



STANDARD PROVISIONS

PART 1 - GENERAL

1.01 GENERAL

A. Related Work Specified Elsewhere:

- The general provisions of the Contract, including General and Supplementary Conditions, Instructions to Bidders and General Requirements, apply to the work specified in this Division.
- This section applies to all aspects of Division 15 and is intended to be complementary to the General Conditions, Supplementary General Conditions, and General Requirements.
- Furnish all labor, materials, services, equipment and appliances required for the complete furnishing and installation of the Mechanical systems, including Plumbing, Heating, Ventilating and Air Conditioning and Fire Protection.
- The use of the words "provide", "install", or "install" means that the item or facility is to be both furnished and installed unless expressly stated otherwise.
- The term "Contractor" used in this Division of the Specifications shall mean the "Mechanical Sub-Contractor", "Plumbing Sub-Contractor", or "Fire Protection Sub-Contractor".

B. Scope:

- Refer to Architectural Supplements for the scope of the Project.
- The contract documents and complete scope of work are illustrated on the combined Architectural, Structural, Plumbing, Heating, Ventilating and Air Conditioning, and Electrical drawings. Review and examine the complete set of contract documents. Refer discrepancies, errors, omissions and ambiguities in the contract documents to the Architect. Otherwise, provide materials and labor to achieve same in a manner approved by the Architect at no additional costs to the Owner.
- The intent of the drawings and specifications is to provide complete systems. Items included in one and not the other are of like effect as if included in both. Provide miscellaneous items and accessories required for complete systems.
- Items included in one discipline and not included in another discipline in the drawings and specifications shall be provided as if included, at no additional costs to the Owner.

C. Description of System:

- Facilities and systems of mechanical work in general include, but are not limited to, the following:
 - Basic Materials and Methods
 - Plumbing System
 - Heating, Air Conditioning and Ventilating System
 - Fire Protection System
 - System Controls
- Provide labor, materials, equipment and accessories for complete systems whether or not specifically included in the Contract Documents.
- Drawings are diagrammatic and contain graphic representations, schedules and notations showing mechanical work. Follow drawings as closely as actual construction will permit. Make deviations from drawings for conformance to actual construction at no additional costs to the Owner. Refer items requiring clarifications and interpretations to the Owner's representative for resolution, providing work as required at no additional costs to the Owner. Deviations for reasons other than described above, if deemed necessary, shall be submitted to the Owner's representative for approval. Do not make deviations without written approval.

D. Definitions:

- The Contractor is responsible for the Work of Sub-Contractors.
 - Furnish - Supply Materials.
 - Install - Install Materials.
 - Provide - Furnish and Install Materials.
 - Approval - Written approval to proceed from the Architect.
- 1.02 QUALITY ASSURANCE
- Workmen Qualifications: Skilled mechanics competent in their trades, licensed where required by authorities having jurisdiction.
 - Requirements of Authorities Having Jurisdiction:
 - Determine authorities having jurisdiction and the applicable codes, rules and regulations of those authorities.
 - Perform work in conformance with the requirements of authorities having jurisdiction.
 - Obtain all permits, licenses and inspections as required by all authorities having jurisdiction. Give all notices and comply with all Laws, Ordinances, Rules, Regulations and Codes of any enforcing agency. Secure necessary permits to complete work as required.
 - In cases of differences between requirements of the various authorities having jurisdiction, exceed the lesser requirements and meet the greater, more stringent requirements.
 - All fees and costs for permits, licenses, or inspections shall be paid by this Contractor unless expressly stated otherwise.

