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## 233100 HVAC DUCTWORK AND ACCESSORIES

### Part 1 – GENERAL

#### 1.1 Description

A. This section details the guidelines and expectations for the design and installation of all HVAC ductwork and accessories on Johns Hopkins University Homewood Campus. Project conditions and requirements vary, thus precluding the absolute adherence to the items identified herein in all cases. However, unless there is adequate written justification and approval from the JHFRE Engineering and Energy Department, it is expected that these guidelines will govern the design and specifications.

#### 1.2 Submittals

N/A

#### 1.3 Quality Assurance

A. Ductwork shall be made of galvanized sheet metal for supply, return and exhaust mains. Construction shall be per SMACNA and ASHRAE standards.

B. All ductwork shall be seal class A and with a minimum thickness of 24 AWG.

C. Corrosive systems and laboratory exhaust may require the use of stainless-steel ductwork. Exhaust ducting from fume hoods shall be type 304 stainless-steel up to the exhaust air main connection unless project requirements dictate otherwise.

D. Ductwork carrying steam or high humidity (dishwasher, sterilizer, cage wash, shower rooms, etc.) shall be stainless steel with welded seams, sloped on the horizontal runs and provided with condensate drains at low points that discharges into a building drain.

E. Internally lined ductwork is typically not desired except for open plenum transfer ductwork. Sound attenuators shall be used for sound attenuation purposes on all pressurized ductwork. Sound attenuation should be comprised of closed cell non-porous material only.

F. All duct systems, devices and components shall comply with the indicated NC in Section 230500.

#### 1.4 Delivery and storage

A. Material deliveries and storage areas to be approved by Owner.

B. All ductwork shall be delivered onsite with plastic wrap on both ends to protect from dust and debris prior to installation.

C. Material storage to comply with manufacturer's recommendations.

D. All ductwork shall be stored in a clean and dry place, indoors and out of the elements prior to installation.

## Part 2 – PRODUCTS

2.1 Supply, return, relief and exhaust ductwork shall be sized depending on the application and pressure classification using the SMACNA guidelines, to include the following:

1. Pressure Class +/- 0.5-inch w.g (Transfer): Max. 600-FPM & 0.05-inch PD/100-feet.
2. Pressure Class +/- 0.5-inch w.g (Branch): Max. 875-FPM & 0.10-inch PD/ 100-feet.
3. Pressure Class +/- 1-inch w.g. (Main): Max. 1200-FPM & 0.10-inch PD/100-feet.
4. Pressure Class +/- 2-inch w.g. or greater (Main): Max. 2500-FPM & 0.25-inch PD/100-feet.

2.2 Ducts shall not have an aspect ratio greater than 4:1.

2.3 Air Inlets and Outlets

A. Air devices shall be selected for the maximum NC given in the table in Section 230500 on 12db room noise absorption and 0.1" of pressure drop. Diffuser neck velocity shall not exceed 650fpm.

B. In damp or wet applications, aluminum shall be specified.

C. Air distribution devices to be coordinated with system type and capable of full to partial flow for VAV systems.

D. Ceiling air diffusers shall typically be square with a flush, louvered face. Mounting shall be lay-in type when used with an acoustical ceiling and surface mounted when used in gypsum board ceilings.

E. High profile areas such as conference rooms, lobbies, executive offices, or other areas as determined during the design process shall consider the use of linear diffusers.

F. Diffusers within 8' of a Bio Safety Cabinet shall be laminar flow type.

G. Volume dampers shall not be placed closer than 5' from an air outlet to avoid unwanted noise. Locate volume dampers at the branch take-off.

H. Supply, return or exhaust registers shall be fixed louvered type, surface mounted, 3/4" spacing at 30° or 45° deflection and shall have opposed blade dampers.

I. Grilles shall be fixed louvered type similar to registers, but without the opposed blade damper.

J. The duct connection shall match the neck size of the air device.

2.4 Air Filters

A. Filters shall comply with ASHRAE 52.2 and be provided with support frames and have gasket seals, including at all ends and access doors.

B. Filters types for critical areas shall be dictated by the specific application.

1. Provide filters rated equivalent to MERV 8 for felt seals and a minimum of MERV 13 for liquid seals.

C. Filters shall have separate holding frame with side access and slide out frames. Frames shall be located to permit easy removal of entire frame for filter replacement.

