



Division 23 Heating, Ventilating and Air Conditioning (HVAC)

23 00 00 Heating, Ventilating, and Air Conditioning (HVAC)

23 05 00 Common Work Results for HVAC

23 05 05 General Requirements for HVAC

1. The HVAC system design for all UW-Madison facilities shall comply with all of the provisions of the latest version of the Division of Facilities Development & Management (DFDM) HVAC Design Guidelines, which is available from the DFDM website.
2. References within the DFDM Guidelines regarding the DFDM Project Manager shall apply to the UW-Madison Project Manager on UW-Madison Managed Projects.
3. Project Specifications shall use as their basis all appropriate sections of the latest edition of the DFDM Master Specifications.
4. Deviations from DFDM's Minimum Design Guidelines or the DFDM Master Specification sections shall be made only upon approval from the UW-Madison Project Manager.
5. The Guidelines for Planning and Design of UW-Madison Facilities shall take precedence over DFDM Guidelines, but the A/E shall discuss all conflicts within the guidelines and specifications with the UW-Madison Project Manager.
6. The goals and guiding principles of the UW-Madison Campus Master Plan (latest edition) shall be considered and referenced as part of the planning, design, detailing, and material section for every project.
7. Owner training shall be included for all equipment and systems and training shall be scheduled, take place, and be videotaped.
8. Record drawings shall be kept up to date on the job site, and turned over to the A/E prior to final pay requests. The drawings shall be prepared by the A/E in a clear AutoCAD format.
9. Pitch air intake plenum bottoms shall drain out louver.
10. Louvers shall be sized for low velocity (<300 fpm) through free area.
11. Pans shall be required to be water-proof.
12. All primary heating systems shall require redundancy.
13. All AHU's with return air shall be required to have air blenders.
14. Unconditioned spaces shall be required to have sealed PVC jackets on all piping.
15. All roof caps shall be required to be painted with factory finish.



16. Standing seams shall be required on coping.
17. HVAC units shall be located either on the roof or within the building. HVAC units shall not be placed outside the building on the site.
18. Do not both a pot feeder and water filter on heating water systems. The water filter can be used as a pot feeder.
19. UW-Madison has a preference for Parker water filters.
20. Fans should not be provided with grease lines extending outside the fan housing.
21. All rooftop duct work shall be insulated and well-waterproofed.
22. All thermostats shall be located directly adjacent to light switches in private offices and conference rooms. These shall be placed next to the latch side of the door or side light so the remainder of the wall is open for furniture placement. Coordinate furniture plans with electrical and control plans.

23 05 29 Hangers and Supports for HVAC Piping and Equipment

Specifications *Section 23 05 29 90 Hangers and Supports for Utility Piping and Equipment* is a Division of Facilities Development and Management (DFDM) Standard Specification although it may not be available on their website. Use this specification section for all applicable utility work. It can be obtained from UW-Madison FP&M.

23 05 93 Testing, Adjusting, and Balancing for HVAC

1. Copies of the balance report shall be turned over to the UW-Madison Project Manager as soon as they are available.
2. Operating static pressure set points, on direct-digital control systems, during the time of balancing, shall be indicated.

23 09 00 Instrumentation and Control of HVAC

23 09 23 Direct-Digital Control System for HVAC

1. Specifications for Direct Digital Controls shall be based upon the DFDM Master Specifications sections for DDC systems
2. Any deviations from the DFDM Master Specifications must be approved by the UW-Madison Project Manager
3. A permanent copy of control drawings and sequence of operation document shall be placed inside or next to the control cabinets.
4. High turn-down steam and chilled water meters shall be provided on all campus buildings. Specific meter selections shall be coordinated with UW-Madison Physical Plant.

23 09 53 Pneumatic and Electric Control System for HVAC

1. Individual thermostats for offices shall be reviewed on a per project basis. As a general rule, all private offices occupied by principle investigators or by faculty shall receive



individual controls since their work hours can be irregular. Some staff or supporting offices, sharing the same building exposure and with occupancy consistent across an 8 hour work day, may be zoned.

2. Freeze protection sensors shall be included on heating and cooling coils.
3. In buildings where an air dryer is to be installed for a lab/house air system, the control air shall be tied in after, rather than having another air dryer installed just for control air.
4. All control devices in the system shall be identified with a tag or marker beside the device and not on the device. As devices get replaced in time, identification disappears.
5. Sequencing of air handling units and exhaust fans shall allow reasonable ability for a small adult to open doors of buildings during an alarm condition.
6. All thermostats shall be located directly above light switches in private offices and conference rooms. These shall be placed next to the latch side of the door or side light. Coordinate with the electrical and furniture plans.

