# GENERAL

## SECTION INCLUDES

### Metal ductwork.

### Sheet metal plenums.

### Kitchen hood ductwork.

### Duct cleaning.

## REFERENCE SECTION 23 05 00 FOR THE FOLLOWING:

### References.

#### See Section 23 51 00 for information related to kitchen grease ducts and generator engine exhaust.

### Performance requirements.

#### No variation of duct configuration or sizes shall be permitted except by written permission.

### Submittals.

#### Submit detailed CAD-generated ductwork drawings at minimum ¼” scale, with details of the following:

##### Fabrication, assembly, and installation, including plans, elevations, sections, components, and attachments to other work.

##### Duct layout indicating pressure classification and sizes on plans.

##### Seam and joint construction.

##### Penetrations through fire-rated and other partitions.

##### Hangers and supports, including methods for building attachment, vibration isolation, and duct attachment.

##### NOTE: No installation of ductwork shall be allowed until detailed shop drawings have been reviewed by the Engineer. Any ductwork that is installed prior to the Engineer’s review of the shop drawings shall be subject to removal and replacement at the Contractor’s expense.

### Project record documents.

#### Record actual locations of ducts and duct fittings. Record changes in fitting location and type. Show additional fittings used.

### Quality assurance.

#### Perform Work in accordance with the following standards:

##### NFPA 90A ‑ Installation of Air Conditioning and Ventilating Systems.

##### NFPA 90B ‑ Installation of Warm Air Heating and Air Conditioning Systems.

##### NFPA 91 ‑ Installation of Blower and Exhaust Systems for Dust, Stock and Vapor Removal or Conveying.

##### NFPA 96 ‑ Installation of Equipment for the Removal of Smoke and Grease‑Laden Vapors from Commercial Cooking Equipment.

##### SMACNA ‑ HVAC Air Duct Leakage Test Manual.

##### SMACNA – HVAC Duct Construction Standards ‑ Metal and Flexible.

##### SMACNA ‑ Round Industrial Duct Construction Standards

##### International Mechanical Code, current edition.

### Qualifications.

#### Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum five years documented experience.

#### Installer: Company specializing in performing the work of this section with minimum five year’s experience.

### Regulatory requirements.

#### Construct all ductwork per codes listed in section 1.2.E

## Environmental requirements.

### Do not install duct sealants when temperatures are less than those recommended by sealant manufacturers.

### Maintain temperatures during and after installation of duct sealants.

# PRODUCTS

## MATERIALS

### Galvanized Steel Ducts: ASTM A653 galvanized steel sheet, lock‑forming quality, having G90 zinc coating of in conformance with ASTM A90. Provide mill-phosphatized finish for surfaces of ducts exposed to view.

### Stainless Steel Ducts: ASTM A 480/A 480M, Type 316 sheet form with No. 4 finish for surfaces of ducts exposed to view, and Type 304 sheet form with No. 1 finish for concealed ducts.

### Steel Ducts: ASTM A366.

### Aluminum Ducts: ASTM B209; aluminum sheet, alloy 3003‑H14. Aluminum Connectors and Bar Stock: Alloy 6061‑ T6 or of equivalent strength.

### Insulated Flexible Ducts:

#### UL 181, Class 1, mechanically-locked spun nylon fabric supported by helically wound spring steel wire; fiberglass insulation; fire retardant polyethylene vapor barrier film.

#### Pressure Rating: 6 inches WG positive, 5.0 inches WG negative (through 16” diameter), 1.0’ WG negative (18” to 20”).

