Contract Sum or the Contract Time will be authorized for rock excavation or removal of obstructions.
1. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.
2. Remove rock to lines and grades indicated to permit installation of permanent construction without exceeding the following dimensions:
   a. 24 inches (600 mm) outside of concrete forms other than at footings.
   b. 12 inches (300 mm) outside of concrete forms at footings.
   c. 6 inches (150 mm) outside of minimum required dimensions of concrete cast against grade.
   d. Outside dimensions of concrete walls indicated to be cast against rock without forms or exterior waterproofing treatments.
   e. 6 inches (150 mm) beneath bottom of concrete slabs-on-grade.
   f. 12 inches (300 mm) beneath pipe invert elevation in trenches, and 12 inches (300 mm) wider than outside surface of any pipe or conduit.

C. Classified Excavation: Excavate to subgrade elevations. Material to be excavated will be classified as earth and rock. Do not excavate rock until it has been classified and cross sectioned by Owner. The Contract Sum will be adjusted for rock excavation according to unit prices included in the Contract Documents. Changes in the Contract Time may be authorized for rock excavation.
1. Earth excavation includes excavating pavements and obstructions visible on surface; underground structures, utilities, and other items indicated to be removed; together with soil, boulders, and other materials not classified as rock or unauthorized excavation.
   a. Intermittent drilling; blasting, if permitted; ram hammering; or ripping of material not classified as rock excavation is earth excavation.
2. Rock excavation includes removal and disposal of rock. Remove rock to lines and subgrade elevations indicated to permit installation of permanent construction without exceeding the following dimensions:
   a. 24 inches (600 mm) outside of concrete forms other than at footings.
   b. 12 inches (300 mm) outside of concrete forms at footings.
   c. 6 inches (150 mm) outside of minimum required dimensions of concrete cast against grade.
   d. Outside dimensions of concrete walls indicated to be cast against rock without forms or exterior waterproofing treatments.
   e. 6 inches (150 mm) beneath bottom of concrete slabs-on-grade.
   f. 12 inches (300 mm) beneath pipe invert elevation in trenches, and 12 inches (300 mm) wider than outside surface of any conduit or pipe.

3.05 EXCAVATION FOR STRUCTURES

A. Where existing grades are above proposed subgrade elevation, excavate materials in the building areas to line and grade as shown in the drawings being careful not to over excavate beyond the elevations needed for building subgrades.
   1. Excavate organic soils from the building area. If approved by Owner, organic soil excavation material may be used in landscaped area.
   2. Excavated on-site soils which meet the requirements of the geotechnical engineer may be used as building area fill.
   3. Unsuitable material, such as wood or any other deleterious materials determined to be unsuitable by the geotechnical engineer for use as on-site fill shall be disposed of off-site in accordance with this specification.

B. Excavate to indicated elevations and dimensions within a tolerance of plus 0 to minus 1/2 inch (12 mm). If applicable, extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.
   1. Excavations for Footings and Foundations: Do not disturb bottom of excavation. Excavate by hand to final grade just before placing concrete reinforcement. Trim bottoms to required lines and grades to leave solid base to receive other work.
   2. Pile Foundations: Per geotechnical engineer.
   3. Excavation for Underground Tanks, Basins, and Mechanical or Electrical Utility Structures: Excavate to elevations and dimensions indicated within a tolerance of plus or minus 1 inch (25 mm). Do not disturb bottom of excavations intended as bearing surfaces.

C. Excavations at Edges of Tree- and Plant-Protection Zones:
   1. Excavate by hand to indicated lines, cross sections, elevations, and subgrades. Use narrow-tine spading forks to comb soil and expose roots. Do not break, tear, or chop exposed roots. Do not use mechanical equipment that rips, tears, or pulls roots.
   2. Cut and protect roots according to requirements in Division 01 Section "Temporary Tree and Plant Protection."

3.06 EXCAVATION FOR WALKS AND PAVEMENTS

A. Excavate surfaces under walks and pavements to indicated lines, cross sections, elevations, and subgrades.

3.07 EXCAVATION FOR UTILITY TRENCHES

A. Contact authorities having jurisdictions and utility companies before excavation begins.

B. Utility alignments are designed to avoid obstructions whenever possible. The Contractor shall immediately notify Owner if unanticipated significant obstructions are encountered during utility installation work.

C. Cut trench banks for safety and remove stones as necessary to avoid point-bearing. All trench excavation side walls shall be sloped, shored, sheeted, braced or otherwise supported by means of sufficient strength to protect the workers within in accordance with the applicable rules and regulations established by the Department of Labor, Occupational Safety and Health Administration (OSHA), and by local codes and regulations. Moveable trench boxes shall not be allowed for HDPE, CMP or spiral ribbed pipes larger than 18” when installed in a trench condition in accordance with current OSHA requirements.

D. Excavate trenches at proper width and depth for laying pipe, conduit or cable and in accordance with utility company and/or manufacturer requirements.
   1. Beyond building perimeter, excavate trenches to allow installation of top of pipe at line, grade and elevation as shown on the Drawings, or at minimum 12 inches below frost line.

E. All trench width requirements for pipe, conduit, or cable shall be the minimum practical width that will allow for proper compaction of backfill, comply with trench and bedding details, and satisfy all safety, municipal and utility company regulations. Excavate trenches to uniform widths to provide the necessary clearance on each side of pipe or conduit.

F. Trench Bottoms: Excavate and shape trench bottoms to provide uniform bearing and support of pipes and conduit. Shape subgrade to provide uniform bearing and support for each section of pipe at every point along the entire length except where necessary to excavate for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits. Dig bell holes and depressions

for joints after trench bottom has been graded. Dig no deeper, longer, or wider than needed to make the joint connection properly. Remove projecting stones and sharp objects along trench subgrade.

1. Where foundation material is found to be of poor supporting value or of rock, the Owner's engineer may make minor adjustments in the location of the pipe to provide a more suitable foundation. Where this is not practical, the existing unsuitable material will be removed by undercutting to a depth directed by the geotechnical engineer and backfilling with suitable conditioning material consisting of crushed stone, gravel, or a combination of sand and crushed gravel as approved by the geotechnical engineer. Final selection of suitable conditioning material will be made by the geotechnical engineer.
2. Where foundation material is unacceptable and trench is over-excavated a suitable conditioning material or pipe bedding material will be used as specified by the geotechnical engineer. Bedding material is to be compacted at a minimum of 92% dry density as determined by ASTM D1557, Modified Proctor Test. Place bedding material as specified by geotechnical engineer and as shown on the trenching and bedding details on the Drawings.

G. Blasting: Contractor shall drill and blast so that the rock will be suitable for use on the site as fill. Rock size should not exceed 24 inches and have enough smaller size pieces to create fold free matrix when placed and compacted. Particle velocity from blasting shall not exceed 2 inches per second as measured by a chronograph.

H. Excavated Material: Stockpile excavated material suitable for backfilling in an orderly manner far enough from the trench to avoid overloading the excavation side wall. Remove unsuitable excavated materials from the site. Any abandoned structures, utilities, or debris discovered during construction shall be removed and disposed of, or capped.

I. Utility Installation Depths: Utility installation shall meet the following minimum pipe installation depths, or applicable codes and ordinances, measured from finished grade to the top of the pipe barrel:

1. Water Mains: 42 inches or 12 inches below the frost line whichever is deeper, or as specified on the plans.
2. Sanitary Sewer: As indicated on the drawings, or (36 inches to top of pipe barrel minimum).
3. Storm Drainage (Sewer): Elevations and grades as shown on the drawings, (24 inches minimum)
4. Electrical Conduits: 24 inches, or as required by NEC 300-5, NEC 710-36 codes, or the regulatory authority standard, or utility company standards whichever is deeper.
5. Telephone Conduits: 24 inches, or the regulatory authority standard, or utility company standards whichever is deeper.
6. Landscape Irrigation Piping: See Section 328400 .

J. Laterals: All utilities intended to connect to services within the building shall be extended from the building a distance of five feet in the direction of the utility service and at elevations to connect at those locations shown on the Drawings. All utility ends will be plugged and marked by a 2 inch by 4 inch piece of wood extending from the utility invert to 4 feet above final grade.

K. Trenches in Tree- and Plant-Protection Zones:

1. Hand-excavate to indicated lines cross sections, elevations, and subgrades. Use narrow-tine spading forks to comb soil and expose roots. Do not break, tear, or chop exposed roots. Do not use mechanical equipment that rips, tears, or pulls roots.
2. Do not cut main lateral roots or taproots; cut only smaller roots that interfere with installation of utilities.

3.08 UNDERCUT EXCAVATION

A. When approved by the Owner and recommended by the geotechnical engineer, the Contractor will be required to remove natural soil materials in areas where fills are to be placed where soil materials are determined to be undesirable. The Contractor shall be required to remove the undesirable material and backfill with approved material. The backfill material shall be compacted per Table 3.16.C.

B. At locations where undesirable material is shown on the drawings or identified in the geotechnical engineering study removal and replacement shall be per the drawings or as directed by the geotechnical engineer or Owner.

C. At locations where soil is wet the Contractor shall provide a “good faith” effort in drying and disking these areas prior to requesting approval for undercut excavation.
D. Where undercut excavation is required adjacent or beneath the location of a proposed drainage structure, undercut excavation and backfill shall extend a sufficient distance adjacent to the installation to prevent future operations from disturbing the completed drainage structure.
E. All material removed in the work of undercut excavation will be classified by the geotechnical engineer and Owner as either suitable for other use without excessive manipulation and utilized by the Contractor elsewhere in the work, or unsuitable for future use and disposed of by the Contractor as directed by the geotechnical engineer in accordance with 3.10.M of this specification.
F. The Contractor shall conduct undercut operations in such a way that the necessary measurements can be taken before any backfill is placed.
G. Backfill in undercut areas shall be placed as a continuous operation along with undercutting operation, or as recommended by the geotechnical engineer. No backfill material shall be placed in water or in wet conditions unless otherwise recommended by the geotechnical engineer and approved by the Owner.

3.09 SUBGRADE INSPECTION

A. Notify Owner when excavations have reached required subgrade.
B. If Owner determines that unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed.
C. Proof-roll subgrade below the building slabs and pavements with a pneumatic-tired and loaded 10-wheel, tandem-axle dump truck weighing not less than 15 tons **(13.6 tonnes)** to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.
    1. Completely proof-roll subgrade in one direction**,** repeating proof-rolling in direction perpendicular to first direction. Limit vehicle speed to 3 mph (5 km/h).
    2. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by Owner, and replace with compacted backfill or fill as directed.
D. Authorized additional excavation and replacement material will be paid for according to Contract provisions.
E. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Owner, without additional compensation.

3.10 UNAUTHORIZED EXCAVATION

A. Fill unauthorized excavation under foundations or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation. Lean concrete fill, with 28-day compressive strength of 2500 psi (17.2 MPa), may be used when recommended by the geotechnical engineer and approved by Owner.
    1. Fill unauthorized excavations under other construction, pipe, or conduit as directed by geotechnical engineer and approved by Owner.

3.11 STORAGE OF SOIL MATERIALS

A. Stockpile borrow soil materials and excavated satisfactory soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
    1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.
    2. Stockpiles shall be surrounded by perimeter sediment control measures and shall be covered with temporary measures to prevent erosion as soon as practical but no longer than 14 days after completion of the pile.

3.12 BACKFILL

A. Place and compact backfill in excavations promptly, but not before completing the following:
    1. Construction below finish grade including, where applicable, sub drainage, damp proofing, waterproofing, and perimeter insulation.
    2. Surveying locations of underground utilities for Record Documents.
    3. Testing and inspecting underground utilities.

4. Removing concrete formwork.
5. Removing trash and debris.
6. Removing temporary shoring and bracing, and sheeting.
7. Installing permanent or temporary horizontal bracing on horizontally supported walls.

B. Place backfill on subgrades free of mud, frost, snow, or ice.

3.13 UTILITY TRENCH BACKFILL

A. Place backfill on subgrades free of mud, frost, snow, or ice.

B. Place and compact bedding course on trench bottoms and where indicated. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.

C. Trenches under Footings: Backfill trenches excavated under footings and within **1**8 inches (450 mm) of bottom of footings with satisfactory soil; fill with concrete to elevation of bottom of footings. Concrete is specified in Division 03 Section "Cast-in-Place Concrete"

D. Trenches under Roadways: If shown on the Drawings or specified by the geotechnical engineer provide support for piping or conduit less than 30 inches (750 mm) below surface of roadways.

E. Backfill voids with satisfactory soil while removing shoring and bracing.

F. Do not backfill over porous, wet, frozen or spongy subgrade surfaces.

G. Fill around pipes and conduit shall be placed and compacted in accordance with the trenching and bedding details shown on the Drawings. Place and compact initial backfill approved by the geotechnical engineer, to a height not to exceed 8 inches (200 mm) over the pipe or conduit.
   1. Select material shall be used as specified by trenching and bedding details and where required by the geotechnical engineer. Backfill is to be kept free of stones, frozen lumps, chunks of highly plastic clay or other objectionable material.
   2. Carefully compact initial backfill under pipe haunches and compact evenly up on both sides and along the full length of piping or conduit to avoid damage or displacement of piping or conduit. Coordinate backfilling with utilities testing.
   3. Grade and maintain backfill areas to minimize erosion or saturation will not damage pipe bed or backfill.
   4. Heavy equipment shall not be operated over any pipe until it has been properly backfilled with a minimum of 24 inches of cover. Where any part of the required cover is above the proposed finished grade, the Contractor shall place, maintain and finally remove such material at no cost to the Owner. Pipe which becomes misaligned, shows excessive settlement, or has been otherwise damaged by the Contractor's operations shall be removed and replaced by the Contractor at no cost to the Owner.

H. Place and compact final backfill of satisfactory soil to final subgrade elevation.

I. Install warning tape directly above utilities, 12 inches (300 mm) below finished grade, except 6 inches (150 mm) below subgrade under pavements and slabs.

3.14 SOIL FILL

A. Fill areas to contours and elevations shown on the Construction Drawings with materials deemed satisfactory, less the topsoil depth as specified in Section 329300.

B. Existing grades below building areas shall be leveled prior to fill placement. Contractor shall remove any existing lawn and topsoil in these areas prior to placement of any fill.

C. All existing grades below building areas shall be proofrolled and compacted per this specification.

D. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.

E. Fill shall not be placed:
   1. In areas of standing water, frozen or thawing ground or in areas that have not been approved by the geotechnical engineer.
   2. During unfavorable weather conditions. When work is interrupted by heavy rains fill operations shall not be resumed until all saturated surface soils are returned to satisfactory moisture content as determined by the geotechnical engineer.

F. Place and compact fill material in layers (lifts):
   1. Layers shall be made smooth and free from ruts or indentations at the end of any work day when precipitation is forecasted too prevent saturation of surface fill material. Fill surfaces

shall be graded smooth to drain and sealed with a drum roller at the completion of each work day.

2. Layers (or lifts) shall not exceed 12 inches (300 mm) in depth and shall be compacted systematically to achieve at least 6 passes of the compactor. Larger layer thickness may be approved if broken rock is used and placed at least 6 feet (1.8 m) below grade.
3. Each layer shall be compacted to minimum densities listed in Table 3.16.C and as specified by the geotechnical engineer.

G. Layers (lifts) to required elevations as follows:
1. Under grass and planted areas, use satisfactory soil material.
2. Under walks and pavements, use satisfactory soil material.
3. Under steps and ramps, use engineered fill or fill material approved by geotechnical engineer.
4. Under building slabs, use engineered fill or fill material approved by geotechnical engineer.
5. Under footings and foundations, use engineered fill or fill material approved by geotechnical engineer.

H. Place soilfill on subgrades free of mud, frost, snow, or ice. Wet or saturated material shall be air dried as necessary to achieve field densities specified in this Section. Removal and replacement shall not occur without prior approval of Owner. Removal and replacement shall be used if necessary to facilitate the construction schedule.

I. Contractor shall adjust water content by aeration or adding water to achieve the required density. Assist drying by disking, harrowing or pulverizing until moisture content is reduced to achieve proper compaction and facilitate the construction schedule.

J. Contractor to remove areas of finished subgrade found to have insufficient compaction density of depth necessary and replace with suitable compacted fill as approved by the Owner. Surface subgrade after compaction shall be hard, uniform, smooth, and stable and true to grade and cross-section.

3.15 SOIL MOISTURE CONTROL

A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill soil layer before compaction to within 2 percent of optimum moisture content.
1. Do not place backfill or fill soil material on surfaces that are muddy, frozen, or contain frost or ice.
2. Remove and replace, or scarify and air dry, otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.

3.16 COMPACTION OF SOIL BACKFILLS AND FILLS

A. Place backfill and fill soil materials in layers not more than 12 inches (300 mm) in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches (100 mm) in loose depth for material compacted by hand-operated tampers.

B. Place backfill and fill soil materials evenly on all sides of structures to required elevations, and uniformly along the full length of each structure.

C. Compact soil materials to not less than the following percentages of maximum dry unit weight according to **ASTM D 698** and **ASTM D 1557**. In areas to receive fill and at the final cut subgrade, proofroll and compact the exposed ground surface following clearing and grubbing and any required excavation with a minimum of 4 passes of an approved compactor and obtain at least the density required in the geotechnical engineering study and as indicated below:

TABLE 3.16.C

Location or Area	Standard Proctor Density ASTM D698 (AASHTO T 99)	Modified Proctor Density ASTM D1557 (AASHTO T 180)	Testing Frequency 1 per lift per
Structures and Walkways	95%	92%	20,000 sf
Retaining Walls	95%	92%	1,000 sf
Trenches	95%	92%	150 lf
Landscape or Unimproved Areas	92%	90%	20,000 sf
Building and Pavement Subgrades (Top 18 inches)	100%	95%	10,000 sf
Building and Pavement Subgrades (Below Top 18 inches)	95%	92%	15,000 sf
Out-Parcels (Below Top 18 inches)	95%	92%	20,000 sf

1. In addition to the above referenced table, proofrolling shall be completed in accordance with Section 3.17 Proofrolling.
2. Any soft areas exhibiting excessive weaving or unsatisfactory material identified during excavation, fill placement, compaction and proof testing shall be removed, replaced with suitable fill, and compacted as specified in Table 3.16.C above.
3. Prior to preparing subgrade in low lying areas perform the following:
   a. Drain standing water by gravity or with a pump. Water should not be discharged directly into a storm drain. Sediment laden water may only be discharged to an approved sediment control measure.
   b. After drainage is complete, remove organic debris, mud, debris and other unsuitable material using equipment and methods that will minimize disturbance to the underlying soils.
   c. Thoroughly compact subgrade as specified in Table 3.16.C.
   d. If proposed for fill, all muck, mud and other materials removed from the low area shall be dried on-site by spreading in thin layers for observation by Owner and geotechnical engineer. If after observation by Owner or geotechnical engineer the material is found to be unsuitable, it shall be removed from the site.

3.17 PROOFROLLING

A. The work covered by this subsection consists of furnishing and operating, proofrolling equipment at the direction of the Owner's representative and/or geotechnical engineer.

B. Proofrolling shall be under the observation of the owner's representative and/or the geotechnical engineer as described herein and under the following schedule:
   1. Immediately following the completion of excavation to proposed subgrades in cut areas, proofrolling shall be performed as specified; and,
   2. Immediately **prior to and following** stone base course placement, in pavement and building pad areas for final floor slab preparation, all subgrade and stone base shall be proofrolled. Any areas which deflect, rut or pump under the loaded construction equipment shall be

undercut and replaced with compacted fill material or stone base course as directed by the geotechnical engineer and approved by the Owner, at no additional cost to the Owner.

C. Proofrolling shall be completed with pneumatic tired and loaded 10 wheel tandem-axle dump truck weighing not less than 25 tons (22.6 tonnes) to identify soft pockets and areas of yielding. Other equipment may be used if approved by the geotechnical engineer. Do not proofroll wet or saturated subgrades.

D. Construction methods shall be as follows:
   1. After the subgrade or stone base course has been completed the subgrade or stone base course shall then be proofrolled. The coverage areas and methods will be identified by the geotechnical engineer.
   2. Completely proofroll subgrade in one direction unless otherwise directed by the Owner or geotechnical engineer.
   3. The equipment speed shall be limited to 3 mph (5km/h) such that the geotechnical engineer can comfortably and slowly walk along side the equipment.
   4. If necessary to take corrective action, such as but not limited to under drain installation, undercut and backfill of unsuitable material, and/or aeration of excessively wet materials in areas that have been proofrolled, see Section 3.8. These areas shall be proofrolled again following the completion of the necessary corrections. If the corrections are necessary due to the negligence of the Contractor, the corrective work and additional proofrolling shall be performed by the contractor at on cost to the Owner.
   5. The contractor shall protect all structural facilities on the project including but not limited to box culverts, pipe culverts, and utilities from damage by the proofrolling equipment.

3.18 GRADING

A. General: Shape to conform to the grades shown on the drawings. Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.
   1. Provide a smooth transition between adjacent existing grades and new grades.
   2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.

B. Site Rough Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to required elevations within the following tolerances:
   1. Turf or Unpaved Areas: Plus or minus 1 inch (25 mm).
   2. Walks: 0 to -1/2 inches (13 mm) of the proposed subgrade.
   3. Pavements: 0 to -1/2 inches (13 mm) of the proposed subgrade

C. Grading inside Building Lines: 0 to -1/2 inches (13 mm) of the proposed subgrade when tested with a 50-foot (15-m) grid across the Lowe's building pad/limits.

3.19 BUILDING PAD LIMITS AND PAVED AREA CERTIFICATIONS FOR GEOTECHNICAL ENGINEER AND LAND SURVEYOR

A. The building pad/limits and pave area subgrades shall be satisfactorily proofrolled.

B. The Developer and/or Contractor shall provide the Building Pad/Limits and Paved Area(s) Certification forms for subgrade and stone base. Forms shall be completed in full. Building pad limits and paved area subgrades shall be constructed in accordance with the Drawings and these Specifications. Construction staking methods shall be in accordance with these specifications.

C. Prior to completion of the building pad acceptance report, the Contractor and/or developer shall be required to address all subsurface recommendations identified in the geotechnical engineering study or by the geotechnical engineer retained by the owner.

D. The Owner will not take ownership of the building pad until the pad certification form is received and approved by the Owner. The Building Pad/Limits and Paved Area(s) Certification Forms are attached to this Section.

3.20 SUBSURFACE DRAINAGE

A. Subdrainage Pipe: Specified in Division 33 Section "Subdrainage."

B. Subsurface Drain: Place subsurface drainage geotextile around perimeter of sub drainage trench. Place a 6-inch (150-mm) course of filter material on subsurface drainage geotextile to

support sub drainage pipe. Encase sub drainage pipe in a minimum of 12 inches (300 mm) of filter material, placed in compacted layers 6 inches (150 mm) thick, and wrap in subsurface drainage geotextile, overlapping sides and ends at least 6 inches (150 mm).

1. Compact each filter material layer to 85 percent of maximum dry unit weight according to ASTM D 698.

C. Drainage Backfill: Place and compact filter material over subsurface drain, in width indicated, to within 12 inches (300 mm) of final subgrade, in compacted layers 6 inches (150 mm) thick. Overlay drainage backfill with one layer of subsurface drainage geotextile, overlapping sides and ends at least 6 inches (150 mm).

1. Compact each filter material layer if used to 85 percent of maximum dry unit weight according to ASTM D 698.

3.21 SUBBASE AND BASE COURSES UNDER PAVEMENTS AND WALKS

A. Place subbase course and base course on subgrades free of mud, frost, snow, or ice.

B. On prepared subgrade, place subbase course and base course under pavements and walks as follows:

1. If shown on the Drawings install geogrid reinforcement of base/subbase and/or subgrade improvements according to manufacturer's written instructions, overlapping sides and ends. Geogrid is to be laid at proper elevation and alignment as shown on the drawings. Granular fill placement over geogrid to be in lifts and compacted as directed to minimize development of wrinkles or movement. At minimum a lift of 6 inches must be placed over geogrid prior to operation of tracked vehicles. Rubber-tired equipment may pass over geogrid reinforcement at slow speeds (less than 10 mph) when integrally-formed geogrids are used. When woven, multilayered or welded-strip geogrids are used, rubber-tired equipment shall not be allowed to pass directly on the geogrid until minimum 6 inch base lift has been installed.
2. If shown on the Drawings install separation geotextile on prepared subgrade according to manufacturer's written instructions, overlapping sides and ends.
3. If subbase course is shown on the Drawings, place base course material over subbase course under hot-mix asphalt pavement.
4. Place in uniform loose depth and without segregation. All stone base delivered to the site shall be spread and rolled by the end of each day.
5. Shape subbase course and base course to required crown elevations and cross-slope grades.
6. Place subbase course and base course 8 inches (200 mm) or less in compacted thickness in a single layer.
7. Place subbase course and base course that exceeds 8 inches (200 mm) in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches (150 mm) thick or less than 4 inches (100 mm) thick.
8. Each layer of material shall have been sampled, tested, compacted, and approved prior to placing succeeding layers of subbase course, base course material or pavement.
9. Contractor shall utilize methods of handling, hauling, and placing which will minimize segregation and contamination. Aggregate which is contaminated with foreign materials shall be rejected and removed and replaced by the Contractor at no additional cost to the Owner.

C. Pavement Shoulders: Place shoulders along edges of subbase course and base course to prevent lateral movement. Construct shoulders, at least 12 inches (300 mm) wide, of satisfactory soil materials and compact simultaneously with each subbase and base layer to not less than 95 percent of maximum dry unit weight according to ASTM D 698.

D. Compaction:

1. Compact each layer of subbase course and/or base course at optimum moisture content to required grades, lines, cross sections, and thickness to not less than 98 percent of maximum dry unit weight according to Modified Proctor density ASTM D 1557.
2. Subbase course and base course shall be compacted at the optimum moisture content as determined by the geotechnical engineer and approved by the Owner. The Contractor shall dry or add moisture to materials when required to provide a uniformly compacted and acceptable subbase or base.

3. Final layer of material shall be shaped to conform to the lines, grades and typical sections as shown on the drawings or as established by the engineer. When compacted, the base course shall be smooth, hard, dense, unyielding, and well bonded.

E. Quality Control:
   1. Thickness of the base course shall be within a tolerance of plus or minus ½ inch of the required thickness as specified on the drawings for building pad and pavement areas.
   2. The elevation of the base course within the building limits shall be within a tolerance of 0 to ½ inch. All other areas shall be within a tolerance of plus or minus 0.10 feet.
   3. The Contractor shall be required to repair any areas which do not conform to this tolerance or specification. Any repairs required shall be at no cost to the Owner, and shall meet these specifications.
   4. The developer and/or Contractor shall provide Lowe's Building Pad/Limits and Paved Area(s) Certifications for stone base which are located at the end of this section.

3.22 DRAINAGE COURSE UNDER CONCRETE SLABS-ON-GRADE

A. Place drainage course on subgrades free of mud, frost, snow, or ice.

B. On prepared subgrade, place and compact drainage course under cast-in-place concrete slabs-on-grade as follows:
   1. Install sub drainage geotextile on prepared subgrade according to manufacturer's written instructions, overlapping sides and ends.
   2. Place drainage course 6 inches (150 mm) or less in compacted thickness in a single layer.
   3. Place drainage course that exceeds 6 inches (150 mm) in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches (150 mm) thick or less than 3 inches (75 mm) thick.

3.23 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a qualified geotechnical engineer to perform the following special inspections:
   1. Determine prior to placement of fill that site has been prepared in compliance with requirements.
   2. Determine that fill material and maximum lift thickness comply with requirements.
   3. Determine, at the required frequency, that in-place density of compacted fill complies with requirements.

B. Testing Agency: Owner will engage a qualified geotechnical engineering testing agency to perform tests and inspections.

C. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earth moving only after test results for previously completed work comply with requirements.

D. Footing Subgrade: At footing subgrades, at least one test of each soil stratum will be performed to verify design bearing capacities. Subsequent verification and approval of other footing subgrades may be based on a visual comparison of subgrade with tested subgrade when approved by Owner.

E. Testing agency will test compaction of soils in place according to ASTM D 1556, ASTM D 2167, ASTM D 2922, and ASTM D 2937, as applicable. Tests will be performed at the locations and frequencies shown in Table 3.16.C:

F. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil materials to depth required; recompact and retest until specified compaction is obtained.

3.24 PROTECTION

A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.

B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.

1. Scarify or remove and replace soil material to depth as directed by Owner; reshape and recompact.

C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.
   1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.
   2. Correction of subgrade after compaction shall be hard, uniform, smooth, and stable and true to grade and cross-section.

3.25 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Remove surplus satisfactory soil and waste materials, including unsatisfactory soil, trash, and debris, and legally dispose of them off Owner's property.

B. Transport surplus satisfactory soil to designated storage areas on Owner's property. Stockpile or spread soil as directed by Owner.
   1. Remove waste materials, including unsatisfactory soil, trash, and debris, and legally dispose of them off Owner's property.

END OF SECTION 312000

BUILDING PAD/LIMITS CERTIFICATION FORM

Project	
Date	
Geotech. Engineer	
Surveyor	
Grading Contractor	
Const. Mgr.	

□ **SUBGRADE**

□ **STONE BASE**

GEOTECHNICAL ENGINEERING CERTIFICATION

I certify that the building pad/limits for the above referenced project, has been constructed in accordance with the Geotechnical Investigation prepared by _____ dated, _____, and Project Specifications, dated _____.

All earth cut and fills have been installed competently, properly and have been compacted under the supervision of the below certifying Geotechnical Engineer. The building pad/limits has been acceptably prepared to support the proposed construction. A final report containing a description of the grading work, on-site recommendations and the results of testing and inspections has been prepared and is dated _____.

Geotechnical Engineer (signature) _____ Date _____

Registration No._____ Expiration Date _____

Affix Seal Here (not valid unless sealed)

ELEVATION CERTIFICATION

I certify to the satisfactory completion of the grading for the building pad/limits in accordance with the approved drawings and specifications engineered by_____. All as-built subgrade elevations have been taken on a 50' grid across the Project building pad/limits and are within the tolerance of 0 to –1/2 inches of the proposed subgrade elevation as required by the Project Specifications.

Finished Floor Elevation _____ Date _____

Surveyor (signature) _____ Expiration Date _____

Registration No. _____ Affix Seal Here (not valid unless sealed)

GRADING CONTRACTOR VERIFICATION

I verify to the satisfactory completion of grading for the building pad/limits in accordance with the approved Grading Drawings and Project Specifications.

Contractor (signature) _____ Date _____

PAVED AREA(S) CERTIFICATION FORM

Project	
Date	
Geotech. Engineer	
Surveyor	
Grading Contractor	
Const. Mgr.	

☐ **SUBGRADE**

☐ **STONE BASE**

GEOTECHNICAL ENGINEERING CERTIFICATION

I certify that the paved area, located at _____, for the above referenced project, has been constructed in accordance with the Geotechnical Investigation prepared by _____ dated, _____, and Project Specifications, dated _____.

All earth cut and fills have been installed competently, properly and have been compacted under the supervision of the below certifying Geotechnical Engineer. The paved area has been acceptably prepared to support the proposed construction. A final report containing a description of the grading work, on-site recommendations and the results of testing and inspections has been prepared and is dated _____.

Geotechnical Engineer (signature) _____ Date _____

Registration No._____ Expiration Date _____

Affix Seal Here (not valid unless sealed)

ELEVATION CERTIFICATION

I certify to the satisfactory completion of the grading for the paved area in accordance with the approved drawings and specifications engineered by_____. All as-built subgrade elevations have been taken on a 50' grid across the paved areas and are within the tolerance of 0 to –1/2 inches of the proposed subgrade elevation as required by the Project Specifications.

Date _____

Surveyor (signature) _____ Expiration Date _____

Registration No. _____ Affix Seal Here (not valid unless sealed)

GRADING CONTRACTOR VERIFICATION

I verify to the satisfactory completion of grading for the paved areas in accordance with the approved Grading Drawings and Project Specifications.

Contractor (signature) _____ Date _____

SECTION 31 31 16

TERMITE CONTROL

PART 1- **GENERAL**

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and all Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes the following for termite control:
   1. Soil treatment.

1.03 DEFINITIONS

A. EPA: Environmental Protection Agency.
B. PCO: Pest control operator.

1.04 SUBMITTALS

A. The General Contractor and the Sub-contractor must execute the provided Conformance Submittal for each product specified.
B. Soil Treatment Application Report: After application of termiticide is completed, submit report for Owner's record information, including the following as applicable:
   1. Date and time of application.
   2. Moisture content of soil before application.
   3. Brand name and manufacturer of termiticide.
   4. Quantity of undiluted termiticide used.
   5. Dilutions, methods, volumes, and rates of application used.
   6. Areas of application.
   7. Water source for application.
C. Warranties: Warranties specified in this Section.

1.05 QUALITY ASSURANCE

A. Applicator Qualifications: A PCO who is licensed according to regulations of authorities having jurisdiction to apply termite control treatment in jurisdiction where Project is located and who is experienced and has completed termite control treatment similar to that indicated for this Project and whose work has a record of successful in-service performance.
B. Applicator Qualifications: A PCO who is licensed according to regulations of authorities having jurisdiction to apply termite control treatment in jurisdiction where Project is located and who is an experienced installer who employs workers trained and approved by bait station system manufacturer to install manufacturer's products.
C. Regulatory Requirements: Formulate and apply termiticides, and label with a Federal registration number, to comply with EPA regulations and authorities having jurisdiction.

1.06 PROJECT CONDITIONS

A. Environmental Limitations: To ensure penetration, do not treat soil that is water saturated or frozen. Do not treat soil while precipitation is occurring. Comply with EPA-Registered Label requirements and requirements of authorities having jurisdiction.

1.07 COORDINATION

A. Coordinate soil treatment application with excavating, filling, and grading and concreting operations. Treat soil under footings, grade beams, and ground-supported slabs, before construction.

1.08 WARRANTY

A. General Warranty: The warranty specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Warranty: Written warranty for five years from date of Substantial Completion, signed by applicator and Contractor certifying that termite control work, consisting of applied soil termiticide treatment, will prevent infestation of subterranean termites. If subterranean termite activity or damage is discovered during warranty period, re-treat soil and repair or replace damage caused by termite infestation.

1.09 MAINTENANCE SERVICE

A. Continuing Service: Provide a proposal for continuing service, including monitoring, inspection, and retreatment for occurrences of termite activity, from applicator to Owner, in the form of a standard yearly (or other period) continuing service agreement, starting on the date of Substantial Completion. State services, obligations, conditions, and terms for agreement period and for future renewal options.

PART 2- **PRODUCTS**

2.01 SOIL TREATMENT

A. Termiticide: Provide an EPA-registered termiticide complying with requirements of authorities having jurisdiction, in a soluble or emulsible, concentrated formulation that dilutes with water or foaming agent, and formulated to prevent termite infestation. Use only soil treatment solutions that are not harmful to plants. Provide quantity required for application at the label volume and rate for the maximum termiticide concentration allowed for each specific use, according to the product's EPA-Registered Label.

B. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

C. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. BASF Corporation.
   2. Bayer Corporation.
   3. Dow AgroSciences.
   4. FMC Corporation.
   5. Syngenta.

