General HVAC 23.00.01

Description:

The purpose of the section is to highlight the current applicable UMCP Design Standards for general design requirements for HVAC systems within buildings.

Related Sections:

- TBD

Effective Date:

June 01, 2001

Applicable Standards:

- ASHRAE standard 62
- ASHRAE 90.1-1999 (or most recent edition)

General Requirements:

Objectives

- Unless specifically directed otherwise by the program document, the following HVAC standards and preferred design concepts apply to all projects on the College Park campus of the University of Maryland

- The intent of this document is not to dictate the design concept but the interplay of first cost, performance, maintenance and operating cost related to the mechanical systems remains the responsibility of the designer. If the University's preferences are at variance with the application in design, the onus is on the designer to bring this to the attention of the University.

- Because only a small portion of HVAC design is code-driven, and because the choice of HVAC design concepts bears heavily on maintenance cost and energy cost, the University has certain preferences, and expects to see them reflected in designs submitted our consultants. By not doing so, the designer risks rejection of the concept and a requirement to rework without additional compensation.

- Neither is it the intent to discourage creativity. Alternatives are welcome. In fact, depending on the circumstances of project funding, State regulations may require life cycle analysis of several alternatives for HVAC systems. When such comparative analysis is required, the concepts, systems, and components described herein by those favored by the University must be among the alternatives analyzed.

Design Conditions - Heating and Cooling

- Perform the HVAC load calculations based on the following outside conditions
  - Summer -95 degrees design drybulb, 78 degrees wet bulb
  - Winter - 0 degrees drybulb (colder than the ASHRAE 99% value)
  - Select cooling towers at 78 degree design wet bulb (the ASHRAE 1% value)

- Design for the following Inside conditions:
  - Summer 74 degrees drybulb +/-2 degrees (Operating range of 72-76)
  - Winter 70 degrees drybulb +/-2 degrees (Operating range of 68 - 72)

Design Conditions - Humidity control

- Summer:
  - Control - Unless noted to the contrary in the program document, inside relative humidity is not to be directly controlled - the University recognizes that dehumidification is a by-product of the cooling process. However, it is required that cooling equipment and systems be selected and sized to

produce 50% relative humidity + / - 5% in the conditioned space when design outside conditions prevail, and other design parameters are fulfilled.

- HVAC system concepts noted for poor humidity control at part load conditions are subject to rejection. Such systems include, but are not limited to:
  - Systems which allow outside (ventilation) air to pass over inactive cooling coil surfaces.
  - Capacity control schemes which allow coil temperatures to rise above that required for dehumidification.
  - Systems which do not continuously dehumidify all ventilation (outside) air.
- Winter:
  - The university standard is to add no moisture to the air stream. When the program document indicates that humidity control in winter is required, it is expected that humidification equipment will be sized with respect to the envelopes ability to accommodate elevated levels of interior air dew point.
  - Conditions that result in condensation on inside surfaces, visible or concealed must be avoided. The University's intent is to avoid microbial growth on interior surfaces. (see Equipment humidification).

Ventilation

- CFM/person is the university standard for quantification of ventilation rates.
  - Population density will be defined in the program document. Otherwise, refer to ASHRAE Standard 62.
  - Reasonable assumptions (diversity, etc) are encouraged in determining the population for purposes of determining the ventilation air quantity, but the assumptions must be documented and understood by the Using agency.
- Unless the specific application or the applicable building code mandates higher ventilation air quantities, HVAC designers must respect the most current revision of ASHRAE standard 62, while pursuing reasonable first cost, energy-efficient HVAC design noted in ASHRAE 90.1-1999 (or most recent edition). Where aspects of energy use and air quality are in conflict, air quality shall take precedence.
- Note: In attempts to use ASHRAE standard 62 interpretations to reduce the volume of ventilation air, it will not always be possible to assume scenarios of continuous ventilation, non-continuous occupancy. A representative of the Using agency must agree to the occupancy scenarios.
- The application of CO2 sensors is encouraged where appropriate to minimize cooling, dehumidification, and heating of outside ventilation air.

Duct Liner

- Acoustical (fiberglass) duct liner is preferred as the economical alternative to oversized ducts (low velocities) and mechanical sound control devices. However, the duct liner product, and the application techniques, must be specified with the intent to avoid IAQ problems. Examples include, but are not limited to:
  - Special coatings to eliminate the erosion of liner particles
  - Special Installation practices (buttered edges, etc.) to deter erosion of particles
  - No liner may be used in areas where the liner may become wetted during normal system operation, or in abnormal weather conditions.
  - Locate adequately sized and spaced access openings in duct to facilitate periodic inspection and cleaning.

Equipment redundancy, spare capacity and back-up power

- Redundancy - Generally, because of cost control, redundancy is mandated only in the case of critical systems and/or equipment, identified as critical in the program document.

