

5.23.31 – HVAC DUCTS

DESIGN AND CONSTRUCTION STANDARD

PART 1 GENERAL

1.01 Purpose:

- A. This standard is intended to provide useful information to the Professional Service Provider (PSP) to establish a basis of design. The responsibility of the engineer is to apply the principles of this section such that the University may achieve a level of quality and consistency in the design and construction of their facilities. Deviations from these guidelines must be justified through LCC analysis and submitted to the University for approval.

1.02 References:

- A. Codes and Standards that are Standard at the University:
 - 1. SMACNA Standards: Fabricate, support, install, and seal in accordance with SMACNA's "HVAC Duct Construction Standards, Metal and Flexible".
 - 2. ASHRAE Standards: Comply with ASHRAE Fundamentals Handbook and ASHRAE Systems and Equipment for design and fabrication of ductwork.
 - 3. NFPA Compliance: Install duct systems in compliance with NFPA 90A "Installation of Air Conditioning and Venting Systems".
 - 4. Kitchen Hood Exhaust: Duct systems shall conform to NFPA 96 "Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations".
 - 5. Special Exhaust: Duct systems shall conform to NFPA 91 "Standard for Exhaust Systems for Air Conveying of Vapors, Gases, Mists, and Noncombustible Particulate Solids".

1.03 Requirements:

- A. Medium and high-pressure ductwork is hereby defined as ductwork subject to operating pressures in excess of 2" w.g., positive or negative.
- B. Low pressure ductwork is hereby defined as ductwork subjected to velocities of 2500 fpm or less, and operating pressure of 2" w.g. or less, positive or negative.
- C. Seal ductwork to SMACNA seal Class A. All sealant shall be UL rated with NFPA flame spread of no more than 5 and smoke developed of 0.

[LEED EQ Credit 4.1 Low-Emitting Materials – Specify materials that qualify as low-emitting VOC compounds as defined in the LEED Reference Guide]

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- D. Provide balancing dampers at supply, return, and exhaust branches when connected to larger ducts, as required, for air balancing.
- E. Ductwork taps shall be conical or clinch collar with 45 degree or boot connections.
- F. Connect air devices to low pressure ductwork with five-foot maximum length of flexible duct and provide with a Flex-Flow elbow support.
- G. Provide long-radius elbows ($R/D = 1.5$) unless otherwise indicated.
- H. Transition duct sizes gradually, not exceeding 20 degrees divergence and 30 degrees convergence.
- I. Provide flexible duct connection on all rotating equipment.
- J. Duct sizes shown on drawings shall represent the inside air stream clear area. For interior lined ductwork, upsize duct to maintain clear area inside lining.
- K. Pressure class, as defined by SMACNA, shall be clearly indicated on drawings with appropriate symbols.
- L. Refer to section 5.23.07 for ductwork insulation requirements.
- M. For noise-prone and/or noise-sensitive applications, provide double-wall ductwork with a perforated inner liner for a minimum of ten feet after the first elbow from both supply and return plenums of the air handling unit(s). Liner shall be 2" thick, tested against erosion to at least 110% of scheduled duct velocity, and treated with an anti-microbial surface coating.

PART 2 PRODUCTS

2.01 Materials:

- A. Ductwork Materials: Provide materials which are free from visual imperfections including pitting, seam marks, roller marks, stains and discoloration, and other imperfections, including those which would impair painting.
- A. Sheet Metal: Except as otherwise indicated, fabricate ductwork from galvanized sheet steel complying with ASTM A 527, lockforming quality; with G 90 zinc coating in accordance with ASTM A 525; and mill phosphatized for exposed locations.
- B. Corrosive Fume Exhaust: Typically 304 stainless steel with welded seams unless nature of corrosive fumes require otherwise.
- C. Contact Molded Fiberglass Reinforced Plastic: The National Bureau of Standards

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"Voluntary Product Standard, PS-15-69" shall form the minimum basis for the fabrication of these FRP exhaust duct systems. Resin used shall be the Hetron 197 for its fire retardant and corrosion resistant properties.

- D. Flexible Ducts: Interlocking spiral of galvanized steel or aluminum construction rated to two (2) inches WG positive and 1.5 inches WG negative for low pressure ducts. Flexible duct shall be wrapped with flexible glass fiber insulation, enclosed by seamless aluminum pigmented plastic vapor barrier jacket; maximum 0.23 K value at 75 degrees F.
- E. Flexible Duct Connectors: UL Listed fire-retardant neoprene coated woven glass fiber fabric to NFPA 90A, minimum density 20 ounce per square yard. Provide electrical bonding jumpers across flexible connection.

PART 3 EXECUTION

3.01 Installation Of Ductwork:

- A. General: Assemble and install ductwork in accordance with recognized industry practices which will achieve air-tight and noiseless (no objectionable noise) systems, capable of performing each indicated service. Install each run with minimum number of joints. Align ductwork accurately at connections, within 1/8" misalignment tolerance and with internal surfaces smooth. Support ducts rigidly with suitable braces, and anchors of type which will hold ducts true-to-shape and to prevent buckling.
- B. 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 gage as duct. Overlap opening on 4 sides by at least 1-1/2". Fasten to duct and substrate. Provide fire or fire-smoke dampers as required by Code.

3.02 Testing:

- A. Medium Pressure Leakage: After medium pressure duct system is constructed, test for duct leakage in accordance with the latest versions of ASHRAE 90.1 and SMACNA HVAC Air Duct Leakage Test Manual. Repair leaks and repeat tests until total leakage is less than 1% of system design airflow when the system is pressurized to the design duct pressure class rating.

END OF STANDARD