## 2.5 Duct Silencers

A. Duct silencers shall only be provided if acoustical requirements cannot be met with conventional duct design. Where silencers are provided to achieve the necessary NC ratings for the space in which the duct passes through or resides, detail as necessary and specify to be installed as required per the manufacturer.

B. Duct silencers shall be dissipative type that conforms to the latest ASTM E477 and have double-wall construction with perforated surface that contains an acoustical fill which complies with LEED requirements. Silencers shall be encased with an EPA-registered, anti-microbial agent to mitigate chance of fungal or bacterial growth and is specified to be installed vertically wherever possible for maximum structural integrity. If vertical installation is not possible, specify to provide structural reinforcement for silencers wider than 24”.

## 2.6 Fire and Smoke Dampers

A. Fire and Smoke Dampers shall be implemented as per IBC and NFPA 90A. All fire dampers shall be out of airstream type. Dampers with blades located in the airstream are only acceptable if the commercially available sizes of the dampers do not allow the use of dampers with blades located outside of the airstream. Such dampers shall be fitted with an indicator showing whether the damper is in the opened or closed position. The indicator shall be visible from the floor. Dampers shall be sized to give equivalent free area as connecting duct.

## 2.7 Louvers

A. All louvers shall be sized for an intake/exhaust velocity of 500 fpm or less through the free area of the louver at the face.

## Part 3 – EXECUTION

3.1 Ductwork and associated equipment shall be independently supported from the building structure and shall be isolated from vibration.

3.2 The use of flexible ductwork shall be limited to a maximum of 4’ runs to supply diffusers only. Formal approval shall be given by JHU prior to designing with flexible ductwork outside of this scope.

The installation of flex duct shall avoid creating a situation where a large misalignment may occur in the flex duct compared to both connection points per ASHRAE.

- 3.3 Provide flexible connections of neoprene-coated flameproof fabric wherever ductwork is connected to any rotating pieces of equipment such as fans or air handling units which may induce thermal, axial transverse or torsional movement.
- 3.4 All seams, joints, and fittings on ductwork shall be sealed.
- 3.5 Provide a minimum of 4 duct diameters upstream and downstream of any elbows for branch duct connections.
- 3.6 Increase or decrease duct sizes when duct changes by 4" or greater in one or two dimensions.
- 3.7 To the maximum extent practical, limit duct transitions to only one duct dimension at a time.
- 3.8 Duct-taps shall be 2" smaller than duct size to allow for proper sealing and connection.
- 3.9 Provide manual volume dampers on all air distribution branch ductwork and where necessary for balancing, control and air distribution. Dampers shall be opposed blade with adjustable quadrant and locking device with position indicator.
- 3.10 Provide ductwork identification and directional flow arrows at intervals not greater than 20'.
- 3.11 Provide access doors at all areas in ductwork that will require access to provide servicing or inspection.
  - A. This includes fire and smoke dampers, sound attenuators, control dampers, volume dampers, outside air and exhaust air louvers, duct mounted coils (including steam preheat coils for 100% outdoor air units), waveguides and any other device requiring maintenance.
  - B. Contract drawings shall show access door locations.
  - C. Coordinate access door locations with wall and/or ceiling access to the duct access door.
  - D. Access doors for duct mounted coils shall be located upstream of the coil to facilitate cleaning.
  - E. Provide access doors in the first three duct transitions on the supply and return side of an AHU and in the straight lengths of duct evenly spaced, but at no more than 100' intervals for future inspection and cleaning.
  - F. Provide access doors in the fresh air ductwork of AHUs, to facilitate inspection and cleaning of the outside air duct prior to entering the equipment.
  - G. Access doors shall be an appropriately sized manufactured product with a locking mechanism and hinges which allow for the removal of the door.

1. Access doors shall be sized for the largest of either the largest component removal from the duct system or the minimum of 24"x24" to provide adequate space to allow for personnel to access and clean the duct.

H. Ensure access doors are insulated in compatibility with ductwork.

3.12 All ductwork passing through potentially cold spaces or above/behind drywall ceilings shall be fully insulated to prevent condensation.