C. Codes:

- The installation of the mechanical systems shall conform to the requirements of the National Fire Protection Association (NFPA), local and state codes having jurisdiction, and the requirements of the Utility Companies whose services are used.
- Codes and ordinances having jurisdiction over the work shall serve as minimum requirements; but, if the Contract Documents indicate requirements which are in excess of those minimum requirements, then the requirements of the Contract Documents shall be followed. Should there be any conflicts between the Contract Documents and codes or any ordinances having jurisdiction, report these to the Architect.
- Reference Standards: All systems installed by this contractor shall be updated and modified in accordance with the following codes and standards, but in no instance shall the standards be less than the requirements of other paragraphs of these contract documents.
 - Specified manufacturer's instructions and recommendations.
 - American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE).
 - Sheet Metal and Air Conditioning Contractors National Association (SMACNA).
 - National Fire Protection Association (NFPA).
 - Underwriters Laboratories (UL).
 - Americans with Disabilities Act (ADA).
 - Local codes and ordinances.

1.03 SHOP DRAWINGS AND SUBMITTAL DATA:

- Before submittal of the data, the Contractor shall check each piece of apparatus, equipment and accessory to ensure compliance with the requirements of the Plans and Specifications and shall clearly mark each submittal with his signature to indicate that they are in full compliance with the specifications and plans. The Contractor shall verify that all associated trades are aware of their work concerning the equipment submitted. Any submittals received without the Contractor's signature may be returned without being checked by the Architect's office.
- Certificates:
 - Provide certificates required by contract documents and by authorities having jurisdiction.

- Provide Underwriters' Laboratories seals affixed to materials.
- Test Reports: Provide copies of test reports required by contract documents and by authorities having jurisdiction.
- Approval, disapproval, or comments on submittals shall not relieve the Contractor of the requirements of the specifications or the drawings.

1.04 PRODUCT DELIVERY, STORAGE AND HANDLING:

- Delivery: Deliver equipment and materials in unopened manufacturer's standard packaging. Any piece of equipment placed on the job site without prior written review shall be subjected to removal.
- Storage: Store equipment and materials where not subject to damage from personnel and the elements.
- Handling: Avoid damage to materials and surrounding surfaces and finishes before and during installation.

1.05 EXAMINATION OF PREMISES:

- This Contractor shall visit the site to become fully acquainted with the immediate and surrounding premises and the conditions under which the work will be executed.

1.06 SUBCONTRACT AND LABOR:

- All provisions of this Section shall apply to all Subcontractors to the extent that they are applicable to such Subcontractor.

1.07 ACCEPTANCE OF WORK:

- The work, when completed, will be accepted in a finished, perfect and undamaged state only. This Contractor shall provide for protection of the work during its progress and, if damaged, all patching or replacing necessary to be full and satisfactory completion.

1.08 FINALLY:

- It is the intention that this Specification shall provide a complete installation. All auxiliary construction equipment and apparatus necessary or advantageous to the completion and testing of the work shall be included. The omission of specific reference to any part of the work necessary for such complete installation shall not be interpreted as relieving this Contractor from furnishing and installing such part.

1.9 WARRANTY:

- Warrant the work for one year from and after date of beneficial occupancy to include freedom from defects for materials, equipment and labor. Replace defective work during the warranty period. All compressors shall be five year non-prorated warranty.
- The one year warranty provided in the General Conditions shall be in addition to and not in limitation of any guarantees or warranties of longer duration or other remedies provided by law of the Contract Documents.
- The warranty shall include supervision and adjustment, any maintenance recommended by the equipment manufacturer or contractor or inspectors. Also included in the warranty is any refrigerant lost or leaked in normal operation or in service of equipment. Provide four filter changes at appropriate intervals during the warranty period.

PART 2 - PRODUCTS

2.01 MATERIALS:

- New, free from defects, of quality commercial grade standard product by reputable manufacturers.
- Listed by Underwriters' Laboratories for which standards apply.
- In compliance with Contract Documents in regard to quality, dimensions, appearance, design and performance.
- Similar materials of same manufacturers.
- First named under "Acceptable Manufacturers" is the manufacturer whose product was used for design.

