PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes metal ducts for supply, return, outside, and exhaust air-distribution systems in pressure classes from minus 2- to plus 10-inch wg. Metal ducts include the following:
   1. Rectangular ducts and fittings.
   2. Single-wall, round, and flat-oval spiral-seam ducts and formed fittings.
   3. Double-wall, round, and flat-oval spiral-seam ducts and formed fittings.
   4. Plenum.
   5. Duct liner.

B. All ductwork and duct accessories shall be seismically supported and braced per the SMACNA “Seismic Restraint Manual: Guidelines for Mechanical Systems”. Any portions that are not covered in standard shall be designed and stamped by a registered Engineer.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Galvanized Steel Ducts: Lock-forming quality; ASTM A 653/A 653M, G90 (Z275) coating designation; mill-phosphatized finish for surfaces of ducts exposed to view.

B. Comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods, unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

C. Fasteners: Rivets, bolts, or sheet metal screws shall be cadmium plated.

D. Sealant: Non-hardening, water-resistant, fire resistive, compatible with mating materials; liquid used alone or with heavy mastic.

E. Hanger Rod: ASTM A36; steel, galvanized; threaded both ends, threaded one end, or continuously threaded.

PART 3 - EXECUTION

3.1 GENERAL

A. Install manufactured ductwork and fittings in accordance with manufacturer's instructions.

B. Install and seal ducts in accordance with SMACNA DCS and SMACNA HVAC Air Duct Leakage Test Manual.

C. Fabricate ductwork in a workmanlike manner with airtight joints, presenting smooth surfaces on inside, neatly finished on outside, construct with curves, bends, turning vanes to aid the easy flow of air.

D. Connect diffusers to low pressure ducts directly or to single pieces of flexible duct not over maximum 7'-0" in length.

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

3.2 CLEANING NEW SYSTEMS

A. Mark position of dampers and air-directional mechanical devices before cleaning, and perform cleaning before air balancing.

B. Use service openings, as required, for physical and mechanical entry and for inspection.
   1. Create other openings to comply with duct standards.
   2. Disconnect flexible ducts as needed for cleaning and inspection.
   3. Remove and reinstall ceiling sections to gain access during the cleaning process.

C. Vent vacuuming system to the outside. Include filtration to contain debris removed from HVAC systems, and locate exhaust down wind and away from air intakes and other points of entry into building.

D. Clean the following metal duct systems by removing surface contaminants and deposits:
   1. Air outlets and inlets (registers, grilles, and diffusers).
   2. Supply, return, and exhaust fans including fan housings, plenums (except ceiling supply and return plenums), scrolls, blades or vanes, shafts, baffles, dampers, and drive assemblies.
   3. Air-handling unit internal surfaces and components including mixing box, coil section, air wash systems, spray eliminators, condensate drain pans, filters and filter sections, and condensate collectors and drains.
   4. Coils and related components.
   5. Return-air ducts, dampers, and actuators except in ceiling plenums and mechanical equipment rooms.
   6. Supply-air ducts, dampers, actuators, and turning vanes.

E. Mechanical Cleaning Methodology:
   1. Clean metal duct systems using mechanical cleaning methods that extract contaminants from within duct systems and remove contaminants from building.
   2. Use vacuum-collection devices that are operated continuously during cleaning. Connect vacuum device to downstream end of duct sections so areas being cleaned are under negative pressure.
   3. Use mechanical agitation to dislodge debris adhered to interior duct surfaces without damaging integrity of metal ducts, duct liner, or duct accessories.
   4. Clean fibrous-glass duct liner with HEPA vacuuming equipment; do not permit duct liner to get wet.
   5. Clean coils and coil drain pans according to NADCA 1992. Keep drain pan operational. Rinse coils with clean water to remove latent residues and cleaning materials; comb and straighten fins.

F. Cleanliness Verification:
   1. Visually inspect metal ducts for contaminants.
   2. Where contaminants are discovered, re-clean and reinspect ducts.