#### Maximum Velocity: 5500 fpm.

#### Temperature Range: ‑20 degrees F to 250 degrees F.

#### Minimum Sound Attenuation Performance (Insertion Loss in dB of 12’ Length of 12” Round Duct):

##### 63 Hz Octave Band: 13

##### 125 Hz Octave Band: 37

##### 250 Hz Octave Band: 31

##### 500 Hz Octave Band: 34

##### 1 kHz Octave Band: 37

##### 2 kHz Octave Band: 47

##### 4 kHz Octave Band: 34

#### Manufacturer: Flexmaster Type 6B or equivalent.

### Fasteners: Rivets, bolts, or sheet metal screws.

### Joint & Seam Sealant: Shall be a flexible, water-based, adhesive sealant designed for use in all pressure duct systems. After curing, it shall be resistant to ultraviolet light and shall prevent the entry of water, air, and moisture into the duct system. Sealer shall be UL 723 listed and meet NFPA requirements for Class 1 ductwork. VOC shall be <75 g/l.

#### Solids Content: Minimum 65 percent.

#### Shore A Hardness: Minimum 20.

#### Mold and mildew resistant.

#### Service: Indoor or outdoor.

#### Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum sheets.

#### Manufacturer: Ductmate Industries PROseal or equivalent.

### Hanger Rod: ASTM A36; steel or galvanized, threaded.

## SHOP FABRICATED DUCTWORK

### Fabricate, reinforce and support in accordance with SMACNA HVAC Duct Construction Standards ‑ Metal and Flexible, latest edition, and as indicated. Provide duct material, gages, reinforcing, and sealing for operating pressures indicated.

### Construct T's, and elbows in accordance with SMACNA HVAC Duct Construction Standards-Metal and Flexible, latest edition, using radius of not less than 1‑1/2 times width of duct on centerline. Where mitered rectangular elbows are used or indicated, provide dual wall airfoil turning vanes.

### Reference SMACNA figure 2-9 to construct gradual transitions where ductwork changes size or offsets.

## MANUFACTURER FABRICATED DUCTWORK

### Fabricate, reinforce and support in accordance with SMACNA HVAC Duct Construction Standards ‑ Metal and Flexible, latest edition, and as indicated. Provide duct material, gages, reinforcing, and sealing for operating pressures indicated.

### Round and oval duct shall be spiral lockseam duct with light reinforcing corrugations unless indicated otherwise.

### Construct T's, bends, and elbows with minimum bend radius elbows shall be 1.5 times the duct diameter (major or minor axis on oval ductwork depending on direction of bend). Where not possible and where mitered elbows are used or indicated, provide double wall airfoil turning vanes.

### Fabricate round and oval duct; fittings in accordance with SMACNA Standards. Joints shall be minimum 2 inch insertion length for joint connections.

### Weld ductwork is to be weld with filler rod of the same material as the metal that is being welded. Coat welded joints with protective paint to prevent damage to galvanized surfaces.

### On round and oval ducts, provide 45 deg wye tee take-offs or 90 deg conical tee take-offs or 45 degree low loss entry tee take-offs or other fitting as indicated on plans. Straight taps are not acceptable.

## TRANSVERSE DUCT CONNECTION SYSTEM – RECTANGULAR DUCT

### Slide on flange system: Ductmate and Ductmate WDCI connection system complete with interlocking angle and duct edge connection system with sealant, gasket, cleats, and corner clips. Gasket material shall be chemical resistant material in all fume exhaust ductwork.

### Formed on flange system: TDC, TDF or equivalent connection system or equivalent. Such flanges shall be constructed as SMACNA T-24 flange (Page 1-25 and 1-37 ’85 SMACNA Duct Construction Manual, 1985 Edition).

## TRANSVERSE DUCT CONNECTION SYSTEM – ROUND AND OVAL DUCT

### Slip type connector: Keating coupler.

### Slide on flange system. Spiralmate and Ovalmate connection system complete with interlocking angle and duct edge connection system with sealant, gasket, cleats, and corner clips.

### Formed on flange system: Factory-applied Van Stone connection on one end of the duct with field-applied Van Stone connecter on the other end of the duct. Provide factory-applied Van Stone connections on each end of fittings.