2.02 SUBSTITUTIONS:

- Substitute materials will be considered for approval after Contract has been awarded.
- Approval of substitutions is specifically excluded from this Division prior to signing of contract.

C. Requests for substitutions:

- In writing.
- Required data necessary for evaluation.
- Difference in contract amount for each item.
- In accordance with submittal procedure.

- Requests for substitution imply no obligation on the Owner and his representatives.
- If approved substitutions cause changes in the work required, including work by other trades, pay all costs involved and effect all necessary changes to accommodate substitutions at no additional cost to the Owner.

PART 3 - EXECUTION

3.01 INSPECTION:

- Examine materials upon receipt for damage. Replace damaged materials.
- Examine building structure for what materials are to be secured for defects adversely affecting the quality and execution of work. Do not start work until defects are corrected.

3.02 PREPARATION:

- Field Measurements:
 - Refer conflicts to the Architect for review. Resolve conflicts in accordance with the Architect's written direction at no additional costs to the Owner.
 - Coordinate locations of materials with other trades by reference to Contract Documents and by conference with other trades. If work is later found to interfere with work of other trades, make necessary changes to eliminate interference at no additional cost to the Owner.
- Preparation of Surfaces: Clean and otherwise modify surfaces to which materials are to be applied and secured in accordance with manufacturer's recommendations and Architects direction.
- Verify proper type materials being installed for environmental conditions.

3.03 INSTALLATION:

- Install materials in accordance with the requirements of the authorities having jurisdiction and the manufacturer's recommendations. All heights and clearances of equipment to be installed is to be as detailed on the Architectural plans and as required by the ADA. Notify the Architect of all discrepancies in writing prior to rough-in.
- Records for Owner:
 - Mainain full set of Contract Documents at Project. Note daily changes made in connection with final installation.
- Provide a complete set of "as built" reproducible drawings to the Owner showing exact locations of all equipment, valves, piping, ducts, etc. These drawings shall reflect any changes from contract documents and shall be drafted by competent personnel to provide the owner with quality documents of facilities at project completion.

BASIC MATERIALS AND METHODS

PART 1 - GENERAL

1.01 DESCRIPTION:

- Work included in This Section: The following Specification applies to all work of the Mechanical and Plumbing Contractors.

PART 2 - PRODUCTS

2.01 STANDARDS FOR MATERIALS:

- All materials and equipment shall conform to the requirements of the Contract Documents. They shall be new, free from defects, and they shall conform to the following standards where these organizations have set standards. All materials and equipment shall be UL listed and labeled where possible.
 - Underwriters Laboratories, Inc. (UL).
 - National Electrical Manufacturer's Association (NEMA).
 - American National Standards Institute (ANSI).
- Manufacturer's names and catalog numbers are used as a means of establishing product grade and quality. Where several manufacturers are named, only those named manufacturers are to be used on the job. Other named manufacturers, although acceptable as manufacturers, must prove their product will conform satisfactorily and will meet space and capacity requirements, etc., of the first named manufacturer.
- The use of one named manufacturer in the schedules on the Drawings is for guide purposes. The provisions of the above paragraph will govern in the selection of products to be used.
- Where the "or approved equal" clause is used in these specifications, the name, or names, mentioned are to be used as a basis of quality. Other manufacturer's products will, however, be considered as substitutions and shall not be used as a basis for pricing.
- Basis of quality shall be interpreted to include material, workmanship, weight, finish, gauges of material, appearances, capacity, performance, etc.
- Manufacturer's representation as to availability of equipment parts and replacement and service personnel in the area will be a factor in consideration of substitutions.

DUCTWORK

PART 1 - GENERAL

1.01 SCOPE:

- Furnish all labor, materials, tools, equipment and related items required for the complete installation of Ductwork as indicated by the Contract Documents.

