

Facility Operations

HVAC & Building Automation System Construction Standards

1. EQUIPMENT INSTALLATION

- All HVAC and associated equipment shall be installed in such a way as to be considered easily accessible, with a minimum 24” clearance on all sides, and a minimum 30” clearance where access is required for inspections, servicing, repairs, or replacement of any portion of the equipment. HVAC and associated equipment shall be accessible without the need to remove or alter any portion or part of the permanent construction of the building. HVAC and associated equipment shall not be installed in inaccessible or nearly inaccessible locations, or deep in a ceiling where any possibility exists that the HVAC equipment may be concealed, or partially concealed, behind other building systems.

2. CHILLERS

- Trane, York and Daikin brands are generally acceptable, with Trane being the preferred choice.
- Designers/Engineers shall specify equipment built for operation with refrigerants that have zero ozone depletion potential.
- ASHRAE standard 15 shall apply to all chiller installations.
- Microprocessor based controls are preferred.
- Absorption chillers should not be specified.
- Heat rejection equipment shall be rated for 105° ambient.
- On liquid-cooled models, evaporator and condensers shells and tube sheets shall be constructed of carbon steel plate. Evaporator and condenser tubes shall be individually replaceable.

- On air-cooled models, condenser coil shall have aluminum fins mechanically bonded to internally finned seamless copper tubing. Direct-drive vertical discharge condenser fan motors shall be three-phase, with permanently lubricated ball bearings and internal thermal overload protection.
- On air-cooled models, condenser coil shall be protected with factory installed hail guards.
- Instruct PSU Facility Operations HVAC personnel in the operation, maintenance, and trouble-shooting of controls and safeties.
- All chillers shall be controlled by the existing campus Building Automation System (BAS).

3. ROOFTOP PACKAGE SYSTEMS

- AAON and Trane brands are generally acceptable.
- Any HVAC equipment placed on a roof top shall be accessible without the need to utilize portable ladders or other equipment.

4. COOLING TOWERS

- Marley, Evapco and BAC brands are generally acceptable, with Evapco being our preferred choice.
- All wetted, non-media surfaces of cooling tower and evaporative condensers shall be stainless steel. All cooling tower support beams shall be hot-dipped galvanized.
- Cooling tower fans that are gear-driven shall be supplied with synthetic oil. If capacity control is required, use variable frequency drives on fan motors.
- Condenser water shall drain into the sanitary sewer per Pittsburg City code.

5. FAN COIL UNITS

- Trane, Carrier and McQuay brands are generally acceptable.
- Chassis shall be galvanized metal with flanged edges.
- Drain pan shall be galvanized metal and insulated with polystyrene or polyurethane insulation.

- All components (such as filters, motors, belts, and dampers) requiring regular service must be accessible and replaceable without disassembly of the unit.
- The contractor shall be responsible for replacing the air filters in any new or existing fan coil unit affected by the construction. All filters shall be new upon completion of project. One spare filter for each one installed shall be provided upon completion of project.
- Water coils shall be copper tube with aluminum fins.

6. AIR TERMINALS

- Trane, Titus and Price brands are generally acceptable.
- Preferred source of reheat is hot water.
- There shall be no obstructions preventing the removal and replacement of air filters.
- The contractor shall be responsible for replacing the air filters in any new or existing air terminal affected by the construction. All filters shall be new upon completion of project. One spare filter for each one installed shall be provided upon completion of project.
- All air terminals shall be controlled by the existing campus Building Automation System (BAS).

7. CENTRAL STATION AIR HANDLING UNITS

- Trane, York, AAON and McQuay brands are generally acceptable.
- Double wall galvanized construction.
- Air handling units shall have access door to filters, heating and cooling coils, dampers, and fan for maintenance and serviceability. Panels shall be gasketed and air tight.
- Air-handling units shall allow for individual removal of coil.
- Chilled water coils shall be completely drainable through individual headers.
- Hot water coils shall be completely drainable through individual headers.
- Fans shall not require shaft removal for bearing replacement.
- Fan assembly, V-belt drive, and motor shall be internally isolated from the exterior of the fan module. The isolators shall be spring or rubber type.