## LOUVER BACKPAN

### Fabricate in accordance with SMACNA HVAC Duct Construction Standards ‑ Metal and Flexible and NFPA 96.

### Construct of 18-gage galvanized steel using continuous external welded joints.

### Welded ductwork is to be welded with filler rod of the same material as the metal that is being welded. Prime coat and paint welded joints with cold galvanized paint.

### Slope bottom to prevent accumulation of water. Provide drains as necessary.

## DOUBLE WALL, PRE-MANUFACTURED SHEET METAL PLENUMS (OUTSIDE AIR PLENUM, RELIEF AIR PLENUM)

### General: Double wall, insulated pressurized plenum equipment shall be provided as indicated on the drawings. All panels and components shall be prefabricated and supplied by a nationally recognized manufacturer with published standards of construction, assembly and technical performance. Provide plenum as manufactured by McGill Airflow or equivalent.

### The entire plenum installation shall be designed by the plenum manufacturer to be self-supporting. Where roof spaces or loading require additional strength, it shall be provided by heavier panel skins, additional structural members and necessary pipe columns. The installer shall furnish and install all such additional structural members according to the drawings and details furnished by the plenum manufacturer.

### The finished plenum shall be able to withstand a positive internal static pressure of 4" and a negative internal static pressure of -4". Under these static conditions, the assembled structure shall not exhibit any panel joint deflections in excess of L/200 where L is the unsupported span length of any panel section within the completed plenum.

### Joint Construction: Snap-lock type with continuous self-locking joint on both inside and outside of panel surface.

### All panels shall be 4" thick with solid galvanized exterior shell and a solid galvanized interior shell as noted on the drawings and mechanical equipment schedule.

### Outer shall be constructed of minimum 18-ga. galvanized sheet metal. Inner shell shall be constructed of minimum 22-ga. galvanized solid sheet metal.

### Assembly Trim: Minimum 18-ga. hot-dipped galvanized steel furnished in standard lengths to be field cut.

### All perimeter and longitudinal steel channel shall be constructed of ASTM Type A-446 structural quality galvanized steel with a minimum of 18 gage thickness or ASTM Type A-526 galvanized steel with a minimum of 16 gage thickness.

### Each panel assembly shall be completely filled acoustical/thermal insulating material that is inert, mildew and mold resistant as well as vermin proof. Insulation shall have a flame spread rating of 25 and smoke developed rating of 50.

### Thermal Performance: Insulating materials shall have a maximum thermal conductance of 0.06 Btu / Hr per square foot per Deg F (@ 75 Deg F mean temperature).

### Personnel Access Doors: Provide personnel access doors where shown on the plans. Door sizes shall be 36”W x 66”H. All access door panels and doors shall be constructed of 18-ga. solid galvanized steel inner liner and galvanized outer shell. Each door shall have a minimum of two ball bearing hinges and two wedge-lever door handles. All levers shall be operable from inside or outside the casing. Door swings shall be as indicated on the plans. Doors shall seat against neoprene gasket material, installed around entire perimeter of door. Provide 12" square viewing windows which are composed of double-glazed layers of wire reinforced safety glass separated by an air space and sealed with rubber seals.

### Plenum construction shall be fully coordinated with other trades to accommodate walls, floor, structure, piping, and other components in the vicinity. All penetrations and joints shall be sealed airtight.

# EXECUTION

## INSTALLATION

### Install in accordance with manufacturer's instructions; SMACNA HVAC Duct Construction Standards ‑ Metal and Flexible, current edition and International Mechanical Code requirements.

### All ductwork shall be stored, installed, and maintained per the “Intermediate Level” as defined by SMACNA Duct Cleanliness for New Construction Guidelines, current edition. Acceptable cleanliness shall be verified by UNL BSM prior to air distribution system operation.