PART 2 - PRODUCTS:

2.01 MATERIALS:

- General: Non-combustible or conforming to requirements for Class 1 air duct materials, or UL 181.
- Steel Ducts: Galvanized steel sheet, lock-forming quality, having zinc coating of 1.25 oz per sq ft (382 gpg sq ft) for each side in conformance with ASTM A90.
- Flexible Ducts: Interlocking spiral of galvanized steel or aluminum construction; rated to 2 inches WG (500 Pa) positive and 1.5 inches WG (375 Pa) negative.
- Insulated Flexible Ducts: Flexible duct wrapped with flexible glass fiber insulation, encased by seamless aluminum-pigmented plastic vapor barrier jacket, maximum 0.23 K value at 75 degrees F (0.034 KSI at 24 degrees C).
- Fasteners: Rivets, bolts, or steel metal screws.
- Sealant: Non-hardening, weather resistant, fire resistive, compatible with mating materials; used alone or with fiberglass mesh.
- Hanger Rods: Steel galvanized, threaded both ends, threaded one end, or continuously threaded.
- Plumber's strap is not an acceptable duct hanger.
- Duct longitudinal seams shall be double locked and handressed flat.
- Fabricate and support in accordance with SMACNA Low Pressure Duct Construction Standards and ASHRAE handbooks, except as indicated. Provide duct material, coils, reinforcing, and sealing for operating pressures indicated.
- Size round ducts installed in place of rectangular ducts in accordance with ASHRAE table of equivalent rectangular and round ducts. No variation of duct configuration or sizes permitted except by written permission.
- Construct tees, bends, and elbows with radius of not less than 1-1/2 times duct width or duct at centerline. Where not possible and where rectangular elbows are used, provide turning vanes. Where acoustical lining is indicated, provide turning vanes of perforated metal with glass fiber insulation.
- Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible. Divergence upstream of equipment shall not exceed 30 degrees; convergence downstream shall not exceed 45 degrees.

2.02 TESTS, ADJUSTMENTS AND INSPECTIONS:

- On completion of the installation, test and adjust all new equipment installed or existing equipment connected.
- Pay all costs for labor, materials, equipment, etc., as required for testing and adjusting of the systems. Provide all appropriate temporary piping connection or any other requirements for all tests. Take due precautions to prevent damage to the building or its contents incurred by such tests. Repair and make good any damage as caused at no additional cost to Owner.
- Any leaks, defects or deficiencies discovered as a result of these tests or tests performed by the Owner-retained testing and balancing firm shall be repaired and test shall be repeated until tests requirements are fully completed.
- When practical, all piping tests shall be made before pipe is covered or concealed.
- It is the intention of this section of the specifications to provide necessary tests during and at completion of the job to ensure tight piping and a correctly adjusted system, and the Contractor shall do everything necessary to accomplish this.
- All motors, bearings, etc., on all equipment shall be correctly oiled and greased before the equipment is operated and again at the completion of the job. Provide complete oiling and greasing instructions for Owner's designated personnel. Grease fittings shall be installed on equipment that requires periodic greasing.

2.03 LOW PRESSURE FLEXIBLE DUCTWORK:

- Low Pressure flexible duct shall conform to the Class 1 requirements of the NFPA. A nominal 1" thickness of complete insulation shall be enclosed in a factory applied and sealed vapor barrier jacket.
- Insulated flexible duct shall be type SLR-161 Genflex as manufactured by the General Environment Corporation or equal by Wrencofil or Thorflex.
- All flexible duct shall be installed per manufacturer's recommendations.
- All joints and connections shall be made with positive locking steel, straps and approved mastic tape insulation joints.

