



DATE: August 11, 2009

REC'D AUG 13 2009

FROM: Ian M. Salada

TO: Telecommunications & Software Support

RE: Design and Construction Standards Update

DIVISION(S): 23

SECTION(S): 23 70 00

Completed
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Minor change to correct format problem or typographical errors
No entry in the revision log required

Revision Log Entry Required

Description of Change: Update air handler requirements regarding efficiency, system reliability, redundancy, identification, fan arrangement considerations, proper mixing, bearings, dampers, and referencing the sequence of operations

Copy of changes sent via email also
elh291
cal9

Modify subsections .01 and .02 in Section 23 70 00 per the following (deletions are shown struck through and additions are double underlined). Remainder of section is unchanged.

23 70 00 CENTRAL HVAC EQUIPMENT

.01 Air-Handling Equipment (General)

- A. Professional shall design each application for optimal operating efficiency, reliability, and flexibility with the lowest life cycle cost.
 - 1. Design for minimizing fan energy. Specify lower than standard coil and filter face velocities to achieve lower component air pressure drops.
- B. Reliability: Professional shall determine the consequences of system failure and provide for adequate system redundancy for each application.
- C. Determine and specify applicable emergency power requirements.
- D. Equipment Layout: Comply with all Space Planning Requirements indicated in Div 1 .02 Planning for Engineered Building Systems. Maintain minimum recommended service clearances.
- E. Quality Assurance and Uniformity:
 - 1. Equipment manufacturer shall be ISO-9001 certified.
 - 2. Equipment shall be of U.S. manufacturer.
 - 3. Provide equipment of same type by same manufacturer.
- F. Related Standards Sections
 - 1. 23 00 01 Owner General Requirements and Design Intent
 - 2. 23 00 10 Systems Selection and Application
 - 3. 23 01 00 OPERATION AND MAINTENANCE OF HVAC SYSTEMS
 - 4. 23 05 01 Mechanical General Requirements
 - 5. 23 05 93 Testing, Adjusting, and Balancing for HVAC
 - 6. 25 00 00 INTEGRATED AUTOMATION
 - 7. 25 90 00 GUIDE SEQUENCES OF OPERATION
 - 8. 26 29 23 Variable-Frequency Motor Controllers
- G. Provide mechanical identification per University Standards.
 - 1. .06 Mechanical Identification
- H. Schedules shall be complete with area served, location, total air quantity, outside air (min/max), external and internal static pressures, total and sensible cooling capacities, entering and leaving temperatures (air and water) for all coils, heating capacities, steam pressure, steam coil condensation rate, fan rpm, minimum fan efficiency (or maximum brake horsepower), motor hp, voltage, (including starter/speed drive type), and whether on normal/emergency standby power (where applicable).
- I. Fans and motors on 5 tons and larger shall be on a common isolation base or rail unless internally isolated by the equipment manufacturer.

- J. ~~When available, permanently lubricated bearings~~ shall be ~~regreasable~~ used, minimum L10 life of 200,000 hours (preferred, but no less than L10 life of 100,000 hours - Note: L50 life of 200,000 hours is NOT acceptable.) ~~On others, extended lube shaft grease lines to safe and readily accessible location~~ with 1/8" steel tubing and flush plugs with relief set at 5 psig, shall be specified.
- K. All fans 3/4 hp and above shall be Class II fans.
- L. Fan shafts shall be solid. Adequate fan shaft pull space must be provided.
- M. Dampers shall have edge seals, low leakage (2%) type.
- N. All components shall be accessible via access doors and removable panels.
- O. Freeze protection shall be provided on all 100% outdoor air equipment. (Double trap steam coils.)
- P. Belt guards: Where required, guards shall be constructed of expanded metal mesh to allow for quick visual inspection of belts and pulleys without removal. Guards shall be attached to equipment with hinges and/or quick release fasteners that can be turned without tools to allow for ease of maintenance.
- Q. Provide marine lights in sections requiring routine service (fans, filters, full-sized access/inspection). Marine light shall be UL listed for wet locations. Light shall be complete with energy efficient, long-life fluorescent lamp and junction box.
- R. In cooling applications where there can be a net gain in energy performance, use blow-through supply fan arrangement. Primary potential energy benefit is to reduce latent subcooling required to account for fan heat. Sensible heat of fan is added prior to coil and takes less energy to remove than to subcool air a few degrees below design supply air temperature (at saturated conditions) in typical draw-through arrangement. However, care must be taken to achieve evenly distributed air across coils in blow-through arrangement with the least pressure drop penalty or reduction in fan efficiency.
- S. Recirculation systems intended with mixing of air streams shall have a mixing section with necessary components specifically engineered to achieve evenly and thoroughly mixed conditions prior to entering heating or cooling coils. This is critical in cold climates to avoid stratification and nuisance freeze stat tripping. Complete mixing is also important to achieve optimal coil performance, controllability and energy efficiency. Professional shall include in the engineered design the application of air blenders, directional deflectors/baffles designed to force air streams into each other to mix, and/or blow-through supply fan arrangements in which air is mixed in fan section prior to coils. Manufacturers "standard" mixing damper sections have repeatedly performed inadequately and are not acceptable.
 - 1. Actual performance shall be field verified as part of Functional Performance Testing to achieve no greater than a 5°F range between the warmest and coldest spot leaving the mixing section.