G. Protect duct interiors from the elements and foreign materials until building is enclosed. Follow SMACNA's "Duct Cleanliness for New Construction Guidelines." Comply with the following table:

DUCT CLEANLINESS STANDARDS Cleanliness level of ductwork applies to the entire supply return and exhaust air duct systems of the air handling unit(s) or fans serving each area.	
AREA SERVED	SMACNA "DUCT CLEANLINESS FOR NEW CONSTRUCTION GUIDELINE (© SMACNA 2000 Duct Cleaning Technical paper 4-01 .pdf by SMACNA Duct Cleaning Taskforce)
Office Spaces	Intermediate Level (B)
All exhaust systems after airflow measuring devices	Basic Level (A)
All Exhaust Systems prior to airflow measuring devices	Intermediate Level B
All other areas	Intermediate Level (B)

The following is a summary of SMACNA duct cleanliness levels. Refer to the entire document for details:

3.2 BASIC LEVEL

3.2.1CONDITION OF DUCTS

Ductwork leaving the premises of the manufacturer will include some or all of the following:

(a) internal and/or external self-adhesive labels or marking for part(s) identification;
(b) exposed mastic sealant;
(c) light zinc oxide coating on the metal surface;
(d) a light coating of oil on machine formed ductwork;
(e) minor protrusions into the airway of rivets, screws, bolts, and other jointing devices;
(f) internal insulation and associated fasteners;
(g) discoloration marks fro plasma cutting process.

It should be noted that ductwork will not be wiped down or specially cleaned at this level unless specified.

3.2.2DELIVERY TO SITE

Unless otherwise specified, ductwork delivered from the premises of the manufacturer will have no protection. However, care must be taken to prevent damage during transportation and off loading.

3.2.3INSTALLATION

Before the installation of individual duct sections they are to be inspected to ensure that they are free from all debris, but not be wiped or specially cleaned.

3.2.4PROTECTION OF DUCTWORK RISERS

All risers must be coverd to prevent the entry of debris into the duct.

3.2.5DOWNWARD FACING AND HORIZONTAL DUCT OPENINGS

Downward facing and horizontal openings will not be required to be covered.

3.2.6ACCESS PROVISIONS FOR ON-GOING MAINTENANCE

The specifier shall define the size, location and type of access opening required for maintenance of the system.

3.2.7ACCESS OPENINGS TO IN-DUCT PLANT

Access covers shall be firmly fitted in position on completion of each section of the work.

3.3 INTERMEDIATE LEVEL (B)

In addition to the provisions of the basic level, the following requirements should also be undertaken:

3.3.1SITE STORAGE

The area provided for storage shall be clean, dry, and exposure to dust minimized.

3.3.2INSTALLATION

(a) the working area should be clean and dry and protected from the elements;
(b) the internal surfaces of the uninsulated ductwork shall be wiped to remove excess dust immediately prior to installation;
(c) open ends on completed ductwork and overnight work-in-progress shall be sealed.

3.4 ADVANCED LEVEL (C)

In addition to the provisions of the intermediate level, the following requirements should also be undertaken:

3.4.1PRODUCTION AND SITE DELIVERY REQUIREMENTS

(a) all self-adhesive labels for part identification are to be applied to external surfaces only;
(b) to maintain cleanliness during transportation, all ductwork shall be sealed either by blanking or capping duct ends, bagging small fittings, surface wrapping or shrink wrapping.

3.4.2 SITE STORAGE

(a) a clean and dry environment where the ductwork is protected from dust, must be provided for the storage of ductwork prior to installation;
(b) all sealed ends shall be visually examined and if damaged resealed with an appropriate material.

3.4.3 INSTALLATION

The working area shall be clean, dry and the ductwork protected from dust. Protective coverings shall only be removed immediately before installation and inspected to determine if additional wipe down is necessary.

END OF SECTION