PART 3- **EXECUTION**

3.01 EXAMINATION

A. Examine substrates, areas, and conditions, with Applicator present, for compliance with requirements for moisture content of the soil, interfaces with earthwork, slab and foundation work, landscaping, and other conditions affecting performance of termite control. Proceed with application only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. General: Comply with the most stringent requirements of authorities having jurisdiction and with manufacturer's written instructions for preparing substrate. Remove all extraneous sources of wood cellulose and other edible materials such as wood debris, tree stumps and roots, stakes, formwork, and construction waste wood from soil and around foundations.

B. Soil Treatment Preparation: Remove foreign matter and impermeable soil materials that could decrease treatment effectiveness on areas to be treated. Loosen, rake, and level soil to be treated, except previously compacted areas under slabs and footings. Termiticides may be applied before placing compacted fill under slabs if recommended by termiticide manufacturer.

C. Fit filling hose connected to water source at the site with a backflow preventer, complying with

requirements of authorities having jurisdiction.

3.03 APPLICATION, GENERAL

A. General: Comply with the most stringent requirements of authorities having jurisdiction and with manufacturer's EPA-Registered Label for products.

3.04 APPLYING SOIL TREATMENT

A. Application: Mix soil treatment termiticide solution to a uniform consistency. Provide quantity required for application at the label volume and rate for the maximum specified concentration of termiticide, according to manufacturer's EPA-Registered Label, to the following so that a continuous horizontal and vertical termiticidal barrier or treated zone is established around and under building construction. Distribute the treatment evenly.
   1. Slabs-on-Grade and Basement Slabs: Under ground-supported slab construction, including footings, building slabs, and attached slabs as an overall treatment. Treat soil materials before concrete footings and slabs are placed.
   2. Foundations: Adjacent soil including soil along entire inside perimeter of foundation walls, along both sides of interior partition walls, around plumbing pipes and electric conduit penetrating slab, and around interior column footers, piers, and along entire outside perimeter, from grade to bottom of footing. Avoid soil washout around footings.
   3. Penetrations: At expansion joints, control joints, and areas where slabs will be penetrated.

B. Avoid disturbance of treated soil after application. Keep off treated areas until completely dry.

C. Protect termiticide solution, dispersed in treated soils and fills, from being diluted until ground-supported slabs are installed. Use waterproof barrier according to EPA-Registered Label instructions.

D. Post warning signs in areas of application.

E. Reapply soil treatment solution to areas disturbed by subsequent excavation, grading, landscaping, or other construction activities following application.

END OF SECTION 313116

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CONFORMANCE SUBMITTAL
Section 313116 – Termite Control

Project Location _____
(*City, State*)

General Contractor: _____
(*Company Name, Phone Number*)

_____
(*Address*)

Sub-Contractor: _____
(*Company Name, Phone Number*)

_____
(*Address*)

The following product has been selected (check one box) for use in this project from the list of acceptable products specified:

☐ BASF Corporation.

☐ Bayer Corporation.

☐ Dow AgroSciences.

☐ FMC Corporation.

☐ Syngenta.

I represent to the owner that the product selected will be installed in compliance with the applicable codes for the authorities having jurisdiction and in accordance with the project specification. If noncompliance is discovered the General Contractor shall make or cause to be made all necessary corrections to meet the applicable codes and specifications. Immediately or as directed by the owner, the work shall be completed without additional cost to the Owner and / or the contract.
General Contractor:

_____
(*Signature of the Authorized Agent of the General Contractor*)

_____
(*Print Name of the Authorized Agent of the General Contractor*)

I represent to the owner that the product selected will be installed in compliance with the applicable codes for the authorities having jurisdiction and in accordance with the project specification. If noncompliance is discovered the General Contractor shall make or cause to be made all necessary corrections to meet the applicable codes and specifications. Immediately or as directed by the owner, the work shall be completed without additional cost to the Owner and / or the contract.
Sub-Contractor:

_____
(*Signature of the Authorized Agent of the Sub-Contractor*)

_____
(*Print Name of the Authorized Agent of the Sub-Contractor*)

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SECTION 32 12 16

ASPHALT PAVING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and all Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:
   1. Cold milling of existing hot-mix asphalt pavement.
   2. Hot-mix asphalt patching.
   3. Hot-mix asphalt paving.
   4. Hot-mix asphalt paving overlay.
   5. Asphalt surface treatments.
   6. Pavement-marking paint.
   7. Imprinted asphalt.

B. Related Sections:
   1. Division 02 Section “Structure Demolition" for demolition, removal, and recycling of existing asphalt pavements, and for geotextiles that are not embedded within courses of asphalt paving.
   2. Division 31 Section "Earth Moving" for aggregate subbase and base courses and for aggregate pavement shoulders.
   3. Division 32 Sections for other paving installed as part of crosswalks in asphalt pavement areas.
   4. Division 32 Section "Concrete Paving Joint Sealants" for joint sealants and fillers at paving terminations.

1.03 REFERENCE STANDARDS

A. American Association of State Highway and Transportation Officials (AASHTO)
   1. M140 - Standard Specification for Emulsified Asphalt Nineteenth Edition; Revised Per Interim Specifications - Specifications - 1999 R(1998)
   2. M226 -Standard Specification for Viscosity Graded Asphalt Cement Nineteenth Edition R(1996)
   3. T245 - Standard Method of Test for Resistance to Plastic Flow of Bituminous Mixtures Using Marshall Apparatus Nineteenth Edition; ASTM D1559-76
   4. PP46-01 – Recommended Practice for Geosynthetic Reinforcement of the Aggregate Base Course of Flexible Pavement Structures, April 2001 Interim Edition of the AASHTO Provisional Standards.

B. American Society for Testing and Materials (ASTM)
   1. D1559 – Test Method for Resistance to Plastic Flow of Bituminous Mixtures Using Marshall Apparatus.
   2. D2041 - Standard Test Method for Theoretical Maximum Specific Gravity and Density of Bituminous Paving Mixtures
   3. D2171 – Standard Test Method for Viscosity of Asphalts by Vacuum Capillary Viscometer (RAP Asphalt Mixes)
   4. D1388-96 – Standard Test Method for Stiffness of Fabrics, Option A
   5. D3786 – Standard Test method for Hydraulic Bursting Strength of Knitted Goods and Nonwoven Fabrics
   6. D4355 – Test Method for Deterioration of Geotextiles from Exposure to Ultraviolet Light and Water
   7. D4439 – Terminology for Geotextiles
   8. D4873 – Guide for Identification, Storage, and Handling of Geotextiles
   9. D6637-01 – Standard Test Method for Determining Tensile Properties of Geogrids by the Single or Multi-rib Tensile Method

10. D4354-96 – Practice for Sampling of Geosynthetics for Testing
11. D4759-92 – Practice for Determining the Specification Conformance of Geosynthetics
12. D5818-95 – Practice for Obtaining Samples of Geosynthetics from a Test Section for Assessment of Installation Damage
13. ASTM D-140 Standard Practice for Sampling of Bituminous Materials
14. ASTM D-449 Asphalt Used in Damp-proofing and Waterproofing, Type II and III
15. ASTM D-2939 Standard Test Methods Emulsion Bitumen's Use as Protective Coatings
16. ASTM D-3405 Joint Sealant Hot-Applied for Concrete and Asphalt Pavement
17. ASTM D-3320 Emulsified Coal Tar Pitch (Mineral Colloid Type)
18. ASTM D-3910 Design, Testing and Construction of Slurry Seal

C. Asphalt Institute (AI)
1. MS-2 – Mix Design Method for Asphalt Concrete and Other Hot Mix Types
2. MS-22 – Principles of Construction of Hot-Mix Asphalt Pavement, Addendum

1.04 DEFINITIONS

A. Hot-Mix Asphalt Paving Terminology: Refer to ASTM D 8 for definitions of terms.

B. Geosynthetics:
1. Geogrid: A biaxial polymeric grid formed by a regular network of integrally connected tensile elements with apertures of sufficient size to allow interlocking with the surrounding soil, rock, or earth to function primarily as reinforcement.
2. Non-woven Geotextile: An interlayer (paving fabric) used above fatigued asphalt or binder layer and beneath asphalt pavement overlay to provide a permanent moisture barrier and to retard reflective cracking.
3. Woven Geogrid: A geogrid product formed by weaving discrete strips of polymer into a network. These geogrids usually require a protective coating to protect the polymer from premature degradation.
4. Welded Strip Geogrid: A geogrid product formed by heat bonding (welding) discrete strips of polymer into a network.
5. Average Roll Value: Minimum Average Roll Value (MARV) is property value calculated as typical minus two standard deviations.

1.05 SUBMITTALS

A. Product Data: Contractor to submit mix design using either of the two methods below for each pavement course and each type of product indicated. Mix design data submittal shall be submitted to the Owner for review and approval 45 days prior to schedule production and paving of the mix design.
1. "Marshal Stability": Marshal Stability design mix submittals shall include type and name of mix, gradation analysis, grade of asphalt cement, Marshall Stability in pounds flow, effective asphalt content in percent (%), and corresponding copies of covering State Department of Transportation material specifications or regulatory authorities having jurisdiction for each proposed material.
2. "Superpave": Superpave design mix submittals may be submitted in lieu of a "Marshall Stability" design mix, meeting the specifications of the governing State Department of Transportation or regulatory authorities having jurisdiction.

B. Material Certificates: Contractor shall submit product data statement (at end of this Section) stating that asphalt mix to be supplied complies with the specifications of the governing State Department of Transportation or regulatory authority having jurisdiction, as well as copies of the regulatory specifications corresponding to the asphalt mix formula and material. The Conformance Submittal shall be signed by the asphalt mix producer and the Contractor.

C. Samples for Verification: For the following products (if used on the project), in manufacturer's standard sizes unless otherwise indicated:
1. Each paving fabric, 12 by 12 inches (300 by 300 mm) minimum.
2. Each pattern and color of imprinted asphalt.

D. Cutting and Patching Proposal: Where asphalt cutting and patching is necessary to complete the work, the Contractor shall submit a proposal describing procedures to be followed at least 10 days prior to the time cutting and patching will be performed. The Contractor shall not proceed

with cutting and patching work until authorized by the Owner to proceed. The Cutting and Patching Proposal will include:

1. Extent of cutting and patching including how it will be performed and why it can not be avoided.
2. Changes to existing construction describing anticipated results including a description of any changes to structural elements, operating components, changes in building appearance and other significant visual elements.
3. List of products to be used and firms or entities that will perform the work.
4. Dates when cutting and patching will be performed.
5. List of utilities that will or could be affected, list of utilities that will be relocated, and a list of utilities that will be temporarily out of service. If existing utilities will be out of service provide length of time service will be disrupted.
6. Indicate if cutting and patching will involve adding reinforcement to structural elements and provide details necessary to integrate reinforcement with the original structure.
7. Owner's approval must be received prior to proceeding with the work. Owner approval does not waive its right to later require removal and replacement of unsatisfactory work.

E. Asphalt Seal Coat: Submit materials certificate to the Owner's engineer which is signed by the Contractor, certifying that materials comply with, or exceed the requirements herein.

F. Geotextiles:

1. Submit product data sheet and certification from the Manufacturer that the geotextile or geogrid product supplied meets the requirements of this Section. Manufacturer's certificate to include statement that furnished geotextile meets MARV requirements of the specification.
2. Manufacturing Quality Control test results shall be provided upon request.
3. Submit Manufacturer's installation instructions and general recommendations

G. Qualification Data: For qualified manufacturer and Installer.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: A paving-mix manufacturer registered with and approved by authorities having jurisdiction or the DOT of state in which Project is located.

B. Installer Qualifications: Imprinted-asphalt manufacturer's authorized installer who is trained and approved for installation of imprinted asphalt if required for this Project.

C. Comply with Asphalt Institute Manual MS-22, "Construction of Hot Mix Asphalt Pavements", unless more stringent requirements are indicated.

D. Geosynthetics:

1. Pre-Construction Conference: Prior to installation of any pavement overlay geotextile system, the Contractor shall arrange a meeting at the site with the geotextile material supplier and, where applicable the geotextile installer. The Owner and the Engineer shall be notified at least three days in advance of the time of the meeting. A representative of the supplier shall be available on an "as-needed" basis during construction.
2. Sampling and Testing: Sampling and testing to verify conformance with specification in accordance with ASTM D 4354.
3. Acceptance: Shall be in accordance with ASTM D 4759 based on testing of either conformance submittal using Procedure A of ASTM D 4354 or based on manufacturer's certifications and testing of quality control samples obtained using Procedure B of ASTM D 4354.
4. Sewn Seams (if required): Field sewn or factory sewn samples shall be submitted to Engineer for approval prior to installation. Submit 6 foot (2 meter) length of sewn seam for approval.

E. Testing Agency Qualifications: Qualified according to ASTM D 3666 for testing indicated.

F. Regulatory Requirements: Comply with materials, workmanship, and other applicable requirements of the regulatory authority having jurisdiction and State Department of Transportation for asphalt paving work.

G. Cutting and Patching: The Contractor shall perform all cutting, fitting or patching that may be required to complete the work or to make its several parts fit together properly. The Contractor shall not damage or endanger any portion of the work or the work of the Owner or any separate contractors by cutting, patching or otherwise altering any work, or by excavation. The contractor shall not cut or otherwise alter the work of the Owner or any separate contractor except with the

written consent of the Owner and the separate contractor. The Contractor shall not unreasonably withhold from the Owner or any separate contractor his consent to cutting or other altering the work.

H. Cutting and Patching: Cutting and patching activities shall not:
   1. Change load caring capacity or load-deflection ratio of structural elements
   2. Reduce the capacity of operational elements to perform as intended or increase required maintenance or decrease operational life or safety.
   3. Reduces the buildings aesthetic qualities (as determined by the Owner). Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.
   4. If possible retain original installer or fabricator to cut and patch work described. If original installer or fabricator is not available, engage another recognized, experienced and specialized firm to do the work.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver pavement-marking materials to Project site in original packages with seals unbroken and bearing manufacturer's labels containing brand name and type of material, date of manufacture, and directions for storage.

B. Store pavement-marking materials in a clean, dry, protected location within temperature range required by manufacturer. Protect stored materials from direct sunlight.

C. Geotextiles:
   1. Labeling, shipment and storage shall follow ASTM D 4873.
   2. Product labels shall clearly show the manufacturer or supplier name, style name and roll number.
   3. Each shipping document shall include a notation certifying that the material is in accordance with the manufacturer’s certificate.
   4. Each geotextile roll shall be wrapped with a material that will protect the geotextile from damage to shipment, water, sunlight, and contaminates. Protective wrapping shall be maintained during shipment and storage. If wrapping is damaged prior to installation, outer wrap of geotextile shall be removed and discarded prior to installation.
   5. During storage rolls to be elevated above ground and adequately protected from construction damage, extended exposure to ultraviolet radiation, precipitation, chemicals, flames, sparks, temperatures below -20 deg C (-29 deg C) or in excess of 71 deg C (160 deg F) and any other environmental condition that might damage the product.

1.08 PROJECT CONDITIONS

A. Environmental Limitations: Do not apply asphalt materials if sub-grade is wet or excessively damp, during rainy weather, if rain is imminent or expected before time required for adequate cure, if the sub-grade or base course is frozen or if the air temperature, measured in the shade away from artificial heat at the location of the paving operations does not meet:
   1. Prime Coat: Minimum ambient temperature in the shade has been 40 degrees F for at least 12 hours immediately prior to application.
   2. Tack Coat: Minimum ambient temperature in the shade has been 40 degrees F for at least 12 hours immediately prior to application or minimum.
   3. Asphalt Base Course: Minimum surface temperature of 35 deg F and rising at time of placement.
   4. Asphalt Binder (Intermediate) Course: Minimum surface temperature of 40 deg F and rising at the time of placement.
   5. Asphalt Surface Course: Minimum surface temperature of 50 deg F (15.6 deg C) at time of placement.

B. Pavement-Marking Paint: Proceed with pavement marking only on clean, dry surfaces and at a minimum ambient or surface temperature of 40 deg F (4.4 deg C) for oil-based materials, and 55 deg F (12.8 deg C) for water-based materials, and not exceeding 95 deg F (35 deg C).

C. Imprinted Asphalt Paving (If Used on Project): Proceed with coating imprinted pavement only when air temperature is at least 50 deg F (10 deg C) and rising and will not drop below 50 deg F (10 deg C) within 8 hours of coating application. Proceed only if no precipitation is expected within two hours after applying the final layer of coating.

PART 2 - PRODUCTS

2.01 AGGREGATES

A. General: Use materials and gradations that have performed satisfactorily in previous installations.

B. Coarse Aggregate: ASTM D 692, sound; angular crushed stone, crushed gravel, or cured, crushed blast-furnace slag.

C. Fine Aggregate: AASHTO M 29, sharp-edged natural sand or sand prepared from stone, gravel, or combinations thereof.

2.02 ASPHALT MATERIALS

A. Asphalt Binder: AASHTO M 320 or AASHTO MP 1a, performance grade as specified by local authorities having jurisdiction or state department of transportation.

B. Asphalt Cement: Type and grade of asphalt cement for the paving mixture shall comply with the applicable requirements of AASHTO M 226, Table 2, and meeting governing DOT specifications.

C. Prime Coat: Emulsified asphalt applications shall meet the requirements of AASHTO M 140 and the governing DOT specifications.

D. Tack Coat: Emulsified asphalt applications shall meet the requirements of AASHTO M 140 and the governing DOT specifications.

E. Hot Mix Asphalt: Unless otherwise noted on the drawings, the design mix shall have the minimum stability base in accordance with AASHTO T245 or ASTM D 1559 and as specified by the State Department of Transportation in which the Project is located.

F. Reclaimed Asphalt Pavement (RAP): May be utilized as approved by the Owner. No more than 25% (total mixture) of RAP material shall be utilized in proposed mixes and shall meet the governing State Department of Transportation specifications. The origin of the RAP material shall be clearly identified to the owner prior to approval, including the RAP percentage identified in the pavement mix de4sign submittal. RAP material shall be free of contamination, including dirt, debris, concrete, clean stone, and other pollutants.

G. Water: Potable.

H. Undersealing Asphalt: ASTM D 3141, pumping consistency.

I. Asphalt Seal Coat Equipment:

1. Self-propelled squeegee equipment shall have at least two squeegee or brush devices (one behind the other) to assure adequate distribution and penetration of sealer into the bituminous pavement. Equipment shall have continuous agitation or mixing capabilities to maintain homogenous consistency of pavement sealer mixture throughout the application process.
2. Pressurized spray application equipment shall be capable of spraying pavement sealer with sand added. Equipment shall have continuous agitation or mixing capabilities to maintain homogenous consistency of pavement sealer mixture throughout the application process.
3. Hand squeegee and brushes shall be acceptable only in areas where practicality prohibits the use of mechanized equipment.

J. Asphalt Seal Coat: Shall be as per the requirement of the regulatory authority having jurisdiction or as approved by the Owner.

1. SealMaster Polymer Modified Coal Tar Sealer (PMCTS) with the following specifications:
   a. Material shall be homogeneous and show no separation or coagulation that cannot be overcome by moderate stirring.
   b. Non Volates: 40%
   c. Ash Non Volates: 35 - 40%
   d. Solubility of non Volitates in CS2%: 20 min.
   e. Specific Gravity: 25C – 1.18 Min.
   f. Drying Time: 8 hours max. (Typically less than 60 min.)
   g. Adhesion and Resistance to Water: No penetration or loss of adhesion
   h. Resistance to Heat: No blistering or sagging
   i. Flexibility: No cracking or flaking
   j. Resistance to Impact: No chipping, flaking or cracking
   k. Resistance to Volatilization: 10% loss in weight maximum
   l. Wet Film Continuity: Smooth non-granular free from course particles

2. Sealmaster Polymer Modified MasteSeal (PMM) to be used in AK, CA, AZ and NM only, with the following specifications:
    a. Material shall be homogeneous and show no separation or coagulation that cannot be overcome by moderate stirring.
    b. Non Volates: 43% - 47%
    c. Ash Non Volates: 42% - 52%
    d. Solubility of non Volitates in CS2%: 20 min.
    e. Specific Gravity: 25C – 1.15 – 1.25
    f. Drying Time: 8 hours max.
    g. Adhesion and Resistance to Water: No penetration or loss of adhesion
    h. Resistance to Heat: No blistering or sagging
    i. Flexibility: No cracking or flaking
    j. Resistance to Impact: No chipping, flaking or cracking
    k. Resistance to Volatilization: 10% loss in weight maximum
    l. Wet Film Continuity: Smooth non-granular free from course particles

3. Oil Spot Treatment: SealMaster PetroSeal or prep seal oil sot primer as specified by the manufacturer for pavement sealer.
4. Aggregate or sand as required and specified by the manufacturer.
5. Silica Sand: 400 meeting 40 to 60 fineness rating (AFS) .Black Beauty Slag Sand (with comparable sieve rating) may be substituted when silica sand is not available.
6. Polymer Additive (optional).
7. Fortifier
    a. Water based epoxy-latex additive, 3%, designed as a fortifier for refined coal tar emulsions to increase resistance to power steering marks, fuel and chemical effects and to assist in fast drying of the coating is acceptable.
    b. Thickeners are not permitted.

2.03 AUXILIARY MATERIALS

A. Herbicide: Commercial chemical for weed control, registered by the EPA. Provide in granular, liquid, or wettable powder form.

B. Sand: ASTM D 1073 or AASHTO M 29, Grade Nos. 2 or 3.

C. Paving Geotextile: AASHTO M 288, nonwoven polypropylene; resistant to chemical attack, rot, and mildew; and specifically designed for paving applications.
    1. Minimum Average Roll Values:
        a. Grab Tensile Strength: ASTM D 4632, Type I 90 lbs (400 N), Type II 120 lbs (530 N)
        b. Grab Elongation: ASTM D 4632, Type I & II 50%
        c. Mullen Burst: ASTM D 3786, Type I 180 psi (1240 kPa), Type II 230 psi (1580 kPa)
        d. Mass Per Unit Area: ASTM D 5261, Type I 3.6 oz/syd (122 g/sm), Type II 4.6 oz/syd (156 g/sm)
        e. Asphalt Retention: ASTM D 6140, Type I 0.20 gal/syd (.9 L/sqm), Type II 0.24 gal/syd (1.1 L/sqm)
        f. Melting Point: ASTM D 276 Type I & II 320 deg F (160 deg C)
        g. UV Resistance: ASTM D 4355, Type I & II 70% at 150 hours.
    2. Tack Coat: Sealant material used to impregnate and seal the geotextile as well as bond it to both the base pavement and overlay shall be a paving grade asphalt recommended by the geotextile manufacturer and approved by the Engineer. Emulsions that contain solvents shall not be used. The grade of asphalt cement specified for hot-mix design in each geographic location is generally the most acceptable material.

D. Joint Sealant: ASTM D 6690 or AASHTO M 324, Type I, hot-applied, single-component, polymer-modified bituminous sealant.

E. Pavement-Marking Paint: Alkyd-resin type, lead and chromate free, ready mixed, complying with AASHTO M 248.
    1. Color: White (on asphalt paving).
    2. Materials:

a. **Sherwin Williams Setfast Non- leaded Chlorinated Rubber -** White on asphalt (TM5126), yellow on concrete (TM5127), or as indicated on the drawing(s) is preferred.
b. **Sherwin Williams "Setfast Acrylic Waterborne Traffic Marking Paint"** – White on asphalt (TM226, yellow on concrete (TM225), or as indicated on the drawing(s)
c. **Valspar Enterprise Latex Traffic Marking Paint** - White on asphalt (#2540), yellow on concrete (#2541), or as indicated on the drawing(s).
d. **PPG (Pittsburg Paints)"SEEDHIDE® Traffic and Zone Marking Flat Latex" –** White on asphalt (11-23), yellow on concrete, or as indicated on the drawing(s).

3. Execution
   a. Proceed with pavement marking only on clean, dry surfaces and at a minimum ambient or surface temperature of 50 degrees F not exceeding 90 degrees F and relative humidity at a maximum of 85%.
   b. Surface shall be clean and free of dirt, grease, oil, or other contaminants which could interfere with adhesion.
   c. Apply paint material at manufacturer's recommended rates to provide a minimum wet film thickness of 15 mils and dry film thickness of 10 mils per coat.
   d. Paint to be applied in 2 coats using a template or striping machine. Stripes shall be a minimum width of 4 inches unless otherwise noted on the Drawings.
4. Temporary Pavement Markings
   a. Temporary paint shall be applied in accordance with permanent pavement marking specifications however only one (1) coat of paint shall be required. The contractor may use a temporary removable pavement marking tape only as approved in writing by the Owner. Tape that has become damaged and is no longer serviceable shall be replaced without additional compensation.
   b. All temporary markings shall be removed when no longer required. Any pavement area that has been determined to be damaged as a result of the removal operation shall be repaired at no additional cost to the Owner.
5. Pavement Marking Removal
   a. A motorized abrasive device shall be utilized to remove existing markings. Existing pavement marking lines and symbols that are to be removed shall be accomplished such that material or structural damage to the surface or texture of the pavement is avoided. The Contractor shall repair any damage to the pavement at no expense to the Owner. After removal, the pavement shall be in a condition that will not mislead or misdirect customers or motorists. Pavement marking removal within public rights of way shall be completed in accordance with the regulatory authority having jurisdiction and the Drawings and Specifications.

F. Wheel Stops: Precast, air-entrained concrete, 2500-psi (17.2-MPa) minimum compressive strength, 6 inches (150 mm) high by 6 inches (150 mm) wide by 72 inches (1800 mm) long. Provide chamfered corners, drainage slots on underside, and holes for anchoring to substrate.
   1. Dowels: Galvanized steel, 3/4-inch (19-mm) diameter, 12-inch (300-mm) minimum length. Or #4 bars 12-inch (300 mm) minimum.

2.04 IMPRINTED ASPHALT MATERIALS (When Used on the Project)

A. Templates: Imprinted-asphalt manufacturer's standard flexible templates for imprinting pattern into hot asphalt paving.
   1. Pattern: As indicated on the Drawings.

B. Coating System: Imprinted-asphalt manufacturer's standard system formulated for exterior application on asphalt paving surfaces.

2.05 MIXES

A. Hot-Mix Asphalt: Dense, hot-laid, hot-mix asphalt plant mixes as indicated on the Drawings and approved by authorities having jurisdiction and the State Department of Transportation where the project is located**;** designed according to procedures in AI MS-2, "Mix Design Methods for Asphalt Concrete and Other Hot-Mix Types";. and complying with the following requirements:
   1. Provide mixes with a history of satisfactory performance in geographical area where Project is located.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that subgrade is dry and in suitable condition to begin paving.

B. Proof-roll subgrade below pavements with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.

1. Completely proof-roll subgrade in one direction, repeating proof-rolling in direction perpendicular to first direction. Limit vehicle speed to 3 mph (5 km/h).
2. Proof roll with a loaded 10-wheel, tandem-axle dump truck weighing not less than 15 tons (13.6 tonnes).
3. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by Architect, and replace with compacted backfill or fill as directed.

C. Proceed with paving only after unsatisfactory conditions have been corrected.

D. Verify that utilities, traffic loop detectors, and other items requiring a cut and installation beneath the asphalt surface have been completed and that asphalt surface has been repaired flush with adjacent asphalt prior to beginning installation of imprinted asphalt.

E. Examine surfaces to be cut and patched and conditions under which cutting and patching are to be performed. Before patching, verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers. Proceed with installation only after unsafe or unsatisfactory conditions have been corrected.

3.02 COLD MILLING

A. Clean existing pavement surface of loose and deleterious material immediately before cold milling. Remove existing asphalt pavement by cold milling to grades and cross sections indicated.

1. Milling of existing asphalt pavement shall be at the depth and location as indicated on the Construction Drawings or as directed by the Owner.
2. Mill to a uniform finished surface free of excessive gouges, grooves, and ridges. The milled pavement surface shall be thoroughly cleaned of all loose aggregate particles, dust, and other objectionable material by the use of power brooms, power blowers and power vacuums and other means.
3. Control rate of milling to prevent tearing of existing asphalt course.
4. Repair or replace curbs, manholes, and other construction damaged during cold milling. Contractor shall coordinate any adjustment of manholes, meter boxes, drainage inlets, valve boxes, and other utilities affected by the milling operations.
5. Excavate and trim unbound-aggregate base course, if encountered, and keep material separate from milled hot-mix asphalt.
6. All milled material shall become the property of the Contractor and shall be disposed of off-site or used in conformance with Section 312000) or for utilization as Reclaimed Asphalt Pavement in conformance with this specification and only as approved by the Owner.

3.03 CUTTING AND PATCHING

A. Preparation: Protect existing construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of the Project that might be exposed during cutting and patching operations.

B. General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at earliest feasible time, and complete without delay.

C. Cutting: Cut existing construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to the original condition.

1. Cut existing construction by sawing, drilling, breaking, chipping, grinding and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original installer and comply with original installer's written recommendations.
   a. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots as small as possible, neatly to size

required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.

b. Existing Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.

c. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.

d. Excavating and Backfilling: Comply with requirements in applicable Specification Sections where required by cutting and patching operations.

e. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.

f. Proceed with patching after construction operations requiring cutting are complete.

D. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of the other Work. Patch with durable seams that are as invisible as possible. Provide materials and comply with installation requirements specified below:

E. Hot-Mix Asphalt Pavement: Saw cut perimeter of patch and excavate existing pavement section to sound base. Excavate rectangular or trapezoidal patches, extending 12 inches (300 mm) into adjacent sound pavement, unless otherwise indicated. Cut excavation faces vertically. Remove excavated material. Re-compact existing unbound-aggregate base course to form new sub-grade.

F. Surface Preparation: Immediately before placing asphalt materials, remove loose and deleterious material from substrate surfaces. Ensure that prepare substrate surface is ready to receive paving. Sweep loose granular particles from surface of un-bound aggregate base course.

G. Tack Coat: Apply uniformly to vertical surfaces abutting or projecting into new, hot-mix asphalt paving at a rate of 0.05 to 0.15 gal./sq. yd. (0.2 to 0.7 L/sq. m).

1. Allow tack coat to cure undisturbed before applying hot-mix asphalt paving.
2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.

H. Patching: Partially fill excavated pavements with hot-mix asphalt base mix and, while still hot, compact. Cover asphalt base course with compacted, hot-mix surface layer finished flush with adjacent surfaces. Restore exposed finished of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.

3.04 REPAIRS

A. Leveling Course: Install and compact leveling course consisting of hot-mix asphalt surface course to level sags and fill depressions deeper than 1 inch (25 mm) in existing pavements.

1. Install leveling wedges in compacted lifts not exceeding 3 inches (75 mm) thick.

B. Crack and Joint Filling: Remove existing joint filler material from cracks or joints to a depth of 1/4 inch (6 mm).

1. Clean cracks and joints in existing hot-mix asphalt pavement.
2. Use emulsified-asphalt slurry to seal cracks and joints less than 1/4 inch (6 mm) wide. Fill flush with surface of existing pavement and remove excess.
3. Use hot-applied joint sealant to seal cracks and joints more than 1/4 inch (6 mm) wide. Fill flush with surface of existing pavement and remove excess.

3.05 SURFACE PREPARATION

A. General: Immediately before placing asphalt materials, remove loose and deleterious material from substrate surfaces by use of power blower or mechanical sweeping equipment.. Ensure that prepared sub-grade is ready to receive paving.

1. Surface hairline cracks up to ½ inch must be filled with crack filler; cracks larger than ½ inch must be cleaned and filled with elastomeric emulsion crack filler.
2. When using a high performance crack sealant, please note on proposal.
3. Potholes, alligator cracks, and similar surface defects must be cut out and repaired.

B. Prime Coat: Apply uniformly over surface of compacted unbound-aggregate base course at a rate of 0.20 gal./sq. yd. Apply enough material to penetrate and seal but not flood surface. Allow prime coat to cure.

1. If prime coat is not entirely absorbed within 24 hours after application, spread sand over surface to blot excess asphalt. Use enough sand to prevent pickup under traffic. Remove loose sand by sweeping before pavement is placed and after volatiles have evaporated.
2. Protect primed substrate from damage until ready to receive paving.

C. Tack Coat: Apply uniformly to surfaces of existing pavement at a rate of 0.05 to 0.15 gal./sq. yd. (0.2 to 0.7 L/sq. m).
1. Allow tack coat to cure undisturbed before applying hot-mix asphalt paving.
2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.
3. Adequate traffic control shall be provided to prohibit traffic from traversing applied area.

3.06 PAVING GEOTEXTILE INSTALLATION

A. Preparation:
1. Washed concrete sand may be spread over an asphalt-saturated geotextile to facilitate movement of equipment during construction or to prevent tearing or delaminating of the geotextile. Hot-mix broadcast in front of construction vehicle tires may also serve this purpose. If sand is applied, excess quantities shall be removed from the geotextile prior to placing the surface course.
2. Sand is not usually required. However, ambient temperatures are occasionally sufficiently height to cause bleed-through of the asphalt sealant resulting in undesirable geotextile adhesion to construction vehicle tires.
3. Neither the asphalt sealant nor the geotextile shall be placed when weather conditions, in the opinion of the Owner or Engineer are not suitable. Air and pavement temperatures shall be sufficient to allow the asphalt sealant to hold the geotextile in place. For asphalt cements air temperature shall be at least 10 deg C (50 deg F) and rising. For asphalt emulsions air temperature shall be 15 deg C (60 deg F) and rising.
4. The surface shall be free of dirt, water, vegetation or other debris.

B. Installation of Tack Coat:
1. Apply tack coat, asphalt binder, asphalt cement, as specified on the Drawings uniformly to existing pavement surfaces.
2. Rate of asphalt sealant application must be sufficient to satisfy the asphalt retention properties of the geotextile and bond the geotextile and overlay the pavement.
3. Application shall be by manufacturers recommendations. Minimum temperature shall be 150 deg C (300 deg F) and shall not exceed 160 deg C (320 deg F).
4. Target width of asphalt sealant application shall be the geotextile width plus 6 inches (150 mm). The asphalt sealant shall not be applied any farther in advance of geotextile placement than the distance the contractor can maintain free of traffic.

C. Installation of Geosynthetic (Paving Fabric):
1. Geotextile to be placed onto the asphalt sealant (calendared or smooth side up) with minimum wrinkling prior to the time the asphalt has cooled and lost tackiness. Upon approval of Engineer wrinkles or folds in excess of 1 inch (25 mm) shall be slit and laid flat.
2. Place paving geotextile promptly according to manufacturer's written instructions. Broom or roll geotextile smooth and free of wrinkles and folds.
3. Overlap longitudinal joints 4 inches (100 mm) and transverse joints 6 inches (150 mm). Transverse joints shall be lapped in direction of paving to prevent edge pickup by the paver. A second application of asphalt sealant to the geotextile overlap will be required if needed to ensure proper bonding of the double geotextile layer as directed by the Engineer.
4. Protect paving geotextile from traffic and other damage and place hot-mix asphalt paving overlay the same day.
5. Removal and replacement of geotextile that is damaged will be

D. Protection:
1. Traffic on the geotextile will be permitted for emergency and construction vehicles only.
2. Placement of the hot-mix overlay should closely follow geotextile installation.
3. Prior to placing a seal coat (or thin overlay such as an open-graded friction course), lightly sand the geotextile and a spread rate of 0.15 to 0.20 lb per square foot and pneumatically roll the geotextile tightly into the sealant.