Regardless of the system redundancy requirements of the program document, the design shall provide for redundancy in the following items of mechanical equipment, if such equipment is a part of the project design and if the need for redundancy has not been expressly waived by the program document:

- Condensate (steam) return units: Duplex pumps with automatic alternators are required. The design shall be such that design flows will be handled by a single pump with 33% run time.

  This equipment shall be powered from the emergency generator, if an emergency generator is part of the project. It is not the intent of this provision to create a requirement for an emergency generator.

- Package sump pumps (storm water): The design shall incorporate duplex pumping with automatic alternators. The design shall be such that design flows will be handled by a single pump with 33% run time. This equipment shall be powered from the emergency generator, if an emergency generator is part of the project. It is not the intent of this provision to create a requirement for an emergency generator. The equipment covered by this provision does not refer to residential-type submersible pumps, powered from 120 V/AC receptacles.

- Sewage Ejectors - A single sump is acceptable. Incorporate duplex pumping with automatic alternators. The design shall be such that design flows will be handled by a single pump, with 33% run time.

  This equipment shall be powered from the emergency generator, if an emergency generator is part of the project. It is not the intent of this provision to create a requirement for an emergency generator.

- Submersible sump pumps in elevator pits, etc. There is no requirement for redundant pumps. However, a high water alarm shall be installed, connected to the CCMS, and the submersible pump shall be powered from the emergency generator, if an emergency generator is part of the project. It is not the intent of this provision to create a requirement for an emergency generator. Submersible pumps shall not be used in “pits” where exposed to temperatures above 100 degrees F. (Refer Section 14.20.00)

- Chilled water pumps - In single chiller applications, a second, full sized pump/motor assembly shall be designed. The second pump shall be designed for manual valving in and starting after a failure of the main pump. It is permissible to use the spare pump as a standby pump for an associated single condenser water pump.

  The use of parallel pumping arrangement for purposes of creating spare capacity (with the second pump) is not allowed.

- Primary chilled water pumps. In multiple chiller / dedicated pump applications, one spare primary chilled water pump motor shall be specified.

- Secondary chilled water pumps. Where used, secondary chilled pumps will typically be a single pump, VFD controlled. If the water flow rate is such that two pumps are indicated, the designer shall bring this to the attention of the University for discussion in the schematic design phase. Unless two pumps are needed to handle design flow, a second, standby secondary pump is required, with a dedicated VFD. The second pump shall be designed for manual valving in and manual starting after a failure of the main pump system. Generally, the University prefers end-suction pumps, but this preference may be waived in the interest of limiting the number of pumps.

- Condenser water pumps. In single chiller / tower applications, a second condenser water pump, full size shall be designed. The second pump shall be designed for manual valving in and starting after a failure of the main pump.

  The use of parallel pumping for purposes of creating spare capacity is not allowed.

  It is permissible to use the spare condenser water pump as a standby pump for a single chilled water pump. Note: In multiple chiller/pump applications, with a dedicated condenser water pump in each condenser water circuit, a spare pump motor shall be specified, stored on site in corrosion-resistant packaging.

- Primary hot water pumps - In single boiler applications, a second, full sized pump/motor assembly shall be designed. The second pump shall be designed for manual valving in and starting after a failure of the main pump. The use of parallel pumping for spare capacity will be disallowed. Note: In multiple boiler /dedicated HW pump applications (such as in primary/secondary pumping) one spare primary hot water pump motor shall be specified, stored on site in corrosion-resistant packaging.

- Secondary hot water pumps. Where used, secondary hot water pumps shall typically be a single pump, VFD controlled. If the water flow rate is such that two pumps are indicated, the designer shall bring this to the attention of the University in the schematic design phase. A second, standby pump shall be designed, with a dedicated VFD. The second pump shall be designed for manual valving in and manual starting after a failure of the main pump system. Generally, the University prefers end-suction pumps, but this preference is waived in the interest of limiting the number of pumps.

- Control air compressors. A single tank is acceptable. The design shall incorporate duplex air compressors / motors with automatic alternator. The design shall be predicated on one third run time for one compressor, with the second compressor designed as a full standby. There is no requirement for redundancy in the refrigerated air dryer or oil filter system.

Spare Capacity

- Generally, equipment shall be sized at half capacity and used in multiples of two. Allowance for load growth beyond that specified below will be stated in the program documents.
  - In the case of local heating boilers, size each boiler for the full calculated boiler load.

  - In the case of steam boilers intended for use only during the annual steam outage, there is no requirement for spare capacity or redundancy.

  - Chilled water cooling coils and filter banks - size the coil for 450 fpm face initial velocity to allow for air quantity growth to 550 fpm. Size the fan (but not the fan motor) for the resistance at the future (higher air) flow.

Firestopping

- The designer shall note in the specifications that firestopping of floor and wall penetrations related to the trades in division 23.00.00 of the specifications is to be specified, furnished and installed under another section of the specification.

  The division 23.00.00 specification shall require that the subcontractors furnish, when transmitting prices to the prime contractor, a list, with sizes, of all openings to be firestopped.