23 20 00 HVAC Piping and Pumps

23 22 00 Steam Condensate Piping and Pumps

1. Campus steam usually has a fair amount of superheat. Provisions shall be made for proper venting of flash steam from condensate. Receivers and vents shall be directed to discharge well away from outside air intakes and other areas susceptible to vapor freezing damage. Returns shall not be insulated in Mechanical rooms, for sub cooling.
2. Campus superheated steam has a tendency to have its condensate flash in the return piping. Provisions shall be made for proper condensate cooling, particularly on large steam heating coils.

23 26 00 Valves

1. All valves shall have a method of determining position – either rising stem or pointer. Do not use non-rising stem valves.
2. Valves in campus steam and chilled water systems shall be specified to handle the higher than usual operating pressures and temperatures found in the central systems.

23 30 00 HVAC Air Distribution

23 31 00 HVAC Ducts and Casings

1. Flammable storage cabinets shall be vented with low volume exhaust (10-20 cfm) to prevent accumulation of vapors. Use only metal duct or pipe. Include a blast gate to adjust air volume. The opening from the cabinet to the duct must have a flame arrestor, usually provided with the cabinet.
2. Corrosive storage cabinets shall be vented with low volume exhaust (10-20 cfm) to prevent accumulation of vapors. Use corrosion-resistant metal or appropriate not-metal duct. Include a blast gate to adjust air volume.
3. Duct lining shall be limited to un-powered short transfer ducts for noise control.



4. If fibrous lining is used for noise control in laboratory fume hood exhausts, the fibrous material shall not be exposed to the exhaust stream. (Rationale: Exposed fibrous material could pick up contamination over many years and require disposal as hazardous waste).

23 33 00 Air Duct Accessories

1. The mixed air section in air handlers shall be properly designed for air blending. Return air and outside air shall enter mixing box very close to each other and in a position that forces the two streams in to each other, preferably with the cold outside air on the top. Ideally the two air streams shall be forced together at a higher velocity in the duct upstream of the mixing box. Air blenders alone do not solve the problem of poor entering duct arrangements. Be careful when using multiple air blenders side by side.
2. Screens in air intakes shall be mounted in such a way that they can be easily removed and cleaned. If the intake is in an area well, the grating sections shall be sized so one person can remove them. If the intake is not in an area well, sufficient space (about 3') inside of intake plenums shall be provided where a person can get inside, remove and clean the screens. If this is not possible, the screens shall be placed on the exterior.
3. Air intakes shall be designed to prevent problems with plugged frozen filters. Intakes shall be kept as high off of horizontal surfaces as possible. Low intake velocities shall be used. Ducts shall be attached high on intake plenums and plenums shall be deep enough to prevent high velocity concentrations near intake duct.
4. Filters shall be at least 4 feet from any outside louver and have added duct section on exterior of louver if the filters are less than 8 feet from the exterior to prevent precipitation from saturating the filters. Entering velocities shall not exceed 300 fpm.

23 36 00 Air Terminal Units

Variable flow devices shall not be used on biological safety cabinets.

23 40 00 HVAC Air Cleaning Equipment

23 40 50 General Requirements for Filters

Each filter type shall have its own separate filter bank.

23 70 00 Central HVAC Equipment

23 72 00 Air-to-Air Energy Recovery Equipment

1. All heat recovery units for critical systems where system shutdown is dangerous or difficult to schedule (e.g. fume exhaust) shall have tight dampers and a bypass arrangement so coils can be cleaned and maintained. Seal shall also lock into damper blades. Dampers shall be sized for full face.
2. Heat wheels shall be used anywhere possible to reduce heating and cooling loads. Where contaminated air streams might be present, UW-Madison Environment, Health and Safety shall be contacted.
3. Heat recovery coils shall be protected by filters.



23 80 00 Decentralized HVAC Equipment

23 82 00 Convection Heating and Cooling Units

23 82 16 Air Coils

Chilled water coils have a history of freezing problems. Individual coils shall be blown out with 90 psi air then the air dry shall be turned on. Coils shall be installed properly. Coils shall be leveled so they do not hold water in the return bends.