PART 3 - EXECUTION

3.01 INSTALLATION:

- Provide openings in ductwork where required to accommodate thermometers and controllers. Provide pilot tube openings where required for testing of systems, complete with metal can with spring device to secure against air leakage. Where openings are provided in insulated ductwork install insulation material inside a metal ring.
- Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.
- Connect diffusers or transfer boots to low pressure ducts with 5 feet (1.5 m) maximum length of flexible duct. Hold in place with strap or clamp.
- Support rectangular ducts by 1" x 16 gauge galvanized band iron or 3/8" galvanized rod hangers attached to reinforcing angles and spaced same as reinforcing angles. Secure hangers to concrete beam or slab by inserts, anchor bolts and bolt, toggle bolt, or expansion bolt. All hangers shall be attached to the top chord of bar joists.
- Flash and counter flash around all ducts passing through the roof using galvanized steel securely built into roofing in accordance with the instructions of the Roofing Contractor. Provide roof curb for all penetrations.
- Flat duct surface shall be crimped diagonally regardless of size. Longitudinal joints in all duct sizes may be fast lock joints. Transverse joints and intermediate bracing shall be constructed of galvanized sheet metal or galvanized structural angles.
- Flat joints shall be handressed to meet each other. Inside of duct shall present a smooth surface to flow of air.
- Turns shall be made with a throat radius of not less than the duct width. Duct tap from mixing boxes to main ducts shall be made with low loss fittings.
- Transformations shall have a ratio of not more than 1" in transformation to each 7" of length.

DUCTWORK INSULATION

PART 1 - GENERAL

1.01 SCOPE:

- Furnish all labor, materials, tools, equipment and related items required for the complete installation of Ductwork Insulation as indicated by the Contract Documents. All piping insulation values (R-values) must meet that required by the applicable energy codes regardless of the thickness listed.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS:

- Fiberglass insulation: Owens-Corning Fiberglas, Manville, Knauf, Certainteed
- Mastics: Benjamin Foster, Insul-Coustic, Chicago Mastec, Childers Products, St. Clair Rubber Co.
- Owens-Corning Fiberglass ED-100 FRK 25 Duct Wrap or approved equal, 3/4" density with .0025" aluminum foil exterior.
- Outliner: A neoprene coated Fiberglass board having a density of not less than 1-1/2 pcf. in conformance with Fed. Spec. HH-1545B, Type 1. Owens-Corning Fiberglass Aeroflex duct liner or approved equal.
- Owens-Corning Fiberglass duct liner board or approved equal.
- Benjamin Foster 85-15 insulation bonding adhesive or approved equal.
- At Contractor's option, concealed cold supply air ducts and plenums, and elsewhere as indicated, shall be lined with 1" thick Fiberglass 1-1/2 pound density coated duct liner complying with NFPA 90A requirements.
- Sound Duct Insulation - Where indicated, sound insulate air ducts with 1" thick Fiberglass 1-1/2 pound density coated duct liner, applied as specified above.

2.02 MATERIALS:

- When the unit is running during the occupied hours the minimum outside air damper shall be open. When the unit is off or is running in the unoccupied mode the outdoor air dampers shall be closed.
- The duct-belt economizer shall allow the outside air dampers to open and the return air damper to close to provide "free cooling" when the outside air is below 57°F. Maintain selected mixed air temperature and lock out compressor below approximately 57°F ambient, return dampers shall be in minimum position above approximately 70°F ambient.
- Provide a programmable room thermostat with a remote sensor with fan ON-AUTO and system HEAT-OFF-COOL-AUTO switches.
- When the rooftop unit is factory furnished with one or more smoke detectors, provide a switch and pilot light indicator to remotely show it is in the tripped position and to reset the smoke detector.

3.02 SEQUENCE OF OPERATION:

A. Cooling

- The room thermostat shall control the cooling cycle.
- The fan may either run continuously or be cycled by the thermostat. This function shall be set at the thermostat.
- Minimum outside air damper: open on fan start and close on fan stop.

B. Heating

- The room thermostat shall be controlled by the room thermostat.
- In the "off" position, the fan shall be controlled by a bonnet switch or timer.
- The fan may either run continuously or be cycled by the thermostat. This function shall be set at the thermostat.
- Minimum outside air damper: open on fan start and close on fan stop.