### Seal ducts in accordance with SMACNA HVAC Duct Construction Standards ‑ Metal and Flexible, current edition.

### Drawings indicate general arrangement of ducts, fittings, and accessories.

### Construct and install each duct system for the specific duct pressure classification indicated.

### Install round in lengths not less than 12 feet, unless interrupted by fittings.

### Install ducts with fewest possible joints.

### Install fabricated fittings for changes in directions, changes in size and shape, and connections.

### Install only low loss high efficiency fittings at takeoffs. Extractors not allowed.

### Install couplings tight to duct wall surface with a minimum of projections into duct.

### Install ducts, unless otherwise indicated, vertically and horizontally, parallel and perpendicular to building lines; avoid diagonal runs.

### Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.

### Install ducts with a clearance of 2 inch, plus allowance for insulation thickness.

### Conceal ducts from view in finished spaces. Do not encase horizontal runs in solid partitions, unless specifically indicated.

### Coordinate layout with suspended ceiling, fire- and smoke-control dampers, lighting layouts, and similar finished work.

### Electrical Equipment Spaces: Route ductwork to avoid passing through transformer vaults and electrical equipment spaces and enclosures.

### Non-Fire-Rated Partition Penetrations: Where ducts pass through interior partitions and exterior walls, and are exposed to view, conceal space between construction opening and duct or duct insulation with sheet metal flanges of same metal thickness as duct. Overlap opening on four sides by at least 1-1/2 inches.

### Fire-Rated Partition Penetrations: Where ducts pass through interior partitions and exterior walls, install appropriately rated fire damper, sleeve, and firestopping sealant. Fire and smoke dampers are specified in Division 23 Section "Duct Accessories." Firestopping materials and installation methods are specified in Division 07 Section "Firestopping."

### Verify location of air outlets and inlets and make necessary adjustments in position to conform with architectural features, symmetry, and lighting arrangement. Refer to reflected ceiling plans, finish schedule, material finish specification, and shop drawings.

### Coordinate routing with all other trades to establish space requirements for each.

### Contractor may vary route and shape of ductwork and make offsets during progress of work if required to meet structural or other interferences. Where such changes impair the system performance, the changes will be corrected at Contractor’s expense.

### All ductwork shall be substantially and neatly supported on galvanized steel straps or angles riveted or bolted to duct flanges and properly anchored to the construction so that horizontal ducts are without sag or sway, vertical ducts are without buckle, and all ducts are free from the possibility of deformation, collapse or vibration.

### Openings required for ductwork through structural elements in new construction shall be coordinated with the General Contractor. Shop drawings locating such openings shall be prepared in ample time to meet the construction schedule.

### Provide sleeves at all duct penetrations through walls, floors and roofs. Openings through sound-rated partitions shall have annular space stuffed with fiberglass insulation for full thickness of wall.

### Provide 2-inch deep bitumastic coated drip pans on all non-ducted hoods, fans or penthouses used for relief or exhaust air service. Pans shall be 12 inches larger all around than roof opening with clear vertical openings between pan and structure as indicated. Insulate pan where indicated.

### Install automatic control dampers as recommended by the manufacturer.

### Prevent passage of unfiltered air around filters with felt, rubber, neoprene gaskets, or other approved safing material.

### Provide openings in ductwork to accommodate thermometers and controllers. Provide pitot tube openings for testing of systems, complete with metal cap with spring device or screw to prevent air leakage.

### Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.

### During construction, provide temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering ductwork system. Keep openings covered until ready for continuing duct run or final connections.

### Paint ductwork visible behind wall-mounted air outlets and inlets matte black.

### Change duct sizes gradually, not exceeding 30 degrees divergence and 20 degrees convergence. Blunt transitions are not acceptable.

### Use crimp joints with or without bead for joining round duct sizes 8 inches and smaller and install with crimp in direction of air flow.

### Provide closure flanges around exposed ductwork at wall and ceiling penetrations, 1-1/4 inches wide minimum.

### Provide flexible connect between ductwork and all moving equipment.

#### Provide 1-inch slack for free movement.

### Join VAV boxes to medium pressure supply duct mains with minimum straight length of duct equal to 5 times box inlet diameter size. Duct to be rigid and the same size as VAV box inlet. Flexible ductwork is not allowed to join boxes to supply duct main.

