

METAL DUCTS

1. GENERAL

1.1 Scope

- .1 Ductwork and plenums
- .2 Balancing dampers
- .3 Fasteners
- .4 Sealants
- .5 Diffusers
- .6 Duct insulation & recovery

1.2 Definitions

- .1 Low Pressure: static pressure in duct less than 500 Pa (2 in.wg.) and velocities less than 10 m/s (2000 fpm).
- .2 Duct sizes shown on plans are inside clear dimensions. For acoustically lined or internally insulated ducts, maintain sizes inside ducts.

1.3 Quality Assurance

- .1 Ductwork shall meet the requirements of NFPA No. 90A - Air Conditioning and Ventilating Systems; and NFPA No. 90B - Standard for the Installation of Warm Air Heating and Air Conditioning Systems.
- .2 Fabricate in accordance with SMACNA duct manuals and ASHRAE handbooks.
- .3 Insulation shall be installed by skilled workmen regularly engaged in this type of work.
- .4 Flexible air duct shall conform to NFPA 90A and UL181 standard for factory made air duct materials and air duct connectors.

1.4 Submittals

- .1 Submit Shop Drawings and samples of duct fittings for approval, including particulars such as gauge sizes, welds and configurations prior to start of work.

1.5 Alternatives

- .1 Obtain written permission from the Contract Administrator prior to making variations in duct configuration or sizes. Size alternatives using ASHRAE table for circular equivalents of rectangular ducts.

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2. PRODUCTS

2.1 Duct Materials

- .1 Ducts: galvanised steel lock forming quality, having galvanised coating of 380 g/m² (1.25 oz/ft²) for both sides.
- .2 Fasteners: use rivets and bolts throughout; sheet metal screws accepted on low pressure ducts. Weld kitchen exhaust ducts.
- .3 Sealant: water resistant, fire resistive, compatible with mating materials.
- .4 Flexible Duct - Low Pressure: flexible air duct shall be used where shown on drawings. Length of flexible duct shall not exceed 900 mm. Flexible duct shall be polymeric liner banded to a steel wire helix, wrapped with fiberglass insulation and outer fiberglass reinforced metallised vapour barrier jacket. Flexible duct rated for 12 m/s (2400 fpm) velocity and pressure rated for 500 Pa (2 in.wg.) positive and 500 Pa (2 in.wg.) negative.
 - .1 Standard Acceptance: Thermaflex M-KE.
- .5 Flexible Duct - Medium and High Pressure: flexible air duct may be used to connect terminal units to metal duct. Length of flexible duct shall not exceed 300 mm. Flexible duct shall be woven and vinyl coated fiberglass liner bonded to a steel wire helix. Where flexible air duct is attached to metal insulated duct, furnish flexible air duct with fiberglass insulation and outer fiberglass reinforced metallised vapour barrier jacket. Flexible duct rated for 30 m/s (6000 fpm) velocity and pressure rated for 4.0 kPa (16 in.wg.) positive and 500 Pa (2 in.wg.) negative.
 - .1 Standards of Acceptance:
 - .1 Uninsulated - Thermaflex S-TL; Insulated - Thermaflex M-KC.

2.2 Balancing Dampers

- .1 Fabricate of galvanised steel, minimum 1.6 mm (16 ga). Full blade-length shafts of hollow square construction with blades rigidly fastened along entire blade length.
- .2 On round ducts construct of single blade (butterfly) type. On 500 Pa (2 in wg) class and on all dampers over 300 mm diameter fabricate with full blade-length shaft.
- .3 On round ductwork install operating mechanism on a steel mounted base firmly secured to the ductwork.

2.3 Diffusers (S-1)

- .1 EH Price steel square 3-cone diffuser with 150mm neck connection, for T-bar ceiling installation and finished in a white powder coat.
- .2 Size air outlets as indicated on drawings.

2.4 Duct Insulation & Recovery (Ducts Exposed to Outdoors)

- .1 50 mm insulation thickness with aluminum recovery jacketing.

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- .2 Insulation: Flexible fibrous glass or mineral fibre insulation, "K" value maximum 0.035 W/m°C (0.25 BTUh-in/(sqft°F)) at 24°C (75°F). Hot duct service temperature 20°C (68°F) to 65°C (150°F).
- .3 Recovery Jackets: 0.9 mm (20 ga) embossed aluminum sheet.