PART 3 - EXECUTION

3.01 INSPECTION:

- Examine surfaces to be covered with insulation to insure work of preceding trades is completed.
 - Check that available space is of sufficient depth for required insulation thickness.
 - Seal all joints and penetrations of the duct wrap insulation facing with tape or mastic to provide a vapor tight seal.
 - Do not proceed with application until conditions are satisfactory.
- 3.02 THICKNESS:
- Supply ductwork:
 - Concealed in attics or any unconditioned space - 2 inch thick ductwrap.
 - Concealed in return air plenums or conditioned spaces - 1 inch thick ductwrap.
 - Exposed in conditioned spaces - 1 inch thick available ductwrap.
 - Exposed in unconditioned spaces and equipment rooms - 2 inch thick liner.
 - Where also indicated on drawings to be lined - 1 inch thick liner.
 - All return air plenums, return air ducts and fan connections past first elbow or first fifteen feet - 1 inch thick liner.
 - Return air ductwork: 1 inch thick liner.
 - Outside air and mixed return and outside air ductwork: 1 inch thick liner.
 - Outside exposed to weather except exhaust ductwork: 2 inch thick liner.
 - General kitchen exhaust ductwork: 1 inch (minimum) ductwrap (if not acceptable).

3.03 APPLICATION:

- Duct to be insulated includes all supply air ductwork, all outside air ductwork, mixed return and outside air ductwork, all return air ductwork, and where indicated on drawings, exhaust air ductwork.
- All plenums shall be insulated as required for ductwork.
- Joints shall be taped 5 inches in both directions, sealed with approved mastic applied over each joint and secured in place. When wrapped insulation meets lined ducts overlap the insulation types 24 inches.
- Insulation shall be installed in a vapor-tight manner and may be fastened with the use of staples or other fastening material as recommended by insulation manufacturer provided the fasteners are covered with mastic or SMACNA tape.
- Where rectangular ducts are 24" in width or greater, duct wrap insulation shall be additionally secured to the bottom of the duct with mechanical fasteners such as pins and spaced disc washers, spaced 18" on centers (maximum) to prevent sagging of insulation.
- Use double wrap and seal on all joints and penetrations of the duct wrap insulation facing with tape or mastic to provide a vapor tight seal.
- Where indicated to be lined, ductwork shall be insulated internally, rather than externally.
- For internal insulation, apply insulation to inside of ducts and plenums with fire retardant adhesive with faced side exposed to air stream. For external insulation, apply insulation to outside of ducts and plenums with fire retardant adhesive with faced side exposed to air stream. Use double wrap and seal on all joints and penetrations of the duct wrap insulation facing with tape or mastic to provide a vapor tight seal. In ducts and plenums with one side more than 24", secure insulation with adhered with welded mechanical fasteners in addition to adhesive. Fasteners spaced at 14" centers in both directions.
- Work will not be considered complete until inspected or approved by the Architect/Engineer for compliance with project specifications.
- No insulation shall be installed on any duct before building is adequately closed in. Where necessary to install any insulation before it is closed in, the Contractor shall be advised by the Architect/Engineer where permission is granted, the covering must be effectively protected by roofing felt, wired on covering to make an absolute waterproof protection for covering.
- Gray duct tape is not an approved material.

DUCTWORK ACCESSORIES

PART 1 - GENERAL

1.01 SCOPE:

- Furnish all labor, materials, tools, equipment and related items required for the complete installation of Ducts and all devices for proper air flow as indicated by the Contract Documents or as required for good practice.
- 1.02 REFERENCES:
- NFPA 90A - Installation of Air Conditioning and Ventilating Systems.
 - SMACNA - Low Pressure Duct Construction Standards.
 - UL 33 - Heat Resistant Liners for Fire-Protection Service.
 - UL 555S - Fire Dampers and Ceiling Dampers.