### Protect duct interiors from the elements and foreign materials until building is enclosed. Follow SMACNA’s “Duct Cleanliness for New Construction”.

### Threaded cap test holes shall be provided in all ductwork. Test holes shall be installed after the reheat coil in all VAV boxes. Provide extensions to allow for insulation thickness. Test holes shall be “Ventlok” or equal.

## GENERAL

### Install in accordance with manufacturer's instructions; SMACNA HVAC Duct Construction Standards ‑ Metal and Flexible, current edition and International Mechanical Code requirements.

### Seal ducts in accordance with SMACNA HVAC Duct Construction Standards ‑ Metal and Flexible, current edition.

### Duct sizes are inside clear dimensions. For lined ducts, maintain sizes inside lining.

### Provide openings in ductwork where required to accommodate thermometers and controllers.

### Do not allow round duct to be fitted to oval by deformation alone. A round-to-oval transition must be used.

### Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.

### Cover all exposed fiberglass insulation with duct tape.

### During construction provide temporary closures of metal or tape polyethylene on open ductwork to prevent construction dust from entering ductwork system.

### Connect flexible ducts to metal ducts with stainless steel bands with worm gear tightener, nylon bands are unacceptable.

### Duct transition from round to rectangular and vise versa shall be made with rectangular to round duct transition fitting.

### Provide flange-type joint at transverse joints or seal as specified. All transverse joints shall be inspected by the Owner prior to insulating ductwork.

### Duct work upstream of air terminal units shall be rigid duct with minimum five diameters of straight ductwork upstream of air terminal unit inlet or 18” whichever is greater. Straight duct shall be the same inside diameter as air terminal unit inlet. No reducers, flex duct or change of direction allowed within this distance.

### Air terminal take-offs from rectangular main ducts shall be lo-loss 45°F take-offs, extractors are not allowed.

### Diffusers and register take-offs from rectangular duct mains shall be lo-loss 45° fittings, with integral balancing damper that is provided with stand-off bracket and quadrant lock. Extractors are not allowed.

### A maximum length of 3’ of flexible duct is allowed upstream of each diffuser or grille. See details on Drawings.

### Exhaust grille/register branch duct connections to rectangular mains shall be lo-loss 45° entry fittings with integral balancing damper.

### Set plenum doors 6 to 12 inches above floor. Arrange door swings so that fan static pressure holds door in closed position.

### Plenum construction shall be fully coordinated with other trades to accommodate walls, floor, structure, piping, and other components in the vicinity. All penetrations and joints shall be sealed airtight.

## INSTALLATION OF 2" AND GREATER PRESSURE CLASS DUCTWORK (POSITIVE OR NEGATIVE PRESSURE)

### All round and oval duct elbows installed shall be die-formed, gored, pleated or mitered. All mitered elbows shall be equipped with turning vanes.

### On round and oval ducts, provide 45 deg wye or 90 deg conical tee take-offs as indicated on plans. Straight taps are not acceptable.

### All diverging flow fittings shall be constructed such that no excess material projects from the body into the branch tap entrance.

### Transverse joints of all rectangular ducts greater than 24" wide or deep shall be fabricated with flanging system as called out previously (Ductmate or equivalent).

## INSTALLATION OF 1" AND LESS PRESSURE CLASS DUCTWORK (POSITIVE OR NEGATIVE PRESSURE)

### All round duct elbows installed shall be of the adjustable, die-formed, gored, pleated or mitered type. All adjustable elbows shall be sealed after installation.

### All mitered elbows shall be equipped with turning vanes.

### Connect ceiling diffusers to low pressure ducts with adjustable elbow at duct and short length of flexible duct held in place with strap or clamp. Do not use flexible duct to change direction. Connection detail as well as maximum length of flex duct allowed to diffusers is indicated on the plans.