3.07 HOT-MIX ASPHALT PLACING

A. Machine place hot-mix asphalt on prepared surface, spread uniformly, and strike off. Place asphalt mix by hand to areas inaccessible to equipment in a manner that prevents segregation of mix. Place each course to required grade, cross section, and thickness when compacted.
   1. Place hot-mix asphalt base course in number of lifts and thicknesses indicated.
   2. Place hot-mix asphalt surface course in single lift.
   3. Spread mix at minimum temperature of 250 deg F (121 deg C) and at maximum temperature of 325 deg F.
   4. Begin applying mix along centerline of crown for crowned sections and on high side of one-way slopes unless otherwise indicated.
   5. Regulate paver machine speed to obtain smooth, continuous surface free of pulls and tears in asphalt-paving mat.

B. Place paving in consecutive strips not less than 10 feet (3 m) wide unless infill edge strips of a lesser width are required.
   1. After first strip has been placed and rolled, place succeeding strips and extend rolling to overlap previous strips. Complete a section of asphalt base course before placing asphalt surface course.

C. Promptly correct surface irregularities in paving course behind paver. Use suitable hand tools to remove excess material forming high spots. Fill depressions with hot-mix asphalt to prevent segregation of mix; use suitable hand tools to smooth surface.

3.08 JOINTS

A. Construct joints to ensure a continuous bond between adjoining paving sections. Construct joints free of depressions, with same texture and smoothness as other sections of hot-mix asphalt course. Construct joints parallel to traffic flow.
   1. Clean contact surfaces and apply tack coat to joints.
   2. Offset longitudinal joints, in successive courses, a minimum of 6 inches (150 mm).
   3. Offset transverse joints, in successive courses, a minimum of 24 inches (600 mm).
   4. Construct transverse joints at each point where paver ends a day's work and resumes work at a subsequent time. Construct these joints using either "bulkhead" or "papered" method according to AI MS-22, for both "Ending a Lane" and "Resumption of Paving Operations." Or as shown on Drawings.
   5. Compact joints as soon as hot-mix asphalt will bear roller weight without excessive displacement.
   6. Compact asphalt at joints to a density within 2 percent of specified course density.

3.09 COMPACTION

A. General: Begin compaction as soon as placed hot-mix paving will bear roller weight without excessive displacement. Compact hot-mix paving with hot, hand tampers or with vibratory-plate compactors in areas inaccessible to rollers.
   1. Complete compaction before mix temperature cools to 185 deg F (85 deg C).

B. Breakdown Rolling: Complete breakdown or initial rolling immediately after rolling joints and outside edge. Examine surface immediately after breakdown rolling for indicated crown, grade, and smoothness. Correct laydown and rolling operations to comply with requirements.

C. Intermediate Rolling: Begin intermediate rolling immediately after breakdown rolling while hot-mix asphalt is still hot enough to achieve specified density. Continue rolling until hot-mix asphalt course has been uniformly compacted to the following density:
   1. Density: Compare density of in-place material against laboratory specimen of same mixture. Average density shall meet specifications and requirements of the State Department of Transportation in which the Project is located.
      a. Average Density: 95 percent of reference maximum theoretical density according to ASTM D 2041, for binder (intermediate) and surface courses.
      b. Average Density: 92 percent of reference maximum theoretical density according to ASTM D 2041, for base courses.

D. Finish Rolling: Finish roll paved surfaces to remove roller marks while hot-mix asphalt is still warm.

E. Edge Shaping: While surface is being compacted and finished, trim edges of pavement to proper alignment. Bevel edges while asphalt is still hot; compact thoroughly.
F. Repairs: Remove paved areas that are defective or contaminated with foreign materials and replace with fresh, hot-mix asphalt. Compact by rolling to specified density and surface smoothness.
G. Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened.
H. Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked.

3.10 INSTALLATION TOLERANCES

A. Pavement Thickness: Compact each course to produce the thickness indicated within the following tolerances:
   1. Base Course: Plus or minus 1/4 inch (6 mm).
   2. Binder (Intermediate) Course: Plus or minus ¼ inch (6 mm)
   3. Surface Course: Plus or minus 1/8 inch (3 mm).
B. Pavement Surface Smoothness: Compact each course to produce a surface smoothness within the following tolerances as determined by using a 10-foot (3-m) straightedge applied transversely or longitudinally to paved areas:
   1. Base Course: 1/2 inch (12 mm).
   2. Binder (Intermediate) Course: ¼ inch (6 mm)
   3. Surface Course: 1/8 inch (3 mm**)**.
C. Testing: Contractors duties relating to testing include:
   1. Notify Owner 72 hours prior to asphalt paving
   2. Notify laboratory of conditions requiring testing
   3. Coordinate with laboratory for field testing.

3.11 SURFACE TREATMENTS

A. Application: Apply pavement sealer with ambient temperature is at least 50 degrees F and rising for a period of at least 24 hours after application. And subject to the following limitations:
   1. Do not apply when temperatures are expected to drop below 50 degrees F in a 24-hour period or if rain is expected or imminent within 8 hours
   2. Do not apply pavement sealer when ambient temperature is 90 degrees and above without first cooling the surface with a fine mist of water (fogging). The fogging should only dampen the surface without causing water pockets to form.
   3. Do not apply between September 15 and May 1 unless the specifications and requirements of the State Department of Transportation WEATHER LIMITATIONS in which the project is located permit application between these dates.
B. Surface Preparation:
   1. Surface must be free from dirt, dust and includes grass along the edges. Remove and dispose of any loose and unsuitable materials, dirt, and debris from pavement surface by power blower or mechanical sweeping equipment.
   2. Surface hairline cracks up to ½ inch must be filled with crack filler; cracks larger than ½ inch must be cleaned and filled with elastomeric emulsion crack filler.
   3. When using a high performance crack sealant, please note on your proposal.
   4. Potholes, alligator areas, and similar surface defects must be cut out and repairs made.
   5. Treat all grease, oil and gasoline spots with compatible primer of the manufactured coating. In hot weather, the surface should be fogged with water prior to sealing.
   6. Prior to spreading pavement sealer, paint all existing white paint stripes with black paint.
   7. Contractor to dispose of all cans bags and leftover materials off-site.
C. Application:
   1. Mix pavement sealer in accordance with the manufacturer's procedure to a uniform consistency before using. For each coat, the sealant shall be diluted with clean potable water while agitating. The percent of water to be added will be as per the manufacturer specification based on the asphalt surface quality, and the type of traffic it will experience. When the rubberized mixture has thickened, add sand or aggregate slowly to the mixing tank. Mix thoroughly before and slowly during the application.

a. First coat on all parking areas at a rate of .13 gallons per square yard/coat. At no time are total coats to exceed .051 gallons per square yard. The first coat may be applied by hand squeegee, self propelled squeegee equipment or pressurized spray equipment. Hand squeegee or self propelled squeegee equipment is preferred.
b. Second coat on all parking areas at a rate of .13 gallons per square yard/coat. At no time total coats are to exceed .051 gallons per square yard. The second coat must be applied with pressurized spray equipment.

2. Lines, stencils, and markings shall be repainted in original size & location, unless otherwise directed by the Owner, in accordance with this specification.
3. It is the Contractor's responsibility to check local zoning codes & regulations.
4. All seal coat and re-striping projects must be performed during available time periods (usually at night) that DO NOT interfere with normal store operations. Applications must be staged to provide customers free access to Lowe's the following business day.

3.12 WHEEL STOPS

A. Install wheel stops in bed of adhesive as recommended by manufacturer.
B. Securely attach wheel stops to pavement with not less than two galvanized-steel dowels embedded at one-quarter to one-third points. Securely install dowels into pavement and bond to wheel stop. Recess head of dowel beneath top of wheel stop.

3.13 IMPRINTING ASPHALT (when used on project)

A. General: Imprint asphalt according to manufacturer's written instructions, using manufacturer's recommended equipment.
B. Freshly Laid Asphalt: Immediately after asphalt has been laid and compacted but still plastic, begin the surface imprinting process.
   1. Monitor asphalt surface temperature in compliance with manufacturer's written recommendations to ensure required temperature to perform surface imprinting.
   2. Reheat asphalt if surface temperature drops below that required.
C. Reheating Asphalt: Soften asphalt pavement surface by heating to a depth of at least 1/2 inch (13 mm) without burning asphalt.
   1. Heat to a temperature of 300 to 325 deg F (149 to 163 deg C) immediately before applying templates.
   2. Regularly monitor the pavement temperature to prevent overheating.
   3. Direct flame heaters are not permitted.
   4. If pavement is overheated and begins to emit black smoke, remove damaged pavement by milling down 1 inch (25 mm) and replace removed pavement with new, compacted surface course prior to resuming imprinting work.
D. Surface Imprinting: Apply and imprint templates to a minimum depth as indicated on the Drawings and as required to embed precut marking material flush or barely beneath pavement surface.
E. Coating Application: After imprinted surface has cooled, apply according to Drawings and manufacturer's recommendations. Do not allow traffic until coating has completely dried and cured.
F. Precut Marking Material Application: Position precut marking material aligned with imprinted pattern and slowly heat to a temperature no higher than 325 deg F (163 deg C) until marking material begins to liquefy and flow. Do not allow traffic until installed marking material has cooled to ambient temperature.

3.14 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to perform tests, inspections and to prepare reports. Testing agency will be paid by Owner..
B. Thickness: In-place compacted thickness of hot-mix asphalt courses will be determined according to ASTM D 3549.
C. Surface Smoothness: Finished surface of each hot-mix asphalt course will be tested for compliance with smoothness tolerances.
D. In-Place Density: Testing agency will take samples of un-compacted paving mixtures and compacted pavement according to ASTM D 979 or AASHTO T 168.

1. Reference maximum theoretical density will be determined by averaging results from four samples of hot-mix asphalt-paving mixture delivered daily to site, prepared according to ASTM D 2041, and compacted according to job-mix specifications.
2. In-place density of compacted pavement will be determined by testing core samples according to ASTM D 1188 or ASTM D 2726.
    a. Two 4 inch core sample will be taken for every 5000 sq. yd. (836 sq. m) or less of intermediate course, at locations chosen by the Owner.
    b. The Owner shall provide random location field density testing of in-place compacted pavement determined by nuclear method according to ASTM D 2950 and correlated with ASTM D 1188 or ASTM D 2726.

E. Contractor to replace and compact hot-mix asphalt where core tests were taken.

F. The Owner reserves the right to take additional testing. Remove and replace or install additional hot-mix asphalt where test results or measurements indicate that it does not comply with specified requirements. All areas that do not comply with specified requirements shall be remedied by the Contractor as prescribed by the Owner.

3.15 DISPOSAL

A. Except for material indicated to be recycled, remove excavated materials from Project site and legally dispose of them in an EPA-approved landfill.
1. Do not allow milled materials to accumulate on-site. Perimeter protection shall be provided for milled material stockpiles temporarily stored on site where there is a potential for these materials to mix with stormwater and be discharged from the site.
2. Cleaning asphalt paving equipment and tools is not permitted on site.

END OF SECTION 321216

MARSHALL STABILITY
MIX DESIGN SUBMITTAL FORM

Project Location: _____
Type/Name of Mix: _____
AC Grade: _____
Reclaimed Asphalt Pavement (RAP) Mix: ڤ Yes _____% RAP or ڤ No

Gradation Limits	
Sieve Size	% Passing by Weight
Marshall Design Properties ڤ 50 Blow Method or ڤ 75 Blow Method	
Number of Blows, each end (___ inch specimen)	
Stability (lbs.)	
Flow (0.01 in.)	
Voids in Total Mix, VTM (%)	
Voids in Mineral Aggregate, VMA (%)	
Voids Filled with Asphalt, VFA (%)	
AC Content (%)	
Fines to Asphalt Ratio	

SUBMITTAL WILL BE REJECTED WITHOUT EACH OF THE FOLLOWING ATTACHED:

1. State Department of Transportation (DOT) or Authority Having Jurisdiction (AHJ) asphalt mix design specifications for each type of mix.
2. Material certificates stating the asphalt mix to be supplied complies with the specifications of the DOT or AHJ signed by the Asphalt Mix Producer and the Contractor.
3. Origin or RAP material if applicable.

SUPERPAVE
MIX DESIGN SUBMITTAL FORM

Project Location: _____
Type/Name of Mix: _____
Reclaimed Asphalt Pavement (RAP) Mix: ف Yes _____% Binder in RAP or ف No
Reclaimed Asphalt Shingle (RAS) Mix: ف Yes _____% Binder in RAS or ف No

Gradation Limits Mix Type (Nominal Maximum Aggregate Size)	
ف 9.5 mm ف 12.5 mm ف 19.0 mm ف 25.0 mm ف 37.5 mm	
Sieve Size	% Passing

Binder PG Grade	
No. Gyration N_{ini} /N_{des} /N_{max}	
Voids in Mineral Aggregate VMA (%)	
Voids in Total Mix VTM (%)	
Voids Filled with Asphalt VFA (%)	
%Gmm @ N_{ini}	
%Gmm @ N_{max}	
Dust to Binder Ratio ($P_{0.075}/P_{be}$)	

NOTE: Mix design must be performed in accordance with the Superpave mix design system as described in AASHTO PP 28.

SUBMITTAL WILL BE REJECTED WITHOUT EACH OF THE FOLLOWING ATTACHED:

1. State Department of Transportation (DOT) or Authority Having Jurisdiction (AHJ) asphalt mix design specifications for each type of mix.
2. Material certificates stating the asphalt mix to be supplied complies with the specifications of the DOT or AHJ signed by the Asphalt Mix Producer and the Contractor.
3. Origin or RAP/RAS material if applicable.

SECTION 32 12 36.13

ASPHALT SEAL AND FOG COAT

PART 1 - GENERAL

1.01 SUMMARY

A. Work under this section shall include cleaning and preparing the pavement surface, mixing the pavement sealer, and applying the asphalt pavement sealer over existing bituminous pavement surfaces.

B. Restriping parking lot markings for an existing parking lot for maintenance and repair application. Areas to receive parking lot markings are all areas within the property boundary.

1.02 REFERENCED SECTIONS

A. Section 321216 - Asphalt Paving

B. Section 321313- Concrete Pavement Curb and Sidewalk

1.03 REFERENCE STANDARDS

A. American Society of Testing and Materials
   1. ASTM D-140 Standard Practice for Sampling of Bituminous Materials
   2. ASTM D-449 Asphalt Used in Damp-proofing and Waterproofing, Type II and III
   3. ASTM D-2939 Standard Test Methods Emulsion Bitumen's Use as Protective Coatings
   4. ASTM D-3405 Joint Sealant Hot-Applied for Concrete and Asphalt Pavement
   5. ASTM D-3320 Emulsified Coal Tar Pitch (Mineral Colloid Type)
   6. ASTM D-3910 Design, Testing and Construction of Slurry Seal

1.04 SUBMITTALS

A. Material Certificates: Submit materials certificate to the Owner's engineer which is signed by the Contractor, certifying that materials comply with, or exceed, the requirements herein.

B. Seal Coat design shall be as per the requirement of the regulatory authority having jurisdiction or as approved by the Owner.

PART 2 - PRODUCTS

2.01 MATERIALS

A. SealMaster Polymer Modified Coal Tar Sealer (PMCTS) at the following specifications:
   1. SealMaster Specification
      a. Material – Material shall be homogenous and show no separation or coagulation that cannot be overcome by moderate stirring.
      b. Non Volatiles – 40%
      c. Ash Non Volatiles – 35 – 40%
      d. Solubility of Non Volatiles in CS2% - 20 min.
      e. Specific Gravity 25C – 1.18 MIN.
      f. Drying Time – 8 hr. MAX. (Typically less than 60 min.)
      g. Adhesion & Resistance to Water – No Penetration or Loss of Adhesion
      h. Resistance to Heat – No Blistering or Sagging
      i. Flexibility – No Cracking or Flaking
      j. Resistance to Impact – No Chipping, Flaking or Cracking
      k. Resistance to Volatilization – 10% Loss in Weight Max.
      l. Wet Film Continuity – Smooth, Nongranular Free from course particles

B. SealMaster Polymer Modified MasterSeal (PMM) to be used in AK, CA, AZ and NM ONLY at the following specifications:
   1. SealMaster Specification
      a. Material – Material shall be homogenous and show no separation or coagulation that cannot be overcome by moderate stirring.
      b. Non-Volatile, 43 – 47%

c. Ash of Non-Volatile, 42 – 52%
d. Specific Gravity 25oc 1.15 – 1.25
e. Drying Time – 8hrs. MAX.
f. Adhesion & Resistance to Water – No Penetration or Loss of Adhesion
g. Resistance to Heat – No Blistering or Sagging
h. Flexibility – No Cracking or Flaking
i. Resistance to Impact – No Chipping, Flaking or Cracking

Note: Only materials meeting the above specifications will be accepted. Certificate of Compliance from the refined coal tar manufacturer is required prior to application.

C. Oil Spot Treatment: SealMaster PetroSeal or prep seal oil spot primer as specified by the manufacturer for pavement sealer.
D. Water
E. Aggregate or sand as required and specified by the manufacturer
F. Polymer Additive (optional)
G. Fortifier
1. Water based epoxy-latex additive, designed as a fortifier for refined coal tar emulsions to increase resistance to power steering marks, fuel and chemical effects to assist in fast drying of the coating is acceptable.
2. Thickeners only are not permitted.

2.02 EQUIPMENT

A. Self-propelled squeegee equipment shall have a least 2 squeegee or brush devices (one behind the other) to assure adequate distribution and penetration of sealer into the bituminous pavement. Equipment shall have continuous agitation or mixing capabilities to maintain homogenous consistency of pavement sealer mixture throughout the application process.
B. Pressurized spray application equipment shall be capable of spraying pavement sealer with sand added. Equipment shall have continuous agitation or mixing capabilities to maintain homogenous consistency of pavement sealer mixture throughout the application process.
C. Hand squeegee and brushes shall be acceptable only in areas where practicality prohibits the use of mechanized equipment.

2.03 MIX DESIGNS

A. Sealer concentrate – 100 Gallon
B. Silica Sand 400 Meeting 40 to 60 fineness rating (AFS).
1. Black Beauty Slag Sand (w/ comparable sieve rating) may be substituted when silica sand is not available.
C. Water – Specified material does not require onsite dilution
D. Fortifier 3%
E. Curing agents on high traffic areas (when applicable)

PART 3 - EXECUTION

3.01 Apply pavement sealer when ambient temperature is 50° F and rising for a period of 24 hours after application. Do not apply when temperature is expected to drop below 50° F in a 24-hour period. Do not apply if rain is imminent within 8 hours.

3.02 Do not apply pavement sealer when ambient temperature is 90° F and above without first cooling the surface with a fine mist of water (fogging). The fogging should only dampen the surface without causing puddling.

3.03 Between September 15 and May 1, check the specifications and requirements of the State Department of Transportation WEATHER LIMITATIONS on the permitted dates of applying the seal coats.

3.04 SURFACE PREPARATION

A. Surface must be free from dirt, dust and includes grass along the edges. Remove and dispose of any loose and unsuitable materials, dirt, and debris from pavement surface by power blower or mechanical sweeping equipment.
B. Surface hairline cracks up to ½ inch must be filled with crack filler; cracks larger than ½ inch must be cleaned and filled with elastomeric emulsion crack filler.
C. When using a high performance crack sealant, please note on your proposal.
D. Potholes, alligator areas, and similar surface defects must be cut out and repairs made.
E. Treat all grease, oil and gasoline spots with compatible primer of the manufactured coating. In hot weather, the surface should be fogged with water prior to sealing.
F. Prior to spreading pavement sealer, paint all existing white paint stripes with black paint.
G. Contractor to dispose of all cans, bags and leftover materials off-site.

3.05 APPLICATION

A. Mix pavement sealer in accordance with the manufacturer's procedure to a uniform consistency before using. For each coat, the sealant shall be diluted with clean potable water while agitating. The percent of water to be added will be as per the manufacturer specification based on the asphalt surface quality, and the type of traffic it will experience. When the rubberized mixture has thickened, add sand or aggregate slowly to the mixing tank. Mix thoroughly before and slowly during the application.
    1. First coat on all parking areas at a rate of .13 gallons per square yard/coat. At no time are total coats to exceed 0.51 gallons per square yard. The first coat may be applied by hand squeegee, self propelled squeegee equipment or pressurized spray equipment. Hand Squeegee or self propelled squeegee equipment is preferred.
    2. Second coat on all parking areas at a rate of .13 gallons per square yard/coat. At no time are total coats to exceed 0.51 gallons per square yard. The second coat must be applied with pressurized spray equipment.
B. Allow a minimum of 24 hours of curing time before allowing traffic over treated surface or application of traffic marking paint. Use of solvent borne paint shall not be permitted.
C. Lines, stencils, and markings shall be repainted in original size & location, unless otherwise directed by the Owner, in accordance with Section 02745 Pavement Markings and Removal.
D. It is the Contractor's responsibility to check local zoning codes & regulations.
E. All seal coat and re-striping projects must be performed during available time periods (usually at night) that DO NOT interfere with normal store operations. Applications must be staged to provide customers free access to the building the following business day.

END OF SECTION 321236.13

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SECTION 32 13 13

CONCRETE PAVEMENT CURB AND SIDEWALK

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and all Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes exterior cement concrete pavement for the following:
   1. Driveways and roadways.
   2. Parking lots.
   3. Curbs and gutters.
   4. Walkways.
   5. Unit paver base (if used).

B. Related Sections include the following:
   1. Division 03 Section "Cast-in-Place Concrete" for general building applications of concrete.
   2. Division 31 Section "Earth Moving" for subgrade preparation, grading, and subbase course.
   3. Division 32 Section "Concrete Paving Joint Sealants" for joint sealants of joints in concrete pavement and at isolation joints of concrete pavement with adjacent construction (if used).

1.03 REFERENCE STANDARDS

A. American Society of Testing Materials (ASTM)
   1. A82 - Standard Specification for Steel Wire, Plain, for Concrete Reinforcement
   2. A185 - Standard Specification for Steel Welded Wire Fabric, Plain, for Concrete Reinforcement
   3. A615/A615M - Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
   4. C33 - Standard Specification for Concrete Aggregates
   5. C94 - Standard Specification for Ready-Mixed Concrete
   6. C150 - Standard Specification for Portland Cement
   7. C171 - Standard Specification for Sheet Materials for Curing Concrete
   8. C260 - Standard Specification for Air-Entraining Admixtures for Concrete
   9. C309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete
   10. C494/C494M - Standard Specification for Chemical Admixtures for Concrete
   11. C979 - Standard Specification for Pigments for Integrally Colored Concrete
   12. C1116 - Standard Specification for Fiber-Reinforced Concrete and Shotcrete
   13. D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)
   14. D1752 - Standard Specification for Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction
   15. D3405 - Standard Specification for Joint Sealants, Hot-Applied, for Concrete and Asphalt Pavements
   16. D5249 - Standard Specification for Backer Material for Use with Cold- and Hot-Applied Joint Sealants in Portland-Cement Concrete and Asphalt Joints
   17. D5893 - Standard Specification for Cold Applied, Single Component, Chemically Curing Silicone Joint Sealant for Portland Cement Concrete Pavements

B. American Concrete Institute (ACI)
   1. 301R-99 – Specifications for Structural Concrete
   2. 304R – Placing and Handling Concrete, etc.
   3. 309R-96 – Guide for Consolidating of Concrete
   4. 330.1 – Standard Specifications for Plain Concrete Parking Lots
   5. 330R-92 – Guide for Design & Construction of Concrete Parking Lots

6. 211.1R-91 – Standard Practice for Selecting Proportions for Normal, Heavyweight and Mass Concrete

C. American Association of State Highway and Transportation Officials (AASHTO)
1. M182 – Standard Specifications for Burlap Cloth made from Jute for Kenaf
2. M153 – Standard Specifications for Preformed Sponge Rubber and Cork Expansion Joint Filler.

1.04 SUBMITTALS

A. Product Data: For each type of manufactured material and product mix indicated.

B. Design Mixtures: For each concrete pavement mixture (see attached form at the end of this section). Include alternate mixture designs when characteristics of materials, project conditions, weather, test results, or other circumstances warrant adjustments.

C. General Contractor and Subcontractor shall execute the Conformance Submittal(s) at the end of this section.

D. Minutes of pre-installation conference.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Manufacturer of ready-mixed concrete products who complies with ASTM C 94/C 94M requirements for production facilities and equipment.

B. ACI Publications: Comply with ACI 301, "Specification for Structural Concrete," unless modified by requirements in the Contract Documents.

C. Concrete Testing Service: The Owner will engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures.
1. A slump test and an air entrainment test shall be performed for each load delivered.
2. Four (4) standard test cylinders shall be taken for each 55 cubic yards of concrete or each days pour, whichever is more frequent. Two cylinders shall be broken at 7 days and two cylinders shall be broken at 28 days.

D. Pre-installation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."
1. Before submitting design mixtures, review concrete pavement mixture design and examine procedures for ensuring quality of concrete materials and concrete pavement construction practices. Require representatives, including the following, of each entity directly concerned with concrete pavement, to attend conference:
    a. Contractor's superintendent.
    b. Independent testing agency responsible for concrete design mixtures.
    c. Ready-mix concrete producer.
    d. Concrete pavement subcontractor.

1.06 PROJECT CONDITIONS

A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products specified.
2. Products: Subject to compliance with requirements, provide one of the products specified.
3. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.
4. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.02 FORMS

A. Form Materials: Plywood, metal, metal-framed plywood, or other approved panel-type materials to provide full-depth, continuous, straight, smooth exposed surfaces.
   1. Use flexible or curved forms for curves with a radius 100 feet (30.5 m) or less.

B. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.

2.03 STEEL REINFORCEMENT

A. Plain-Steel Welded Wire Reinforcement: ASTM A 185, 6 inches x 6 inches #10 mesh fabricated from as-drawn steel wire into flat sheets.

B. Reinforcing Bars: ASTM A 615/A 615M, Grade 40 deformed.

C. Plain Steel Wire: ASTM A 82, as drawn.

D. Deformed-Steel Wire: ASTM A 496.

E. Diamond Dowel Bars: ¼" x 4-1/2" Diamond Dowels by PNA.

F. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars, welded wire reinforcement, and dowels in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from steel wire, plastic, or precast concrete of greater compressive strength than concrete.

2.04 CONCRETE MATERIALS

A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source throughout the Project:
   1. Portland Cement: ASTM C 150, Type I, Type II or III.
   2. If indicated on the plan and only as approved by the Owner supplement with the following:
      a. Fly Ash: ASTM C 618, Class F.

B. Normal-Weight Aggregates: ASTM C 33, Combined aggregate gradation for concrete pavement and other designated concrete shall be 8% - 18% for large top size aggregates (1-1/2") or 8% - 22% for smaller top size aggregates (1" or ¾") retained on each sieve below the top size above the no. 100 sieve. Select coarse-aggregate size from options in first subparagraph below; add gradation requirements if preferred. PCA recommends maximum aggregate size of 3/4 inch (19 mm) in base slab if seeded exposed aggregate is pavement finish.
   1. Maximum Coarse-Aggregate Size: 1-1/2 inches nominal.

C. Water: ASTM C 94/C 94M.

D. Air-Entraining Admixture: ASTM C 260.

E. Calcium Chloride: The use of calcium chloride or admixtures containing more than 0.05% chloride ions is prohibited.

F. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and to contain not more than 0.1 percent water-soluble chloride ions by mass of cementitious material.
   1. Air-Entraining Admixture: ASTM C 260.
   2. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
   3. Retarding Admixture: ASTM C 494/C 494M, Type B.
   4. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
   5. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
   6. Water-Reducing and Accelerating Admixture: ASTM C 494/C 494M, Type E.

2.05 CURING MATERIALS

A. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. (305 g/sq. m) dry.

B. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

C. Water: Potable.

D. Evaporation Retarder: Waterborne, monomolecular film forming; manufactured for application to fresh concrete.

E. Clear Solvent Borne Liquid Membrane Forming Curing Compound: ASTM C 309, Type 1, Class B.

F. Clear Waterborne Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B.

G. White Waterborne Membrane-Forming Curing Compound: ASTM C 309, Type 2, Class B.

2.06 RELATED MATERIALS

A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 175, asphalt-saturated cellulosic fiber or ASTM D 1752, cork or self-expanding cork.

B. Coloring Agent: When required, add coloring agent to mix according to manufacturer's written instructions.
   1. Color Pigment: ASTM C 979, synthetic mineral-oxide pigments or colored water-reducing admixtures; color stable, free of carbon black**,** non-fading, and resistant to lime and other alkalis.
   2. Color: As indicated on Drawings and per manufacturer's designation.

C. Slip-Resistive Aggregate Finish: Factory-graded, packaged, rustproof, nonglazing, abrasive aggregate of fused aluminum-oxide granules or crushed emery with emery aggregate containing not less than 50 percent aluminum oxide and not less than 20 percent ferric oxide; unaffected by freezing, moisture, and cleaning materials.

D. Bonding Agent: ASTM C 1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.

E. Epoxy Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade to requirements, and as follows:

F. Chemical Surface Retarder: Water-soluble, liquid-set retarder with color dye, for horizontal concrete surface application, capable of temporarily delaying final hardening of concrete to a depth of 1/8 to 1/4 inch (3 to 6 mm).

G. Pigmented Mineral Dry-Shake Hardener: Factory-packaged dry combination of portland cement, graded quartz aggregate, color pigments, and plasticizing admixture. Use color pigments that are finely ground, nonfading mineral oxides interground with cement.

2.07 PAVEMENT MARKINGS

A. Pavement-Marking Paint: Lead and chromate free, ready mixed, complying with AASHTO M 248.
   1. Color: Yellow (on concrete).

B. Materials:
   1. **Sherwin Williams Setfast Non- leaded Chlorinated Rubber -** White on asphalt (TM5126), yellow on concrete (TM5127), or as indicated on the drawing(s) is preferred.
   2. **Sherwin Williams "Setfast Acrylic Waterborne Traffic Marking Paint"** – White on asphalt (TM226, yellow on concrete (TM225), or as indicated on the drawing(s)
   3. **Valspar Enterprise Latex Traffic Marking Paint** - White on asphalt (#2540), yellow on concrete (#2541), or as indicated on the drawing(s).
   4. **PPG (Pittsburg Paints)"SEEDHIDE® Traffic and Zone Marking Flat Latex" –** White on asphalt (11-23), yellow on concrete, or as indicated on the drawing(s).

C. Execution
   1. New concrete pavement shall age a minimum of 30 days before painting, unless otherwise approved by the Owner.
   2. Proceed with pavement marking only on clean, dry surfaces and at a minimum ambient or surface temperature of 50 degrees F not exceeding 90 degrees F and relative humidity at a maximum of 85%.
   3. Surface shall be clean and free of dirt, grease, oil, or other contaminants which could interfere with adhesion.
   4. Apply paint material at manufacturer's recommended rates to provide a minimum wet film thickness of 15 mils and dry film thickness of 10 mils per coat.
   5. Paint to be applied in 2 coats using a template or striping machine. Stripes shall be a minimum width of 4 inches unless otherwise noted on the Drawings.

D. Temporary Pavement Markings
   1. Temporary paint shall be applied in accordance with permanent pavement marking specifications however only one (1) coat of paint shall be required. The contractor may use a temporary removable pavement marking tape only as approved in writing by the Owner. Tape that has become damaged and is no longer serviceable shall be replaced without additional compensation.

2. All temporary markings shall be removed when no longer required. Any pavement area that has been determined to be damaged as a result of the removal operation shall be repaired at no additional cost to the Owner.

E. Pavement Marking Removal
   1. A motorized abrasive device shall be utilized to remove existing markings. Existing pavement marking lines and symbols that are to be removed shall be accomplished such that material or structural damage to the surface or texture of the pavement is avoided. The Contractor shall repair any damage to the pavement at no expense to the Owner. After removal, the pavement shall be in a condition that will not mislead or misdirect customers or motorists. Pavement marking removal within public rights of way shall be completed in accordance with the regulatory authority having jurisdiction and the Drawings and Specifications.

2.08 WHEEL STOPS

A. Wheel Stops: Precast, air-entrained concrete, 2500-psi (17.2-MPa) minimum compressive strength, 6 inches (150 mm) high by 6 inches (150 mm) wide by 72 inches (1820 mm) long. Provide chamfered corners and drainage slots on underside and holes for anchoring to substrate.
   1. Dowels: Galvanized steel, 3/4-inch (19-mm) diameter, 12-inch (300-mm) minimum length. Or #4 bars 12-inch (300 mm) minimum.

2.09 CONCRETE MIXTURES

A. Prepare design mixtures, proportioned according to ACI 211.IR-91 and ACI 304 and ACI 301, for each type and strength of normal-weight concrete determined by either laboratory trial mixes or field experience.
   1. Use a qualified independent testing agency for preparing and reporting proposed concrete mixture designs for the trial batch method.

B. Proportion mixtures to provide normal-weight concrete with the following properties:
   1. Compressive Strength (28 Days): 4000 psi (27.6 MPa).
   2. Slump Limit: Maximum 5 inches (125 mm) at time of placement for pavement, 2 inch (50 mm) for curb and sidewalk.

C. Add air-entraining admixture at manufacturer's prescribed rate to result in normal-weight concrete at point of placement having an air content as follows:
   1. Air Content: 5-% to 8% for pavement, curb and sidewalk.

D. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.

E. Chemical Admixtures: Use admixtures according to manufacturer's written instructions.
   1. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.

F. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement according to ACI 301 requirements, only as authorized by the Owner in writing as follows:
   1. Fly Ash or Pozzolan: 25 percent.

G. Color Pigment: When indicated on the Drawings add color pigment to concrete mixture according to manufacturer's written instructions and to result in hardened concrete color consistent with approved mockup.

2.10 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M and ASTM C 1116. Furnish batch certificates for each batch discharged and used in the Work.
   1. When air temperature is between 85 deg F (30 deg C) and 90 deg F (32 deg C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F (32 deg C), reduce mixing and delivery time to 60 minutes.

B. Project-Site Mixing: On-site mixing must be approved by the Owner. Comply with requirements and measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M. Mix concrete materials in appropriate drum-type batch machine mixer.

1. For concrete mixes of 1 cu. yd. (0.76 cu. m) or smaller, continue mixing at least 1-1/2 minutes, but not more than 5 minutes after ingredients are in mixer, before any part of batch is released.
2. For concrete mixes larger than 1 cu. yd. (0.76 cu. m), increase mixing time by 15 seconds for each additional 1 cu. yd. (0.76 cu. m).
3. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mixture type, mixing time, quantity, and amount of water added.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine exposed subgrades and subbase surfaces for compliance with requirements for dimensional, grading, and elevation tolerances.

B. Proof-roll prepared sub-base surface below concrete pavements with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding.
   1. Completely proof-roll subbase in one direction and repeat in perpendicular direction. Limit vehicle speed to 3 mph (5 km/h).
   2. Proof-roll with a loaded 10-wheel tandem-axle dump truck weighing not less than 15 tons (13.6 tonnes).
   3. Subbase with soft spots and areas of pumping or rutting exceeding depth of 1/2 inc**h (13 mm)** require correction according to requirements in Division 31 Section "Earth Moving."

