**Equipment Rooms, Mechanical**

**Identification / Security:** Each mechanical equipment room is to be labeled "Mechanical Equipment". Mechanical equipment rooms that house equipment, systems and/or supplies for which the Facilities and Services (F&S) Division has responsibility are to be securable and lockable such that access is limited to appropriate employees of the F&S Division only. Door locks serving each room are to be keyed to the standard mechanical room key. Therefore it is necessary for the F&S Locksmith Shop to provide keying. No departmental equipment/systems that require access by non-F&S personnel are to be located within building mechanical equipment rooms for safety and security reasons. Each mechanical equipment room is to be labeled “Mechanical Equipment”.

**Storage:** Items are not to reside or be stored within mechanical equipment rooms that does not directly support the operation and maintenance of building mechanical systems including plumbing and fire protection as applicable. Mechanical equipment rooms are not to house departmental equipment, systems or supplies that require access by non-F&S personnel.

**Equipment Room Access:** Each mechanical equipment room is to be accessible from an egress corridor and/or from the exterior of the building only. Access to equipment rooms is not to be provided through other spaces such as restrooms, offices, etc. It is not to be necessary to travel through a vulnerable finished area or a functioning occupied area in order to reach an equipment room. Otherwise, finishes will become soiled and/or personnel/functions will be disturbed. Mechanical equipment room doors are to open outward.

**Equipment Room Size / Layout:** Mechanical equipment rooms are to be adequate in size and layout such that the mechanical equipment components such as heat transfer coils, heat recovery wheels, air-to-air heat exchangers, dampers, fans, fan motors and drives, heat exchanger tube bundles, pumps, pump motors, chiller tubes, chiller compressors, boiler tubes, and sump pumps can be conveniently accessed for inspection and/or maintenance and can be conveniently removed for repair or replacement. Service platforms are to be provided as required to provide convenient access to equipment that is not readily accessible from the floor level. Refer to heating, ventilating, air-conditioning, electrical, plumbing, and fire suppression (MEP) section entitled MEP Space Requirements within these General Guidelines for general dimensional requirements for MEP equipment spaces.

**Air-Handling Unit (AHU) / Ductwork Considerations:** Each mechanical equipment room that houses air handling units is to be adequate in size and layout to allow the outdoor air plenum and ductwork, the return air ductwork and the actual mixing area upstream of each air handling unit to be properly configured. Proper configuration ensures that outdoor air enters the room/unit without water or snow entrainment and outdoor air and return air streams mix thoroughly prior to entering the unit. In order to accomplish this, an adequate space is required. This prevents coil freeze-up problems as well as trip-outs of freeze protection thermostats. Variable air volume (VAV) air handling units are especially susceptible to this problem. Each equipment room that houses ducted fans is to be adequate in size and layout for the installation of properly configured fan inlet and discharge ductwork. This results in proper air distribution system operation with maximum efficiency and minimal noise. This requires space that must be provided when sizing and laying out the equipment room.

**Provision for Equipment Removal:** Mechanical equipment rooms are to be laid out internally and provided with one or more access openings that can accommodate the removal of equipment assemblies or major subassemblies from the building for replacement or for repair and reinstallation. Removal of “fully assembled” equipment may be impractical for field assembled or built-in-place equipment such as custom air handling units. In such case, access as described is to be provided for each major component, subassembly or module in lieu of the fully assembled unit. Examples include heat transfer coils, heat recovery wheels, air-to-air heat exchangers, fans and motors.

**Lower Level Equipment Rooms:** To the greatest extent practical, mechanical
equipment and associated piping are to be housed within equipment rooms located at the lowest level of a building. This is especially true of rotating equipment prone to generating noise and vibration. Examples of such equipment include air compressors, vacuum pumps, air conditioning/refrigeration compressors, chillers and pumps. It is also important that systems prone to leaking fluid or vapor or those prone to generating uncontrolled heat gain be located in lower level equipment rooms. These include chilled water metering / pressure regulating stations, steam pressure regulating stations, steam reboiler humidification equipment, condensate return units, hot water generating equipment, chilled water heat exchangers and water treatment systems. It is acknowledged that optimized ventilation and heat recovery system design often places air-handling equipment at locations other than the lower level. However, the lower level is preferred.