PART 2 - PRODUCTS

2.01 GENERAL:

- In each square elbow, provide airtight panel double thickness turning vane. Turning vane shall be constructed in accordance with SMACNA Manual. Turning vane shall be equal to Barber-Coleman "Air-Turns", Tuttle and Bailey "Duct-Turns".
- Each low pressure ductwork branch from a low pressure duct and at each sweeping elbow take-off to a grille, provide a splitter damper consisting of two plates on a square operating rod fitted with an adjusting device except at flexible duct take-off. Unless otherwise indicated on plans, the adjusting device shall consist of a control rod and Ventiflex, Inc. No 803 joint bracket.
- Provide where indicated a Model SM-ZDE spin-firing with extractor and damper operator as manufactured by General Environment Co. for use with fire dampers.
- Each individual air supply or return unit, whether sidewall or ceiling diffuser shall be fitted with a device to permit the adjustment of the amount of air supplied to the unit independently of any other outlet. These devices may take the form of outlet boots with Samitrols, or of manually adjustable louvers, or of other devices, as long as they are not in any case, shall be fitted with a means of manual adjustment of the amount of air delivered to the outlet.
- Flash and counter flash around all ducts passing through the roof using galvanized steel securely built into the roofing in accordance with the instructions of the Roofing Contractor. Provide roof curb for all penetrations.
- Ductwork where required shall have 1" 1/2 lb. Johns-Manville "Micro-Bar" duct liner.
- Flexible ductwork shall be installed to supply diffusers, with length not to exceed five feet (5'-0").

2.02 FIRE DAMPERS, SMOKE DAMPERS AND COMBINATION FIRE AND SMOKE DAMPERS:

A. Fire Dampers:

- Fabricate in accordance with NFPA 90A and UL 555S requirements and shall carry the corresponding label and shall be in accordance with the instructions of the Roofing Contractor. Provide roof curb for all penetrations.
- Fire dampers shall be of solid steel curtain type with corrosion resistant steel blades and frames which shall be continuous one-piece roll formed construction with mounting langes. In closed position the blades with blades which shall be horizontally mounted in the frame and shall be locked by the use of stainless steel springs. Damper reset shall be accomplished by use of access panels which shall be furnished and installed.
- Fire dampers for low pressure rectangular ducts shall be Type B with 95% or greater free area. Fire dampers for round or oval ducts shall be Type C with 100% free area. Fire dampers for medium pressure rectangular ducts shall be Type C with 100% free area.
- Fabricate ceiling type fascia of galvanized steel, 22 gauge (0.76 mm) frame and 16 gauge (1.5 mm) flap, two layers 0.125 inch (3.2 mm) exterior flange bar on one side and one layer on bottom side for round flaps, with locking plug.
- Fabricate ceiling dampers of galvanized steel, 22 gauge (0.76 mm) frame, stainless steel closure spring, and light weight, heat retardant non-asbestos fabric blanket closure.
- Fabricate curtain type gable damper of galvanized steel with interlocking blades. Provide stainless steel closure springs and latches for horizontal installations. Configure with blades out of air stream except for low pressure ducts up to 12 inches (300 mm) in height.
- Fabricate multiple blade fire dampers with 16 gauge (1.5 mm) galvanized steel frame and blades, oil-impregnated bronze or stainless steel sleeve bearings and plated steel axles, 1/8 x 1/2 inch (3.2 x 12.7 mm) plated steel concealed linkage, stainless steel closure spring, blade stops, and lock.
- Provide links, UL 33, shall separate at 160 degrees F. Provide adjustable link straps for combination firebalancing dampers.

