SECTION 23 00 00 – HEATING, VENTILATING, AND AIR CONDITIONING (HVAC)

PART 1: GENERAL

1.1 GENERAL REQUIREMENTS

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 and the ones that follow such that the University of Texas at Dallas may achieve a level of quality and consistency in the mechanical design of their facilities. Deviations from these guidelines must be justified through LCC analysis and submitted to the University for approval.

B. Use UT Dallas specifications and equipment schedule format for HVAC equipment, where available.

C. Use UT Dallas standard installation and construction details where available. Refer to Appendix for list of available standard CADD details.

D. Use UT Dallas standardized HVAC control schematic and component parts where available. Refer to Appendix for list of available standard CADD control schematics.

E. Use gravity drain of liquids at all possible places. Recover all fin water sources to the extent of economic feasibility.

F. UT Dallas preference for mounting of air handler temperature control valves is for serviceability from floor without the use of ladder; maximum height 5'0" AFF. Where service valves are mounted 8’ above the floor provide service platform, catwalk, or Rotohammer chain wheels and safety-trimmed chains. Do not block equipment access when locating temperature control valves.

G. Indicate required service clearances on drawings with dashed lines. Design shall provide for service and maintenance access to all equipment. Service area shall comply with codes and manufacturer’s recommendations and shall be reasonably planned for human access. Project shall provide elevator access to all levels including basement and attic mechanical spaces. Elevators shall be sized and designed for equipment removal.

H. Design shall include plan for removal of all equipment. Plan shall indicate sizes of major pieces of equipment and clearly marked paths of removal and egress for this equipment from point of installed equipment-to-equipment loading area exterior to building. Entire egress path shall be coordinated for removal of equipment. Preference is to remove all equipment through elevators to ground level. Egress paths of equipment through removable louvers or roof cupolas are acceptable provided louver or cupolas locations are crane accessible. Coordinate with structural to add lifting beams as required to move or replace heavy equipment.

I. Include a 0-100 psi pressure gauge on the domestic water header. Also include an electronic pressure sensor on the header, suitable for connection to University BAS system.

J. Provide N+1 redundancy for equipment providing building utility service such as local chilled water pumps, heating hot water converters, and heating hot water pumps. N+1 redundancy shall also be provided for equipment serving critical applications such as laboratory exhaust fans.

K. Avoid 3½” and 5” diameter pipe.

L. Mechanical systems shall be designed in accordance with the latest version of ASRHAE 90.1 adopted by the State Energy Conservation Office.

M. A detailed HVAC control sequence of operations and BAS point list shall be included in the plans and specifications.

1.2 CODES:

A. Refer to Section 4.01.02 Codes and Standards.

1.3 MECHANICAL SYSTEMS SELECTION:

A. Airside - HVAC

1. Provide air handling units configured to serve campus buildings in accordance with these standards as minimum level and consistent with good engineering practice, zoned in a practical manner to facilitate convenient building operation, thermal performance and shutdown. Design HVAC systems with a practical number of air handling units preferably located to a common mechanical room to increase functional space within the building. The exact quantity, location, and configuration of the air handling units shall be verified through LCC analysis. The baseline system required by these standards shall be as follows:

a). LABS: 100% outside air, single duct, variable air volume, central air-handling units with single duct VAV boxes with hot water reheat coils.

1). Lab Exhaust Headered system connecting all chemical fume hoods, ducted bio-safety cabinets, and general lab exhaust to common lab exhaust fan system located on roof. Lab exhaust shall terminate with stack to exhaust contaminants to provide acceptable dilution and prevent recirculation of containments into building ventilation.

2). Exhaust Energy Recovery Laboratory facilities with total exhaust greater than 15,000 CFM shall include heat energy recovery systems to precondition outside air. Energy recovery systems will be designed for zero cross-contamination.

b). CLASSROOM/OFFICE: Single duct, variable air volume, central air-handling units with VAV boxes with hot water reheat coils with approval as needed. Building ventilation shall be provided by dedicated outside air pre-treatment unit(s).

1). Exhaust Energy Recovery ***NOT*** recommended, due to reduced hours of operation for Classroom and Office Facilities, except where required by ASHRAE 90.1 or requested by the University.

c). DORMITORY: Single duct, variable air volume, central air- handling units with VAV boxes with hot water reheat coils with approval as needed, zoned for individual living suite control. Fan powered VAV boxes shall only be allowed when they can be installed in accessible/serviceable locations (e.g. must be accessible via a standard 10’ high ladder). Building ventilation shall be provided by dedicated outside air pre-treatment unit(s).