## PLENUMS

### General

#### Unless otherwise noted, mount casings on 4-inch high concrete curbs.

## INSTALLATION OF EXPOSED DUCTWORK

### Protect ducts exposed in finished spaces from being dented, scratched, or damaged.

### Trim duct sealants flush with metal. Create a smooth and uniform exposed bead. Do not use two-part tape sealing system.

### Grind welds to provide smooth surface free of burrs, sharp edges, and weld splatter. When welding stainless steel with a No. 3 or 4 finish, grind the welds flush, polish the exposed welds, and treat the welds to remove discoloration caused by welding.

### Maintain consistency, symmetry, and uniformity in the arrangement and fabrication of fittings, hangers and supports, duct accessories, and air outlets.

### Repair or replace damaged sections and finished work that does not comply with these requirements.

### Exposed ductwork serving ventilated workstations and corrosive storage cabinets:

#### Install the exposed stainless steel ductwork serving the ventilated workstations with the longitudinal weld facing the adjacent wall and away from public view. If possible, install one continuous exposed duct without transverse joints. Install escutcheon ring at ceiling penetration. Ring shall be same material and same finish as exposed duct. Note that exposed ductwork shall be provided with a No. 4 finish. Verify acceptable appearance of installed ductwork with Architect after installation.

## CLEANING

### The air handling units, energy recovery wheel, exhaust fans, and other HVAC airside equipment shall not be used for temporary building conditioning without the written permission from the Owner and Architect/Engineer. Open ductwork that has been installed shall be protected during the duration of the project with polyethylene plastic and duct tape over the open ends. Uninstalled ductwork shall be protected from construction dust by covering the uninstalled ductwork with polyethylene plastic. Prior to installing ductwork, the inside of the ductwork shall be wiped down or vacuumed.

### Clean inside all air handling units, energy recovery units, and outside air duct systems before the fans are turned on. Call for inspection by the owner’s representative to verify that all ducts are cleaned. If the ductwork is unacceptable, the contractor shall provide vacuuming of these duct systems by forcing air at high velocity through duct where manual cleaning in not possible due to duct lengths or size. Call for re-inspection by Owner's representative.

### Protect equipment which may be harmed by excessive dirt with temporary filters, or bypass during cleaning.

### Call for inspection by Owner's representative.

### Install a fresh set of filters in all equipment immediately prior to project turnover.

## DUCTWORK SCHEDULE

## [Note to A/E: Check and revise pressure class column in Ductwork Schedule based on project specific requirements]

| **Duct System:** | **Material:** | **Longitudinal Joints:** | **Transverse Joints:** | **Pressure Class:** | **Sealant Class:** | **Leakage Class:** | **Additional Notes:** |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Outside air system upstream of AHU | Galv. Steel | 3A | 4A, 4C | -2” | B | 24 |  |
| Rectangular SA system upstream of terminal units | Galv. Steel | 3A, 3E | 4A, 4C, 4D | +4” | A | 6 | 8B |
| Round SA system upstream of terminal units | Galv. Steel | 3C, 3E | 4B, 4D | +4” | A | 3 | 8B |
| Rectangular SA system downstream of terminal units | Galv. Steel | 3A, 3B, 3E | 4A, 4C, 4D | +2” | A | 24 | 8B |
| Round SA system downstream of terminal units | Galv. Steel | 3C, 3E | 4B, 4D | +2” | A | 12 | 8B |
| Rectangular general EA or RA system upstream of terminal unit | Galv. Steel | 3A, 3B, 3E | 4A, 4C, 4D | -2” | A | 24 | 8B |
| Round general EA or RA system upstream of terminal unit | Galv. Steel | 3C, 3E | 4B, 4D | -2” | A | 12 | 8B |
| Rectangular general EA or RA system downstream of terminal unit | Galv. Steel | 3A, 3E | 4A, 4C, 4D | -4” | A | 6 | 8B |
| Round general EA or RA system downstream of terminal unit | Galv. Steel | 3C, 3E | 4B, 4D | -4” | A | 3 | 8B |
| Rectangular fume EA system upstream of terminal unit | Stainless Steel | 3A, 3B, 3E | 4A, 4C, 4D | -2” | A | 6 | 8B |
| Round concealed fume EA system upstream of terminal unit | Stainless Steel | 3C, 3E | 4B, 4D | -2” | A | 3 | 8B |
| Round exposed fume EA system upstream of terminal unit | Stainless Steel | 3E | 4D | -2” | A | 3 | 8B |
| Rectangular fume EA system downstream of terminal unit | Stainless Steel | 3A, 3E | 4A, 4C, 4D | -4” | A | 6 | 8B |
| Round fume EA system downstream of terminal unit | Stainless Steel | 3C, 3E | 4B, 4D | -4” | A | 3 | 8B |