2. Design for adequate mixing between leaving face and bypass preheat coils and entering cooling coils.
3. Complete mixing external to AHU is another alternative.
4. Other resources for further reference: Functional Testing Guide, [Air Blenders and Baffle Plates](#)

Field Code Changed

~~Belt guards: Where required, guards shall be constructed of expanded metal mesh to allow for quick visual inspection of belts and pulleys without removal. Guards shall be attached to equipment with hinges and/or quick release fasteners that can be turned without tools to allow for ease of maintenance.~~

.02 Central Station Air-Handling Units

A. Units shall comply with requirements of .01 of Air-Handling Equipment (General) above.

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~~A. Schedules should be complete with area served, location, total and sensible cooling capacities, entering and leaving temperatures (air and water) for all coils, motor hp, voltage, heating capacities, steam pressure, steam coil condensation rate, fan rpm, total air quantity, outside air, external and internal static pressures.~~

- B. Fans shall be statically and dynamically balanced, non-overloading centrifugal type.
- C. Double wall, insulated casings and plenums shall be specified for all units including those serving heat and vent applications.
 1. All fan sections shall have a perforated inner wall.
- D. Casings for heat and vent applications shall have space for installation of future cooling coil.
- E. Units shall be installed to allow removal of all coils, filters, and fan shaft. Provide full finned width of coil on one side of the unit to facilitate removal.
- ~~F. Units shall be mounted on vibration isolators, unless internally isolated by the manufacturer and placed on a 6" concrete housekeeping pad.~~

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~~G. Units shall have mixing box and filter box or combination filter/mixing box properly sized so as not to exceed filter manufacturers recommended face velocities. Provide low leakage dampers (2%) for mixing box dampers.~~

- ~~F.~~
- ~~H.G.~~ All coils shall be air vented and arranged for proper drainage.
- ~~H.H.~~ Steam coils shall be piped to prevent freeze-ups. This shall include vacuum breakers and 18" drip leg to trap inlet which may dictate that units be mounted on angle iron frame above housekeeping pad.
- ~~J.I.~~ One hundred percent (100%) outdoor air preheat coils shall be steam distributing type with external face and bypass control. Coils shall be double trapped.
 1. Do not use valve control for preheat application.

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2. Review other heating mediums with University when steam is not available.

~~K.~~J. Provide flexible connectors in all piping and ductwork.

K. On economizer applications, apply dual OA dampers for better control and airflow measurement accuracy: (1) for minimum OA and (1) for economizer. Comply with airflow measuring device manufacturer's recommendations and instructions regarding airflow measuring devices to avoid inaccuracies such as turbulence created by adjacent crossflows of return air streams.

L. For Variable Air Volume applications, refer to Div 25 for guide sequence of operation. Air-Handling Units - Variable Air Volume

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END of revision

Update Commentary:

Section was updated primarily for the following reasons:

- 1) To develop and document General Owner Requirements in order to define basic design intent and selection criteria.
 - a. Goal – to provide guidelines to promote and achieve Efficiency and Reliability
 - b. Note the following special points:
 - i. Select units with reduced maximum face velocity to minimize internal component pressure drops.
 - ii. Coordinate with Space Planning requirements. Preference for central air handling equipment to be located indoors.
 - iii. Identification
 - iv. Scheduling minimum fan efficiencies.
 - v. Special bearing requirements
 - vi. Evaluate blow-through vs. draw thru fan configurations for optimal overall net efficiency.
 - vii. Performance requirements for proper mixing
- 2) To update the Equipment Requirements for the technical details of central Air Handling Units
 - a. Goal – to improve specifications in order to achieve better performance and controls.