C. Proceed with concrete pavement operations only after nonconforming conditions have been corrected and sub-grade is ready to receive pavement.

3.02 PREPARATION

A. Remove loose material from compacted sub-base surface immediately before placing concrete.

3.03 EDGE FORMS AND SCREED CONSTRUCTION

A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides for pavement to required lines, grades, and elevations. Install forms to allow continuous progress of work and so forms can remain in place at least 24 hours after concrete placement.

B. Maintain sufficient quantity of forms to allow continuing work so that forms are in place a minimum of 24 hours after concrete placement.

C. Clean forms after each use and coat with form-release agent to ensure separation from concrete without damage.

D. Flexible or curved forms shall be used on curves. Forms shall be of full depth of the concrete and of strength when staked sufficient to resist the pressure of concrete and the loads resulting from the finishing operations without springing, settling or losing shape.

3.04 STEEL REINFORCEMENT

A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.

B. Clean reinforcement of loose rust and mill scale, earth, ice, or other bond-reducing materials.

C. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement. Maintain minimum cover to reinforcement.

D. Accurately position and support reinforcement and secure against displacement. Set wire ties with ends directly into concrete.

E. Install welded wire reinforcement in lengths as long as practicable. Lap adjoining pieces at least one full mesh, and lace splices with wire. Offset laps of adjoining widths to prevent continuous laps in either direction. Support reinforcing steel on wire chairs to ensure wire stays mid-depth of sidewalk section during concrete pour.

3.05 JOINTS

A. General: Form pre-molded expansion and contraction joints, construction joints, control joints, thickened edge expansion joints, isolation joints, and tool edgings true to line with faces

perpendicular to surface plane of concrete. Construct transverse joints at right angles to centerline, unless otherwise indicated.

1. When joining existing pavement, place transverse joints to align with previously placed joints, unless otherwise indicated.

B. Construction Joints: Set construction joints at side and end terminations of pavement and at locations where pavement operations are stopped for more than one-half hour unless pavement terminates at isolation joints.

1. Diamond Dowels: Install ¼" x 4-1/2" Diamond Dowels by PNA at 24" on center or as shown on the drawings. Install per manufacturer's recommendations.

C. Isolation Joints: Locate isolation joints as shown on the Drawings. Form isolation joints of preformed joint-filler strips abutting Provide catch basins, manholes, inlets, structures, walks, light pole bases and other fixed objects , and where indicated.

1. Expansion: Provide joint filler for the entire depth of the slab section and not less than one (1) inch below finished surface so as to allow for joint sealer. Provide thickened edge expansion joint as indicated on the Drawings.
    a. Provide ½" expansion joints for curb and gutter and sidewalk at 100 feet on center.
    b. Provide ½" contraction joints for curb and gutter at 10 feet on center.
    c. Extend joint fillers full width and depth of joint.
    d. Terminate joint filler not less than 1/2 inch (13 mm) or more than 1 inch (25 mm) below finished surface if joint sealant is indicated.
    e. Place top of joint filler flush with finished concrete surface if joint sealant is not indicated.
    f. Furnish joint fillers in one-piece lengths. Where more than one length is required, lace or clip joint-filler sections together.
    g. Protect top edge of joint filler during concrete placement with metal, plastic, or other temporary preformed cap. Remove protective cap after concrete has been placed on both sides of joint.

D. Contraction ("control") Joints: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of the concrete thickness, or 1 inch, whichever is deeper. For sidewalks, control joint spacing shall be equal to the sidewalk width. For concrete pavement, control joint spacing shall be placed as shown on the drawings but no greater than 30 times the slab thickness on center both ways.

1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint with grooving tool to a 3/8-inch (10-mm) radius. Repeat grooving of contraction joints after applying surface finishes. Eliminate groove marks on concrete surfaces.
2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- (3-mm-) wide joints into concrete within 24 hours of concrete placement and as soon as the cutting action will not tear, abrade, or otherwise damage surface. If required re-saw joint immediately prior to installing sealant to achieve a ¼ inch joint width - second saw joint to be ¼-inch (6 mm) if required. Power saws are to be equipped with a bag to collect concrete dust. Concrete dust shall be disposed of in accordance with the Stormwater Pollution Prevention Plan.

E. Edging: Tool edges of pavement, gutters, curbs, and joints in concrete after initial floating with an edging tool to a 3/8-inch (10-mm) radius. Repeat tooling of edges after applying surface finishes. Eliminate tool marks on concrete surfaces.

3.06 CONCRETE PLACEMENT

A. General: All concrete walks and aprons shall be a minimum of 4 inches thick as shown on the Drawings, with a turned down edge as detailed. Comply with tolerances in ACI 330.1 Specification for Plain Concrete Parking Lots.

B. Inspection: Before placing concrete, inspect and complete formwork installation, steel reinforcement, and items to be embedded or cast in. Notify other trades to permit installation of their work.

C. Remove snow, ice, or frost from sub-base surface and reinforcement before placing concrete. Do not place concrete on frozen surfaces.

D. Moisten sub-base to provide a uniform dampened condition at time concrete is placed. Do not place concrete around manholes or other structures until they are at required finish elevation and alignment.

E. Comply with ACI 301 requirements for measuring, mixing, transporting, and placing concrete.
F. Do not add water to fresh concrete after testing.
G. Deposit and spread concrete in a continuous operation between transverse joints. Do not push or drag concrete into place or use vibrators to move concrete into place.
H. Consolidate concrete according to ACI 301 by mechanical vibrating equipment supplemented by hand spading, rodding, or tamping.
   1. Consolidate concrete along face of forms and adjacent to transverse joints with an internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms. Use only square-faced shovels for hand spreading and consolidation. Consolidate with care to prevent dislocating reinforcement, dowels, and joint devices.
I. Screed pavement surfaces with a straightedge and strike off.
J. Commence initial floating using bull floats or darbies to impart an open textured and uniform surface plane before excess moisture or bleed water appears on the surface. Do not further disturb concrete surfaces before beginning finishing operations or spreading surface treatments.
K. Curbs and Gutters: When automatic machine placement is used for curb and gutter placement, submit revised mix design and laboratory test results that meet or exceed requirements. Produce curbs and gutters to required cross section, lines, grades, finish, and jointing as specified for formed concrete. If results are not approved, remove and replace with formed concrete.
L. Slip-Form Pavers: When automatic machine placement is used for pavement, submit revised mix design and laboratory test results that meet or exceed requirements. Produce pavement to required thickness, lines, grades, finish, and jointing as required for formed pavement.
   1. Compact subbase and prepare subgrade of sufficient width to prevent displacement of paver machine during operations.
M. When adjoining pavement lanes are placed in separate pours, do not operate equipment on concrete until pavement has attained 85 percent of its 28-day compressive strength.
N. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
   1. When air temperature has fallen to or is expected to fall below 40 deg F (4.4 deg C), uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F (10 deg C) and not more than 80 deg F (27 deg C) at point of placement.
   2. Do not use frozen materials or materials containing ice or snow.
   3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mix designs.
O. Hot-Weather Placement: Comply with ACI 301 and as follows when hot-weather conditions exist:
   1. Cool ingredients before mixing to maintain concrete temperature below 90 deg F (32 deg C) at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
   2. Cover steel reinforcement with water-soaked burlap so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.
   3. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

3.07 FLOAT FINISHING

A. General: Do not add water to concrete surfaces during finishing operations.
B. Float Finish: Begin the second floating operation when bleed-water sheen has disappeared and concrete surface has stiffened sufficiently to permit operations. Float surface with power-driven floats, or by hand floating if area is small or inaccessible to power units. Finish surfaces to true planes. Cut down high spots and fill low spots. Refloat surface immediately to uniform granular texture.
   1. Medium Textured Broom Finish: Draw a medium bristle broom across float-finished concrete surface perpendicular to line of traffic to provide a uniform, medium (1/16 (1.6mm)) texture.

3.08 CONCRETE PROTECTION AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.
B. Comply with ACI 306.1 for cold-weather protection.
C. Evaporation Retarder: Apply evaporation retarder to concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h (1 kg/sq. m x h) before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.
D. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.
E. Curing Methods: Cure concrete by moisture curing, moisture-retaining-cover curing, curing compound, or a combination of these as follows:
    1. Moist Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
        a. Water.
        b. Continuous water-fog spray.
        c. Absorptive cover, water saturated and kept continuously wet. Cover concrete surfaces and edges with 12-inch (300-mm) lap over adjacent absorptive covers.
    2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches (300 mm), and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
    3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.
    4. All exterior concrete surfaces shall receive one coat of exterior sealer.

3.09 PAVEMENT TOLERANCES

A. Comply with tolerances of ACI 117 (based on ACI 330.1) and as follows:
    1. Elevation: 1/4 inch (6 mm).
    2. Thickness: Plus 3/8 inch (10 mm), minus 1/4 inch (6 mm).
    3. Surface: Gap below 10-foot- (3-m-) long, unleveled straightedge not to exceed 1/4 inch (6 mm).
    4. Lateral Alignment and Spacing of Tie Bars and Dowels: 1 inch (25 mm).
    5. Vertical Alignment of Tie Bars and Dowels: 1/4 inch (6 mm).
    6. Alignment of Tie-Bar End Relative to Line Perpendicular to Pavement Edge: 1/2 inch (13 mm).
    7. Alignment of Dowel-Bar End Relative to Line Perpendicular to Pavement Edge: Length of dowel 1/4 inch per 12 inches (6 mm per 300 mm).
    8. Joint Spacing: 3 inches (75 mm).
    9. Contraction Joint Depth: Plus 1/4 inch (6 mm), no minus.
    10. Joint Width: Plus 1/8 inch (3 mm), no minus.

3.10 PAVEMENT MARKING

A. Do not apply pavement-marking paint until layout, colors, and placement have been verified with Owner.
B. Allow concrete pavement to cure for 28 days and be dry before starting pavement marking.
C. Sweep and clean surface to eliminate loose material and dust.
D. Apply paint with mechanical equipment to produce pavement markings of dimensions indicated with uniform, straight edges. Apply at manufacturer's recommended rates to provide a minimum wet film thickness of 15 mils (0.4 mm).

3.11 WHEEL STOPS

A. Securely attach wheel stops into pavement with not less than two galvanized steel dowels embedded in holes drilled or cast into wheel stops at one-quarter to one-third points. Firmly bond

each dowel to wheel stop and to pavement. Securely install dowels into pavement and bond to wheel stop. Recess head of dowel beneath top of wheel stop.

3.12 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage and pay for a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Testing Services: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:

1. Slump and Air Content Testing Frequency: Obtain at least 1 composite sample for each load delivered.
    a. Slump: ASTM C 143/C 143M; Perform additional tests when concrete consistency appears to change.
    b. Air Content: ASTM C 231, pressure method.
    c. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F (4.4 deg C) and below and when 80 deg F (27 deg C) and above.
2. Test Cylinder Frequency: Obtain four standard test cylinders for each 55 cubic yards of concrete or each day's pour, whichever is more frequent.
    a. Compressive-Strength Tests: ASTM C 39/C 39M; test 2 specimen cylinders at 7 days and 2 specimen cylinders at 28 days.

C. Strength of each concrete mix will be satisfactory if average of any 3 consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi (3.4 MPa).

D. Test results shall be reported in writing to Owner, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.

E. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect.

F. Remove and replace concrete pavement where test results indicate that it does not comply with specified requirements.

G. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.13 REPAIRS AND PROTECTION

A. Remove and replace concrete pavement that is broken, damaged, or defective or that does not comply with requirements in this Section.

B. Protect concrete from damage. Exclude traffic from pavement for at least 14 days after placement. When construction traffic is permitted, maintain pavement as clean as possible by removing surface stains and spillage of materials as they occur.

C. Maintain concrete pavement free of stains, discoloration, dirt, and other foreign material. Sweep concrete pavement not more than two days before date scheduled for Substantial Completion inspections.

END OF SECTION 321313

DESIGN INFORMATION

	Please check one
Based on Standard Deviation Analysis	
Trial Mix Test Data	

DESIGN CHARACTERISTICS

Density		pcf
Strength		psi (28 day)
Air		% specified

If trial mixes are used the Mix Design is proportioned to achieve f'cr = f'c + 1200 psi
(1400 psi for strength higher than 5000 psi at 28 days)

MATERIALS	***Type/ Source***	***Specific Gravity***	***Weight/lb.***	***Absolute Vol. cu.ft.***
Cement				
Microsilica				
Coarse Aggregate				
Fine Aggregate				
Water				
Other				
		TOTAL		27.0 cu. ft.

* Water/Cement Ratio (lbs. water/lbs. cement) = _____%

ADMIXTURES	**Manufacturer**	**Dosage oz/cwt**
Water Reducer		
Air Entraining Agent		
High Range Water Reducer		
Non-Corrosive Accelerator		
Other		

Slump before HRWR		*inches*
Slump after HRWR		*inches*

Standard Deviation Analysis (from experience records):

# of Test Cylinders Evaluated:	
Standard Deviation:	

f'cr-f'c + 1.34s or f'cr = f'c + 2.33s - 500

Slump before HRWR		*inches*		
Slump after HRWR		*inches*		

Standard Deviation Analysis (from experience records):

# of Test Cylinders Evaluated:	
Standard Deviation:	

f'cr-f'c + 1.34s or f'cr = f'c + 2.33s - 500

(Refer to ACI 301 for increased deviation factor when less than 30 tests are available)

LABORATORY TEST DATA

Compressive Strength	Age (days)	Mix # 1	Mix #2	Mix #3
	7	psi	psi	psi
	7	psi	psi	psi
	28	psi	psi	psi
	28	psi	psi	psi
	28 average	psi	psi	psi

REQUIRED ATTACHMENTS

	Please Check
Coarse Aggregate Gradation Report	
Fine Aggregate Gradation Report	
Concrete Compressive Strength Data or Trial Mixture Test Data	
Admixture Compatability certification letter	

Submitted by:

Name:	
Address:	
Phone #:	
Main Plant Location:	
Miles from Project:	
Secondary Plant Location:	
Miles from Project:	
Date:	

CONFORMANCE SUBMITTAL
SECTION 321313 – CONCRETE PAVEMENT CURB AND SIDEWALK

Project Location _____
(*City, State*)

General Contractor: _____
(*Company Name, Phone Number*)

_____
(*Address*)

Sub-Contractor: _____
(*Company Name, Phone Number*)

_____
(*Address*)

The following products have been selected (check one box) for use in this project from the list of acceptable products specified:

Exterior Concrete Sealant:
☐ Sonneborn "Kure-N-Seal 30" exterior acrylic sealer
☐ Euclid "Super Rez-Seal

Cold-Applied Joint Sealant ASTM D5893, self leveling silicone sealant:
☐ Crafco Inc. "Roadwaver Silicone-SL"
☐ Dow Corning 888
☐ Dow Corning 890-SL
☐ Sonneborn "Sonomeric 1 Sealant"
☐ Tremco "Vulkem 45"

Hot-Applied Joint Sealant: ASTM D3405, Polymeric sealant.
☐ Crafco Inc. "ROADSAVER 22"
☐ W.R. Meadows, Inc. "SEALTIGHT HI-SPEC"

I represent to City/Owner/Engineer that the product selected will be installed in compliance with the applicable codes for the authorities having jurisdiction and in accordance with the contract documents. If noncompliance is discovered the General Contractor shall make or cause to be made all necessary corrections to meet the applicable codes and specifications. Immediately or as directed by Owner the work shall be completed without additional cost to the Owner and / or the contract.

Sub-Contractor: _____
(*Signature of the Authorized Agent of the Sub-Contractor*) Date

_____
(*Print Name of the Authorized Agent of the Sub-Contractor*)

General Contractor: _____
(*Signature of the Authorized Agent of the General Contractor*) Date

_____
(Print Name of the Authorized Agent of the General Contractor

SECTION 32 13 73

CONCRETE PAVING JOINT SEALANTS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and all Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:
   1. Cold-applied joint sealants.
   2. Cold-applied, jet-fuel-resistant joint sealants.
   3. Hot-applied joint sealants.
   4. Hot-applied, jet-fuel-resistant joint sealants.

B. Related Sections:
   1. Division 32 Section " Asphalt Paving" for constructing joints between concrete and asphalt pavement.
   2. Division3 2 Section "Concrete Pavement Curb and Sidewalk" for constructing joints in concrete pavement.
   3. Testing will not be required if joint-sealant manufacturers submit joint-preparation data that are based on previous testing, not older than 24 months, of sealant products for compatibility with and adhesion to joint substrates and other materials matching those submitted.

1.03 SUBMITTALS

A. Product Data: For each joint-sealant product indicated.

B. Product Certificates: For each type of joint sealant and accessory, from manufacturer.

C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for joint sealants.

1.04 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.

B. Source Limitations: Obtain each type of joint sealant from single source from single manufacturer.

1.05 PROJECT CONDITIONS

A. Do not proceed with installation of joint sealants under the following conditions:
   1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer.
   2. When joint substrates are wet.
   3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
   4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Compatibility: Provide joint sealants, backing materials, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer based on testing and field experience.

B. Colors of Exposed Joint Sealants: As indicated on the Drawings.

2.02 COLD-APPLIED JOINT SEALANTS

A. Single-Component, Self-Leveling, Silicone Joint Sealant for Concrete: ASTM D 5893, Type SL.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. Crafco Inc., an ERGON company; RoadSaver Silicone Sealant.
      b. Dow Corning Corporation; 888.
      c. Sonneborn “Sonometic 1 Sealant”
      d. Tremco “Vulkem 45”.

2.03 HOT-APPLIED JOINT SEALANTS

A. Hot-Applied, Single-Component Joint Sealant for Concrete and Asphalt: ASTM D 6690, Types I, II, and III.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. Craftco Inc. “Roadsaver 222”
      b. Meadows, W. R., Inc.; Sealtight Hi-Spec.

2.04 CONCRETE SEALANTS

A. Exterior Concrete Sealant: Sonneborn “kure-n-Seal 30” exterior acrylic sealer, or Euclid “Super Rez-Seal.

2.05 JOINT FILLERS

A. Joint Fillers: Resilient pre-molded bituminous impregnated fiberboard units complying with ASTM D 1751, asphalt-saturated cellulosic fiber, ASSHTO M 152, Type I: or ASTM D 1752, cork or self-expanding cork.

2.06 JOINT-SEALANT BACKER MATERIALS

A. General: Provide joint-sealant backer materials that are non-staining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by joint-sealant manufacturer based on field experience and laboratory testing.
B. Round Backer Rods for Hot-Applied Joint Sealants: ASTM D 5249, Type 1, of diameter and density required to control sealant depth and prevent bottom-side adhesion of sealant.
C. Round Backer Rods for Cold-Applied Joint Sealants: ASTM D 5249, Type 3, of diameter and density required to control joint-sealant depth and prevent bottom-side adhesion of sealant.
D. Backer Strips for Cold- and Hot-Applied Joint Sealants: ASTM D 5249; Type 2; of thickness and width required to control joint-sealant depth, prevent bottom-side adhesion of sealant, and fill remainder of joint opening under sealant.

2.07 PRIMERS

A. Primers: Product recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.
B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions.
B. Joint Priming: Prime joint substrates where indicated or where recommended in writing by joint-sealant manufacturer, based on preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

3.03 INSTALLATION OF JOINT SEALANTS

A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated unless more stringent requirements apply.

B. Joint-Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

C. Install joint-sealant backings of kind indicated to support joint sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
   1. Do not leave gaps between ends of joint-sealant backings.
   2. Do not stretch, twist, puncture, or tear joint-sealant backings.
   3. Remove absorbent joint-sealant backings that have become wet before sealant application and replace them with dry materials.

D. Install joint sealants using proven techniques that comply with the following and at the same time backings are installed:
   1. Place joint sealants so they directly contact and fully wet joint substrates.
   2. Completely fill recesses in each joint configuration.
   3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

E. Tooling of Nonsag Joint Sealants: Immediately after joint-sealant application and before skinning or curing begins, tool sealants according to the following requirements to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint:
   1. Remove excess joint sealant from surfaces adjacent to joints.
   2. Use tooling agents that are approved in writing by joint-sealant manufacturer and that do not discolor sealants or adjacent surfaces.

F. Provide joint configuration to comply with joint-sealant manufacturer's written instructions unless otherwise indicated.

3.04 CLEANING

A. Clean off excess joint sealant or sealant smears adjacent to joints as the Work progresses, by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.05 PROTECTION

A. Protect joint sealants, during and after curing period, from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately and replace with joint sealant so installations in repaired areas are indistinguishable from the original work.

3.06 PAVEMENT-JOINT-SEALANT SCHEDULE

A. Joint-Sealant Application: Joints within cement concrete pavement.
   1. Joint Location:
      a. Expansion and isolation joints in cast-in-place concrete pavement.
      b. Contraction joints in cast-in-place concrete pavement.
      c. Construction joints in cast-in-place concrete pavement.
      d. Saw joints in joints in cast-in-place concrete pavement
      e. Other joints as indicated.
   2. Silicone Joint Sealant for Concrete:
      a. Crafco Inc., an ERGON company; RoadSaver Silicone.
      b. Dow Corning Corporation; 888.
      c. Sonneborn “Sonometic 1 Sealant”
      d. Tremco “Vulkem 45”.
   3. Hot-Applied Joint Sealant for Concrete:
      a. Craftco Inc. “Roadsaver 22”

b. Meadows, W. R., Inc.; Sealtight Hi-Spec.

4. Joint-Sealant Color: Unless otherwise indicated on Drawings: Gray.

END OF SECTION 321373

SECTION 32 92 00

TURF AND GRASSES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and all Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:
   1. Seeding.
   2. Hydroseeding.
   3. Sodding.
   4. Plugging.
   5. Sprigging.
   6. Meadow grasses and wildflowers.
   7. Turf renovation.
   8. Erosion-control material(s).
   9. Grass paving.

B. Related Sections:
   1. Division 31 Section "Site Clearing" for topsoil stripping and stockpiling.
   2. Division 31 Section "Earth Moving" for excavation, filling and backfilling, and rough grading.
   3. Division 32 Section "Planting Irrigation" for turf irrigation.
   4. Division 33 Section "Storm Utility Drainage Piping" for subsurface drainage.

1.03 DEFINITIONS

A. Duff Layer: The surface layer of native topsoil that is composed of mostly decayed leaves, twigs, and detritus.

B. Finish Grade: Elevation of finished surface of planting soil.

C. Manufactured Topsoil: Soil produced off-site by homogeneously blending mineral soils or sand with stabilized organic soil amendments to produce topsoil or planting soil.

D. Pesticide: A substance or mixture intended for preventing, destroying, repelling, or mitigating a pest. This includes insecticides, miticides, herbicides, fungicides, rodenticides, and molluscicides. It also includes substances or mixtures intended for use as a plant regulator, defoliant, or desiccant.

E. Pests: Living organisms that occur where they are not desired or that cause damage to plants, animals, or people. These include insects, mites, grubs, mollusks (snails and slugs), rodents (gophers, moles, and mice), unwanted plants (weeds), fungi, bacteria, and viruses.

F. Planting Soil: Standardized topsoil; existing, native surface topsoil; existing, in-place surface soil; imported topsoil; or manufactured topsoil that is modified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth.

G. Subgrade: Surface or elevation of subsoil remaining after excavation is complete or top surface of a fill or backfill before planting soil is placed.

H. Subsoil: All soil beneath the topsoil layer of the soil profile, and typified by the lack of organic matter and soil organisms.

I. Surface Soil: Soil that is present at the top layer of the existing soil profile at the Project site. In undisturbed areas, the surface soil is typically topsoil, but in disturbed areas such as urban environments, the surface soil can be subsoil.

1.04 SUBMITTALS

A. Product Data: For each type of product indicated.
   1. Pesticides and Herbicides: Include product label and manufacturer's application instructions specific to this Project.

B. Certification of Grass Seed: From seed vendor for each grass-seed monostand or mixture stating the botanical and common name, percentage by weight of each species and variety, and

percentage of purity, germination, and weed seed. Include the year of production and date of packaging.

1. Certification of each seed mixture for turfgrass sod. Include identification of source and name and telephone number of supplier.

C. Conformance Submittal: Submit Installer's Qualifications as indicated prior to beginning work for qualified landscape installer.

D. Product Certificates: For soil amendments and fertilizers, from manufacturer.

E. Material Test Reports: For standardized ASTM D 5268 topsoil and imported or manufactured topsoil.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: A qualified landscape Installer whose work has resulted in successful turf establishment.

1. Professional Membership: Installer shall be a member in good standing of either the American Landscape Contractors Association or the American Nursery and Landscape Association.
2. Registration. Installer shall be a Registered Landscape Contractor (where applicable).
3. Experience: Five years' experience in turf installation in addition to requirements in Division 2 Section "Quality Requirements."
4. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when work is in progress.
5. Maintenance Proximity: Not more than two hours' normal travel time from Installer's place of business to Project site.
6. Pesticide Applicator: State licensed, commercial.

B. Soil-Testing Laboratory Qualifications: An independent laboratory or university laboratory, recognized by the State Department of Agriculture, with the experience and capability to conduct the testing indicated and that specializes in types of tests to be performed.

C. Soil Analysis: For each unamended soil type, furnish soil analysis and a written report by a qualified soil-testing laboratory stating percentages of organic matter; gradation of sand, silt, and clay content; cation exchange capacity; deleterious material; pH; and mineral and plant-nutrient content of the soil.

1. Testing methods and written recommendations shall comply with USDA's Handbook No. 60.
2. The soil-testing laboratory shall oversee soil sampling, with depth, location, and number of samples to be taken per instructions from Architect. A minimum of three representative samples shall be taken from varied locations for each soil to be used or amended for planting purposes.
3. Report suitability of tested soil for turf growth.
    a. Based on the test results, state recommendations for soil treatments and soil amendments to be incorporated. State recommendations in weight per 1000 sq. ft. (92.9 sq. m) or volume per cu. yd. (0.76 cu. m) for nitrogen, phosphorus, and potash nutrients and soil amendments to be added to produce satisfactory planting soil suitable for healthy, viable plants.
    b. Report presence of problem salts, minerals, or heavy metals, including aluminum, arsenic, barium, cadmium, chromium, cobalt, lead, lithium, and vanadium. If such problem materials are present, provide additional recommendations for corrective action.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Seed and Other Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of conformance with state and federal laws, as applicable.

B. Sod: Harvest, deliver, store, and handle sod according to requirements in "Specifications for Turfgrass Sod Materials" and "Specifications for Turfgrass Sod Transplanting and Installation" in TPI's "Guideline Specifications to Turfgrass Sodding." Deliver sod in time for planting within 24 hours of harvesting. Protect sod from breakage and drying.

C. Fertilizer: Deliver to site in original unopened standard size bags showing weight, analysis and name of manufacturer. Store in weatherproof place and keep dry to maintain effectiveness. Store partially used bags in sealed containers.

D. Bulk Materials:
   1. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas or plants.
   2. Provide perimeter-control measures to prevent displacement of bulk materials, discharge of soil-bearing water runoff, and airborne dust reaching adjacent properties, water conveyance systems, or walkways.
   3. Accompany each delivery of bulk fertilizers and soil amendments with appropriate certificates.

1.07 PROJECT CONDITIONS

A. Planting Restrictions: See drawings for planting periods and specific species for specific planting dates.

B. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit planting to be performed when beneficial and optimum results may be obtained. Apply products during favorable weather conditions according to manufacturer's written instructions.

1.08 MAINTENANCE SERVICE

A. Initial Turf Maintenance Service: Provide full maintenance by skilled employees of landscape Installer. Maintain as required in Part 3. Begin maintenance immediately after each area is planted and continue until acceptable turf is established but for not less than the following periods:
   1. Seeded Turf: 60 days from date of planting completion.
      a. When initial maintenance period has not elapsed before end of planting season, or if turf is not fully established, continue maintenance during next planting season.
   2. Sodded Turf: 30 days from date of installation.
   3. Plugged and Sprigged Turf: 60 days from date of planting completion.

B. Continuing Maintenance Proposal: From Installer to Owner, in the form of a standard yearly (or other period) maintenance agreement, starting on date initial maintenance service is concluded. State services, obligations, conditions, and terms for agreement period and for future renewal options. Include with Maintenance Service Proposal as defined in Division 21 Section 329300 Part 1.10.

PART 2 - PRODUCTS

2.01 SEED

A. Grass Seed: Fresh, clean, dry, new-crop seed complying with AOSA's "Journal of Seed Technology; Rules for Testing Seeds" for purity and germination tolerances.

B. Seed Species: State-certified seed of grass species as indicated on the drawings, with not less than 95 percent germination, not less than 85 percent pure seed, and not more than 0.5 percent weed seed:

C. Grass Seed Mix: Proprietary seed mix as indicated on the drawings.

2.02 TURFGRASS SOD

A. Turfgrass Sod: Certified, complying with "Specifications for Turfgrass Sod Materials" in TPI's "Guideline Specifications to Turfgrass Sodding." Furnish viable sod of uniform density, color, and texture, strongly rooted, and capable of vigorous growth and development when planted.

B. Turfgrass Species: Shall be as indicated on the drawings or as approved by the Owner.

C. Turfgrass Species: Sod of grass species (from seed at sod farm) as follows, with not less than 95 percent germination, not less than 85 percent pure seed, and not more than 0.5 percent weed seed:

2.03 PLUGS

A. Plugs: Turfgrass sod, certified, complying with "Specifications for Turfgrass Sod Materials" in TPI's "Guideline Specifications to Turfgrass Sodding." Furnish viable sod of uniform density, color, and texture, cut into square or round plugs, strongly rooted, and capable of vigorous growth and development when planted; of the following turfgrass species and plug size:

1. Turfgrass Species: Shall be as indicated on the drawings.
2. Plug Size: Shall be as indicated on the drawings.

2.04 SPRIGS

A. Sod Sprigs: Healthy living stems, rhizomes, or stolons with a minimum of two nodes and attached roots free of soil, of the following turfgrass species:
   1. Turfgrass Species: Shall be as indicated on the drawings.
   2. Turfgrass Species: Shall be as indicated on the drawings.

2.05 MEADOW GRASSES AND WILDFLOWERS

A. Wildflower Seed: Fresh, clean, and dry new seed, of mixed species as follows:
   1. Species as identified on drawings.
B. Native Grass Seed: Fresh, clean, and dry new seed, of mixed species as follows:
   1. Species as identified on drawings.
C. Wildflower and Native Grass Seed: Fresh, clean, and dry new seed, of mixed species as follows:
   1. Species as identified on drawings.
D. Seed Carrier: Inert material, sharp clean sand or perlite, mixed with seed at a ratio of not less than two parts seed carrier to one part seed.

2.06 INORGANIC SOIL AMENDMENTS

A. Lime: ASTM C 602, agricultural liming material containing a minimum of 80 percent calcium carbonate equivalent and as follows:
   1. Class: T, with a minimum of 99 percent passing through No. 8 (2.36-mm) sieve and a minimum of 75 percent passing through No. 60 (0.25-mm) sieve.
   2. Class: O, (only in high wind areas) with a minimum of 95 percent passing through No. 8 (2.36-mm) sieve and a minimum of 55 percent passing through No. 60 (0.25-mm) sieve.
   3. Provide lime in form of ground dolomitic limestone.
B. Sulfur: Granular, biodegradable, containing a minimum of 90 percent sulfur, and with a minimum of 99 percent passing through No. 6 (3.35-mm) sieve and a maximum of 10 percent passing through No. 40 (0.425-mm) sieve.
C. Iron Sulfate: Granulated ferrous sulfate containing a minimum of 20 percent iron and 10 percent sulfur.
D. Aluminum Sulfate: Commercial grade, unadulterated.
E. Perlite: Horticultural perlite, soil amendment grade.
F. Agricultural Gypsum: Minimum 90 percent calcium sulfate, finely ground with 90 percent passing through No. 50 (0.30-mm) sieve.
G. Sand: Clean, washed, natural or manufactured, and free of toxic materials.

2.07 ORGANIC SOIL AMENDMENTS

A. Compost: Well-composted, stable, and weed-free organic matter, pH range of 5.5 to 8; moisture content 35 to 55 percent by weight; 100 percent passing through 1-inch (25-mm) sieve; soluble salt content of 2 to 5 decisiemens/m; not exceeding 0.5 percent inert contaminants and free of substances toxic to plantings; and as follows:
   1. Organic Matter Content: 50 percent of dry weight.
B. Sphagnum Peat: Partially decomposed sphagnum peat moss, finely divided or of granular texture, with a pH range of 3.4 to 4.8.
C. Wood Derivatives: Decomposed, nitrogen-treated sawdust, ground bark, or wood waste; of uniform texture and free of chips, stones, sticks, soil, or toxic materials.
D. Manure: Well-rotted, unleached, stable or cattle manure containing not more than 25 percent by volume of straw, sawdust, or other bedding materials; free of toxic substances, stones, sticks, soil, weed seed, and material harmful to plant growth.

2.08 FERTILIZERS

A. Bonemeal: Commercial, raw or steamed, finely ground; a minimum of 1 percent nitrogen and 10 percent phosphoric acid.
B. Superphosphate: Commercial, phosphate mixture, soluble; a minimum of 20 percent available phosphoric acid.

C. Commercial Fertilizer: Commercial-grade complete fertilizer of neutral character, consisting of fast- and slow-release nitrogen, 50 percent derived from natural organic sources of urea formaldehyde, phosphorous, and potassium in the following composition:
   1. Composition: 1 lb/1000 sq. ft. (0.45 kg/92.9 sq. m) of actual nitrogen, 4 percent phosphorous, and 2 percent potassium, by weight unless recommended in soil reports from a qualified soil-testing laboratory or as specified on the drawings.

D. Slow-Release Fertilizer: Granular or pelleted fertilizer consisting of 50 percent water-insoluble nitrogen, phosphorus, and potassium in the following composition:
   1. Composition: 20 percent nitrogen, 10 percent phosphorous, and 10 percent potassium, by weight, unless recommended in soil reports from a qualified soil-testing laboratory or as specified on the drawings.

2.09 PLANTING SOILS

A. Planting Soil: ASTM D 5268 topsoil, with pH range of 5.5 to 7, a minimum of 6 percent organic material content; free of stones 1 inch (25 mm) or larger in any dimension and other extraneous materials harmful to plant growth. Mix ASTM D 5268 topsoil with the following soil amendments in the following quantities to produce planting soil:
   1. Ratio of Loose Compost to Topsoil by Volume: 1:4.

B. Planting Soil: Existing, native surface topsoil formed under natural conditions with the duff layer retained during excavation process and stockpiled on-site. Verify suitability of native surface topsoil to produce viable planting soil. Clean soil of roots, plants, sod, stones, clay lumps, and other extraneous materials harmful to plant growth.
   1. Supplement with native surface (topsoil) planting soil when quantities are insufficient.
   2. Mix existing, native surface topsoil with the following soil amendments in the following quantities to produce planting soil:
      a. Ratio of Loose Compost to Topsoil by Volume: 1:4.
      b. Ratio of Loose Sphagnum 1:4.