C. Combination Fire and Smoke Dampers:

- Fabricate in accordance with NFPA 90A and UL 555S, and as indicated.
 - Normally Closed Smoke Vent Dampers: Curtain type, opening by gravity upon actuation of electro thermal link, flexible stainless steel blade edge seals to provide constant sealing pressure.
 - Normally Closed Open Smoke Dampers: Curtain type, closing upon actuation of electro thermal link, flexible stainless steel blade edge seals to provide constant sealing pressure, stainless steel springs with locking devices ensure positive closure for units mounted horizontally.
- D. Smoke Dampers:
- Fabricate in accordance with NFPA 90A and UL 555S, and as indicated.
 - Normally Closed Smoke Vent Dampers: Curtain type, opening by gravity upon actuation of electro thermal link, flexible stainless steel blade edge seals to provide constant sealing pressure.
 - Normally Closed Open Smoke Dampers: Curtain type, closing upon actuation of electro thermal link, flexible stainless steel blade edge seals to provide constant sealing pressure, stainless steel springs with locking devices ensure positive closure for units mounted horizontally.

PART 3 - EXECUTION

3.01 INSTALLATION:

- Install accessories in accordance with manufacturer's instructions.
- Provide balancing dampers at points on low pressure supply, return, and exhaust systems where branches are taken from larger ducts as required for air balancing. Use splitter dampers only where indicated.
- Provide fire dampers, combination fire and smoke dampers and smoke dampers at locations indicated, where ducts and outlets pass through fire rated partitions and where required by authorities having jurisdiction. Install with required perimeter mounting angles, sleeves, breakaway duct connections, corrosion resistant springs, bearings, bushings and hinges. Install fire dampers of equal or greater fire rating as the wall or ceiling penetrated.
- Demonstrate re-setting of fire dampers to authorities having jurisdiction and Owner's representative.
- Provide backdraft dampers on all exhaust fans or exhaust ducts nearest to outside and where indicated.
- Provide flexible connections immediately adjacent to equipment in ducts associated with fans and motorized equipment.
- Provide duct access doors for inspection and cleaning before and after filters, coils, fans, automatic dampers, at fire dampers, adjustment of backdraft dampers and elsewhere as indicated. Provide minimum 8 X 8 inch size for hand access, 18 X 18 inch size for shoulder access, and as indicated.

HVAC TESTING AND BALANCING

PART 1 - GENERAL

1.01 SCOPE:

- The work included in this Section consists of the furnishing of all labor, instruments, tools and services required in connection with the Testing, Adjusting and Balancing (TAB) of the Heating, Ventilating and Air Conditioning (HVAC) systems as described in the mechanical specifications and/or shown on the mechanical plans, or reasonably implied therefrom.
- The TAB Firm is responsible to and shall submit all reports directly to the Architect/Engineer and/or Owner.
- TAB services shall result in the optimum temperature, airflow and noise levels in the conditioned spaces of the project.
- The following basic components of the HVAC system shall be tested, adjusted and balanced.
 - Air Distribution System
 - Air Moving Equipment
 - Heating Systems (HVAC)
 - Control Systems Verification

E. Document Review:

- The TAB Firm shall be responsible for reviewing the HVAC plans and specifications relating to the TAB services for proper arrangement and adequate provisions of devices for testing, adjusting and balancing.
- TAB Firm shall review HVAC manufacturer's submittal data relative to balanceability.
- TAB Firm shall review submitted HVAC automatic temperature control sequences for conformity to the specifications.

1.02 QUALIFICATIONS:

- All work is to be performed by an independent Test and Balance Agency (TAB Agency) that specializes in, and whose business is limited to the testing and balancing of air and hydronic systems. The TAB Agency shall be fully certified by the Associated Air Balance Council (AABC). All instruments shall be accurately calibrated and maintained in good working order. If requested, the TAB Agency shall provide proof of having successfully completed at least five projects of similar size and scope during the past five years. The tab agency shall be approved by the architect.
- The TAB Firm is responsible to and shall submit all reports directly to the Architect/Engineer and/or Owner. If the equipment is free from mechanical defects, runs smoothly and quietly and performs satisfactorily to meet the requirements set forth in the mechanical