1). Exhaust Energy Recovery ASHRAE 90.1 establishes minimum requirement; however, individual pre-treat units over 8,000 CFM shall be evaluated for the use of exhaust energy recovery.

2). Common building areas will be served by single duct, variable air volume, central air-handling units with VAV boxes using hot water re-heat coils with approval as needed.

3). A system consisting of individual 4-pipe fan coil units for each dorm room or suite may be selected as the preferred mechanical system. This selection will be made at the discretion of the University, based on specific building program and marketability. Building ventilation shall be provided by dedicated outside air pre-treatment unit(s) ducted directly to the room fan coils.

2. Utilize dedicated 100% outside air handling units to pre-treat ventilation air prior to delivery to main central air handling nit(s). Provide outside air handling units dedicated to a single or group of central air handlers consistent with prudent engineering practice and to facilitate convenient building operation and shutdown.

3. Exhaust energy recovery units shall not exceed 50,000 CFM.

4. Locate building air intakes as high as possible to ensure the cleanest possible air. Devote special attention to noxious fume exhaust systems to make certain that the exhaust contents escape boundary layer entrainment and subsequent contamination of the building or its neighbors.

5. Use variable frequency drives (VFDs) for fan static pressure control.

6. Control air handling system outside air ventilation rates using a carbon dioxide based demand ventilation control strategy to reduce the total supply or outside air during periods of reduced occupancy. Monitor the carbon dioxide levels at in the zones as well as outdoor levels and vary ventilation rates to track a carbon dioxide offset consistent with ASHRAE 62 recommendations.

7. Provide an engineered smoke control system where required by NFPA 101 and per the requirements of NFPA 96A.

8. Use plenum-like low friction ductwork sizing with long radius fittings (R/D = 1.5) preferred. Target values for air duct design velocities are 1,500' per minute on trunks and 800' per minute on run outs and drops.

9. Construct supply and return duct to withstand a minimum pressure class of 4" for high pressure duct and 2" for low pressure duct. Seal ductwork to SMACNA Seal Duct Class A.

10. Provide balancing dampers at supply, return, and exhaust branches when connected to larger ducts.

11. Provide laboratories or areas with high airflow rates with special design consideration for pollutant containment, humidity control, and for energy recovery or reduction.

12. Provide night setback temperature control on classroom/office buildings. Laboratory temperature setback shall be evaluated based on specific environmental requirements of laboratory space.

B. Waterside

1. Chilled Water

a). Use full reverse-return routing on all chilled water coil piping.

b). Control chilled water flow through units with 2-way valves.

c). Chilled water design supply water temperature should be 42° F, with a <u>minimum</u> return water temperature of 58° F to optimize pipe sizing for water systems. This shall be accomplished without the use of blending stations.

d). Modulate chilled water pumps with variable frequency drives.

e). Chilled water pumps shall typically be end suction type with mechanical seals and bronze fitted and connected to campus chilled water loop whenever practical.

f). Provide building chilled water pumps to handle full building differential pressure. Provide bypass and isolation valves around building chilled water pump.

1). Hydronic heating shall be provided via shell and tube heat exchangers utilizing campus steam where available.

2). Provide sufficient unions and flanges to permit removal of equipment.

3). Provide dielectric unions or dielectric nipples with a non-dielectric union to join dissimilar piping materials.

4). Provide a minimum 2" clearance between insulated piping and other piping, structural members or other obstructions.

5). For closed-loop hydronic heating systems, provide effective chemical water treatment to minimize effects of oxidation, scale, and other typical contaminants. Ion exchange softeners are not required for average makeup water tap hardness below 100 parts per million (ppm), or 5.8 grains per gallon.

g). Provide Inline Air Separators on all Water Systems to provide continuous air removal regardless of System size. Provide drain valves at low points and manual air vents at high points. Use eccentric reducers to maintain top of pipe level.

1.4 MECHANICAL SYSTEM WARRANTIES

A. All mechanical systems, components and controls shall be provided with a minimum 12 month warranty initiating upon substantial completion of building. Specific mechanical components may have longer warranty periods. Warranty shall be unconditional and include material, labor and response within 24 hours of notification.

END OF SECTION 23 00 00