C. Planting Soil: Existing, in-place surface soil. Verify suitability of existing surface soil to produce viable planting soil. Remove stones, roots, plants, sod, clods, clay lumps, pockets of coarse sand, concrete slurry, concrete layers or chunks, cement, plaster, building debris, and other extraneous materials harmful to plant growth. Mix surface soil with the following soil amendments in the following quantities to produce planting soil:
   1. Ratio of Loose Compost to Surface Soil by Volume: 1:3.

D. Imported Planting Soil: Imported topsoil or manufactured topsoil from off-site sources. Obtain topsoil displaced from naturally well-drained construction or mining sites where topsoil occurs at least 4 inches (100 mm) deep; do not obtain from agricultural land**,** bogs or marshes.
   1. Additional Properties of Imported Topsoil or Manufactured Topsoil: Screened and free of stones 1 inch (25 mm) or larger in any dimension; free of roots, plants, sod, clods, clay lumps, pockets of coarse sand, paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, building debris, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, acid, and other extraneous materials harmful to plant growth; free of obnoxious weeds and invasive plants including quackgrass, Johnsongrass, poison ivy, nutsedge, nimblewill, Canada thistle, bindweed, bentgrass, wild garlic, ground ivy, perennial sorrel, and bromegrass; not infested with nematodes, grubs, other pests, pest eggs, or other undesirable organisms and disease-causing plant pathogens; friable and with sufficient structure to give good tilth and aeration. Continuous, air-filled, pore-space content on a volume/volume basis shall be at least 15 percent when moisture is present at field capacity. Soil shall have a field capacity of at least 15 percent on a dry weight basis.
   2. Mix imported topsoil or manufactured topsoil with the following soil amendments in the following quantities to produce planting soil:
      a. Ratio of Loose Compost to Topsoil by Volume: 1:4.

2.10 MULCHES

A. Straw Mulch: Provide air-dry, clean, mildew- and seed-free, salt hay or threshed straw of wheat, rye, oats, or barley.

B. Compost Mulch: Well-composted, stable, and weed-free organic matter, pH range of 5.5 to 8; moisture content 35 to 55 percent by weight; 100 percent passing through 1-inch (25-mm) sieve; soluble salt content of 2 to 5 decisiemens/m; not exceeding 0.5 percent inert contaminants and free of substances toxic to plantings; and as follows:
   1. Organic Matter Content: 50 to 60 percent of dry weight.
C. Fiber Mulch: Biodegradable, dyed-wood, cellulose-fiber mulch; nontoxic and free of plant-growth or germination inhibitors; with a maximum moisture content of 15 percent and a pH range of 4.5 to 6.5.
D. Non-asphaltic Tackifier: Colloidal tackifier recommended by fiber-mulch manufacturer for slurry application; nontoxic and free of plant-growth or germination inhibitors.
E. Asphalt Emulsion: NOT PERMITTED.

2.11 PESTICIDES

A. General: Pesticide, registered and approved by EPA, acceptable to authorities having jurisdiction, and of type recommended by manufacturer for each specific problem and as required for Project conditions and application. Do not use restricted pesticides unless authorized in writing by authorities having jurisdiction.
B. Pre-Emergent Herbicide (Selective and Non-Selective): Effective for controlling the germination or growth of weeds within planted areas at the soil level directly below the mulch layer.
C. Post-Emergent Herbicide (Selective and Non-Selective): Effective for controlling weed growth that has already germinated.

2.12 EROSION-CONTROL MATERIALS

A. Rolled Erosion-Control Blankets (RECP): Biodegradable wood excelsior, straw, or coconut-fiber mat enclosed in a photodegradable plastic mesh. Include manufacturer's recommended steel wire staples, 6 inches (150 mm) long.
B. Erosion-Control Fiber Mesh: Biodegradable burlap or spun-coir mesh, a minimum of 0.92 lb/sq. yd. (0.5 kg/sq. m), with 50 to 65 percent open area. Include manufacturer's recommended steel wire staples, 6 inches (150 mm) long.
C. Turf Reinforcement Mats (TRM): Cellular, non-biodegradable slope-stabilization mats designed to isolate and contain small areas of soil over steeply sloped surface, thickness as detailed on the drawings. Include manufacturer's recommended anchorage system for slope conditions.
   1. Products: See drawings and details,

2.13 GRASS-PAVING MATERIALS

A. Grass Paving: Cellular, non-biodegradable plastic mats, designed to contain small areas of soil and enhance the ability of turf to support vehicular and pedestrian traffic, see plan and details for mat thickness. Include manufacturer's recommended anchorage system for slope conditions.
   1. Products: See drawings and details.
B. Base Course: Sound crushed stone or gravel complying with [ASTM D 448 for Size No. 8] Division 2 Section "Earthwork" for base-course material.
C. Sand: Sound, sharp, washed natural sand or crushed stone complying with gradation requirements in ASTM C 33 for fine aggregate.
D. Proprietary Growing Mix: As shown on the drawings or submitted and acceptable to Owner.
E. Sandy Loam Soil Mix: Sound, sharp, washed, natural sand or crushed stone complying with gradation requirements in ASTM C 33 for fine aggregate blended with planting soil as specified. Use blend consisting of 1/2 sand and 1/2 planting soil.
F. Soil for Paving Fill: Planting soil as specified on the drawings.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine areas to be planted for compliance with requirements and other conditions affecting performance.

1. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in soil within a planting area.
2. Do not mix or place soils and soil amendments in frozen, wet, or muddy conditions.
3. Suspend soil spreading, grading, and tilling operations during periods of excessive soil moisture until the moisture content reaches acceptable levels to attain the required results.
4. Uniformly moisten excessively dry soil that is not workable and which is too dusty.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

C. If contamination by foreign or deleterious material or liquid is present in soil within a planting area, remove the soil and contamination as directed by Owner and replace with new planting soil.

3.02 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities, trees, shrubs, and plantings from damage caused by planting operations.
1. Protect adjacent and adjoining areas from hydroseeding and hydromulching overspray.
2. Protect grade stakes set by others until directed to remove them.

B. Install erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

3.03 TURF AREA PREPARATION

A. Limit turf subgrade preparation to areas to be planted.

B. Newly Graded Subgrades: Loosen subgrade to a minimum depth of 6 inches (150 mm). Remove stones larger than 1 inch (25 mm) in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Owner's property.
1. Apply superphosphate fertilizer directly to subgrade before loosening.
2. Spread topsoil, apply soil amendments and fertilizer on surface, and thoroughly blend planting soil.
   a. Delay mixing fertilizer with planting soil if planting will not proceed within a few days.
   b. Mix lime with dry soil before mixing fertilizer.
3. Spread planting soil to a depth of 6 inches (150 mm) but not less than required to meet finish grades after light rolling and natural settlement. Do not spread if planting soil or subgrade is frozen, muddy, or excessively wet.
   a. Spread approximately 1/2 the thickness of planting soil over loosened subgrade. Mix thoroughly into top 2 inches (50 mm) of subgrade. Spread remainder of planting soil.
   b. Reduce elevation of planting soil to allow for soil thickness of sod where used.

C. Unchanged Subgrades: If turf is to be planted in areas unaltered or undisturbed by excavating, grading, or surface-soil stripping operations, prepare surface soil as follows:
1. Remove existing grass, vegetation, and turf. Do not mix into surface soil.
2. Loosen surface soil to a depth of at least 8 inches (200 mm). Apply soil amendments and fertilizers according to planting soil mix proportions and mix thoroughly into top 4 inches (100 mm) of soil. Till soil to a homogeneous mixture of fine texture.
   a. Apply superphosphate fertilizer directly to surface soil before loosening.
3. Remove stones larger than 1 inch (25 mm) in any dimension and sticks, roots, trash, and other extraneous matter.
4. Legally dispose of waste material, including grass, vegetation, and turf, off Owner's property.

D. Finish Grading: Grade planting areas to a smooth, uniform surface plane with loose, uniformly fine texture. Grade to within plus or minus 1/2 inch (13 mm) of finish elevation. Roll and rake, remove ridges, and fill depressions to meet finish grades. Limit finish grading to areas that can be planted in the immediate future. All turf areas shall slope to drain

E. Moisten prepared area before planting if soil is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.

F. Before planting, obtain Architect's acceptance of finish grading; restore planting areas if eroded or otherwise disturbed after finish grading.

3.04 PREPARATION FOR EROSION-CONTROL MATERIALS

A. Prepare area as specified in "Turf Area Preparation" Article.

B. For turf reinforcement mats (TRM), install planting soil in two lifts, with second lift equal to thickness of erosion-control mats. Install erosion-control mat and fasten as recommended by material manufacturer.
C. Fill cells of turf reinforcement mat with planting soil and compact before planting.
D. For rolled erosion-control blanket (RECP) or mesh, seed area, install RECP from top of slope, working downward, and as recommended by material manufacturer for site conditions and as shown on the details. Fasten as recommended by material manufacturer.
E. Moisten prepared area before planting if surface is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.

3.05 PREPARATION FOR GRASS-PAVING MATERIALS

A. Reduce subgrade elevation soil to allow for thickness of grass-paving system. Grade planting areas to a smooth, uniform surface plane with loose, uniformly fine texture. Grade so that installed paving is within plus or minus 1/2 inch (13 mm) of finish elevation. Roll and rake, remove ridges, and fill depressions.
B. Install base course (sand, soil mix, proprietary growing mix, or soil for paving fill) as shown on drawings) and as recommended by paving-material manufacturer for site conditions; comply with details shown on Drawings. Compact according to paving-material manufacturer's written instructions.
C. Install paving mat and fasten according to paving-material manufacturer's written instructions.
D. Before planting, fill cells of paving mat with planting soil mix as shown on the drawings and compact according to manufacturer's written instructions.
E. Moisten prepared area before planting if surface is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.

3.06 SEEDING

A. Sow seed with spreader or seeding machine. Do not broadcast or drop seed when wind velocity exceeds 5 mph (8 km/h). Evenly distribute seed by sowing equal quantities in two directions at right angles to each other.
   1. Do not use wet seed or seed that is moldy or otherwise damaged.
   2. Do not seed against existing trees. Limit extent of seed to outside edge of planting saucer.
B. Sow seed at a total rate as indicated on the drawings.
C. Rake seed lightly into top 1/8 inch (3 mm) of soil, roll lightly, and water with fine spray.
D. Protect seeded areas with slopes exceeding 3:1 with RECP installed and stapled according to manufacturer's written instructions.
E. Protect seeded areas with turf reinforcement mats where shown on Drawings; install and anchor according to manufacturer's written instructions.
F. Protect seeded areas with slopes not exceeding 3:1 and not indicated to receive RECP or TRM by spreading straw mulch. Spread uniformly at a minimum rate of 2 tons/acre (42 kg/92.9 sq. m) to form a continuous blanket in loose thickness over seeded areas. Spread by hand, blower, or other suitable equipment.
   1. Anchor straw mulch by crimping into soil with suitable mechanical equipment, or bond by spraying with approved tackifier at rate specified by manufacturer.
G. Protect seeded areas from hot, dry weather or drying winds by applying specified mulch within 24 hours after completing seeding operations. Water and soak areas, scatter mulch uniformly and roll surface smooth.

3.07 HYDROSEEDING

A. Hydroseeding: Mix specified seed, fertilizer, and fiber mulch in water, using equipment specifically designed for hydroseed application. Continue mixing until uniformly blended into homogeneous slurry suitable for hydraulic application.
   1. Mix slurry with non-asphaltic fiber-mulch, or manufacturer's recommended tackifier.
   2. Apply slurry uniformly to all areas to be seeded in a two-step process. Apply first slurry coat at a rate so that mulch component is deposited at not less than 500-lb/acre (5.2-kg/92.9 sq. m) dry weight, and seed component is deposited at not less than the specified seed-sowing rate. Apply slurry cover coat of fiber mulch (hydromulching) as indicated on the drawings or at a rate of 1000 lb/acre (10.4 kg/92.9 sq. m).

3.08 SODDING

A. Area: Shall be as indicated on the drawings or at minimum a three (3) foot wide strip along walks, roadways and parking areas to reduce erosion.
B. Lay sod within 24 hours of harvesting. Do not lay sod if dormant or if ground is frozen or muddy.
C. Lay sod to form a solid mass with tightly fitted joints. Butt ends and sides of sod; do not stretch or overlap. Stagger sod strips or pads to offset joints in adjacent courses. Avoid damage to subgrade or sod during installation. Tamp and roll lightly to ensure contact with subgrade, eliminate air pockets, and form a smooth surface. Work sifted soil or fine sand into minor cracks between pieces of sod; remove excess to avoid smothering sod and adjacent grass.
    1. Lay sod across angle of slopes exceeding 4:1.
    2. Anchor sod on slopes exceeding 6:1 with steel staples spaced as recommended by sod manufacturer but not less than 2 anchors per sod strip to prevent slippage.
D. Saturate sod with fine water spray within two hours of planting. During first week after planting, water daily or more frequently as necessary to maintain moist soil to a minimum depth of 1-1/2 inches (38 mm) below sod.

3.09 PLUGGING

A. Plant plugs in holes or furrows, spaced as indicated on the drawings. On slopes, contour furrows to near level.

3.10 SPRIGGING

A. Plant freshly shredded sod sprigs in furrows as indicated on drawings. Place individual sprigs with roots and portions of stem in moistened soil, as indicated, and fill furrows without covering growing tips. Lightly roll and firm soil around sprigs after planting.
B. Broadcast Method: If broadcast method is indicated on drawings, spread sprigs uniformly over prepared surface at rate indicated and mechanically force sprigs into lightly moistened soil.
    1. Spread a 1/4-inch- (6-mm-) thick layer of planting soil on sprigs.
    2. Lightly roll and firm soil around sprigs after planting.
    3. Water sprigs immediately after planting and keep moist by frequent watering until well rooted.

3.11 TURF RENOVATION

A. Renovate existing turf.
B. Renovate existing turf damaged by Contractor's operations, such as storage of materials or equipment and movement of vehicles.
    1. Reestablish turf where settlement or washouts occur or where minor regrading is required.
    2. Install new planting soil as required.
C. Remove sod and vegetation from diseased or unsatisfactory turf areas; do not bury in soil.
D. Remove topsoil containing foreign materials such as oil drippings, fuel spills, stones, gravel, and other construction materials resulting from Contractor's operations, and replace with new planting soil.
E. Mow, dethatch, core aerate, and rake existing turf.
F. Remove weeds before seeding. Where weeds are extensive, apply selective herbicides as required. Do not use pre-emergence herbicides.
G. Remove waste and foreign materials, including weeds, soil cores, grass, vegetation, and turf, and legally dispose of them off Owner's property.
H. Till stripped, bare, and compacted areas thoroughly to a soil depth of 6 inches (150 mm).
I. Apply soil amendments and initial fertilizers required for establishing new turf and mix thoroughly into top 4 inches (100 mm) of existing soil. Install new planting soil to fill low spots and meet finish grades.
J. Apply seed and protect with straw mulch, or sod as required for new turf.
K. Water newly planted areas and keep moist until new turf is established.

3.12 TURF MAINTENANCE

A. Maintain and establish turf by watering, fertilizing, weeding, mowing, trimming, replanting, and performing other operations as required to establish healthy, viable turf. Roll, regrade, and replant bare or eroded areas and remulch to produce a uniformly smooth turf. Provide materials and installation the same as those used in the original installation.

1. Fill in as necessary soil subsidence that may occur because of settling or other processes. Replace materials and turf damaged or lost in areas of subsidence.
2. In areas where mulch has been disturbed by wind or maintenance operations, add new mulch and anchor as required to prevent displacement.
3. Apply treatments as required to keep turf and soil free of pests and pathogens or disease. Use integrated pest management practices whenever possible to minimize the use of pesticides and reduce hazards.

B. Watering: Water to keep turf uniformly moist to a depth of 6 inches (150 mm).
1. Watering shall be done in such a manner and as frequently as deemed necessary by the Owner to assure continued growth of healthy grass.
2. Schedule watering to prevent wilting, puddling, erosion, and displacement of seed or mulch. Lay out temporary watering system to avoid walking over muddy or newly planted areas.
3. Water turf with fine spray at a minimum rate of 1 inch (25 mm) per week unless rainfall precipitation is adequate.
4. Owner will provide water, if available on-site, if not available on-site the Contractor shall provide all necessary water. The Contractor shall furnish all labor, fuel and equipment necessary and required to transport and apply water to the turf areas as required.

C. Protection: Protect seeded or sod area from trespass during grass establishment. Furnish and install fences, signs, and barriers or any other necessary temporary protective devices. Damage resulting from trespass, erosion, settlement, or other causes shall be repaired at the Contractor's expense. All temporary measures must be removed prior to final acceptance.

D. Mow turf as soon as top growth is tall enough to cut. Repeat mowing to maintain specified height without cutting more than 1/3 of grass height. Remove no more than 1/3 of grass-leaf growth in initial or subsequent mowing. Do not delay mowing until grass blades bend over and become matted. Do not mow when grass is wet. Schedule initial and subsequent mowing to maintain the following grass height:
1. Bentgrass to a height of 1 inch (26 mm) or less.
2. Bermuda grass to a height of 1 to 1-1/2 inch (26 to 40 mm).
3. Centipedegrass, perennial ryegrass and zoysiagrass to a height of 1 to 2 inches (25 to 50 mm).
4. Kentucky bluegrass, buffalograss and red fescue to a height of 1-1/2 to 2 inches (38 to 50 mm).
5. Bahiagrass, turf-type tall fescue, and St Augistine grass to a height of 2 to 3 inches (50 to 75 mm).

E. Turf Post fertilization: Apply fertilizer after initial mowing and when grass is dry.
1. Use fertilizer that will provide actual nitrogen of at least 1 lb/1000 sq. ft. (0.45 kg/92.9 sq. m) to turf area.

3.13 SATISFACTORY TURF

A. Turf installations shall meet the following criteria as determined by Owner:
1. Satisfactory Seeded Turf: At end of maintenance period, a healthy, uniform, close stand of grass has been established, free of weeds and surface irregularities, with uniform coverage exceeding 85 percent perennial vegetative cover.
2. Satisfactory Sodded Turf: At end of maintenance period, a healthy, well-rooted, even-colored, viable turf has been established, free of weeds, open joints, bare areas, and surface irregularities.
3. Satisfactory Plugged Turf: At end of maintenance period, the required number of plugs has been established as well-rooted, viable patches of grass, and areas between plugs are free of weeds and other undesirable vegetation.
4. Satisfactory Sprigged Turf: At end of maintenance period, the required number of sprigs has been established as well-rooted, viable plants, and areas between sprigs are free of weeds and other undesirable vegetation.

B. After grass growth has started all areas or parts of areas, which fail to show a uniform stand of grass for any reason whatsoever shall be re-seeded repeatedly until all areas are covered with a satisfactory growth of grass at no additional cost to the Owner.

C. Use specified materials to reestablish turf that does not comply with requirements and continue maintenance until turf is satisfactory.

3.14 MEADOW GRASSES AND WILDFLOWERS

A. Sow seed with spreader or seeding machine. Do not broadcast or drop seed when wind velocity exceeds 5 mph (8 km/h). Evenly distribute seed by sowing equal quantities in two directions at right angles to each other.
   1. Do not use wet seed or seed that is moldy or otherwise damaged.
B. Sow seed at a total rate as shown on the drawings.
C. Brush seed into top 1/16 inch (1.6 mm) of soil, roll lightly, and water with fine spray.
D. Protect seeded areas from hot, dry weather or drying winds by applying compost or straw mulch within 24 hours after completing seeding operations. Soak areas, scatter mulch uniformly to a thickness of 3/16 inch (4.8 mm), and roll surface smooth.
E. Water newly planted areas and keep moist until meadow is established.

3.15 MEADOW GRASSES AND WILDFLOWER MAINTENANCE

A. Maintain and establish meadow by watering, weeding, mowing, trimming, replanting, and performing other operations as required to establish a healthy, viable meadow. Roll, regrade, and replant bare or eroded areas and remulch. Provide materials and installation the same as those used in the original installation.
   1. Fill in as necessary soil subsidence that may occur because of settling or other processes. Replace materials and meadow damaged or lost in areas of subsidence.
   2. In areas where mulch has been disturbed by wind or maintenance operations, add new mulch and anchor as required to prevent displacement.
   3. Apply treatments as required to keep meadow and soil free of pests and pathogens or disease. Use integrated pest management practices whenever possible to minimize the use of pesticides and reduce hazards.
B. Watering: If indicated on the drawings, install and maintain temporary piping, hoses, and meadow-watering equipment to convey water from sources and to keep meadow uniformly moist.
   1. Schedule watering to prevent wilting, puddling, erosion, and displacement of seed or mulch. Lay out temporary watering system to avoid walking over muddy or newly planted areas.
   2. Water meadow with fine sprays at a minimum rate of 1/2 inch (13 mm) per week until final acceptance unless rainfall precipitation is adequate.

3.16 PESTICIDE APPLICATION

A. Apply pesticides and other chemical products and biological control agents in accordance with requirements of authorities having jurisdiction and manufacturer's written recommendations. Coordinate applications with Owner's operations and others in proximity to the Work. Notify Owner before each application is performed.
B. Post-Emergent Herbicides (Selective and Non-Selective): Apply only as necessary to treat already-germinated weeds and in accordance with manufacturer's written recommendations.

3.17 CLEANUP AND PROTECTION

A. Promptly remove soil and debris created by turf work from paved areas. Clean wheels of vehicles before leaving site to avoid tracking soil onto roads, walks, or other paved areas.
B. Erect temporary fencing or barricades and warning signs as required to protect newly planted areas from traffic. Maintain fencing and barricades throughout initial maintenance period and remove after plantings are established.
C. Remove nondegradable erosion-control measures after grass establishment period.

END OF SECTION 329200

SECTION 33 10 00

FACILITY WATER DISTRIBUTION PIPING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 31 Section 312000 “Earth Moving”, apply to this Section.

1.02 SUMMARY

A. This Section includes water-distribution piping and related components outside the building from tapping the main to:
   1. Within 5 feet of outside the building limits for domestic and irrigation water service
   2. 1 foot above finished floor elevation for the fire service mains
   3. Supply and discharge piping including connections to fire protection water tank if shown on the plans..

B. All work shall conform to the requirements of the local water authority, fire marshal, and other regulatory authorities having jurisdiction, or this specification, whichever is more stringent.

C. Utility-furnished products include water meters that will be furnished to the site, ready for installation.

1.03 DEFINITIONS

A. EPDM: Ethylene propylene diene terpolymer rubber.
B. LLDPE: Linear, low-density polyethylene plastic.
C. PA: Polyamide (nylon) plastic.
D. PE: Polyethylene plastic.
E. PP: Polypropylene plastic.
F. PVC: Polyvinyl chloride plastic.
G. RTRF: Reinforced thermosetting resin (fiberglass) fittings.
H. RTRP: Reinforced thermosetting resin (fiberglass) pipe.

1.04 REFERENCE STANDARDS

A. Factory Mutual (FM)
   1. Approval Guide

B. Underwriters Laboratories (UL)
   1. Fire Protection Equipment Directory
   2. UL 1285 - Pipe and Couplings, Polyvinyl Chloride (PVC), for Underground Fire Service
   3. UL 262 - Gate Valves for Fire-Protection Service
   4. UL 246 - Hydrants for Fire-Protection Service

C. National Sanitation Foundation (NSF)
   1. NSF 14 - Plastics Piping System Components and Related Materials
   2. NSF 61 - Drinking Water System Components - Health Effects

D. National Fire Protection Association (NFPA)
   1. NFPA 70 - National Electrical Code
   2. NFPA 24 - Standard for the Installation of Private Fire Service Mains and their Appurtenances
   3. NFPA 1963 - Screw Threads and Gaskets for Fire Hose Connections (revision of ANSI/NFPA 1963-1993)
   4. NFPA 13 – Installation of Sprinkler Systems (latest edition)

E. American Water Works Association (AWWA)
   1. C151 Ductile-Iron Pipe, Centrifugally Cast, for Water (revision of ANSI/AWWA C151/A21.51-91)
   2. C104 - Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water

3. C150 - Thickness Design of Ductile-Iron Pipe
4. C110 - Ductile-Iron and Gray-Iron Fittings, 3 in through 48 in (75 mm through 1200 mm), for Water and Other Liquids
5. C153 - Ductile-Iron Compact Fittings, 3 in. through 24 in. (76 mm Through 610 mm) and 54 in. through 64 in. (1,400 mm Through 1,600 mm), for Water Service
6. C900 - Polyvinyl Chloride (PVC) Pressure Pipe, 4 Inch through 12 Inch for Water Distribution
7. C500 - Gate Valves for Water and Sewage Systems
8. C111 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
9. C550 - Protective Epoxy Interior Coatings for Valves and Hydrants
10. C509 - Resilient-Seated Gate Valves for Water Supply Service
11. M44 – Distribution Valves: Selection, Installation, Field Testing, and Maintenance
12. C800 - Underground Service Line Valves and Fittings
13. C702 - Cold Water Meters - Compound Type
14. C502 - Hydrants, Dry Barrel Fire
15. M41 – Ductile Iron Pipe and Fittings
16. C600 - Installation of Ductile-Iron Water Mains and Their Appurtenances
17. C605 - Water Treatment - Underground Installation of Polyvinyl Chloride PVC Pressure Pipe and Fittings for Water
18. M23 - PVC Pipe: Design and Installation
19. M17 - Fire Hydrants: Installation, Field Testing, and Maintenance
20. C651 - Disinfecting Water Mains

F. American Society for Testing and Materials (ASTM)

1. B88 - Standard Specification for Seamless Copper Water Tube
2. B813 - Standard Specification for Liquid and Paste Fluxes for Soldering Applications of Copper and Copper Alloy Tube
3. B32 - Standard Specification for Solder Metal
4. D2241 - Standard Specification for Poly(Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series)
5. D3139 - Standard Specification for Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals
6. F645 - Standard Guide for Selection, Design, and Installation of Thermoplastic Water Pressure Piping Systems

G. American Society of Mechanical Engineers (ASME)

1. B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings R(1994)
2. B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings

H. Manufacturer’s Standardization Society (MSS)

1. SP-60 - Connecting Flange Joint Between Tapping Sleeves and Tapping Valves

I. Copper Development Association (CDA)

1. Copper Tube Handbook

1.05 SUBMITTALS

A. The General Contractor and Subcontractor(s) shall execute the Conformance Submittal(s) at the end of this section.

1.06 QUALITY ASSURANCE

A. Regulatory Requirements:
1. Comply with requirements of regulatory authorities having jurisdiction or the utility company supplying water including tapping of water mains, backflow prevention installation, testing, and disinfection.
2. Comply with standards of authorities having jurisdiction for potable-water-service piping, including materials, installation, testing, and disinfection.
3. Comply with standards of authorities having jurisdiction for fire-suppression water-service piping, including materials, hose threads, installation, and testing.

B. Piping materials shall bear label, stamp, or other markings of specified testing agency.

C. Electrical Components, Devices, and Accessories: UL listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
D. Comply with ASTM F 645 for selection, design, and installation of thermoplastic water piping.
E. Comply with FMG's "Approval Guide" or UL's "Fire Protection Equipment Directory" for fire-service-main products.
F. NFPA Compliance: Comply with NFPA 13 and NFPA 24 for materials, installations, tests, flushing, and valve and hydrant supervision for fire-service-main piping for fire suppression.
G. NSF Compliance:
   1. Comply with NSF 14 for plastic potable-water-service piping.
   2. Comply with NSF 61 for materials for water-service piping and specialties for domestic water.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Preparation for Transport: Prepare valves, including fire hydrants, according to the following:
   1. Ensure that valves are dry and internally protected against rust and corrosion.
   2. Protect valves against damage to threaded ends and flange faces.
   3. Set valves in best position for handling. Set valves closed to prevent rattling.
B. During Storage: Use precautions for valves, including fire hydrants, according to the following:
   1. Do not remove end protectors unless necessary for inspection; then reinstall for storage.
   2. Protect from weather. Store indoors and maintain temperature higher than ambient dew-point temperature. Support off the ground or pavement in watertight enclosures when outdoor storage is necessary.
C. Handling: Use sling to handle valves and fire hydrants if size requires handling by crane or lift. Rig valves to avoid damage to exposed parts. Do not use hand wheels or stems as lifting or rigging points.
D. Deliver piping with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe-end damage and to prevent entrance of dirt, debris, and moisture.
E. Protect stored piping from moisture and dirt. Elevate above grade. Do not exceed structural capacity of floor when storing inside.
F. Protect flanges, fittings, and specialties from moisture and dirt.
G. Store plastic piping protected from direct sunlight. Support to prevent sagging and bending.

1.08 PROJECT CONDITIONS

A. Removal and Relocation of Existing Utilities: The contractor shall be responsible for removal and/or relocation of existing utilities, where conflicts occur but may or may not be shown on the Drawings, at no additional cost to the Owner.
B. Interruption of Existing Water-Distribution Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary water-distribution service according to requirements indicated:
   1. Notify Owner two (2) days in advance of proposed interruption of service.
   2. Do not proceed with interruption of water-distribution service without Owner's written permission.

1.09 COORDINATION AND FEES

A. The Contractor shall be responsible for obtaining and payment of all tap and construction permit fees associated with this section.
B. The Contractor shall provide and install domestic and irrigation water lines, meters, and appurtenances as shown on the drawings to within 5 feet of building limits, including, but not limited to, any taps, meters, vault, and backflow prevention. If Contractor’s Work terminates at a connection point where work by others is complete, Contractor shall make the connection. If future connections will be required by others, Contractor shall install plugging and marking apparatus as necessary to protect the Work.
C. The Contractor shall provide and install fire service water lines, meters, and appurtenances as shown on drawings to 1 foot above finished floor elevation, including, but not limited to any taps, meters, backflow prevention, hydrants, and free standing fire department connections. If Contractor’s Work terminates at a connection point where work by others is complete, Contractor

shall make the connection. If future connections will be required by others, Contractor shall install plugging and marking apparatus as necessary to protect the Work.

PART 2 - PRODUCTS

2.01 COPPER TUBE AND FITTINGS

A. Soft Copper Tube: NPS 3 inches or smaller; **ASTM B 88, Type K**, annealed temper.
   1. Copper, Solder-Joint Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought-copper, solder-joint pressure type or ASME B 16.22 for wrought-copper and copper allow, solder joint pressure fitting type. Furnish only wrought-copper fittings if indicated.
   2. Soldering flux shall be in accordance with ASTM B813, water-flushable type.
   3. Solder filler metal shall be in accordance with ASTM B 32, with 0.20 percent maximum lead content.
   4. Copper, Pressure-Seal Fittings:
      a. NPS 2 (DN 50) and Smaller: Wrought-copper fitting with EPDM O-ring seal in each end.
      b. NPS 2-1/2 to NPS 4 (DN 65 to DN 100): Bronze fitting with stainless-steel grip ring and EPDM O-ring seal in each end.

2.02 DUCTILE-IRON PIPE AND FITTINGS

A. Mechanical-Joint, Ductile-Iron Pipe, NPS 3 inches or larger: AWWA C151 Class 350, and shall have a cement-mortar lining of standard thickness in accordance with AWWA C104; pipe thickness shall be in accordance with AWWA C150; pipe shall have push-on joints in accordance with AWWA C110, additional pipe:
   1. Mechanical-Joint, Ductile-Iron Fittings: AWWA C110, ductile- or gray-iron standard pattern or AWWA C153, ductile-iron compact pattern.
   2. Glands, Gaskets, and Bolts: AWWA C111, ductile- or gray-iron glands, rubber gaskets, and steel bolts.
      a. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
      b. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

2.03 PVC PIPE AND FITTINGS

A. Polyvinyl Chloride (PVC) Pipe, NPS 4 inches to NPS 12 inches:

   1. PVC pipe shall conform to the requirements of AWWA C900, Class 150, DR 18. Pipe joints shall be elastomeric joints only. Sleeve couplings are not permitted except as necessary for repairs during testing, or connections to existing mains. Comply with UL 1285 for fire-service mains. Fittings shall be mechanical-joint ductile-iron compact fittings in accordance with AWWA C153 or standard size in accordance with AWWA C110.

B. Polyvinyl Chloride (PVC) Pipe NPS 2 inch to NPS 3 inch:

   1. Pipe shall conform to the requirements of ASTM D2241, SDR 21, with elastomeric joints conforming to ASTM D3139. Pipe jointing shall be by elastomeric joints only. Sleeve couplings are not permitted except as necessary for repairs during testing, or connections to existing mains. Fittings shall be PVC fabricated fittings with elastomeric gaskets, or ductile iron compact fittings conforming to AWWA C153 with elastomeric gaskets.

2.04 GATE VALVES

A. AWWA, Cast-Iron Gate Valves:
   1. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings
   2. Nonrising-Stem, Metal-Seated Gate Valves:
      a. Description: Gray- or ductile-iron body and bonnet; with cast-iron or bronze double-disc gate, bronze gate rings, bronze stem, and stem nut.
         1) Standard: AWWA C500, UL 262, FM-Approved.

2) Minimum Pressure Rating: 200 psig (1380 kPa).
3) End Connections: Mechanical joint per AWWA C111.
4) Interior Coating: Complying with AWWA C550.
5) Nut: 2 inches square, complying with AWWA C500.

3. Nonrising-Stem, Resilient-Seated Gate Valves:
   a. Description: Gray- or ductile-iron body and bonnet; with bronze or gray- or ductile-iron gate, resilient seats, bronze stem, and stem nut.
      1) Standard: AWWA C509 UL 262 FM-Approved.
      2) Minimum Pressure Rating: 200 psig (1380 kPa).
      3) End Connections: Mechanical joint per ANSI A21.11 (AWWA C111).
      4) Interior Coating: Complying with AWWA C550.
      5) Nut: 2 inches square, complying with AWWA C500.

2.05 GATE VALVE ACCESSORIES AND SPECIALTIES

A. Tapping-Sleeve Assemblies:
   1. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings.
   2. Description: Sleeve and valve compatible with drilling machine.
      a. Standard: MSS SP-60.
      b. Tapping Sleeve: Cast- or ductile-iron or stainless-steel, two-piece bolted sleeve with flanged outlet for new branch connection. Include sleeve matching size and type of pipe material being tapped and with recessed flange for branch valve.
      c. Valve: AWWA, cast-iron, nonrising-stem, metal or resilient-seated gate valve with one raised face flange mating tapping-sleeve flange.

B. Valve Boxes: Comply with AWWA M44 for cast-iron valve boxes. Include top section, adjustable extension of length required for depth of burial of valve, plug with lettering "WATER," and bottom section with base that fits over valve and with a barrel approximately 5 inches (125 mm) in diameter.
   1. Operating Wrenches: Steel, tee-handle with one pointed end, stem of length to operate deepest buried valve, and socket matching valve operating nut.
   2. Provide 24” x 24” x 6” thick concrete apron around all valve boxes in asphalt pavement areas.

2.06 CORPORATION VALVES AND CURB VALVES (STOPS)

A. Service-Saddle Assemblies: Comply with AWWA C800. Include saddle and valve compatible with tapping machine.
   1. Service Saddle: Copper alloy with seal and AWWA C800, threaded outlet for corporation valve.
   2. Corporation Valve: Bronze body and ground-key plug, with AWWA C800, threaded inlet and outlet matching service piping material.

