DESIGN GUIDELINE 230016
COMPUTER ROOM AIR CONDITIONING

General

This section addresses air conditioning requirements for computer rooms (including server rooms), and requirements for computer room units.

Related Sections

U-M Design Guideline Sections:
230000 – Basic Mechanical Requirements

U-M Master Specification Sections:
230900 – Mechanical Systems Controls

Design Requirements

Cooling Loads

Cooling loads vary widely in "computer rooms" throughout campus. The A/E shall work closely with the U-M Design Manager and end user to determine actual peak diversified load based on actual equipment. Consider future growth, redundancy requirements (see additional comments below in "Computer Room Unit Selection"), and seasonal changes, including seasonal limitations on the chilled water system, if used to provide primary source cooling. Clearly define all load and system design assumptions to U-M Design Manager, in a OPR/BOD document.

Temperature and Humidity Criteria

Clarify and document acceptable temperature and humidity criteria (summer and winter, including allowable range) with users and U-M Design Manager. The ASHRAE "recommended" temperature an humidity ranges found in the ASHRAE publication *"Thermal Guidelines for Data Processing Environments"* (most recent edition) should be the design criteria typically utilized for computer rooms. More stringent requirements shall be challenged and validated by the requesting parties because of the higher energy use that will result.

U-M generally discourages humidification for dedicated computer room systems. While humidification criteria is rarely as high as it had been in years past, extremely low RH (below 15%) may not be acceptable. Carefully analyze psychrometrics and alternatives (such as discharge air reset) before including computer room humidification. If humidification is required, steam generator-type humidifiers are preferred.

Source of Cooling

Outside air (air handler economizer cycles), in particular for larger computer rooms, is the preferred source of cooling when the application and infrastructure conditions permit. For critical applications, chilled water is the preferred source of cooling. Where chilled water is not available year-round, or where the chilled water system is prone to unscheduled shut-downs (including loss of chilled water during transition from free cooling to absorption cooling), combinations of chilled water primary and mechanical cooling secondary are recommended. For these applications, the refrigeration circuit may be air-cooled (equipped with low ambient refrigerant side controls) or glycol-cooled (with remote dry cooler).

The use of potable cold water for condenser cooling is not acceptable, except for very short-term temporary or emergency applications. These rare applications should be made only with the approval of the U-M Utilities Group through the U-M Design Manager.

Computer Room Unit Redundancy

While some computer rooms require full "n-1" redundancy (systems that can meet all loads with loss of the single largest component), most do not require this level of redundant capacity. Conversely, most systems will require some level of back-up cooling. For rooms with loads over 5 tons, multiple units should be installed, to offer some cooling capacity in the event of unit failure.

Controls and Alarms

Units that include mechanical cooling may include manufacturer's standard electronic controls. Units with chilled water cooling only should be DDC controlled, integrated into U-M standard DDC system. In either case, unit failure and high temperature alarms should be integrated into U-M DDC BAS system.

Where chilled water is less reliable, where system does not provide full redundancy, and other select applications, consider using high temperature warning at 5F above setpoint to implement a graceful shut-down of non-essential equipment. In this way, users can improve reliability of essential systems. This strategy is not fully adopted by all computer room users.

For units located above a raised floor and other locations where deemed necessary, install a water sensor to detect an overflowing drain pan. Connect alarm to U-M DDC BAS system.

Emergency Power Impact

Computer rooms are not typically fed from emergency power, although many will have UPS systems. In the event that they are fed from emergency power, consider need to put computer room units and all required controls on emergency power. Central chilled water systems are not typically fed from emergency power.

Additional Computer Room Unit Features

A filter should be installed at the air-return opening.

The unit should be supplied with the optional integral fused disconnect switch, and all necessary controls to provide a completely functional unit.

Installation Requirements

At a minimum, chilled water coils should be piped with a 2-way control valve, isolation valves, and individually sized balancing valve (manual or automatic).

The unit should be supported from the concrete sub-floor slab with properly rated supports. Mounting units directly on raised floors is not be acceptable.