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PART 1 - GENERAL

1.01 GENERAL CRITERIA

- A. The heating system typical set point shall be 70° F inside.
 - 1. The winter outdoor design temperature for most systems shall be -6° F.
 - 2. The winter outdoor design temperature for 100% outside air systems shall be -20° F.
- B. Air conditioning system typical set point shall be 70°-76° F inside, depending on facility and occupant requirements. The typical set point for General Purpose spaces is 76° F.
 - 1. The summer outdoor design temperature shall be 97° F db and 72° F wb.
- C. Justification for Design Criteria:
 - 1. With the advent of global climate change the Inland Northwest has experienced multiple consecutive summers with very high humidity conditions. This created the need to revise the previous design criteria for air handler coil selection above the historic ASHRAE standards and the Washington State Energy Code for Eastern Washington. Due to the critical nature of research, WSU has invoked the temperatures listed above to determine the cooling capacity for building HVAC systems designed in the future from the date of this document. Heating requirements remain the same as the historic numbers listed.
- D. The Consultant shall discuss energy conservation strategies with the WSU Project Manager and Engineering Services as early as possible during the design process, preferably while developing the Basis of Design.
 - 1. System design shall meet the criteria for the Energy Life Cycle Cost Analysis (ELCCA) Guidelines for State of Washington public agencies.
 - 2. For energy savings, design the system to shut off during unoccupied periods. Provide auxiliary perimeter heat so that building temperatures can be maintained when the ventilating system is shut off during unoccupied periods.
- E. As part of the design process (no later than the 50% Construction Drawings), the Consultant shall submit a Process and Instrumentation Drawing (P&ID) for each major system, illustrating all subcomponents of that system, for review by the WSU Project Manager and Engineering Services.

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1. For renovation and renewal projects, the Process and Instrumentation Drawing (P&ID) shall illustrate all subcomponents of the existing systems, together with the connections and integration of all new work.
- F. When designing a new building, consider how the building location and dimensions can affect nearby existing buildings.
1. For new construction or renovations of laboratory buildings, the Consultant shall perform a wind tunnel study pinpointing the effects of emissions from nearby buildings. If the construction process or materials emit contaminants, the Consultant shall characterize the effects on nearby building air intakes.
- G. Central heating, ventilating, and air conditioning systems are preferred installations, with equipment located in basement and penthouse mechanical rooms.
- H. Air intakes shall not be located near building exhaust, fume hood exhaust, loading docks, parking lots, garages, grassy areas, dumpsters, emergency generators, or any other area that can cause air intakes to be affected by outside fumes. In general, at the WSU Pullman campus air intakes shall face north or east, to minimize dust infiltration.
- I. Design frost control for the pre-heat coil filters for all 100% outside air heating systems.

1.02 SPECIFIC DESIGN CRITERIA

A. Heating:

1. Heating shall be by circulating hot water using Central Steam and Condensate system (see section 23 22 00) as the heat source. Steam is available in utility tunnels at 100 psig.
2. Supply fan steam heating systems shall be low pressure, two-pipe system with gravity return.
 - i. Radiation heaters shall be aluminum or copper finned; copper tube convactor (fin tube); floor mounted or wall mounted; flat top; front outlet; recessed only when directed. Provide proper insulation behind convectors.
 - ii. Greenhouses: Preferred material inside greenhouses shall be steel or copper finned radiator heaters.
 - iii. Select finned pipe radiation to extend for entire length of each glass area. Fin tubes shall not be mounted directly against exterior glass.
 - iv. All coils and convectors shall be provided with shutoff ball valves on both supply and return for isolation and repair of heating coils and

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control valves. Valves shall be placed between all automatic air vents and service lines. Valves shall be readily accessible by Maintenance and Utilities personnel.

3. Water temperature shall vary inversely with outside temperature by means of temperature control on steam to hot water converters.
 - i. Where there are multiple zones of hot water heating, each zone shall have individual converter and circulating pumps.
 - ii. Hot water hydronic heating is required. Direct steam reheat is not allowed.
 - iii. Hot water converter selection shall include a 0.001 water side fouling factor.
4. Hot water systems shall be zoned according to building orientation with flow water temperature reset by outdoor temperature.
5. Radiation shall be sized for 80% of transmission losses.
6. Preheat integral face and bypass coils in one-way air systems shall be steam, utilizing a two-position control valve. Use low pressure steam, no greater than 15 psig. Size coil and valve based on 7 psig steam.
7. Venturi fittings and balancing valves with tapped outlets may only be used to calibrate zone flow controls. Provide isolation valves on each unit.

B. Ventilation

1. All building spaces suitable for present or future occupancy shall be served by mechanical ventilation.
2. Fan rooms shall not be used as supply or exhaust air plenums.
3. Supply air flow to areas with fume hood exhaust shall be approximately 10% less than total air exhausted. Controls shall adjust flows to track variations in fume hood exhaust flows.
4. For fume hood exhaust, see section 23 38 00 Ventilation Hoods (Fume Hoods).
5. Air intakes shall be a minimum of ten feet above grade; air exhaust discharges shall be at the highest point of the building.

C. Cooling:

1. The Central Chilled Water (CCW) system (section 33 60 00) is the approved source of cooling for all campus buildings. The central chiller

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plants are considered N +1 redundant, so no backup chillers are required for individual programs.

- i. Each building program shall be assessed an infrastructure fee to provide for central system capacity for that building's cooling load. The fee is applied toward ongoing expansion projects.
 - ii. Each project shall provide extension of mains from central distribution system. Size and location of these main extensions shall consider the infrastructure planning requirements of the WSU Campus Master Plan. Each building project incrementally adds to the development of the total infrastructure, which may require pipe sizing for mains and lateral connections that are larger than the service needs of the building itself.
 - iii. Chilled water service is distributed to air handling systems through main piping risers to the individual air handlers per the standard piping arrangement _____. This configuration shall not be altered without approval from WSU Engineering Services. Each air handling application will provide a circulating pump and bypass arranged so only that amount of chilled water required to carry the cooling load will be drawn off the system.
 - iv. From an energy code standpoint WSU considers the Central Chilled Water System to function as a water-side economizer.
2. Independent cooling shall be used for applications requiring year-round control of temperature or humidity such as animal quarters, computer installations, patient care, or research areas showing justification.
- D. Water Treatment: On all closed loop water systems (hot and cold), pot-type chemical feeders are the preferred method for water treatment. See Design and Construction Standard Detail _____.
1. Glycol shall be used to prevent freezing of coils exposed to sub-freezing outside air.
 2. Glycol containing systems shall have concentration (freeze point) alarm.
- E. Specific Interface Requirements:
1. Steam service brought into buildings at 100 psig shall terminate in a steam header and then be distributed through a pressure reducing station.
 2. For service purposes only, provide bypass around isolating valves in branch lines from CCW flow and return.

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PART 2 - PRODUCTS (SEE SECTION 23 30 00 HVAC AIR DISTRIBUTION)

PART 3 - EXECUTION (NOT USED)

END OF SECTION