B. Curb Valves: Comply with AWWA C800. Include bronze body, ground-key plug or ball, and wide tee head, with inlet and outlet matching service piping material.

C. Service Boxes for Curb Valves: Similar to AWWA M44 requirements for cast-iron valve boxes. Include cast-iron telescoping top section of length required for depth of burial of valve, plug with lettering "WATER," and bottom section with base that fits over curb valve and with a barrel approximately 3 inches (75 mm) in diameter.
   1. Shutoff Rods: Steel, tee-handle with one pointed end, stem of length to operate deepest buried valve, and slotted end matching curb valve.

2.07 WATER METERS

A. Manufacturers:
   1. Basis-of-Design Product: Subject to compliance with requirements, if utility company does not furnish water meter provide the product indicated on Drawings.

B. 1-1/2 Inch Compound-Type Water Meters:
   1. Description:
      a. Standard: AWWA C702.
      b. Registration: Flow in gallons (liters).

C. Fire Service Meters:
   1. Description: Use Fire Service Meter only when required by authorities having jurisdiction. Include meter modified with signal-transmitting assembly, low-voltage connecting wiring, and remote register assembly.
      a. Standard: AWWA C703.
      b. Registration: Flow in **gallons (liters)**.

2.08 BACKFLOW PREVENTERS

A. Comply with regulatory authorities having jurisdiction requirements.
   1. Maximum Pressure Loss (RPZ valve): 12 psig (83 kPa) at 2250 gpm maximum, through middle 1/3 of flow range.
   2. Maximum Pressure Loss (double detector check valve): 5 psig (83 35) at 2250 gpm maximum, through middle 1/3 of flow range.

2.09 WATER METER BOXES

A. Description: Cast-iron body and cover (H-20 rated) for disc-type water meter, with lettering "WATER METER" in cover; and with slotted, open-bottom base section of length to fit over service piping. Use only when required by the utility authority. Provide a 24” x 24” x 6” thick concrete apron in pavement areas.

2.10 FIRE HYDRANTS

A. Dry-Barrel Fire Hydrants:
   1. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings.
   2. Description: Freestanding, with one NPS 4-1/2 (DN 115) and two NPS 2-1/2 (DN 65) outlets, 5-1/4-inch (133-mm) main valve, drain valve, and NPS 6 (DN 150) mechanical-joint inlet. Include interior coating according to AWWA C550. Hydrant shall have cast-iron body, compression-type valve opening against pressure and closing with pressure.
      a. Standard: AWWA C502 UL 246, FM-Approved.
      b. Pressure Rating: **150 psig (1035 kPa**).
      c. Outlet Threads: NFPA 1963, with external hose thread used by local fire department. Include cast-iron caps with steel chains.
      d. Operating and Cap Nuts: Pentagon, 1-1/2 inches (38 mm) point to flat.
      e. Direction of Opening: Open hydrant valve by turning operating nut to left or counterclockwise. A clearly visible arrow and the word “OPEN” shall be cast in relief on the top of the hydrant to designate direction of opening.
      f. Exterior Finish: Red alkyd-gloss enamel paint (two coats), unless otherwise indicated.

2.11 RESTRAINED JOINT SYSTEMS FOR FIRE LINE LEAD IN

A. The following section shall only apply to the portion of fire protection main extending from the 90 degree elbow below the sprinkler riser room floor to the flanged end of the pipe extending 1’-0” above the sprinkler riser room finished floor and the horizontal portion of pipe extending from the 90 degree elbow towards the building foundation.

B. The fire protection main entering the sprinkler riser room through the floor shall be restrained from movement by the following:

   1. Pipe Clamps
      a. Clamp dimensions shall be 5/8” x 2½” for 10” pipe, 5/8” x 3” for 12” and larger pipe;
      b. Clamp bolt dimensions shall be ¾” for 10” pipe, 7/8” for 12” and larger pipe;
      c. The diameter of the bolt hole shall be 1/16” larger than that of the corresponding bolt.
   2. Tie Rods: Threaded sections of rods shall not be formed or bent. Rods shall not be less than 5/8” in diameter and the minimum number of rods for each clamp shall be:
      a. 10” Pipe: (4)-5/8” or (3)-3/4” or (2)-7/8” rods;
      b. 12” Pipe: (6)-5/8” or (4)-3/4” or (3)-7/8” rods; and
      c. 14” Pipe: (8)-5/8” or (5)-3/4” or (4)-7/8” rods
      d. 16” Pipe: (10)-5/8” or (7)-3/4” or (5)-7/8” rods

3. Washers
   a. Cast-iron washer dimensions shall be 5/8” x 3” for 10” pipe, ½” x 3½” for 12” pipe and larger;
   b. Steel washer dimensions shall be ½” x 3” for 10” pipe, ½” x 3½” for 12” pipe and larger; and
   c. The diameter of the hole in the washer shall be 1/8” larger than the rod.
4. Polyethylene Encasement: To prevent corrosion, a polyethylene tube/sheet shall be applied to the exterior piping, fittings, clamp and rods. The polyethylene casing shall be applied per the manufacturer’s listing and shall extend 6” above finished floor elevation in the sprinkler room.

PART 3 - EXECUTION

3.01 EARTHWORK
A. Refer to Division 31 Section 312000 “Earth Moving” for excavating, trenching, and backfilling.

3.02 PIPING APPLICATIONS
A. General: Use pipe, fittings, and joining methods for piping systems according to the following applications.
B. Transition couplings and special fittings with pressure ratings at least equal to piping pressure rating may be used, unless otherwise indicated.
C. Do not use flanges or unions for underground piping.
D. Flanges, unions, grooved-end-pipe couplings, and special fittings may be used, instead of joints indicated, on aboveground piping and piping in vaults.
E. Underground water-service piping shall be as shown on the plans

3.03 VALVE APPLICATIONS
A. General Application: Use mechanical-joint-end valves for NPS 2 (DN 50) and larger underground installation. Use threaded- or flanged-end valves for installation in vaults. Use UL/FMG, nonrising-stem gate valves for installation with indicator posts. Use corporation valves and curb valves with ends compatible with piping, for NPS 2 (DN 50) and smaller installation.
B. Drawings indicate valve types to be used.
C. Provide 24” x 24” x 6” thick concrete apron around all valve boxes in asphalt pavement areas.

3.04 PIPING SYSTEMS - COMMON REQUIREMENTS
A. See Division 22 Section "Common Work Results for Plumbing" for piping-system common requirements.

3.05 PIPING INSTALLATION
A. Water-Main Connection: Verify with regulatory authority having jurisdiction that size of tap and location shown on the drawings are acceptable. Tap water main according to requirements of water utility company and of size and in location indicated.
B. Make connections NPS 2 (DN 50) and smaller with drilling machine according to the following:
   1. Install service-saddle assemblies and corporation valves in size, quantity, and arrangement required by utility company standards.
   2. Install service-saddle assemblies on water-service pipe to be tapped. Position outlets for corporation valves.
   3. Use drilling machine compatible with service-saddle assemblies and corporation valves. Drill hole in main. Remove drilling machine and connect water-service piping.
   4. Install corporation valves into service-saddle assemblies.
   5. Install manifold for multiple taps in water main.
   6. Install curb valve in water-service piping with head pointing up and with service box.
C. Comply with NFPA 24 for fire-service-main piping materials and installation.
D. Install ductile-iron, water-service piping according to AWWA C600 and AWWA M41.
E. Install PVC, AWWA pipe according to ASTM F 645 and AWWA M23.

F. Bury piping with depth of cover over top at least [42 inches (1061 mm), with top at least 12 inches (300 mm) below level of maximum frost penetration, or as required by regulatory authority having jurisdiction, whichever is deeper. If pipe is installed in an excavated “cut” section prior to completion of grading operations, pipe shall be installed so that minimum required cover will exist upon completion of grading operations.

G. Install piping by tunneling or jacking, or combination of both, under streets and other obstructions that cannot be disturbed.

H. Extend water-service piping and connect to water-supply source and building-water-piping systems five (5) feet outside face of building wall in locations and pipe sizes indicated.
   1. Terminate water-service piping five (5) feet outside building wall until building-water-piping systems are installed. Terminate piping with caps, plugs, or flanges as required for piping material. Make connections to building-water-piping systems when those systems are installed.

I. Install underground piping with restrained joints at horizontal and vertical changes in direction. Use restrained-joint piping, thrust blocks, anchors, tie-rods and clamps, and other supports.

J. Pipe Bedding: Pipe bedding material shall be as specified on trenching and bedding details as shown on drawings. No pipe shall be laid resting on a rock, blocking or unyielding objects.

K. Location with Sewers: Separate trenches shall be provided for water lines and sewer lines, with lines separated by a minimum of 10 feet horizontally. Water mains that cross sewers shall have a minimum vertical separation of 18 inches.

L. All piping shall be installed and verified to be level. This shall apply to piping in the horizontal and vertical positions.

M. See Division 21 Section "Water-Based Fire-Suppression Systems" for fire-suppression-water piping inside the building.

N. See Division 22 Section "Domestic Water Piping" for potable-water piping inside the building.

3.06 JOINT CONSTRUCTION

A. See Engineering Drawings for basic piping joint construction.

B. Make pipe joints according to the following:
   1. Copper-Tubing, Pressure-Sealed Joints: Use proprietary crimping tool and procedure recommended by copper, pressure-seal-fitting manufacturer.
   2. Ductile-Iron Piping, Gasketed Joints for Water-Service Piping: AWWA C600 and AWWA M41.
   3. Ductile-Iron Piping, Gasketed Joints for Fire-Service-Main Piping: UL 194.
   4. PVC Piping Gasketed Joints: Use joining materials according to AWWA C900. Construct joints with elastomeric seals and lubricant according to ASTM D 2774 or ASTM D 3139 and pipe manufacturer's written instructions.
   5. Dissimilar Materials Piping Joints: Use adapters compatible with both piping materials, with OD, and with system working pressure. Refer to Division 22 Section "Common Work Results for Plumbing" for joining piping of dissimilar metals.

3.07 ANCHORAGE INSTALLATION

A. Install anchorages for tees, plugs and caps, bends, crosses, valves, and hydrant branches. Include anchorages for the following piping systems:
   1. Gasketed-Joint, Ductile-Iron, Water-Service Piping: According to AWWA C600.
   2. Gasketed-Joint, PVC Water-Service Piping: According to AWWA M23.
   3. Fire-Service-Main Piping: According to NFPA 24.

B. Apply full coat of asphalt or other acceptable corrosion-resistant material to surfaces of installed ferrous anchorage devices.

3.08 VALVE INSTALLATION

A. AWWA Gate Valves: Comply with AWWA C600 and AWWA M44. Install each underground valve with stem pointing up and with valve box.

B. AWWA Valves Other Than Gate Valves: Comply with AWWA C600 and AWWA M44.

C. UL/FMG, Gate Valves: Comply with NFPA 24. Install each underground valve and valves in vaults with stem pointing up and with vertical cast-iron indicator post.
D. UL/FMG, Valves Other Than Gate Valves: Comply with NFPA 24.
E. MSS Valves: Install as component of connected piping system.
F. Corporation Valves and Curb Valves: Install each underground curb valve with head pointed up and with service box.

3.09 WATER METER INSTALLATION

A. Install water meters, piping, and specialties according to utility company's written instructions.

3.10 ROUGHING-IN FOR WATER METERS

A. Rough-in piping and specialties for water meter installation according to utility company's written instructions.

3.11 BACKFLOW PREVENTER INSTALLATION

A. Install backflow preventers of type, size, and capacity indicated. Include valves and test cocks. Install according to requirements of plumbing and health department and authorities having jurisdiction.
B. Do not install backflow preventers that have relief drain in vault or in other spaces subject to flooding.
C. Do not install bypass piping around backflow preventers.

3.12 WATER METER BOX INSTALLATION

A. Install water meter boxes in paved areas flush with surface. Provide 24” x 24” x 6” thick concrete apron around all valve boxes in asphalt pavement areas.
B. Install water meter boxes in grass or earth areas with top 2 inches (50 mm) above surface.

3.13 FIRE HYDRANT INSTALLATION

A. General: Install each fire hydrant with separate gate valve in supply pipe, anchor with restrained joints or thrust blocks, and support in upright position.
B. AWWA Fire Hydrants: Comply with AWWA M17.
C. UL/FMG Fire Hydrants: Comply with NFPA 24.

3.14 CONNECTIONS

A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
B. See Engineering Plans for piping connections to valves and equipment.

3.15 FIELD QUALITY CONTROL

A. Piping Tests: Conduct piping tests before joints are covered and after concrete thrust blocks have hardened sufficiently. Fill pipeline 24 hours before testing and apply test pressure to stabilize system. Use only potable water.
B. Hydrostatic Tests: Test at not less than one-and-one-half times working pressure for two hours.
    1. The Contractor shall test all pipe lines and appurtenances with water at test pressure of 200 psi or 50 psi in excess of the system working pressure, whichever is greater. Test pressure must be maintained for at least 2 hours. All leakage apparent after testing must be repaired immediately. The work will not be finally accepted until leakage shall be as follows:
        a. The amount of leakage at the joints shall not exceed 2 quarts per hour per 100 gaskets or joints, irrespective of pipe diameter.
        b. The amount of leakage specified above shall be permitted to be increased by 1 fluid ounce per inch valve diameter per hour for each metal seated valve isolating the test section.
        c. If dry barrel hydrants are tested with the main valve open so the hydrants are under pressure, an additional 5 fluid ounces per minute shall be permitted for each hydrant.
        d. The amount of leakage in buried piping shall be measured at the specified test pressure by pumping from a calibrated container.

2. Fire Water System tests shall be in full conformity with the requirements of all applicable codes, NFPA standards, and other authorities having jurisdiction.
    a. All new underground mains and lead-ins shall be flushed thoroughly before connection is made to internal system piping. The site utility subcontractor shall be responsible for disposal of the test water drained from the test outlets.
    b. The trench shall be backfilled between joints before testing to prevent movement of pipe.
    c. Test shall be made by the site utility subcontractor in the presence of the regulatory authority having jurisdiction and/or the Owner's representative.
    d. After the fire service underground main and lead-in have been installed by the site utility subcontractor and are ready for use, the site utility subcontractor shall furnish 2 completed copies of the "Contractor's Material and Test Certificate for Private Fire Service Mains" form to the General Contractor. Prior to attachment of any pipe or equipment to the lead-in located in the sprinkler room, the sprinkler subcontractor shall obtain a copy of the completed form from the General Contractor.
    e. The site utility subcontractor shall prepare reports of testing activities and submit 2 copies to the General Contractor.

C. Prepare reports of testing activities.

3.16 IDENTIFICATION

3.17 Install continuous underground detectable warning tape during backfilling of trench for underground water-distribution piping. Locate below finished grade, directly over piping. Underground warning tapes are specified in Division 31 Section 312000 "Earth Moving" .

3.18 CLEANING

A. Clean and disinfect water-distribution piping as follows:
1. Purge new water-distribution piping systems and parts of existing systems that have been altered, extended, or repaired before use.
2. Use purging and disinfecting procedure prescribed by authorities having jurisdiction or, if method is not prescribed by authorities having jurisdiction, use procedure described in NFPA 24 for flushing of piping. Flush piping system with clean, potable water until dirty water does not appear at points of outlet.
3. Use purging and disinfecting procedure prescribed by authorities having jurisdiction or, if method is not prescribed by authorities having jurisdiction, use procedure described in AWWA C651 or do as follows:
    a. Fill system or part of system with water/chlorine solution containing at least 50 ppm of chlorine; isolate and allow tostand for 24 hours.
    b. Drain system or part of system of previous solution and refill with water/chlorine solution containing at least 200 ppm of chlorine; isolate and allow to stand for 3 hours.
    c. After standing time, flush system with clean, potable water until no chlorine remains in water coming from system.
    d. Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedure if biological examination shows evidence of contamination.

B. The site utility subcontractor shall prepare reports of purging and disinfecting activities and submit two (2) copies to the General Contractor.

C. All fire protection underground mains shall be flushed per the flow rates listed below:

Fire Pump and/or Water Storage Tank Installed		No Fire Pump or Water Storage Tank	
8" pipe	2,350 gpm	8" pipe	1,560 gpm
10" pipe	3,670 gpm	10" pipe	2,440 gpm
12" pipe	5,290 gpm	12" pipe	3,520 gpm
14" pipe	7,188 gpm		
16" pipe	9,388 gpm		

Underground and lead-in fire protection mains shall be flushed through fire hydrants at dead ends of the underground piping system or through aboveground flushing outlets which are accessible will allow water to drain to a safe location and will provide the required flow listed above. Flush

underground mains until water is clear. Continue to flush for five minutes after water is clear. Utilize approved water flow measuring devices to verify that the required water flow is achieved.

END OF SECTION 331000

CONFORMANCE SUBMITTAL

SECTION 331000 – Facility Water Distribution Piping

Project Location _____

(*City, State*)

General Contractor: _____

(*Company Name, Phone Number*)

_____

(*Address*)

Sub-Contractor: _____

(*Company Name, Phone Number*)

_____

(*Address*)

The following products have been selected (check one box) for use in this project from the list of acceptable products specified:

Domestic and Fire Mains:

☐ Ductile-Iron Pipe, AWWA C151 Class 350, MJ DI Compact Fittings

☐ Polyvinyl Chloride (PVC) Pipe, AWWA C900, Class _____, MJ DI Compact Fittings

☐ Other per AHJ: _____

Domestic and Irrigation Supply Lines:

☐ Copper Tubing, ASTM B88, Type K, Annealed Temper, Copper Fittings

☐ Polyvinyl Chloride (PVC) Pipe, ASTM D2241, SDR 21

☐ Other per AHJ: _____

Fire Hydrants, BFP's, Valves, Meters, Fittings, Vaults, and all other Appurtenances:

☐ Conform to Project Specifications and All Authorities Having Jurisdiction

---

I represent to the City/Owner/Engineer that the product selected will be installed in compliance with the applicable codes for the authorities having jurisdiction and in accordance with the contract documents. If noncompliance is discovered the General Contractor shall make or cause to be made all necessary corrections to meet the applicable codes and specifications. Immediately or as directed by Owner the work shall be completed without additional cost to the Owner and / or the contract.

Sub-Contractor: _____

(*Signature of the Authorized Agent of the Sub-Contractor*) Date

_____

(*Print Name of the Authorized Agent of the Sub-Contractor*)

General Contractor: _____

(*Signature of the Authorized Agent of the General Contractor*) Date

_____

(Print Name of the Authorized Agent of the General Contractor)

WATER DISTRIBUTION SYSTEM CERTIFICATION FORM

Project	
Date	
Engineer	
General Contractor	
Utility Contractor	
Const. Mgr.	

ENGINEER CERTIFICATION (If required)

I certify that the water distribution system for the above referenced project has been installed and tested in accordance with local code and Project Plans and Specifications dated _____**.**

Engineer _____

Registration No._____ Affix Seal Here (not valid unless sealed)

Date _____

GENERAL CONTRACTOR CERTIFICATION (Required)

I certify that the water distribution system for the above referenced project has been installed and tested in accordance with local code and Project Plans and Specifications dated _____**.**

General Contractor _____

License No._____

Date _____

UTILITY CONTRACTOR CERTIFICATION (Required)

I certify that the water distribution system for the above referenced project has been installed and tested in accordance with local code and Project Plans and Specifications dated _____**.**

Utility Contractor _____

License No._____

Date _____

* Submit this certification form with test results, local certificates, etc.

Contractor's Material and Test Certificate for Underground Piping

PROCEDURE

Upon completion of work, inspection and tests shall be made by the contractor's representative and witnessed by an owner's representative. All defects shall be corrected and system left in service before contractor's personnel finally leave the job.

A certificate shall be filled out and signed by both representatives. Copies shall be prepared for approving authorities, owners, and contractor. It is understood the owner's representative's signature in no way prejudices any claim against contractor for faulty material, poor workmanship, or failure to comply with approving authority's requirements or local ordinances.

Property name		Date
Property address		
Plans	Accepted by approving authorities (names)	
	Address	
	Installation conforms to accepted plans	☐ Yes ☐ No
	Equipment used is approved If no, state deviations	☐ Yes ☐ No
Instructions	Has person in charge of fire equipment been instructed as to location of control valves and care and maintenance of this new equipment? If no, explain	☐ Yes ☐ No
	Have copies of appropriate instructions and care and maintenance charts been left on premises? If no, explain	☐ Yes ☐ No
Location	Supplies buildings	
Underground pipes and joints	Pipe types and class	Type joint
	Pipe conforms to _____ standard Fittings conforms to _____ standard If no, explain	☐ Yes ☐ No ☐ Yes ☐ No
	Joints needed anchorage clamped, strapped, or blocked in accordance with _____ standard If no, explain	☐ Yes ☐ No
Test description	Flushing: Flow the required rate until water is clear as indicated by no collection of foreign material in burlap bags at outlets such as hydrants and blow-offs. Flush at flows not less than 390 gpm (1476 L/min) for 4-in. pipe, 880 gpm (3331 L/min) for 6-in. pipe, 1560 gpm (5905 L/min) for 8-in. pipe, 2440 gpm (9235 L/min) for 10-in. pipe, and 3520 gpm (13,323 L/min) for 12-in. pipe. When supply cannot produce stipulated flow rates, obtain maximum available. Hydrostatic: Hydrostatic tests shall be made at not less than 200 psi (13.8 bar) for 2 hours or 50 psi (3.4 bar) above static pressure in excess of 150 psi (10.3 bar) for 2 hours. Leakage: New pipe laid with rubber gasketed joints shall, if the workmanship is satisfactory, have little or no leakage at the joints. The amount of leakage at the joints shall not exceed 2 quarts per hour (1.89 L/hr) per 100 joints irrespective of pipe diameter. The leakage shall be distributed over all joints. If such leakage occurs at a few joints, the installation shall be considered unsatisfactory and necessary repairs made. The amount of allowable leakage specified above can be increased by 1 fluid ounce per inch valve diameter per hr. (30 mL/25 mm/hr) for each metal seated valve isolating the test section. If dry barrel hydrants are tested with the main valve open so the hydrants are under pressure, an additional 5 ounces per minute (150 mL/min) leakage is permitted for each hydrant.	
Flushing tests	New underground piping flushed according to _____ standard by (company) If no, explain	☐ Yes ☐ No
	How flushing flow was obtained ☐ Public water ☐ Tank or reservoir ☐ Fire pump	Through what type opening ☐ Hydrant butt ☐ Open pipe
	Lead-ins flushed according to _____ standard by (company) If no, explain	☐ Yes ☐ No
	How flushing flow was obtained ☐ Public water ☐ Tank or reservoir ☐ Fire pump	Through what type opening ☐ Y connection to flange and spigot ☐ Open pipe

Hydrostatic test	All new underground piping hydrostatically tested at _____ psi for _____ hours	Joints covered ☐ Yes ☐ No
Leakage test	Total amount of leakage measured _____ gallons _____ hours	
	Allowable leakage _____ gallons _____ hours	
Hydrants	Number installed / Type and make	All operate satisfactorily ☐ Yes ☐ No
Control valves	Water control valves left wide open If no, state reason	☐ Yes ☐ No
	Hose threads of fire department connections and hydrants interchangeable with those of fire department answering alarm	☐ Yes ☐ No
Remarks	Date left in service	
Signatures	Name of installing contractor	
	Tests witnessed by	
	For property owner (signed) / Title / Date	
	For installing contractor (signed) / Title / Date	
Additional explanation and notes		

SECTION 333000

SANITARY SEWER

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and all Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:

1. This section includes sanitary sewer piping and related appurtenances from connection to main to within 5 feet of outside building limits.
2. Pipe and fittings.
3. Non-pressure and pressure couplings.
4. Expansion joints and deflection fittings.
5. Backwater valves.
6. Cleanouts.
7. Encasement for piping.
8. Manholes.

1.03 REFERENCE STANDARDS

A. American Society for Testing and Materials (ASTM)
   1. A746 - Standard Specification for Ductile Iron Gravity Sewer Pipe
   2. D3034 – Standard Specification for Type PSM Poly Vinyl Chloride (PVC) Sewer Pipe and Fittings
   3. F477 - Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe
   4. F696 - Standard Specification for Poly Vinyl Chloride (PVC) Large-Diameter Plastic Gravity Sewer Pipe and Fittings
   5. C476 - Standard Specification for Grout for Masonry
   6. C443 - Standard Specification for Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets
   7. C923 - Standard Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes and Laterals
   8. D2321 - Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications
   9. D478 - Standard Specifications for Precast Reinforced Concrete Manhole Sections
   10. C969 - Standard Practice for Infiltration and Exfiltration Acceptance Testing of Installed Precast Concrete Sewer Lines
B. American Society of Sanitary Engineers (ASSE)
C. American National Standards Institute (ANSI)
D. American Concrete Institute (ACI)
   1. 318 - Code Requirements for Structural Plain Concrete
E. National Sanitation Foundation (NSF)
F. American Water Works Association (AWWA)
   1. C110 - Ductile-Iron and Gray-Iron Fittings, 3 in through 48 in (75 mm through 1200 mm), for Water and Other Liquids (revision of ANSI/AWWA C110/A21.10-93)
   2. C1111 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings C153 - Ductile-Iron Compact Fittings, 3 in. through 24 in. (76 mm Through 610 mm) and 54 in. through 64 in. (1,400 mm Through 1,600 mm), for Water Service (revision of ANSI/AWWA C153/A21.53-94).
   3. C600 - Installation of Ductile-Iron Water Mains and Their Appurtenances (revision of ANSI/AWWA C600-93)
   4. C150 - ANSI Standard for Thickness Design of Ductile Iron Pipe
   5. C151 – ANSI Standard for Ductile Iron Pipe

6. C153 – ANSI Standard for Ductile Iron Pipe Compact Fittings

G. Federal Specifications
   1. SS-S-00210 - Sealing Compound Preformed Plastic for Pipe Joints

H. Uni-Bell PVC Pipe Association
   1. UNI-B-6 - Low-Pressure Air Testing of Installed Sewer Pipe

1.04 SUBMITTALS

A. Conformance Submittal: The General Contractor and the Subcontractor shall execute the Conformance Submittal(s) at the end of this Section.

B. Field inspection, testing and quality-control reports.

C. Sanitary Sewer Certification Form (signed by the Engineer, General Contractor and Utility Contractor) at the end of this Section.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Do not store pipe, and fittings in direct sunlight.

B. Protect pipe, pipe fittings, and seals from dirt and damage.

C. Handle manholes according to manufacturer's written rigging instructions.

1.06 PROJECT CONDITIONS

A. Coordination and Fees:
   1. Contractor shall comply with requirements of the regulatory authorities having jurisdiction including tapping of sewer mains, installation and testing.
   2. Contractor shall be responsible for obtaining and payment of all tap and construction permit fees associated with this Section.
   3. Contractor to install all sanitary sewer lines and appurtenances as shown on the drawings to within 5 feet of building limits. If the Contractor’s work terminates at a connection point where work by others is complete, the Contractor shall make the connection. If future connections are required by others, the Contractor shall install plugging and marking as necessary to identify and locate the work.

B. Interruption of Existing Sanitary Sewerage Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary service according to requirements indicated:
   1. Notify Owner no fewer than two days in advance of proposed interruption of service.
   2. Do not proceed with interruption of service without Owner’s written permission.

PART 2 - PRODUCTS

2.01 DUCTILE-IRON, GRAVITY SEWER PIPE AND FITTINGS

A. Pipe: ASTM A 746, for push-on joints.

B. Standard Fittings: AWWA C110, ductile or gray iron, for push-on joints.

C. Compact Fittings: AWWA C153, ductile iron, for push-on joints.

D. Gaskets: AWWA C111, rubber.

2.02 PVC PIPE AND FITTINGS

A. Performance Requirements:

   1. Gravity Flow Non-Pressure Piping Pressure Ratings: at least equal to system test pressure.
   2. Force-Main Pressure Ratings: at least equal to system operating pressure but not less than 150 psig.

B. PVC Gravity Sewer Piping:
   1. 12 Inch and Smaller PVC Pipe and Fittings: ASTM D 3034, SDR, PVC gravity sewer pipe with bell-and-spigot ends and with integral ASTM F 477, elastomeric seals for gasketed joints.
   2. 15 Inch and Larger PVC Pipe and Fittings: ASTM F 679, SDR 35, Type T-1 wall thickness, PVC gravity sewer pipe with bell-and-spigot ends and with integral ASTM F 477, elastomeric seals for gasketed joints.

2.03 NONPRESSURE-TYPE TRANSITION COUPLINGS

A. Comply with ASTM C 1173, elastomeric, sleeve-type, reducing or transition coupling, for joining underground nonpressure piping. Include ends of same sizes as piping to be joined and corrosion-resistant-metal tension band and tightening mechanism on each end.

B. Sleeve Materials:
   1. For Plastic Pipes: ASTM F 477, elastomeric seal or ASTM D 5926, PVC.
   2. For Dissimilar Pipes: ASTM D 5926, PVC or other material compatible with pipe materials being joined.

C. Unshielded, Flexible Couplings:

2.04 CLEANOUTS

A. Cleanouts shall be provided on sanitary sewer service laterals at no more than 100’ on center. Exterior cleanout plug shall be level with adjacent grade and provided with a 2’ x 2’ x 6” thick concrete apron as shown on the Drawings.

B. Cast-Iron Cleanouts:
   1. Basis-of-Design Product: Subject to compliance with requirements, provide US Foundry cover USF 7621 or equal product as indicated on Drawings.
   2. Description: ASME A112.36.2M, round, gray-iron housing with clamping device and round, secured, scoriated, gray-iron cover. Include gray-iron ferrule with inside calk or spigot connection and countersunk, tapered-thread, brass closure plug.
   3. Top-Loading Classification(s): Heavy Duty.
   4. Sewer Pipe Fitting and Riser to Cleanout: ASTM A 74, Service class, cast-iron soil pipe and fittings.

C. PVC Cleanouts:
   1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings.
   2. Description: PVC body with PVC threaded plug. Include PVC sewer pipe fitting and riser to cleanout of same material as sewer piping.

2.05 ENCASEMENT FOR PIPING

A. Standard: ASTM A 674 or AWWA C105.

B. Material: high-density, cross-laminated polyethylene film of 0.004-inch (0.10-mm) minimum thickness.

C. Form: Sheet.

D. Color: Black.

2.06 MANHOLES

A. Standard Precast Concrete Manholes:
   1. Description: ASTM C 478 (ASTM C 478M), precast, reinforced concrete, of depth indicated, with provision for rubber gasketed joints and rubber pipe boots.
   2. Inside Diameter: 48 inches (1200 mm) minimum unless otherwise indicated.
   3. Ballast: Increase thickness of precast concrete sections or add concrete to base section, as required to prevent flotation.
   4. Base Section: 8-inch (175-mm) minimum thickness for floor slab and 5-inch (125-mm) minimum thickness for walls and base riser section; with separate base slab or base section with integral floor.
   5. Riser Sections: 5-inch (125-mm) minimum thickness, of length to provide depth indicated.
   6. Top Section: Eccentric-cone type unless concentric-cone or flat-slab-top type is indicated; with top of cone of size that matches grade rings.
   7. Gasket: ASTM C 443, rubber (when required by local authority having jurisdiction).
   8. Resilient Pipe Connectors: ASTM C 923 (ASTM C 923M), cast or fitted into manhole walls, for each pipe connection.
   9. Steps: Individual FRP steps wide enough to allow worker to place both feet on one step and designed to prevent lateral slippage off step. Cast or anchor steps into sidewalls at 16-inch (400-mm) intervals. Omit steps if total depth from floor of manhole to finished grade is less than 42 inches (1050 mm).

10. Grade Rings (if required): Reinforced-concrete rings, 6- to 9-inch (150- to 225-mm) total thickness, with diameter matching manhole frame and cover, and with height as required to adjust manhole frame and cover to indicated elevation and slope.
11. Pipe Connectors: ASTM C 923, resilient, of size required for each pipe connecting to base section.
12. Joints of the manhole sections shall be tongue and groove filled with approved preformed butyl rubber base sealing compound conforming to Federal Specifications SS-S210A, Type 1, and Rope Form.

B. Designed Precast Concrete Manholes:
1. Description: ASTM C 913; designed according to ASTM C 890 for A-16 (ASSHTO HS20-44), heavy-traffic, structural loading; of depth, shape, and dimensions indicated, with provision for sealant joints.
2. Ballast: Increase thickness of one or more precast concrete sections or add concrete to manhole as required preventing flotation.
3. Joint Sealant: ASTM C 990 (ASTM 990M), bitumen or butyl rubber.
4. Resilient Pipe Connectors: ASTM C 923 (ASTM C 923M), cast or fitted into manhole walls, for each pipe connection.
5. Steps: Individual FRP steps or wide enough to allow worker to place both feet on one step and designed to prevent lateral slippage off step. Cast or anchor steps into sidewalls at 16-inch (400-mm) intervals. Omit steps if total depth from floor of manhole to finished grade is less than **42 inches (1050 mm)**.
6. Grade Rings: Reinforced-concrete rings, 6- to 9-inch (150- to 225-mm) total thickness, with diameter matching manhole frame and cover, and with height as required to adjust manhole frame and cover to indicated elevation and slope.

C. Manhole Frames and Covers:
1. Description: Ferrous; 24-inch (610-mm) ID by 7- to 9-inch (175- to 225-mm) riser, with 4-inch- (100-mm-) minimum-width flange and 26-inch- (660-mm-) diameter cover. Include indented top design with 2 inch high lettering cast into cover, with the words "SANITARY SEWER." Cover must be bolted (to prevent theft).
2. Standard manhole frame and cover shall conform to the standard detail of the regulatory authorities having jurisdiction for the project. Otherwise manhole frames and covers shall be as detailed on the Drawings.

2.07 CONCRETE

A. General: Cast-in-place concrete complying with ACI 318, ACI 350/350R (ACI 350M/350RM), and the following:
1. Cement: ASTM C 150, Type II.
2. Fine Aggregate: ASTM C 33, sand.
3. Coarse Aggregate: ASTM C 33, crushed gravel.
4. Water: Potable.

B. PortlandCement Design Mix: 4000 psi (27.6 MPa) minimum, with 0.45 maximum water/cementitious materials ratio.
1. Reinforcing Fabric: ASTM A 185/A 185M, steel, welded wire fabric, plain.
2. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (420 MPa) deformed steel.

C. Manhole Channels and Benches: Factory or field formed from concrete. Portland cement design mix, 4000 psi (27.6 MPa) minimum, with 0.45 maximum water/cementitious materials ratio. Include channels and benches in manholes.
1. Channels: Concrete invert, formed to same width as connected piping, with height of vertical sides to three-fourths of pipe diameter. Form curved channels with smooth, uniform radius and slope.
    a. Invert Slope: 2 percent through manhole.
2. Benches: Concrete, sloped to drain into channel.
    a. Slope: 4 percent.

D. Ballast and Pipe Supports: Portland cement design mix, 3000 psi (20.7 MPa) minimum, with 0.58 maximum water/cementitious materials ratio.
1. Reinforcing Fabric: ASTM A 185/A 185M, steel, welded wire fabric, plain.
2. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (420 MPa) deformed steel.

