PART 1: GENERAL

1.01 RELATED SECTIONS

A. Section 230700 – HVAC Insulation

B. Section 237300 – Air Handling

C. Section 230900 – Building Automation and Control System Guidelines

D. Section 283100 – Fire Alarm System & Detection Systems

1.02 RELATED STANDARD DETAILS

A. Detail 3.8.8, Building Automation and Control System Floor Pressurization Control

1.03 CEILING AIR PLENUMS

A. Ceiling supply air plenums shall not be used.

B. Ceiling return plenums must not be used in laboratories and are discouraged in all other applications. Fully ducted systems are preferred. When ceiling plenums are used:

1. Automatic control dampers with airflow stations shall be installed at each floor level. The dampers shall automatically adjust based on a summation of the supply airflow to the floor, taking into account any fixed or variable exhaust airflow from the floor. The floor shall be kept at a positive or negative pressure by specifying and controlling to an airflow offset. See Cornell Standard Detail 3.8.8, Building Automation and Control System Floor Pressurization Control for additional information.

2. Careful consideration should be given to the design construction details to ensure adequate sealing of the plenum space, including all penetrating chases. Consider performing blower door testing to ensure adequate sealing of the plenum space.

3. Coordinate above ceiling plans to ensure plenum has adequate free area throughout.

4. Design the plenum pressure relative to the occupied space at a differential pressure of 0.04-in w.c. or less. Avoid the use of tile retainer clips.
1.04 DUCTWORK

A. The Consultant is encouraged to size ductwork for as low a pressure drop as feasible, typically with a design pressure drop not to exceed 0.08 in-w.c. per 100-feet. Deviation from this requirement should be discussed with Facilities Engineering.

B. All ductwork shall be constructed and supported in accordance with the latest revision of SMACNA Duct Construction Standards.

C. Access doors shall be installed at each fire damper or duct mounted coil.

1.05 SOUND ATTENUATION

A. Sound traps are the preferred method of sound attenuation. The use of acoustic lining shall be minimized as a means to attenuate sound.

B. When used, lining in medium and high velocity ducts shall have a perforated metal cover (i.e. doublewall construction). Acoustic lining shall be installed in accordance with the latest SMACNA standards. It shall be rated to prevent fiber erosion at air velocities up to 4,000 FPM and shall have a minimum density of 1.5 pounds per cubic foot.

1.06 DUCT ACCESSORIES

A. Fire Dampers: These assemblies shall be UL and FM specification tested. Curtain type fire dampers with blades out of the airstream are preferred, and shall be provided with an integral UL-approved sleeve. Sleeve seams shall be continuously welded or sealed, and the transverse joint should be a sealed UL-approved flanged duct sleeve connection.

1. Acceptable Manufacturers:
   a. Greenheck
   b. Ruskin
B. Combination Fire/Smoke Dampers:

1. These assemblies shall be UL and FM specification tested. The assembly shall be provided with an integral UL-approved sleeve. Jackshaft penetrations shall be provided with a factory shaft seal; providing sealing in field of this penetration is unacceptable. Sleeve seams shall be continuously welded or sealed, and the transverse joint should be a sealed UL-approved flanged duct sleeve connection. Damper actuator shall use 120 VAC power. The mechanical consultant shall include accessories that allow for remote damper test/reset and damper position indication. The remote test/reset/position accessory shall be located next to the smoke detector remote test/reset/status accessory.

2. The duct smoke detectors associated with these devices shall be specified by the electrical engineer to be provided by the fire alarm contractor so they coordinate with the building fire alarm system. A standard photoelectric, addressable, sampling type detector shall be used; the use of no-flow detectors is NOT acceptable. Options for remote LED annunciator and remote test/reset shall also be specified. See Cornell Design and Construction Standard Section 283100 – Fire Alarm System & Detection Systems.

3. The smoke damper shall be designed to close whenever the associated air distribution system fan is shutdown. This shall be initiated via the fire alarm system via appropriate addressable relay modules, addressable monitor modules, and relay contacts that interface directly with the 120 VAC fire/smoke damper actuator. The electrical consultant shall provide for this in the design and the fire alarm contractor shall be responsible for the installation. Use of the Building Automation and Control System (BACS) to perform this function is not acceptable. See Cornell Design and Construction Standard Section 283100 – Fire Alarm System & Detection Systems for additional information.