3. EXECUTION

3.1 Plenum Gauges

- .1 Fabricate fan plenums and plenums downstream of fan in accordance with SMACNA manual.
- .2 Fabricate plenums between fan and upstream apparatus of 1.6 mm (16 ga) thick material.
- .3 Fabricate plenums between filters and upstream apparatus of 1.3 mm (18 ga) thick material.

3.2 Duct Sealing

- .1 All supply, return and exhaust duct joints, longitudinal as well as transverse, should be sealed using:
 - .1 Low Pressure Ductwork:
 - .1 Slip Joints: apply heavy brush-on high pressure duct sealant. Apply second application after the first application has completely dried out. Where metal clearance exceeds 1.5 mm (0.06 inch) use heavy mastic type sealant.
 - .2 Flanged Joints: soft elastomer butyl or extruded form of sealant between flanges followed by an application of heavy brush-on high pressure duct sealant.
 - .3 Other Joints: heavy mastic type sealant.
 - .2 Medium and High Pressure Ductwork: combination of woven fabrics and sealing compound followed by an application of high pressure duct sealant.
- .2 Duct tapes as sealing method are not permitted.
- .3 Surfaces to receive sealant should be free from oil, dust, dirt, moisture, rust and other substances that inhibit or prevent bonding.
- .4 Prior to sealing all ductwork, demonstrate sealing of a section of each type of duct and obtain approval from the Contract Administrator.
- .5 Do not insulate any section of the ductwork until it has been inspected and approved of duct sealant application.

3.3 Installation

- .1 Locate ducts with sufficient space around equipment to allow normal operation and maintenance activities.

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- .2 Provide openings in ductwork where required to accommodate thermometers and controllers. Provide pitot tube openings where required for testing of systems, complete with metal can with spring device or screw to ensure against air leakage. Where openings are provided in insulated ductwork, install insulation material inside a metal ring.
- .3 Interrupt duct linings at fire, balancing backdraft and smoke dampers so as not to interfere with operation of devices. Provide sheet metal edge protection over linings on both sides of damper device.
- .4 Shield ductwork from dust and construction material during construction. Clean any ductwork found to be dirty at no extra cost to the Contract.
- .5 Protect carbon steel ductwork exposed to weather by painting or coating with suitable weather resistant material.
- .6 Do not use flexible duct to change direction. Provide a minimum of three (3) duct diameters of straight metal duct between box inlet and flexible connector.
- .7 Connect diffusers or troffer boots to low pressure ducts with 300 mm maximum length of flexible duct. Hold in place with caulking compound and strap or clamp.
- .8 Prove that ductwork is substantially airtight before covering or concealing.
- .9 Clean duct systems and force air at high velocity through duct to remove accumulated dust. To obtain sufficient air, clean half the system at a time. Protect equipment which may be harmed by excessive dirt with filters or bypass during cleaning.
- .10 Fabricate ductwork from field measurements and not from plans and shop drawings exclusively. Failure to do so will not constitute an extra to the Contract.
- .11 Complete metal ducts within themselves with no single partition between ducts. Where width of duct exceeds 450 mm, cross brace for rigidity. Open corners are not acceptable.
- .12 Lap metal ducts in direction of air flow. Hammer down edges and slips to leave smooth duct interior.
- .13 Construct tees, bends and elbows with radius of not less than 1-1/2 times width of cut on centre line. Where not possible and where rectangular elbows are specified, provide double wall air foil type turning vanes. Where acoustical lining is provided, provide turning vanes of perforated metal type with fibreglass inside.
- .14 Increase duct sizes gradually, not exceeding 15° divergence wherever possible. Maximum divergence upstream of equipment to be 30° and 45° convergence downstream.
- .15 Rigidly construct metal ducts with joints mechanically tight, substantially airtight, braced and stiffened so as not to breathe, rattle, vibrate or sag. Caulk duct joints and connections with sealant as ducts are being assembled. Seal seams on fresh air and exhaust ducts watertight with mastic or low velocity duct sealant.
- .16 Set plenum doors 150 mm above floor. Arrange door swings so that fan static holds door in closed position.

END OF SECTION