PART 3 - EXECUTION

3.01 EARTHWORK

A. Excavating, trenching, and backfilling are specified in Division 31 Section "Earth Moving"

3.02 PIPING INSTALLATION

A. General Locations and Arrangements: Drawing plans and details indicate general location and arrangement of underground sanitary sewer piping. Location and arrangement of piping layout take into account design considerations. Install piping as indicated, to extent practical. Where specific installation is not indicated, follow piping manufacturer's written instructions.

B. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions for using lubricants, cements, and other installation requirements.

C. Clear interior of piping and structures of dirt and deleterious materials as work progresses. Place plug in end of incomplete piping at end of day and work stops for greater than 24 hours. Flush piping between manholes and other structures to remove collected debris when needed.

D. Install manholes for changes in direction unless fittings are indicated. Use fittings for branch connections unless direct tap into existing sewer is indicated.

E. Install proper size increasers, reducers, and couplings where different sizes or materials of pipes and fittings are connected. Reducing size of piping in direction of flow is prohibited.

F. Install gravity-flow piping to within 5 feet of the building limits of sizes and in locations shown on the Drawings. Terminate piping as specified.

G. When installing pipe under streets or other obstructions that cannot be disturbed, use pipe-jacking process of micro tunneling.

H. Install gravity-flow, nonpressure, drainage piping according to the following:

1. Install piping pitched down in direction of flow, at slope shown on the Drawings, and at a minimum slope of 1 percent for 6 inch diameter pipe and 0.5 percent for 8 diameter inch pipes unless otherwise indicated.
2. Install piping with 36-inch (915-mm) minimum cover.
3. Install ductile-iron, gravity sewer piping according to ASTM A 746.
4. Install PVC gravity sewer piping according to ASTM D 2321 and ASTM F 1668.

I. Install force-main, pressure piping according to the following:

1. Install piping with restrained joints at tee fittings and at horizontal and vertical changes in direction. Use corrosion-resistant rods, pipe or fitting manufacturer's proprietary restraint system, or cast-in-place-concrete supports or anchors.
2. Install piping with 36-inch (915-mm) minimum cover.
3. Install ductile-iron special fittings according to AWWA C600.
4. Install PVC pressure piping according to AWWA M23 or to ASTM D 2774 and ASTM F 1668.

J. If indicated on Drawings install corrosion-protection piping encasement over the following underground metal piping according to ASTM A 674 or AWWA C105:

1. Ductile-iron pipe and fittings.
2. Expansion joints and deflection fittings.

K. Clear interior of piping and manholes of dirt and superfluous material as work progresses. Maintain swab or drag in piping, and pull past each joint as it is completed. Place plug in end of incomplete piping at end of day and when work stops.

3.03 PIPE JOINT CONSTRUCTION

A. Join gravity-flow, nonpressure, drainage piping according to the following:

1. Join ductile-iron, gravity sewer piping according to AWWA C600 for push-on joints.
2. Join PVC gravity sewer piping according to ASTM D 2321 and ASTM D 3034 for elastomeric-seal joints or ASTM D 3034 for elastomeric-gasket joints.
3. Join dissimilar pipe materials with nonpressure-type, flexible or rigid couplings.

B. Join force-main, pressure piping according to the following:

1. Join PVC pressure piping according to AWWA M23 for gasketed joints.

C. Pipe couplings, expansion joints, and deflection fittings with pressure ratings at least equal to piping rating may be used in applications below unless otherwise indicated.
1. Use non-pressure flexible couplings where required to join gravity-flow, nonpressure sewer piping unless otherwise indicated.
   a. Shielded flexible couplings for pipes of same or slightly different OD.
   b. Unshielded, increaser/reducer-pattern, flexible couplings for pipes with different OD.
   c. Ring-type flexible couplings for piping of different sizes where annular space between smaller piping's OD and larger piping's ID permits installation.
2. Use pressure pipe couplings for force-main joints.

3.04 MANHOLE INSTALLATION

A. General: Install manholes complete with appurtenances and accessories indicated.
B. Install precast concrete manhole sections with sealants according to ASTM C 891.
C. Install FRP manholes according to manufacturer's written instructions.
D. Form continuous concrete channels and benches between inlets and outlet.
E. Set tops of frames and covers flush with finished surface of manholes that occur in pavements. Set tops 3 inches (76 mm) above finished surface elsewhere unless otherwise indicated.

3.05 CONCRETE PLACEMENT

A. Place cast-in-place concrete according to ACI 318.

3.06 BACKWATER VALVE INSTALLATION (If used)

A. Install horizontal-type backwater valves in piping manholes or pits.
B. Install combination horizontal and manual gate valves in piping and in manholes.
C. Install terminal-type backwater valves on end of piping and in manholes. Secure units to sidewalls.

3.07 CLEANOUT INSTALLATION

A. Install cleanouts and riser extensions from sewer pipes to cleanouts at grade. Use cast-iron soil pipe fittings in sewer pipes at branches for cleanouts, and use cast-iron soil pipe for riser extensions to cleanouts. Install piping so cleanouts open in direction of flow in sewer pipe.

1. Use Heavy-Duty, top-loading classification cleanouts in vehicle-traffic and truck service areas.

B. Set cleanout frames and covers in cast-in-place-concrete, 24 by 24 by 6 inches (600 by 600 by 150 mm) deep. Set with tops flush with surrounding grade.
C. Set cleanout frames and covers in concrete pavement and roads with tops flush with pavement surface.

3.08 CONNECTIONS

A. Connect nonpressure, gravity-flow drainage piping to building's sanitary building drains specified in the engineering drawings.
B. Connect force-main piping to building's sanitary force mains specified in Division 22 Section "Sanitary Waste and Vent Piping." Terminate piping where indicated.
C. Make connections to existing piping and underground manholes.
1. Use commercially manufactured wye fittings for piping branch connections. Remove section of existing pipe, install wye fitting into existing piping, and encase entire wye fitting plus 6-inch (150-mm) overlap with not less than 6 inches (150 mm) of concrete with 28-day compressive strength of 3000 psi (20.7 MPa).
2. Make branch connections from side into existing piping, NPS 4 to NPS 20 (DN 100 to DN 500). Remove section of existing pipe, install wye fitting into existing piping, and encase entire wye with not less than 6 inches (150 mm) of concrete with 28-day compressive strength of 3000 psi (20.7 MPa).

3. Make branch connections from side into existing piping, NPS 21 (DN 525) or larger, or to underground manholes by cutting opening into existing unit large enough to allow 3 inches (76 mm) of concrete to be packed around entering connection. Cut end of connection pipe passing through pipe or structure wall to conform to shape of and be flush with inside wall unless otherwise indicated. On outside of pipe or manhole wall, encase entering connection in 6 inches (150 mm) of concrete for minimum length of 12 inches (300 mm) to provide additional support of collar from connection to undisturbed ground.
    a. Use concrete that will attain a minimum 28-day compressive strength of 3000 psi (20.7 MPa) unless otherwise indicated.
    b. Use epoxy-bonding compound as interface between new and existing concrete and piping materials.
4. Protect existing piping and manholes to prevent concrete or debris from entering while making tap connections. Remove debris or other extraneous material that may accumulate.

D. Connect to grease oil and sand interceptors specified in Division 2 Section "Sanitary Sewer."

3.09 CLOSING ABANDONED SANITARY SEWER SYSTEMS

A. The Contractor shall be responsible for removal and/or relocation of existing utilities as necessary, whether shown or not shown on the Drawings. At locations where conflicts occur with proposed sanitary sewer improvements, removal and relocation shall be at no additional cost to the Owner.

B. Abandoned Piping: Close and grout fill open ends of abandoned underground piping indicated to remain in place. Include closures strong enough to withstand hydrostatic and earth pressures that may result after ends of abandoned piping have been closed. Use either procedure below:
1. Close open ends of piping with at least 8-inch- (203-mm-) thick, brick masonry bulkheads.
2. Close open ends of piping with threaded metal caps, plastic plugs, or other acceptable methods suitable for size and type of material being closed. Do not use wood plugs.

C. Abandoned Manholes: Excavate around manhole as required and use either procedure below:
1. Remove manhole and close open ends of remaining piping.
2. Remove top of manhole down to at least 36 inches (915 mm) below final grade. Fill to within 12 inches (300 mm) of top with gravel, or compacted dirt. Fill to top with concrete.

D. Backfill to grade according to Division 31 Section “Earth Moving”

3.10 IDENTIFICATION

A. Materials and their installation are specified in Division 31 Section "Earth Moving." Arrange for installation of green warning tapes directly over piping and at outside edges of underground manholes.
1. Use warning tape or detectable warning tape over ferrous piping.
2. Use detectable warning tape over nonferrous piping and over edges of underground manholes.

3.11 FIELD QUALITY CONTROL

A. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches (600 mm) of backfill is in place, and again at completion of Project.
1. Submit separate report for each system inspection.
2. Defects requiring correction include the following:
    a. Alignment: Less than full diameter of inside of pipe is visible between structures.
    b. Deflection: Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 95 percent of piping diameter.
    c. Damage: Crushed, broken, cracked, or otherwise damaged piping.
    d. Infiltration: Water leakage into piping.
    e. Exfiltration: Water leakage from or around piping.
3. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.
4. Re-inspect and repeat procedure until results are satisfactory.

B. Test new piping systems, and parts of existing systems that have been altered, extended, or repaired, for leaks and defects.

1. Do not enclose, cover, or put into service before inspection and approval.
2. Test completed piping systems according to requirements of authorities having jurisdiction.
3. Schedule tests and inspections by authorities having jurisdiction with at least 24 hours' advance notice.
4. Submit separate report for each test to General Contractor within 2 days of test.
5. If authorities having jurisdiction do not have published procedures, perform tests as follows:
   a. Hydrostatic Tests: Test sanitary sewerage according to requirements of authorities having jurisdiction and the following:
      1) Fill sewer piping with water. Test with pressure of at least 10-foot (3-m) head of water, and maintain such pressure without leakage for at least 15 minutes.
      2) Close openings in system and fill with water.
      3) Purge air and refill with water.
      4) Disconnect water supply.
      5) Test and inspect joints for leaks.
      6) Allowable leakage is a maximum of 50 gal. Per inch of nominal pipe size per mile of pipe per day.
      7) Option: Test ductile iron piping according to AWWA C600, Section “Hydrostatic Testing”. Use test pressure of at least 10 psig.
6. Air Tests: Test sanitary sewerage according to requirements of authorities having jurisdiction, UNI-B-6, and the following:
   a. Option: Test plastic gravity sewer piping according to ASTM F 1417.
7. Force Main: Perform hydrostatic test after thrust blocks, supports, and anchors have hardened. Test at pressure not less than 1-1/2 times the maximum system operating pressure, but not less than 150 psig (1035 kPa).
   a. PVC Piping: Test according to AWWA M23, "Testing and Maintenance" Chapter.
8. Manholes: Perform hydraulic test according to ASTM C 969 (ASTM C 969M).

C. Leaks and loss in test pressure constitute defects that must be repaired.

D. Replace leaking piping using new materials, and repeat testing until leakage is within allowances specified.

3.12 CLEANING

A. Clean dirt and superfluous material from interior of piping flush with potable water**.**

END OF SECTION 333000

CONFORMANCE SUBMITTAL

SECTION 333000 – SANITARY SEWER

Project Location _____
(*City, State*)

General Contractor: _____
(*Company Name, Phone Number*)

_____
(*Address*)

Sub-Contractor: _____
(*Company Name, Phone Number*)

_____
(*Address*)

The following products have been selected (check one box) for use in this project from the list of acceptable products specified:

Piping Materials:

☐ Ductile-Iron Pipe, ASTM A746
☐ Polyvinyl Chloride (PVC) Pipe, ASTM D3034, SDR 35, Elastomeric Gasket Joints ASTM F477
☐ Other per AHJ: _____

Manholes:

☐ Precast with Cored or Cast Holes with Properly Sized Boots
☐ Other per AHJ: _____

I represent to City/Owner/Engineer that the products selected will be installed in compliance with the applicable codes for the authorities having jurisdiction and in accordance with the contract documents. If noncompliance is discovered the General Contractor shall make or cause to be made all necessary corrections to meet the applicable codes and specifications. Immediately or as directed by Owner the work shall be completed without additional cost to the Owner and / or the contract.

Sub-Contractor: _____
(*Signature of the Authorized Agent of the Sub-Contractor*) Date

_____
(*Print Name of the Authorized Agent of the Sub-Contractor*)

General Contractor: _____
(*Signature of the Authorized Agent of the General Contractor*) Date

_____
(Print Name of the Authorized Agent of the General Contractor)

SANITARY SEWER CERTIFICATION FORM

Project	
Date	
Engineer	
General Contractor	
Utility Contractor	
Const. Mgr.	

ENGINEER CERTIFICATION (If required)
I certify that the sanitary sewer system for the above referenced project has been installed and tested in accordance with local code and Project Plans and Specifications dated _____**.**

Engineer _____
Registration No._____ Affix Seal Here (not valid unless sealed)
Date _____

GENERAL CONTRACTOR CERTIFICATION (Required)
I certify that the sanitary sewer system for the above referenced project has been installed and tested in accordance with local code and Project Plans and Specifications dated _____**.**

General Contractor _____
License No._____
Date _____

UTILITY CONTRACTOR CERTIFICATION (Required)
I certify that the sanitary sewer system for the above referenced project has been installed and tested in accordance with local code and Project Plans and Specifications dated _____**.**

Utility Contractor _____
License No._____
Date _____

***** Submit this certification form with test results, local certificates, etc.

SECTION 33 41 00

STORM UTILITY DRAINAGE PIPING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and all Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:
1. Pipe and fittings.
2. Nonpressure transition couplings.
3. Pressure pipe couplings.
4. Expansion joints and deflection fittings.
5. Backwater valves.
6. Cleanouts.
7. Drains.
8. Encasement for piping.
9. Manholes.
10. Channel drainage systems.
11. Catch basins.
12. Stormwater inlets.
13. Stormwater detention structures.
14. Pipe outlets.
15. Dry wells.
16. Stormwater disposal systems.

1.03 STANDARDS

A. American Society For Testing and Materials (ASTM)
1. A185 – Steel Welded Wire Fabric, Plain, for Concrete Reinforcement
2. A615 – Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
3. A760 – Corrugated Steel Pipe, Metallic-Coated, for Sewers and Drains
4. A798 – Installation of Corrugated-Steel Pipe for Sewers and Other Applications
5. A929 – Metallic-Coated by the Hot-Dip Process for Corrugated Steel Pipe
6. C76 – Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe
7. C443 – Joints for Concrete Pipe and Manholes, Using Rubber Gaskets
8. C478 – Precast Reinforced Concrete Manhole Sections
9. C913 – Precast Concrete Water and Wastewater Structures
10. C1479 – Installation of Reinforced Concrete Pipe
11. C990-01A – Joints for Concrete Pipe, Manholes, and Precast Box Sections Using Preformed Flexible Joint Sealants
12. D1056 – Flexible Cellular Materials-Sponge or Expanded Rubber
13. D2306 – Annular Corrugated Profile Wall Polyethylene pipe and Fittings for Gravity Flow Storm Sewer and Subsurface Drainage Applications
14. D2321 – Installation of Thermoplastic Pipe for Sewer/Gravity-Flow Applications
15. D3034 – Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings
16. D3212 – Joints for Drain and Sewer Plastic Pipes Using Elastomeric Seals
17. F477 – Elastomeric Seals (Gaskets) for Joining Plastic Pipe
18. F794 – Poly(Vinyl Chloride) (PVC) Profile Gravity Sewer Pipe and Fittings Based on Controlled Inside Diameter
19. F949 – Poly(Vinyl Chloride) (PVC) Corrugated Sewer Pipe With a Smooth Interior and Fittings
20. F2418 – Polypropylene (PP) Corrugated Wall Stormwater Collection Chambers
21. F2306 – Annular Corrugated Profile Wall Polyethylene (PE) Pipe and Fittings

22. F2562 – Steel Reinforced Thermoplastic Ribbed Pipe
23. C1504 - Precast Steel Reinforced Three Sided Concrete Structures

B. American Association of State Highway and Transportation Officials (AASHTO)
1. M36 – Corrugated Steel Pipe, Metallic-Coated, for Sewers and Drains
2. M198 – Joints for Circular Concrete Sewer and Culvert Pipe Using Flexible Watertight Gaskets
3. M252 – Corrugated Polyethylene Drainage Tubing
4. M274 – Aluminum-Coated (Type 2), for Corrugated Steel Pipe
5. M288 – Geotextile Specification for Highway Applications
6. M294 – Corrugated Polyethylene Pipe.
7. M36 – Metallic Coated Corrugated Steel Culverts and Underdrains
8. M43 – Sizes of Aggregate for Road and Bridge Construction
9. M190 – Bituminous Coated Corrugated Metal Culvert Pipe and Pipe Arches
10. M199 – Standard Specification for Precast Reinforced Concrete Manhole Sections
11. AASHTO LRFD Bridge Design Specifications Sections 3 & 12

C. American Water Works Association (AWWA)
1. C110 – Ductile-Iron and Gray-Iron Fittings, 3 in through 48 in (75 mm through 1200 mm), for Water and Other Liquids (revision of ANSI/AWWA C110/A21.10-93)
2. C111 – Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
3. C151 – Ductile-Iron Pipe, Centrifugally Cast, for Water

D. American Concrete Institute (ACI)
1. 301 – Structural Concrete for Buildings, Specifications for
2. 318 –Building Code Requirements for Structural Plain Concrete

1.04 SUBMITTALS

A. The General Contractor and the Subcontractor shall execute the Conformance Submittals at the end of this section:
1. Storm Drainage Conformance Submittal

B. Product Data: For each type of product indicated.

C. Shop Drawings:
1. Manholes: Include plans, elevations, sections, details, frames, and covers.
2. Catch basins stormwater inlets and dry wells. Include plans, elevations, sections, details, frames, covers, and grates.
3. Stormwater Detention Structures: Include plans, elevations, sections, details, frames, covers, and concrete design-mix reports.

D. Product Certificates: For each type of cast-iron soil pipe and fitting, from manufacturer.

E. Field quality-control reports.

F. Project Record Drawings: Accurately record as-built locations of pipe runs, connections, catch basins, cleanouts, top elevations and invert elevations. Identify and describe unexpected variations of subsurface conditions and location of any utilities encountered.

1.05 QUALITY ASSURANCE

A. All costs associated with re-inspection due to failures shall be paid for by the Contractor at no additional expense to the Owner. Owner reserves the right to direct any inspection that is deemed necessary. Contractor shall provide free access to site for inspection activities.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Do not store plastic, pipe, and fittings in direct sunlight with the exception of Corrugated High Density Polyethylene Pipe and Fittings.

B. All pipe shall be protected against impact, shock and free fall, and only equipment of sufficient capacity and proper design shall be used in the handling of the pipe. Pipes and chambers shall not be rolled or dragged over gravel or rock during handling. The Contractor shall take necessary precautions to ensure the method used in lifting or placing the pipe or chambers does not induce stress fatigue in the pipe or chamber and the lifting device used uniformly distributes the weight of the pipe or chamber along the axis or circumference. Storage of pipe on the job shall be in accordance with the pipe manufacturer’s recommendations.

C. Protect pipe, pipe fittings, and seals from dirt and damage.
D. Damage to Pipe or Chambers:
   1. Each length of pipe or chamber shall be inspected for defects and cracks before carefully being lowered into the trench.
   2. Bituminous coated pipe shall be handled with special care and repair of damaged coating shall conform to AASHTO M190.
   3. Pipe or chambers which are defective from any cause, including damage caused by handling, storage or any other reason as determined by the Owner to be not repairable, shall be unacceptable for installation and shall be replaced at no cost to the Owner and as directed by the Owner.
   4. Pipe or chambers that are damaged or disturbed through any cause prior to acceptance of the work shall be repaired, realigned or replaced as directed by the Owner at no expense to the Owner.
E. Handle manholes according to manufacturer's written rigging instructions.
F. Handle catch basins and stormwater inlets according to manufacturer's written rigging instructions.

1.07 PROJECT CONDITIONS

A. Removal/Relocation of Existing Utilities: The Contractor shall be responsible for removal and/or relocation of existing utilities, whether shown or not shown on the drawings, at locations where conflicts occur with proposed storm drainage improvements. Removal and relocation shall be at no additional cost to the Owner.
B. Interruption of Existing Storm Drainage Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary service according to requirements indicated:
   1. Notify Owner no fewer than seven days in advance of proposed interruption of service.
   2. Do not proceed with interruption of service without Owner's written permission.

PART 2 - PRODUCTS

2.01 DUCTILE-IRON, CULVERT PIPE AND FITTINGS

A. Pipe: ASTM A 716, for push-on joints.
B. Standard Fittings: AWWA C110, ductile or gray iron, for push-on joints.
C. Compact Fittings: AWWA C153, for push-on joints.
D. Gaskets: AWWA C111, rubber.

2.02 ALUMINIZED PIPE AND FITTINGS

A. Aluminized Steel Type 2 Corrugated Steel Pipe 2 (CMP):
   1. Pipe shall meet requirements of ASTM A929 or AASHTO M 274 or ASTM A760
   2. Minimum gauge shall be 16 gauge for pipe diameters 10-24 inches, 14 gage for diameters 30-48 inches. Stormwater detention systems only: 12 gage for diameters 54-96 inches and 10 gauge for diameters 102 inches and larger, but not less than the diameter indicated on the drawings.
   3. Each pipe shall be clearly marked to show the class or gauge, date of manufacture and name or trademark of the manufacturer.
   4. Joints shall be fully corrugated 10” wide outside collars or coupling bands of aluminized steel angles riveted near the ends and bolted through angles to draw the bands tight for silt-tight designations. Additionally, a 7 “wide by 3/8” thick one piece continuous neoprene gasket per ASTM D1056 shall be provided at watertight designations.
   5. Maximum permitted diameter for CMP storm drainage piping is 48”
   6. CMP larger than 48”diameter is allowed for subsurface stormwater detention systems only.
B. Aluminized Steel Type 2 Spiral Ribbed Pipe (Type IR)
   1. Pipe shall meet the requirements of ASTM A929 and AASHTO M274 or ASTM A760 with ¾” x ¾” x 7-1/2” continuous external ribs in accordance with the applicable requirements of AASHTO M-36 or ASTM A760 such as “Ultra-Flo” by Contech or approved equal.

2. Minimum gauge shall be 16 gauge for pipe diameters 10-24 inches and 14 gauge for diameters 30-48 inches, but not less than the diameter indicated on the drawings.
3. Each pipe shall be clearly marked to show the class or gauge, date of manufacture and name or trademark of the manufacturer.
4. Joints shall be fully corrugated 10” wide outside collars or coupling bands of aluminized steel angles riveted near the ends and bolted through angles to draw the bands tight for silt-tight designations. Additionally, a 7 “ wide by 3/8” thick one piece continuous neoprene gasket per ASTM D1056 shall be provided at watertight designations
5. Pipe sizes, gages and corrugations shall be as shown on the project plans.
6. Maximum permitted diameter is 48”

2.03 HDPE PIPE AND FITTINGS

A. Steel Reinforced Thermoplastic Ribbed Smooth Interior Pipe

1. Pipe lengths shall be joined on site using bell and spigots reinforced with steel that is fully encased in a pressure rated high density polyethylene and shall be watertight to an internal water pressure of 15 psi when tested in accordance with ASTM D3212.
2. Gaskets shall meet the requirements of ASTM F477
3. Maximum Diameter shall be 48”

B. High Density Polyethylene Pipe (HDPE) Smooth Interior Pipe:

1. Pipe and Fittings: Shall conform to AASHTO M252 and M294 and/or ASTM F2360 unless otherwise shown on the Drawings.
2. Gaskets: Rubber gaskets shall meet requirements of ASTM F477 with joints conforming to AASHTO M294, watertight designations
3. Maximum permitted diameter is 48”.
4. See drawings for bedding details.
5. HDPE Pipe shall be NTPEP Certified.
6. Approved Manufacturers:
   a. Advance Drainage Systems, Inc., 3300 Riverside Drive, Columbus, Ohio 43221 (614) 457-3051
   b. Hancor, Inc., 401 Olive Street, Findlay, Ohio 45840 (888) 367-7473
   c. Lane Enterprises, Inc. (for Type S Lok-Tite Pipe) 3905 Hartzdale Drive, Suite 514, Camp Hill, PA 17011 (717) 761-8175
   d. Quality Culvert, Inc., 25726 County Road 561, Astatula, FL 34750 (800) 881-1100

2.04 PVC PIPE AND FITTINGS

A. PVC Cellular-Core Piping:

1. PVC Cellular-Core Pipe and Fittings: ASTM F 891, Sewer and Drain Series, PS 50 minimum stiffness, PVC cellular-core pipe with plain ends for solvent-cemented joints.
2. Fittings: ASTM D 3034, SDR 35, PVC socket-type fittings.

B. PVC Corrugated Sewer Piping:

1. Pipe: ASTM F 949, and ASTM F 794 PVC, corrugated pipe with bell-and-spigot ends for gasketed joints.
2. Fittings: ASTM F 949, PVC molded or fabricated, socket type.
3. Gaskets: ASTM F 477, elastomeric seals with joints conforming to ASTM D3212
4. Approved Manufacturers:
   a. Contech “A2000”, 1001 Grove Street, Middletown, OH 45044

2.05 CONCRETE PIPE AND FITTINGS

A. Reinforced-Concrete Pipe and Fittings: ASTM C 76 (ASTM C 76M).

1. Bell-and-spigot or tongue-and-groove ends and gasketed joints with ASTM C 443 (ASTM C 443M), rubber gaskets or sealant joints with ASTM C 990 (ASTM C 990M), bitumen or butyl-rubber sealant for silt-tight designations.
2. Class III, unless otherwise indicated on the Drawings.

2.06 NONPRESSURE TRANSITION COUPLINGS

A. Comply with ASTM C 1173, elastomeric, sleeve-type, reducing or transition coupling, for joining underground nonpressure piping. Include ends of same sizes as piping to be joined, and corrosion-resistant-metal tension band and tightening mechanism on each end.

B. Sleeve Materials:
   1. For Concrete Pipes: ASTM C 443 (ASTM C 443M), rubber.
   2. For Cast-Iron Soil Pipes: ASTM C 564, rubber.
   3. For Fiberglass Pipes: ASTM F 477, elastomeric seal or ASTM D 5926, PVC.
   4. For Plastic Pipes: ASTM F 477, elastomeric seal or ASTM D 5926, PVC.
   5. For Dissimilar Pipes: ASTM D 5926, PVC or other material compatible with pipe materials being joined.

C. Unshielded, Flexible Couplings:
   1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on the Drawings.

D. Shielded, Flexible Couplings:
   1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings

E. Ring-Type, Flexible Couplings:
   1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings

2.07 DRAINS

A. Sub Drains:
   1. Shall be perforated PVC or HDPE unless otherwise indicated on the Drawings. Installation shall be as shown on the drawings.

2.08 CLEANOUTS AND PLUGS

A. Installation shall be as shown on the details and at locations shown on the drawings.

B. All cleanouts shall have a 2’ x 2’ x 6” thick concrete apron.

2.09 ENCASEMENT FOR PIPING

A. Standard: ASTM A 674 or AWWA C105.

B. Material: Linear low-density polyethylene film of 0.008-inch (0.20-mm) minimum thickness.

C. Form: Sheet or tube.

D. Color: Black.

2.10 MANHOLES

A. Standard Precast Concrete Manholes:
   1. Description: ASTM C 478 (ASTM C 478M) and AASHTO M199, precast, reinforced concrete, of depth indicated, with provision for sealant joints. Heavy-duty traffic rated in accordance with Department of Transportation Standards in which project is located.
   2. Diameter: 48 inches (1200 mm) minimum unless otherwise indicated.
   3. Ballast: Increase thickness of precast concrete sections or add concrete to base section as required preventing flotation.
   4. Base Section: 6-inch (150-mm) minimum thickness for floor slab and 4-inch (102-mm) minimum thickness for walls and base riser section, and separate base slab or base section with integral floor.
   5. Riser Sections: 4-inch (102-mm) minimum thickness and lengths to provide depth indicated.
   6. Top Section: Eccentric-cone type unless concentric-cone or flat-slab-top type is indicated, and top of cone of size that matches grade rings.
   7. Joint Sealant: ASTM C 990 (ASTM C 990M), bitumen or butyl rubber.
   8. Resilient Pipe Connectors: ASTM C 923 (ASTM C 923M), cast or fitted into manhole walls, for each pipe connection.
   9. Steps: Individual FRP steps; FRP ladder; or ASTM A 615/A 615M, deformed, 1/2-inch (13-mm) steel reinforcing rods encased in ASTM D 4101, PP, wide enough to allow worker to place both feet on one step and designed to prevent lateral slippage off step. Cast or anchor

steps into sidewalls at 16-inch (400-mm) intervals. Omit steps if total depth from floor of manhole to finished grade is less than 42 inches (1050 mm).

10. Grade Rings: Reinforced-concrete rings, 6- to 9-inch (150- to 225-mm) total thickness, to match diameter of manhole frame and cover, and height as required to adjust manhole frame and cover to indicated elevation and slope.

B. Designed Precast Concrete Manholes:
   1. Description: ASTM C 913; designed according to ASTM C 890 for A-16 (AASHTO HS20-44), heavy-traffic, structural loading; of depth, shape, and dimensions indicated, with provision for sealant joints.
   2. Ballast: Increase thickness of one or more precast concrete sections or add concrete to manhole as required preventing flotation.
   3. Joint Sealant: ASTM C 990 (ASTM C 990M), bitumen or butyl rubber.
   4. Resilient Pipe Connectors: ASTM C 923 (ASTM C 923M), cast or fitted into manhole walls, for each pipe connection.
   5. Steps: Individual FRP steps; FRP ladder; or ASTM A 615/A 615M, deformed, 1/2-inch (13-mm) steel reinforcing rods encased in ASTM D 4101, PP, wide enough to allow worker to place both feet on one step and designed to prevent lateral slippage off step. Cast or anchor steps into sidewalls at 16-inch (400-mm) intervals. Omit steps if total depth from floor of manhole to finished grade is less than 42 inches (1050 mm).
   6. Grade Rings: Reinforced-concrete rings, 6- to 9-inch (150- to 225-mm) total thickness, to match diameter of manhole frame and cover, and of height required to adjust manhole frame and cover to indicated elevation and slope.

C. Manhole Frames and Covers:
   1. Description: As shown on the Drawings, otherwise provide ferrous; 24-inch (610-mm) ID by 7- to 9-inch (175- to 225-mm) riser with 4-inch- (102-mm-) minimum width flange and 26-inch-(660-mm-) diameter security bolted cover.
   2. Material: ASTM A 536, Grade 60-40-18 ductile iron unless otherwise indicated.

2.11 BEDDING AND BACKFILL MATERIAL

A. Bedding material shall be as specified by trenching and bedding details shown on the drawings.

B. Where the foundation material is found to be of poor supporting value or of rock, the Owner may make minor adjustments in the location of the pipe to provide a more suitable foundation. Where this is not practical, the foundation shall be conditioned by removing the existing foundation material by undercutting to the depth as directed by the geotechnical engineer and backfilling with either a suitable local material secured from unclassified excavation or borrow excavation at the nearest accessible location along the project, or foundation conditioning material consisting of crushed stone or gravel or a combination of sand and crushed stone or gravel approved by geotechnical engineer as being suitable for the purpose intended. The selection of the type of backfill material to be used for foundation conditioning will be made by the geotechnical engineer.

2.12 CONCRETE

A. General: Cast-in-place concrete according to ACI 318, ACI 350/350R (ACI 350M/350RM), and the following:
   1. Cement: ASTM C 150, Type II.
   2. Fine Aggregate: ASTM C 33, sand.
   3. Coarse Aggregate: ASTM C 33, crushed gravel.
   4. Water: Potable.

B. Portland Cement Design Mix: (28 day compressive strength) 4000 psi (27.6 MPa) minimum, with 0.45 maximum water/cementitious materials ratio.
   1. Reinforcing Fabric: ASTM A 185/A 185M, steel, welded wire fabric, plain.
   2. Reinforcing Bars: ASTM A 615/A 615M, Grade 40 or 60 (420 MPa) deformed steel.

C. Manhole, Catch Basin and Storm Inlet Channels and Benches: Factory or field formed from concrete. Portland cement design mix, 4000 psi (27.6 MPa) minimum, with 0.45 maximum water/cementitious materials ratio. Include channels and benches in manholes.

1. Channels: Concrete invert, formed to same width as connected piping, with height of vertical sides to three-fourths of pipe diameter. Form curved channels with smooth, uniform radius and slope.
    a. Invert Slope: 1 percent through manhole unless otherwise detailed on the Drawings.
2. Benches: Concrete, sloped to drain into channel.
    a. Slope: 4 percent unless otherwise detailed on the drawings..

D. Ballast and Pipe Supports: Portland cement design mix, 3000 psi (20.7 MPa) minimum, with 0.58 maximum water/cementitious materials ratio.
1. Reinforcing Fabric: ASTM A 185/A 185M, steel, welded wire fabric, plain.
2. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (420 MPa) deformed steel.

2.13 CATCH BASINS

A. Standard Precast Concrete Catch Basins:
1. Description: ASTM C 478 (ASTM C 478M), precast, reinforced concrete, heavy duty (H20), of depth indicated, with provision for sealant joints.
2. Base Section: 6-inch (150-mm) minimum thickness for floor slab and 6-inch (150-mm) minimum thickness for walls and base riser section, and separate base slab or base section with integral floor.
3. Riser Sections: 6-inch (150-mm) minimum thickness, 48-inch (1200-mm) diameter, and lengths to provide depth indicated.
4. Top Section: Eccentric-cone type unless concentric-cone or flat-slab-top type is indicated. Top of cone of size that matches grade rings.
5. Joint Sealant: ASTM C 990 (ASTM C 990M), bitumen or butyl rubber.
6. Grade Rings: Include two or three reinforced-concrete rings, of 6- to 9-inch (150- to 225-mm) total thickness, that match 24-inch- (610-mm-) diameter frame and grate.
7. Steps: Individual FRP steps; FRP ladder; or ASTM A 615/A 615M, deformed, 1/2-inch (13-mm) steel reinforcing rods encased in ASTM D 4101, PP, wide enough to allow worker to place both feet on one step and designed to prevent lateral slippage off step. Cast or anchor steps into sidewalls at 16-inch (400-mm) intervals. Omit steps if total depth from floor of manhole to finished grade is less than 42 inches (1050 mm).
8. Pipe Connectors: ASTM C 923 (ASTM C 923M), resilient, of size required, for each pipe connecting to base section.

B. Designed Precast Concrete Catch Basins: ASTM C 913, precast, reinforced concrete; designed according to ASTM C 890 for A-16 (ASSHTO HS20-44), heavy-traffic, structural loading; of depth, shape, and dimensions indicated, with provision for joint sealants.
1. Joint Sealants: ASTM C 990 (ASTM C 990M), bitumen or butyl rubber.
2. Grade Rings: Include two or three reinforced-concrete rings, of 6- to 9-inch (150- to 225-mm) total thickness, that match 24-inch- (610-mm-) diameter frame and grate.
3. Steps: Individual FRP steps; FRP ladder; or ASTM A 615/A 615M, deformed, 1/2-inch (13-mm) steel reinforcing rods encased in ASTM D 4101, PP, wide enough to allow worker to place both feet on one step and designed to prevent lateral slippage off step. Cast or anchor steps into sidewalls at 16-inch (400-mm) intervals. Omit steps if total depth from floor of manhole to finished grade is less than 42 inches (1050 mm).
4. Pipe Connectors: ASTM C 923 (ASTM C 923M), resilient, of size required, for each pipe connecting to base section.