**DUCTWORK SCHEDULE NOTES:**

Longitudinal Joint Options:

3A: Pittsburgh lock. Refer to Figure 1-5, SMACNA.

3B: Button punch snap lock. Refer to Figure 1-5, SMACNA.

3C: Spiral lockseam.

3D: Snaplock.

3E: Welded.

3F: Double-wall, pre-manufactured sheet metal plenum.

Transverse Joint Options:

4A: Pre-manufactured flanged duct connection system specified under “Products” section of this specification.

4B 0-24” Major Axis Diameter: Interior slip coupling beaded at center, fastened to duct with sealing compound applied continuously around joint before assembling and after fastening.

 26” Major Axis Diameter and Up: Pre-manufactured flanged duct connection system specified under “Products” section of this specification.

4C: Any standard transverse joint as shown in Figure 1-4 of SMACNA is acceptable.

4D: Welded

Sealant Class Options:

6: Seal class is defined by the following table (refer to Table 4-1, SMACNA HVAC Air Duct Leakage Test Manual):

|  |  |
| --- | --- |
| Seal Class: | Sealing Required: |
| A | All transverse joints, longitudinal seams, and ductwork penetrations. Pressure sensitive tape shall not be used as a primary sealant on metal ducts. |
| B | All transverse and longitudinal seams. Pressure sensitive tape shall not be used as a primary sealant on metal ducts. |
| C | Transverse joints only. |

Leakage:

7: Leakage Class is defined by Figure 4-1, SMACNA HVAC Air Duct Leakage Test Manual.

Additional Comments:

8A: See Drawings for further information regarding extent of stainless steel ductwork.

8B: Field welded ductwork is to be welded with filler rod of the same material as the metal that is being welded. Field coat welded joints with protective paint to prevent damage to galvanized surfaces.

## PRESSURE TESTING

### Perform the following field tests and inspections according to SMACNA’s “HVAC Air Duct Leakage Test Manual” and prepare test reports:

#### Disassemble, reassemble, and seal segments of systems to accommodate leakage testing and for compliance with test requirements.

#### Conduct tests at static pressures equal to maximum design pressure of system or section being tested. If pressure classes are not indicated, test entire system at maximum system design pressure. Do not pressurize systems above maximum design operating pressure. Give seven days’ advance notice for testing.

#### Maximum Allowable Leakage: Refer to paragraph 3.6.

#### Remake leaking joints and retest until leakage is equal to or less than maximum allowable.

#### Test no less than 25% of the supply air ductwork upstream of terminal units, 25% of the return air ductwork downstream of terminal units, 25% of the exhaust air ductwork downstream of terminal units, and 50% of the fume exhaust ductwork downstream of terminal units.

## CLEANING NEW SYSTEMS

### Duct cleaning and general cleanliness shall be compliant with the SMACNA: “Duct Cleanliness for New Construction Guidelines”, Advanced Level.

### Ductwork shall not be used for temporary building space conditioning during construction without the written permission from the NU FPC Project Manager. If ductwork is approved for operation prior to substantial completion, the contractor shall coordinate temporary filtration with NU FPC Engineering. In addition, the contractor is fully responsible for all cleaning of the duct systems to the satisfaction of NU FPC.

END OF SECTION 23 31 13