- Stainless steel drain pans are preferred.
- Filter sections shall have filter racks, access door, and block-offs, as required, to prevent air bypass around filters.
- All components (such as filters, motors, belts, and dampers) requiring regular service must be accessible and replaceable without disassembly of the unit.
- The contractor shall be responsible for replacing the air filters in any new or existing air-handling unit affected by the construction. All filters shall be new upon completion of project. One spare filter for each one installed shall be provided upon completion of project.
- If capacity control is required, use variable frequency drives on blower motors.
- Instruct PSU Facility Operations HVAC personnel in the operation, maintenance, and trouble-shooting of controls and safeties.
- All air-handling units shall be controlled by the existing campus Building Automation System (BAS).

8. HYDRONIC PIPING

- Chilled and condenser water piping shall be standard weight black steel pipe. Condenser water pipe may be schedule 40 PVC, where plumbing code allows.
- In designs where chiller redundancy is not available, allowances shall be made in chilled water configuration and design, for easy connection to temporary chiller, in the event of chiller failure. This shall include, but will not be limited to, additional piping, valves, insulation, and victaulic fittings.
- Victaulic couplings may be used for connecting equipment to the piping system.
- Make-up water lines shall have back-flow prevention to protect the domestic water system.
- Vent all high points of the system with air vents that will not allow air to enter the system under vacuum conditions. The discharge from all air vents shall be piped to a drain.

- Specifications shall include the requirement of system cleaning. After hydrostatic tests and prior to the operating tests, equipment including, and not necessarily limited to, the chillers, cooling towers, boilers, heat exchangers and all piping shall be thoroughly cleaned. The initial system cleaning shall be with a solution of caustic soda, trisodium, or an approved equal. After the solution has cleaned the system, the solution shall be drained and thoroughly flushed out with fresh water. See chemical treatment section for additional information.
- All piping system markers shall be pressure-sensitive adhesive vinyl adhering to ASME A13.1, and have arrows showing normal direction of flow.

9. CHILLED WATER PUMPS

- Bell & Gossett, Armstrong, Aurora and Taco brands are generally acceptable.
- In single chiller applications, a second, full-sized chilled water pump/motor shall be designed. The second pump shall be designed for manual valving and starting, after failure of the main pump.
- Secondary chilled water pump may be a single pump with variable frequency drive.

10. CONDENSER WATER PUMPS

- Bell & Gossett, Armstrong, Aurora and Taco brands are generally acceptable.
- In single chiller applications, a second, full-sized condenser water pump/motor shall be designed. The second pump shall be designed for manual valving and starting, after failure of the main pump.

11. CHEMICAL TREATMENT

- All HVAC chilled water, hot water, and condenser water systems shall have a chemical corrosion protection system. Chemsearch is our preferred choice for water treatment supplies and materials. Contact Marti Miner at 417-850-0295.

12. CONTROL AIR COMPRESSORS

- Quincy and Champion brands are generally acceptable.
- System shall incorporate duplex compressor/motors with automatic alternator.
- Single tank design is acceptable.
- Refrigerated air dryer is required.

13. UNITARY HVAC EQUIPMENT

- Trane, Carrier and York brands are generally acceptable.

14. VARIABLE FREQUENCY DRIVES

- All VFDs must have an LCD user interface that displays English words in a Latin-script alphabet. Seven-segment LCDs are not appropriate user interfaces.
- All VFDs must have an immediately intuitive user interface. Service technicians should be able to understand how a VFD is operating, and should be able to adjust basic VFD parameters, without needing to reference a service manual.

15. BUILDING AUTOMATION SYSTEM

- The University currently utilizes a Honeywell Enterprise Buildings Integrator (EBI) system, as well as a Trane Tracer system.
- New construction must directly interface into an existing BAS.
- Where Honeywell controllers are used, ComfortPoint Open series controllers are preferred.
- Where BACnet controllers are used, BACnet Testing Laboratory (BTL)-listed controllers are preferred.
- Front end must be fully functional at time of issuance of Certificate of Occupancy.
- Questions can be directed to Elliott Rowland, HVAC Controls Specialist at 620-235-4702.

16. NOTES

- The contractor shall provide a list of air filters required for each piece of air handling equipment, including fan coil units and air terminals where applicable. The list shall include equipment designation, equipment location, filter sizes, and quantity of each size of filter.
- The contractor shall provide a list of belts required for all equipment provided on the project. The list shall include equipment designation, equipment location, belt sizes, and quantity of belts.