C. Grate and Frame: Per details shown on the drawings. Provide hood with stencil or casting “Dump No Waste – Drains to Waterways” or equal. Provide local casting if required. Provide 6 inch thick rectangular concrete apron, with 18 inch minimum width measured from the edge of structure frame to the end of the concrete apron, around all structure frames located in asphalt pavement areas. Provide saw cuts from each corner of the concrete apron to the frame of the structure as shown on the plan.
1. Rectangular Frames and Grates: ASTM A 536, Grade 60-40-18, ductile iron designed for A-16, heavy duty (H20) structural loading. Include flat grate with small square or short-slotted drainage openings.
    a. Size: 24 by 24 inches (610 by 610 mm) minimum unless otherwise indicated.
    b. Grate Free Area: Approximately 50 percent unless otherwise indicated.

2. Round, Manhole Type Frames and Grates: ASTM A 536, Grade 60-40-18, ductile iron designed for A-16, heavy duty (H20) structural loading. Include 24-inch (610-mm) ID by 7- to 9-inch (175- to 225-mm) riser with 4-inch (102-mm) minimum width flange, and 26-inch- (660-mm-) diameter flat grate with small square or short-slotted drainage openings.
   a. Grate Free Area: Approximately 50 percent unless otherwise indicated.

2.14 STORMWATER INLETS

A. Curb Inlets: Made with vertical curb opening of materials and dimensions according to the details shown on the Drawings.

B. Gutter Inlets: Made with horizontal gutter opening of materials and dimensions according to the details shown on the Drawings. Include heavy-duty frames and grates.

C. Combination Inlets: Made with vertical curb and horizontal gutter openings of materials and dimensions according to the details shown on the Drawings. Include heavy-duty frames and grates.

D. Frames and Grates: Heavy duty and according to the details shown on the Drawings.

2.15 STORMWATER DETENTION STRUCTURES

A. Cast-in-Place Concrete, Stormwater Detention Structures: Constructed of reinforced-concrete bottom, walls, and top; designed according to ASTM C 890 for A-16 (AASHTO HS20-44), heavy-traffic, structural loading; of depth, shape, dimensions, and appurtenances indicated.
   1. Ballast: Increase thickness of concrete as required preventing flotation.
   2. Grade Rings: Include two or three reinforced-concrete rings, of 6- to 9-inch (150- to 229-mm) total thickness, that match 24-inch- (610-mm-) diameter frame and cover.
   3. Steps: Individual FRP steps; FRP ladder; or ASTM A 615/A 615M, deformed, 1/2-inch (13-mm) steel reinforcing rods encased in ASTM D 4101, PP, wide enough to allow worker to place both feet on one step and designed to prevent lateral slippage off step. Cast or anchor steps into sidewalls at 16-inch (400-mm) intervals. Omit steps if total depth from floor of manhole to finished grade is less than 42 inches (1050 mm).

B. Corrugated Aluminized Steel Detention Systems:
   1. Piping shall comply with AASHTO M36 for diameters 12”-144”
   2. The material shall be Aluminized Steel Type 2 conforming to AASHTO M274
   3. All fittings shall be reinforced per ASTM A998

C. Precast Concrete Three Sided Detention Systems:
   1. Precast Concrete Detention Structures shall be manufactured per ASTM C1504
   2. Concrete shall be 4,000 psi mix and reinforcing steel shall have a minimum yield strength of 600 ksi

D. Manhole Frames and Covers: ASTM A 536, Grade 60-40-18, ductile-iron castings designed for heavy-duty service. Include 24-inch (610-mm) ID by 7- to 9-inch (175- to 225-mm) riser with 4-inch (102-mm) minimum width flange, and 26-inch- (660-mm-) diameter cover. Include indented top design with lettering cast into cover, using wording equivalent to "STORM SEWER."

2.16 PIPE OUTLETS

A. Head Walls: Construction shall be according to details shown on the drawings. Headwalls shall be cast-in-place reinforced concrete, with apron and tapered sides unless otherwise indicated.

B. Riprap Aprons: Broken, irregularly sized and shaped, graded stone according to Department of Transportation specifications for the state in which the project is located or by using NSSGA's "Quarried Stone for Erosion and Sediment Control”. Unless otherwise shown on the drawings the median stone size used shall be 6 inches (150 mm). Riprap apron will be constructed of stone shaped according to the detail on the Drawings with an underlayment of medium weight non-woven geotextile fabric.
   1. Average Size: NSSGA No. R-6, screen opening 6 inches (150 mm).

C. Concrete Lined Channels: Construction shall be in accordance with details shown on the drawings.

D. Flared-End Sections: Shall meet Department of Transportation standards for the state in which the project is located unless otherwise indicated on the drawings.

2.17 DRY WELLS

A. Description: ASTM C 913, precast, reinforced, perforated concrete rings. Include the following:
   1. Floor: Cast-in-place concrete.
   2. Cover: Liftoff-type concrete cover with cast-in lift rings.
   3. Wall Thickness: 4 inches (102 mm) minimum with 1-inch (25-mm) diameter or 1-by-3-inch-(25-by-76-mm-) maximum slotted perforations arranged in rows parallel to axis of ring.
      a. Total Free Area of Perforations: Approximately 15 percent of ring interior surface.
      b. Ring Construction: Designed to be self-aligning.
   4. Filtering Material: ASTM D 448, Size No. 24, 3/4- to 2-1/2-inch (19- to 63-mm) washed, crushed stone or gravel.

B. Description: Manufactured PE side panels and top cover that assemble into 50-gal. (190-L) storage capacity units.
   1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings.
   2. Side Panels: With knockout ports for piping and seepage holes.
   3. Top Cover: With knockout port for drain.
   4. Filter Fabric: As recommended by unit manufacturer.
   5. Filtering Material: ASTM D 448, Size No. 24, 3/4- to 2-1/2-inch (19- to 63-mm) washed, crushed stone or gravel.

C. Description: Constructed-in-place aggregate type. Include the following:
   1. Lining: Concrete blocks or precast concrete rings with notches or weep holes.
   2. Filtering Material: ASTM D 448, Size No. 24, 3/4- to 2-1/2-inch (19- to 63-mm) washed, crushed stone or gravel.
   3. Cover: Precast, reinforced-concrete slab designed for structural loading according to ASTM C 890 and made according to ASTM C 913. Include slab dimensions that will extend 12 inches (300 mm) minimum beyond edge of excavation, with bituminous coating over entire surface. Cast cover with opening for manhole in center.
   4. Manhole: 24-inch- (610-mm-) diameter, reinforced-concrete access lid with steel lift rings. Include bituminous coating over entire surface.

2.18 STORMWATER DISPOSAL SYSTEMS

A. Chamber Systems:
   1. Chambers shall meet the requirements of ASTM F2418 and meet the safety factors recommended by Section 12.12 of the AASHTO LRFD Bridge Design Specifications. Loads for design shall be calculated in accordance with Section 3 of the AASHTO LRFD Bridge Design Specifications.
   2. The chamber manufacturer shall provide design data in accordance with ASTM F2418. Installation shall be in accordance with the details shown on the Drawings.
   3. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
      a. Advanced Drainage Systems. 4640 Trueman Blvd., Hilliard, Ohio 43026 (800) 433-7473
      b. CULTEC, Inc. 878 Federal Road, PO Box 280, Brookfield, CT 06804 (800) 4-CULTEC.
      c. Hancor Inc. 401 Olive Street, Findlay, OH 45840 (800) 848-3546.
      d. StormTech LLC. 20 Beaver Road, Wetheresfield , CT 06109 (888) 892-2694
   4. Storage and Leaching Chambers: Chamber rows shall provide continuous, unobstructed internal space with no internal support panels in order to provide ease of access for inspection and maintenance. Include number of chambers, distribution piping, end plates, and other standard components as required for system total capacity.
   5. Geotextile: Shall be enclosed in geotextile fabric for sediment capture and maintenance. Fabric shall be located per manufacturer's details.
      a. Geotextile woven or spun filter fabric, in one or more layers, for minimum total unit weight of 4 oz./sq. yd. (135 g/sq. m).
      b. Fabric between chamber bottom and the stone foundation shall be AASHTO M288 Class 1 woven for stabilization and filtration.
      c. Fabric between the top of the chamber and the embedment stone shall be AASHTO M288 Class 2 non-woven for separation.

6. Filtering Material: ASTM D 448, Size No. 24, 3/4- to 2-1/2-inch (19- to 63-mm) washed, crushed stone or gravel.

B. Pipe Systems:

1. Perforated manifold, header, and lateral piping complying with AASHTO M 252M for NPS 10 (DN 250) and smaller, AASHTO M 294M for NPS 12 to NPS 60 (DN 300 to DN 1500). Include proprietary fittings, couplings, seals, and filter fabric.
2. 360 Degree Perforated Aluminized Steel Type 2 Recharge/Detention System conforming to AASHTO M274. All fittings to be reinforced per ASTM A998
3. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
   a. Advanced Drainage Systems. 4640 Trueman Blvd., Hilliard, Ohio 43026 (800) 433-7473
   b. Hancor Inc. 401 Olive Street, Findlay, OH 45840 (800) 848-3546.
   c. CONTECH Construction Products, Inc. 9025 Centre Pointe Drive, West Chester, Ohio 45069 (336) 854-2177

PART 3 - EXECUTION

3.01 EARTHWORK

A. Excavation, trenching, and backfilling are specified in Division 31 Section "Earth Moving."

3.02 PIPING INSTALLATION

A. Locations and Arrangements: Contractor shall install all drainage structures, pipe and chambers in the locations shown on the drawings and/or as approved by the Owner. Pipe shall be of the type and sizes specified on the drawings and shall be laid accurately to line and grade. Structures shall be accurately located and properly oriented. Where specific installation is not indicated, follow piping manufacturer's written instructions.

B. Install piping beginning at low point, on prepared foundation, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Lap joint pipes shall be laid with the inside circumferential laps pointing downstream and with the longitudinal laps at the side or quarter points.

C. Install chambers in accordance with manufacturer’s guidelines. Rows of chambers shall be laid out using spacers or appropriate measurements and markings to ensure proper spacing between rows for proper backfill and compaction as specified by the manufacturer.

D. Manholes, catch basins and drain inlets shall be constructed as soon as the pipe laying reaches the location of the structures. If the Contractor continues pipe installation without making provisions for completion of the structures the Owner shall have the authority to stop the pipe installation until the structure is completed.

E. Any structure which is miss-located or oriented improperly shall be removed and reconstructed at its proper location, alignment and orientation without cost to the Owner.

F. Install manholes for changes in direction unless fittings are indicated. Use fittings for branch connections unless direct tap into existing storm drainage is indicated.

G. Precast drainage structures shall be assembled in accordance with the manufacturer’s instructions to form a sound structural unit.

H. Cast-in-Place drainage structures shall be installed in accordance with the details or referenced specifications shown on the drawings. Concrete shall comply with the requirements of this section.

I. Solid concrete brick masonry structures shall be installed in accordance with the details or referenced specifications shown on the drawings. Only solid masonry units may be used. Minimum wall thickness shall be 8 inches and minimum bottom slab thickness shall be 6 inches and extended a minimum of 6 inches outside the structure.

J. Fittings and Connections: Pipe connections to drainage structures shall be made so that the pipe does not project beyond 3 inches inside the wall of the drainage structure and shall be grouted as necessary to make smooth and uniform surfaces on the inside of the structure. Connection

material shall not include large stone, broken block or other deleterious material. Bottom invert connections shall be constructed of concrete form smooth to provide a bench between pipe inverts unless otherwise detailed on the plans.

K. Install proper size increasers, reducers, and couplings where different sizes or materials of pipes and fittings are connected. Reducing size of piping in direction of flow is prohibited.

L. When installing pipe under streets or other obstructions that cannot be disturbed, use pipe-jacking process of micro-tunneling.

M. Install gravity-flow, non-pressure drainage piping according to the following:
   1. Install piping pitched down in direction of flow.
   2. Install piping NPS 6 (DN 150) and larger with restrained joints at tee fittings and at changes in direction. Use corrosion-resistant rods, pipe or fitting manufacturer's proprietary restraint system, or cast-in-place concrete supports or anchors.
   3. Install piping with 24-inch (610-mm) minimum cover.
   4. Install hub-and-spigot, cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook."
   5. Install hubless cast-iron soil piping according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook."
   6. Install ductile-iron piping and special fittings according to AWWA C600 or AWWA M41.
   7. Install corrugated steel piping according to ASTM A798 and 798M.
   8. Install HDPE piping according to pipe manufacturer’s installation guidelines for heavy duty drainage applications and ASTM D 2321.
   9. Install PVC profile gravity sewer piping according to ASTM D 2321 and ASTM F 1668.
   10. Install reinforced-concrete sewer piping according to ASTM C 1479 and ACPA's "Concrete Pipe Installation Manual."

N. Install corrosion-protection piping encasement over the following underground metal piping according to ASTM A 674 or AWWA C105:
   1. Hub-and-spigot, cast-iron soil pipe and fittings.
   2. Hubless cast-iron soil pipe and fittings.
   3. Ductile-iron pipe and fittings.
   4. Expansion joints and deflection fittings.

3.03 PIPE JOINT CONSTRUCTION

A. Join gravity-flow, nonpressure drainage piping according to the following:
   1. Join hub-and-spigot, cast-iron soil piping with gasketed joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for compression joints.
   2. Join hub-and-spigot, cast-iron soil piping with calked joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for lead and oakum calked joints.
   3. Join hubless cast-iron soil piping according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless-coupling joints.
   4. Join ductile-iron culvert piping according to AWWA C600 for push-on joints.
   5. Join ductile-iron piping and special fittings according to AWWA C600 or AWWA M41.
   6. Join corrugated steel sewer piping according to ASTM A 798/A 798M.
   7. Join HDPE pipe according to ASTM D 2321
   8. Join PVC cellular-core piping according to ASTM D 2321 and ASTM F 891 for solvent-cemented joints.
   9. Join PVC corrugated sewer piping according to ASTM D 2321 for elastomeric-seal joints.
   10. Join PVC sewer piping according to ASTM D 2321 and ASTM D 3034 for elastomeric-seal joints or ASTM D 3034 for elastomeric-gasketed joints.
   11. Join PVC profile gravity sewer piping according to ASTM D 2321 for elastomeric-seal joints or ASTM F 794 for gasketed joints.
   12. Join reinforced-concrete sewer piping according to ACPA's "Concrete Pipe Installation Manual" for rubber-gasketed joints.
   13. Join dissimilar pipe materials with nonpressure-type flexible couplings.

3.04 BACKWATER VALVE INSTALLATION

A. Install horizontal-type backwater valves in piping where indicated.

B. Install combination horizontal and manual gate-valve type in piping and in manholes where indicated.
C. Install terminal-type backwater valves on end of piping and in manholes where indicated.

3.05 CLEANOUT INSTALLATION

A. Install cleanouts and riser extensions from sewer pipes to cleanouts at grade. Use cast-iron soil pipe fittings in sewer pipes at branches for cleanouts and cast-iron soil pipe for riser extensions to cleanouts. Install piping so cleanouts open in direction of flow in sewer pipe.
   1. Use Heavy-Duty, top-loading classification cleanouts in vehicle-traffic service areas.
B. Set cleanout frames and covers in cast-in-place concrete, 24 by 24 by 6 inches (600 by 600 by 150 mm) deep. Set with tops flush with adjacent grade. At pavement areas and at roads set frames and covers with tops flush pavement surface.

3.06 DRAIN INSTALLATION

A. Install type of drains in locations indicated.
   1. Use Heavy-Duty, top-loading classification drains in vehicle service areas.
B. Install drains according to details on the plans and manufacturer’s installation requirements..
C. Fasten grates to drains if indicated.
D. Set drain frames and covers with tops flush with pavement surface.
E. Assemble trench sections with flanged joints.

3.07 MANHOLE INSTALLATION

A. General: Install manholes, complete with appurtenances and accessories indicated.
B. Install precast concrete manhole sections with sealants according to ASTM C 891.
C. Where specific manhole construction is not indicated, follow manhole manufacturer's written instructions.
D. Set tops of frames and covers flush with finished surface of manholes that occur in pavements. Set tops 3 inches (76 mm) above finished surface elsewhere unless otherwise indicated.

3.08 CATCH BASIN INSTALLATION

A. Construct catch basins to sizes and shapes indicated.
B. Frames, Grates and Hoods
   1. Set frames and grates to elevations indicated.
   2. Firmly embedded in mortar approximately 1 inch thick and aligned to fit the top section of the structure.
   3. Brick set in mortar used to adjust the frame to finished grade shall be limited to no more than four (4) courses for precast structures and have a minimum wall thickness of eight (8) inches.

3.09 STORMWATER INLET AND OUTLET INSTALLATION

A. Construct inlet head walls, aprons, and sides of reinforced concrete, as indicated.
B. Construct riprap of broken stone, as indicated.
C. Install outlets that spill onto grade, anchored with concrete, where indicated.
D. Install outlets that spill onto grade, with flared end sections that match pipe, where indicated.
E. Construct energy dissipaters at outlets, as indicated.

3.10 MODIFICATION OF EXISTING STRUCTURES

A. General: The Contractor shall alter, reconstruct and/or convert existing structures where and as shown on the drawings, and/or as approved by the Owner. Alterations shall be performed with the same type, grade and quality material as used in the original construction unless otherwise indicated on the drawings or approved by the Owner.
B. Damage to Existing Structures: The Contractor shall exercise care during all alterations, reconstructions or conversions so as not to damage any portion of the existing structures or pipe to remain. Any damage caused by the Contractor shall be repaired by the Contractor at its own expense and to the satisfaction to the Owner.

3.11 ROOF DRAINS AND LEADERS

A. The site Contractor shall install roof downspout leaders as shown on the drawings to within five (5) feet of the building limits. If work by others is complete then the Contractor shall complete the connection. If future connections will be required by others, the Contractor shall install plugging and material apparatus as necessary to protect and mark the location of its work.

B. All roof drain leader piping connections shall utilize watertight prefabricated fittings and drainage structures.

3.12 DRY WELL INSTALLATION

A. Excavate hole to diameter of at least 6 inches (150 mm) greater than outside of dry well. Do not extend excavation into ground-water table.

B. Install precast, concrete-ring dry wells according to the following:
   1. Assemble rings to depth indicated.
   2. Extend rings to height where top of cover will be approximately 8 inches (203 mm) below finished grade.
   3. Backfill bottom of inside of rings with filtering material to level at least 12 inches (300 mm) above bottom.
   4. Extend effluent inlet pipe 12 inches (300 mm) into rings and terminate into side of tee fitting.
   5. Backfill around outside of rings with filtering material to top level of rings.
   6. Install cover over top of rings.

C. Install manufactured, PE dry wells according to manufacturer's written instructions and the following:
   1. Assemble and install panels and cover.
   2. Backfill bottom of inside of unit with filtering material to level at least 12 inches (300 mm) above bottom.
   3. Extend effluent inlet pipe 12 inches (300 mm) into unit and terminate into side of tee fitting.
   4. Install filter fabric around outside of unit.
   5. Install filtering material around outside of unit.

D. Install constructed-in-place dry wells according to the following:
   1. Install brick lining material dry and laid flat, with staggered joints for seepage. Build to diameter and depth indicated.
   2. Install block lining material dry, with staggered joints and 20 percent minimum of blocks on side for seepage. Install precast concrete rings with notches or weep holes for seepage. Build to diameter and depth indicated.
   3. Extend lining material to height where top of manhole will be approximately 8 inches (203 mm) below finished grade.
   4. Backfill bottom of inside of lining with filtering material to level at least 12 inches (300 mm) above bottom.
   5. Extend effluent inlet pipe 12 inches (300 mm) into lining and terminate into side of tee fitting.
   6. Backfill around outside of lining with filtering material to top level of lining.
   7. Install manhole over top of dry well. Support cover on undisturbed soil. Do not support cover on lining.

3.13 CONCRETE PLACEMENT

A. Place cast-in-place concrete according to ACI 318 and ACI 350R..

B. No concrete or masonry shall be placed when the temperature is below 40 degrees Fahrenheit, or when indications are for lower temperatures within 24 hours, unless protection of concrete and masonry is approved by the Owner. Damage to the structure because of freezing shall be corrected by the Contractor at the Contractor’s sole expense and to the satisfaction of the Owner.

3.14 STORMWATER DISPOSAL SYSTEM INSTALLATION

A. Chamber Systems: Excavate trenches of width and depth, and install system and backfill according to chamber manufacturer's written instructions. Include storage and leaching chambers, filtering material, and filter mat.

B. Piping Systems: Excavate trenches of width and depth, and install piping system, filter fabric, and backfill, according to piping manufacturer's written instructions.

3.15 CONNECTIONS

A. Connect nonpressure, gravity-flow drainage piping in building's storm building drains specified in Division 22 Section "Facility Storm Drainage Piping."

B. Connect force-main piping to building's storm drainage force mains specified in Division 22 Section "Facility Storm Drainage Piping." Terminate piping where indicated.

C. Compliance with Existing Facilities:

1. Connections made into existing drainage facilities shall be performed in accordance with the requirements of the Owner of the facility. Construction within a public right-of-way will conform to all requirements of the regulatory authority having jurisdiction. The Contractor will be required to comply with all such requirements, including securing all required permits and paying all associated costs related to securing the permits. Costs associated with connections shall be included in the Contract Sum.
2. The contractor shall make all required connections of the proposed drainage facilities into existing drainage facilities where a d as shown on the drawings and/or as approved by the Owner.

D. Make connections to existing piping and underground manholes.

1. Use commercially manufactured wye fittings for piping branch connections. Remove section of existing pipe; install wye fitting into existing piping; and encase entire wye fitting, plus 6-inch (150-mm) overlap, with not less than 6 inches (150 mm) of concrete with 28-day compressive strength of 3000 psi (20.7 MPa).
2. Make branch connections from side into existing piping, NPS 4 to NPS 20 (DN 100 to DN 500). Remove section of existing pipe, install wye fitting into existing piping, and encase entire wye with not less than 6 inches (150 mm) of concrete with 28-day compressive strength of 3000 psi (20.7 MPa).
3. Make branch connections from side into existing piping, NPS 21 (DN 525) or larger, or to underground manholes and structures by cutting into existing unit and creating an opening large enough to allow 3 inches (76 mm) of concrete to be packed around entering connection. Cut end of connection pipe passing through pipe or structure wall to conform to shape of and be flush with inside wall unless otherwise indicated. On outside of pipe, manhole, or structure wall, encase entering connection in 6 inches (150 mm) of concrete for minimum length of 12 inches (300 mm) to provide additional support of collar from connection to undisturbed ground.
   a. Use concrete that will attain a minimum 28-day compressive strength of 3000 psi (20.7 MPa) unless otherwise indicated.
   b. Use epoxy-bonding compound as interface between new and existing concrete and piping materials.
4. Protect existing piping, manholes, and structures to prevent concrete or debris from entering while making tap connections. Remove debris or other extraneous material that may accumulate.

E. Connect to sediment interceptors specified in Section "Sanitary Sewer."

F. Pipe couplings, expansion joints, and deflection fittings with pressure ratings at least equal to piping rating may be used in applications below unless otherwise indicated.

1. Use nonpressure-type flexible couplings where required to join gravity-flow, nonpressure sewer piping unless otherwise indicated.
   a. Shielded flexible couplings for same or minor difference OD pipes.
   b. Unshielded, increaser/reducer-pattern, flexible couplings for pipes with different OD.
   c. Ring-type flexible couplings for piping of different sizes where annular space between smaller piping's OD and larger piping's ID permits installation.
2. Use pressure-type pipe couplings for force-main joints.

3.16 CLOSING ABANDONED STORM DRAINAGE SYSTEMS

A. Abandoned Piping: Close open ends of abandoned underground piping indicated to remain in place. Include closures strong enough to withstand hydrostatic and earth pressures that may result after ends of abandoned piping have been closed. Use either procedure below:

1. Close open ends of piping with at least 8-inch- (203-mm-) thick, brick masonry bulkheads.

2. Close open ends of piping with threaded metal caps, plastic plugs, or other acceptable methods suitable for size and type of material being closed. Do not use wood plugs.

B. Abandoned Manholes and Structures: Excavate around manholes and structures as required and use one procedure below:
   1. Remove manhole or structure and close open ends of remaining piping.
   2. Remove and backfill manhole locations as recommended in the geotechnical report and as indicated on the Drawings.
   3. If not indicated in the geotechnical report or on the Drawings, remove top of manhole or structure down to at least 36 inches (915 mm) below final grade. Fill to within 12 inches (300 mm) of top with stone, rubble, or gravel. Fill to top with concrete.

C. Backfill to grade according to Division 31 Section "Earth Moving."

3.17 IDENTIFICATION

A. Materials and their installation are specified in Division 31 Section "Earth Moving." Arrange for installation of green warning tape directly over piping and at outside edge of underground structures.
   1. Use detectable warning tape over all storm drainage piping and over edges of underground structures.

3.18 PROTECTION AND CLEANING

A. The Contractor shall maintain all pipe and chamber installations and drainage structures in a condition such that they will function continuously and shall be kept clean of silt, debris and other deleterious substances until the project has achieved final acceptance.

B. The Contractor shall use all erosion and sediment control measures necessary to assure construction sediments (or other pollutants) do not reach stormwater pipe and/or chamber installations.

3.19 FIELD QUALITY CONTROL

A. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches (610 mm) of backfill is in place, and again at completion of Project (See 3.20 Post Installation Inspection).
   1. Submit separate reports for each system inspection.
   2. Defects requiring correction include the following:
      a. Alignment: Less than full diameter of inside of pipe is visible between structures.
      b. Deflection: Flexible piping with deflection exceeding 5%.
      c. Damage: Crushed, broken, cracked, or otherwise damaged piping.
      d. Infiltration: Water leakage into piping.
      e. Exfiltration: Water leakage from or around piping.
   3. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.
   4. Re-inspect and repeat procedure until results are satisfactory.

B. Test new piping systems, and parts of existing systems that have been altered, extended, or repaired, for leaks and defects.
   1. Do not enclose, cover, or put into service before inspection and approval.
   2. Test completed piping systems according to requirements in Section 3.20.
   3. Schedule tests and inspections by authorities having jurisdiction with at least 24 hours' advance notice.
   4. Submit separate report for each test.
   5. Gravity-Flow Storm Drainage Piping: Test according to requirements of authorities having jurisdiction, UNI-B-6, and the following:
      a. Exception: Piping with soil tight joints unless required by authorities having jurisdiction.
      b. Option: Test plastic piping according to ASTM F 1417.
      c. Option: Test concrete piping according to ASTM C 924 (ASTM C 924M).
   6. Force-Main Storm Drainage Piping: Perform hydrostatic test after thrust blocks, supports, and anchors have hardened. Test at pressure not less than 1-1/2 times the maximum system operating pressure, but not less than 150 psig (1035 kPa).

a. Ductile-Iron Piping: Test according to AWWA C600, "Hydraulic Testing" Section.
b. PVC Piping: Test according to AWWA M23, "Testing and Maintenance" Chapter.

C. Leaks and loss in test pressure constitute defects that must be repaired.

D. Replace leaking piping using new materials, and repeat testing until leakage is within allowances specified.

3.20 POST INSTALLATION INSPECTIONS

A. Upon completion of the work and before final acceptance by the Owner, the entire drainage system shall be subject to a final inspection in the presence of the Owner and/or the Project Engineer. The work shall not be considered complete until all requirements for line, grade, cleanliness, workmanship and final inspections have been completed. Final inspection of the completed pipe installations will be performed after the embankment and/or trench fill is in place and all non-asphalt bases and/or sub-grades have been completed for at least 30 days.

B. Second Final Post Installation Inspection: (If required for the Project) The Owner shall require a second final post installation inspection.
1. Final post installation inspections (if required) shall be conducted no sooner than 2 months before the end of the one year warranty.
2. Final post installation inspections shall utilize a video camera and laser profiler/deflectometer or a video camera and go-no-go Mandrel. Lasers shall be calibrated to the pipe diameter as shown on the construction plans.

C. Initial and final post installation inspections shall be performed and reported, at the Contractor's expense, by a National Association of Sewer Service Companies (NASSCO) Certified Pipe Inspector. Reports of storm pipe assessments shall be submitted to the Project Engineer for review and appraisal.

D. The initial and post installation inspection report shall include: a copy of all video taken (if required), pipe location identification, equipment used for inspection, inspector name, deviation from design grade, deviation from line, deflection of pipe system, inspector notes, condition of joints, condition of pipe wall (e.g. Distress, cracking, wall damage dents, bulges, creases, tears, holes, etc…), ovality and flow capacity.

E. For RCP: seal cracks having a width greater than .010 inches. Repair or replace pipes exhibiting spalls or de-lamination.

F. For CMP and HDPE: initial and post installation inspection deflection shall not exceed 5%; final post installation (warranty) deflection shall not exceed 7%. Replace locations where deflections exceed these requirements; re-rounding of pipe is not allowed.

3.21 CLEANING

A. Clean interior of piping of dirt and superfluous materials. Flush with water**.**

END OF SECTION 334100

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CONFORMANCE SUBMITTAL
SECTION 334100 – STORM UTILITY DRAINAGE PIPING

Project Location _____
(*City, State*)

General Contractor: _____
(*Company Name, Phone Number*)

_____
(*Address*)

Sub-Contractor: _____
(*Company Name, Phone Number*)

_____
(*Address*)

The following products have been selected (check one box) for use in this project from the list of acceptable products specified:

Concrete Pipe, ASTM C76, Butyl mastic joint sealant ASTM C990-01a for silt-tight designations or rubber gaskets meeting the material and joint configuration requirements of ASTM C443 for watertight designations:
☐ Tongue and Groove RCP, Class _____
☐ Bell and Spigot RCP, Class _____

High Density Polyethylene (HDPE) Pipe, AASHTO M252, M294, Rubber Gasket Joints ASTM F477, silt-tight or watertight designations as specified:
☐ ADS Pipe
☐ Hancor Pipe
☐ Type S Lok-Tite Pipe
☐ Quality Culvert Pipe
☐ DuroMaxx
☐ All underground connections will be made with pre-fabricated HDPE fittings

Polyvinyl Chloride (PVC) Pipe, Rubber Gasket Joints ASTM F477:
☐ PVC Pipe, ASTM D3034, SDR 35
☐ Corrugated PVC Pipe, Contech "A2000"
☐ All underground connections will be made with pre-fabricated PVC fittings

Aluminized Steel Type 2 Corrugated Steel Pipe (CMP), AASHTO M274 or ASTM A929, silt-tight or watertight designations as specified:
☐ Aluminized Steel Type2 Corrugated Steel Pipe

Aluminized Steel Type 2 Spiral Ribbed Pipe (Type IR), AASHTO M274 or ASTM A929 and AASHTO M36 or ASTM A760, silt-tight or watertight designations as specified:
☐ Aluminized Steel Type 2 Spiral Ribbed Pipe (Type IR) such as "Ultra Flo" by Contech or approved equal

Ductile Iron Pipe (DIP), AWWA C151, Fittings AWWA C110, Gaskets AWWA C111:
☐ DIP

Stormwater Collection Chambers ASTM F2418
☐ StormTech
☐ Hancor
☐ CULTEC
☐ StormTech by ADS

Stormwater Detention or Recharge System
☐ Aluminized Steel CMP Detention by CONTECH
☐ 360 Degree Perforated CMP Detention/Recharge by CONTECH
☐ Precast Concrete Detention System

Drainage Boxes (Must be pre-cast unless approved by Owner):
☐ Pre-cast Concrete, per specifications by: ☐DOT #_____, ☐City #_____, ☐Other _____
☐ Cast-in-place Concrete, per specifications by: ☐DOT #_____, ☐City #_____, ☐Other_____
☐ Solid Concrete Brick Masonry, per specifications by: ☐DOT # _____,
☐City #_____, ☐Other _____

Cast Iron Frames, Grates, and Hoods:
Manhole lids, per specifications by: ☐DOT #_____, ☐City #_____, ☐Other_____
Curb Inlets, per specifications by: ☐DOT #_____, ☐City #_____, ☐Other_____
Drop Inlets, per specifications by: ☐DOT #_____, ☐City #_____, ☐Other_____

Detention Pond As-built Survey:
☐ I recognize that an as-built survey of all detention ponds and structures shall be completed prior to project acceptance in accordance with Section 017300 – Field Engineering and Surveying

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I represent to Owner/City/Engineer that the products selected will be installed in compliance with the applicable codes for the authorities having jurisdiction and in accordance with the contract documents. If noncompliance is discovered the General Contractor shall make or cause to be made all necessary corrections to meet the applicable codes and specifications. Immediately or as directed by Owner the work shall be completed without additional cost to the Owner and / or the contract.

Sub-Contractor: _____
(*Signature of the Authorized Agent of the Sub-Contractor*) Date

_____
(*Print Name of the Authorized Agent of the Sub-Contractor*)

General Contractor: _____
(*Signature of the Authorized Agent of the General Contractor*) Date

_____
(Print Name of the Authorized Agent of the General Contractor)

TRENCH DRAIN CONFORMANCE SUBMITTAL
SECTION 334100 – STORM UTILITY DRAINAGE PIPING

Project Location _____
(*City, State*)

General Contractor: _____
(*Company Name, Phone Number*)

_____
(*Address*)

Sub-Contractor: _____
(*Company Name, Phone Number*)

_____
(*Address*)

Product Verification:

The trench drains installed in this store will meet the product guidelines of Section 334100-2.13 "POLYMER-CONCRETE, CHANNEL DRAINAGE SYSTEMS"

Trench Drain Manufacturer & Model Number: _____

Grate Model Number: _____

Trench Drain Manufacturer & Model Number: _____

Grate Model Number: _____

General Contractor's Affidavit:
I represent to Owner that the product selected will be installed in compliance with the applicable codes for the authorities having jurisdiction and in accordance with the project specification. If noncompliance is discovered the General Contractor shall make or cause to be made all necessary corrections to meet the applicable codes and Owner specifications. The work shall be completed immediately as directed by Owners without additional cost to Owner and/or the contract.

General Contractor: _____
(*Signature of the Authorized Agent of the General Contractor*) (Date)

_____
(*Print Name of the Authorized Agent of the General Contractor*)

Sub-Contractor's Affidavit:
I represent to Owner that the product selected will be installed in compliance with the applicable codes for the authorities having jurisdiction and in accordance with the project specification. If noncompliance is discovered the Sub-Contractor shall make or cause to be made all necessary corrections to meet the applicable codes and owners specifications. The work shall be completed immediately as directed by owner and/or the General Contractor without additional cost to owner and/or the contract.

Sub-Contractor: _____
(*Signature of the Authorized Agent of the Sub-Contractor*) (Date)

_____
(*Print Name of the Authorized Agent of the Sub-Contractor*)