4. Acceptable Manufacturers:
   a. Greenheck
   b. Ruskin

C. Dampers: All balancing and control dampers shall be provided with shaft seals.

1.07 SYSTEM LEAKAGE

A. Design: The Consultant shall specify maximum design leakage rates for all components associated with the air distribution system, and shall forward system leakage calculations to Facilities Engineering for review. This analysis and subsequent specifications shall take into effect the following:
1. Ductwork: The Consultant shall specify all ductwork and plenums to be constructed to SMACNA “Seal Class A,” which means all transverse joints, longitudinal seams and duct wall penetrations shall be sealed, regardless of specified pressure class. This requirement exceeds the leakage allowances indicated in SMACNA’s “HVAC Air Duct Leakage Test Manual.” In addition, this seal class is also a mandatory requirement of the current New York State Energy Code adopted on January 1, 2015 (see ASHRAE 90.1-2010, 6.4.4.2.1).


3. Fire Dampers: Duct connections to fire dampers shall be sealed. As such, this accessory should not contribute to any system leakage.

4. Smoke and Combination Fire/Smoke Dampers: Duct connections to smoke and combination fire/smoke dampers shall be sealed. Leakage is expected from this assembly where the jackshaft penetrates the sleeve, and at the duct smoke detector sampling tube penetration.

5. Terminal units: The leakage from terminal units shall be accounted for in the leakage calculations. Longitudinal seams of casings, inlet face of casings, and inlet collars shall be sealed with mastic. The manufacturer shall provide documentation of leakage tests performed in accordance with ASHRAE Standard 130. Leakage shall not exceed 4.5 cfm when tested against a 1.0-in w.c. pressure differential.

6. Coils: Provide flange mounting with gaskets in an insulated plenum or casing. Seal all seams and casing penetrations for supply and return water tubes. The manufacturer shall provide documentation of leakage tests performed in accordance with ASHRAE Standard 126. Leakage shall not exceed 0.5 cfm when tested against a 1.0-in w.c. pressure differential.

7. Access Doors: The manufacturer shall provide documentation of leakage tests performed in accordance with AMCA Standard 500-D.

8. Control and balancing dampers.


B. Acceptance Criteria: Total system leakage (including ductwork, equipment, and accessories) shall be specified by the Consultant per the following recommendations:

1. Interior supply, return, and general exhaust systems: 5% system leakage, tested at 1.25 times the expected operating static pressure.

2. Interior Laboratory exhaust systems: 2% system leakage, tested at 1.25 times the expected operating static pressure.

C. Leakage Testing:

1. Systems designed to operate at 3-inches w.c. and below: 25% percent of the ductwork shall be leak tested. The Consultant/Owner shall randomly choose the sections of ductwork to be tested during the Construction Phase. If any of the original sections fail the leakage test, another 25% of the duct shall be chosen to be tested. If any section of the second 25% fails, the entire duct system shall be leak tested. This exceeds current New York State Energy Code requirements adopted on January 1, 2015 (see ASHRAE 90.1-2010, 6.4.4.2.2).

2. Systems designed to operate in excess of 3-inches w.c. and all ductwork located outdoors shall be leak tested. This is a mandatory requirement of the current New York State Energy Code adopted on January 1, 2015 (see ASHRAE 90.1-2010, 6.4.4.2.2).

3. The allowable leakage in the ductwork system shall be calculated per the procedures outlined in the “SMACNA HVAC Air Duct Leakage Test Manual” as a function of specified seal class and total surface area of the installed ductwork. If the calculated allowable duct leakage rate is not in conformance with the specified system acceptance criteria, discuss the discrepancy with Facilities Engineering before proceeding with testing.

4. Duct Leakage Testing shall be performed in accordance with the “SMACNA HVAC Air Duct Leakage Test Manual”.

5. Leakage testing shall be witnessed by representatives from Cornell University, Project Engineer of Record and Commissioning Agent (if used on the project).