**Leak Prevention:** It is inevitable that leaks or spills will occur in mechanical equipment rooms. Sometimes this is the preventable result of coil cleaning or draining operations. Regardless, special consideration is to be given to preventing leaks from impacting adjacent spaces when they do occur. Of special concern, of course, is the impact upon spaces below. Equipment rooms located on floors other than the lowest level are to have floors and wall bases sealed watertight. Floor penetrations for piping and conduit are to be sleeved and caulked, with the top of sleeves extended above floor level. Floor penetrations for ventilation ductwork are to have metal angles attached and caulked around the perimeter of each penetration to accomplish the same end. The above requirement for watertight wall bases applies even to lower level equipment rooms when adjacent to finished spaces. An adequate number/distribution of floor drains are to be provided in the mechanical equipment rooms and floors are to be aggressively pitched toward these drains. Proper pitching of floors toward drains is rarely achieved, resulting in many unnecessary problems. A curbed, watertight basin or secondary drain pan is to be provided beneath any piece of equipment that is especially vulnerable to leakage.

**Vibration Isolation:** We have found that mechanical equipment located in equipment rooms at the lowest level of a building rarely cause vibration problems. Thus, our standard approach is to hard-mount and hard-pipe floor-supported equipment. Having said this, it may still be prudent to use a limited number of spring hangers for ceiling support of piping on either side of sizable pumps. Vibration isolation of sizable rotating equipment on upper floors requires more extensive structural planning. A less desirable, but alternatively necessary action may be to utilize vibration isolation devices such as inertia bases, vibration isolators and flexible pipe connectors for larger equipment although it may not be necessary for smaller equipment.

**Adjacent Areas:** Spaces that are particularly sensitive to noise and/or vibration are to not be located adjacent to (including above or below) a mechanical equipment room that houses noise and/or vibration generating equipment.

**Highly Sensitive Areas:** Past experience has shown that it may be impractical (or impossible) to achieve adequate vibration and/or sound isolation to prevent unacceptable levels of transmission to highly sensitive lab equipment (e.g. high resolution electron microscopes) via heating, ventilating, and air-conditioning (HVAC) system design. Although it is important to be aware of such requirements and give them adequate consideration, it is typically more cost effective to pursue special isolation and attenuation measures at the lab or instrument level and use standard HVAC system design for the balance of the building. Thus, the installation of costly vibration isolation equipment at each piece of mechanical equipment may not prove to be the most appropriate course.

**Heat Rejection Equipment:** As stated in the Heat Rejection Equipment paragraph within the Building Cooling Systems section of these General Guidelines, air cooled heat rejection equipment is to be located outdoors. Exception is made for smaller units dedicated to year-round process loads such as cold rooms and constant temperature rooms.
**Space Conditioning:** Mechanical equipment rooms are to be provided with dedicated year-round space conditioning. Space conditions are to be adequate to prevent condensation on air handling equipment and to meet the requirements of equipment, electronics, and controls manufacturers. Such condensation has become increasingly problematic as supply air temperature within these units continues to drop. Space conditioning equipment is to be dedicated, not connected to a multiple zone HVAC system or other heating/cooling equipment serving multiple spaces. Cooling is to typically be provided via recirculating fan coil unit(s) or small AHU(s) that utilize campus central chilled water as their cooling source. Use of direct expansion (DX) cooling for such application is to be avoided. If dehumidification is required, such may be equipped with hot water reheat coil. Winter heating may be provided or augmented via installation of dedicated hot water unit heater(s). Space conditioning is to be adequate to maintain the manufacturers room ambient air temperature/humidity conditions throughout the equipment room and the following:

- 60-degrees-Fahrenheit-dry-bulb (F DB) minimum
- 85F DB / 50%-relative humidity (RH) maximum

Units are to be sized generously given the realities of wall breaches, steam leaks, uninsulated hot surfaces, compromised insulation, etc.

**Overheating:** In rooms containing hot equipment, hot water, steam, etc., positive steps are to be taken to ensure that excess heat is not transferred to adjacent spaces, particularly spaces located directly above heat generating equipment (e.g. steam PRVs). Historically, overheating in this manner has been problematic. Application of additional ceiling and wall insulation may be required.

**Equipment Pads:** A reinforced concrete support pad, dowelled into the structural concrete floor, is to be provided for each piece of floor mounted mechanical equipment. Pads for large, rotating, vibrating equipment are to be engineered to identify required mass for application.

**Sill Cock:** Each mechanical equipment room is to be equipped with at least one sill cock with integral vacuum breaker. A minimum of one floor drain is also to be provided.

**Safety:** An approved eye wash and safety shower is to be installed at each location where hazardous chemicals are stored or handled.