**Section 518.2210 Mechanical Requirements**

a) General Requirements

1) Mechanical systems shall be tested, balanced and operated to demonstrate that these systems are installed and will perform according to the plans and specifications.

2) Upon completion of the mechanical systems, the owner shall obtain a complete set of manufacturers' installation, operating, maintenance and preventive maintenance instructions, and a parts list with numbers and a description for each piece of equipment. The owner shall also obtain instruction in the operational use of the systems and equipment as required.

b) Thermal and Acoustical Insulation

1) Insulation shall be provided for the following when located within the building:

A) Boilers, smoke breeching and stacks;

B) Steam supply and condensate return piping;

C) Hot water piping above 120°F and all water heaters, generators, and converters. Exposed hot water supplies to fixtures need not be insulated except where exposed to contact by physically handicapped persons;

D) Chilled water, refrigerant, other process piping and equipment operating with fluid temperatures below ambient dew point;

E) Water supply, storm and drainage piping on which condensation may occur;

F) Air ducts and casings with outside surface temperature below ambient dew point; and

G) Other piping, ducts and equipment as necessary to maintain the efficiency of the system.

2) Insulation on cold surfaces shall include an exterior vapor barrier.

3) Insulation, including finishes and adhesives on exterior surfaces of ducts and equipment, shall have a flame spread rating of 25 or less and a smoke developed rating of 50 or less as determined by an independent testing laboratory in accordance with NFPA 255.

4) Pipe insulation shall have a flame spread rating of 25 or less and a smoke developed rating of 150 or less.

5) No duct linings shall be permitted.

c) Steam and Hot Water Systems

1) Boilers shall have the capacity to supply the normal requirements of all systems and equipment. The number and arrangement of boilers shall be such that when one boiler breaks down or is temporarily taken out of service, the capacity of the remaining boilers shall be sufficient to provide hot water service, steam for sterilization, and heating for all treatment rooms.

2) Boiler feed pumps, heating circulating pumps, condensate return pumps and fuel oil pumps shall be connected and installed to provide normal and standby service.

3) Supply and return mains and risers of cooling, heating and process steam systems shall be valved to isolate the various sections of each system. Each piece of equipment shall be valved at supply and return ends.

4) Humidifiers used in conjunction with air handling systems shall be of the direct steam injection type.

d) Air Conditioning, Heating and Ventilating Systems

1) The FEC shall employ the most economical and energy-efficient systems, in accordance with this subsection (d), to provide a comfortable, clean and controlled environment.

A) The requirements of this subsection (d) do not relieve the designer from providing system capacities and components as required to maintain control of air quality, odor, ventilation rates, space temperatures and space humidity as set forth in this subsection (d).

B) The design of air conditioning, heating and ventilation systems shall be based on no less than the recommended outdoor design conditions listed in the ASHRAE Handbook – Fundamentals for 99% occurrence (winter) and 1% occurrence (summer).

2) Ventilation Systems

A) Air handling systems shall conform to NFPA 90A.

B) Fire dampers, smoke dampers and smoke control systems shall be constructed, located and installed in accordance with the requirements of NFPA 90A.

C) Ducts that penetrate construction intended for x-ray or other ray protection shall preserve the effectiveness of the protection.

D) Outdoor air intakes shall be located at least 15 feet from exhaust outlets of ventilation systems, combustion equipment stacks, medical/surgical vacuum systems, plumbing vents, or areas that may collect vehicular exhaust or other noxious fumes, unless other provisions are made to minimize recirculation of exhaust into outdoor air intakes. Plumbing and vacuum vents that terminate above the level of the top of the air intake may be located as close as 10 feet. The bottom of outdoor air intakes serving central systems shall be located as high as practical but at least 6 feet above ground level, or, if installed above the roof, 3 feet above the roof level.

E) Exhaust outlets from areas that may be contaminated by dangerous or noxious dust, fumes, mists, gases, odors, infectious material or other contaminants harmful to people shall be above the roof level. The discharge to the atmosphere shall be located as far as possible but not less than 25 feet from any operable window, door and/or outdoor intake for a fan that discharges air to an occupied space.

F) The ventilation systems shall be designed and balanced to provide the ventilation and pressure relationships specified in this Section.

G) If the ventilation rates required in this Section do not provide sufficient make-up air for use by hoods, safety cabinets and exhaust fans, the additional make-up air shall be provided to maintain required pressure balance.

H) An all outdoor air system may be used where required by local codes, provided that some form of air-to-air or air-to-water heat recovery system is included to reclaim the energy otherwise discharged with the air exhausted to the outside.

I) To provide maximum energy conservation, air supplied to patient care areas not required as make-up air for 100% exhaust systems shall be recirculated. Any air within the FEC that is circulated between patient rooms, or patient rooms and other areas of the FEC, shall pass through filters having a minimum efficiency reporting value (MERV) 14 rating (see subsection (d)(3) on filters).

J) To provide maximum energy conservation, air supplied to housekeeping, administration and other nonsensitive areas not required as make-up air for 100% exhaust systems shall be recirculated. These areas require filters having a MERV 8 rating on the inlet side of the air handling unit.

K) When a central system serves areas with different filtration requirements, the most stringent filtration requirement will be provided for the complete system.

L) All outside air supplied to patient care areas shall pass through 90% filters (see subsection (d)(3) on filters).

M) Minimum air circulation requirements indicated in this Section are applicable to occupied spaces. During unoccupied periods, minimum air circulation may be provided as required to maintain space design temperature conditions.

N) Where fan coil or terminal room unit systems are provided in areas to be occupied by patients, through-the-wall outside air ventilation is not acceptable. A separate central ventilation system, with final filters having a MERV 14 rating, shall supply the required outdoor air ventilation.

O) Only fully ducted systems are acceptable. Interstitial spaces shall not be used as plenums for supply/return/exhaust.

3) Filters

A) All central ventilation or air conditioning systems shall be equipped with filters having efficiencies no less than those specified in the area requirements (see subsection (e)).

B) Where two filter beds are required, filter bed No. 1 shall be located upstream of the air conditioning equipment and filter bed No. 2 shall be located downstream of the supply fan and air conditioning equipment.

C) Where only one filter bed is required, it shall be located upstream of the air conditioning equipment.

D) All filter efficiencies shall be average atmospheric dust spot efficiencies tested in accordance with ASHRAE Handbook – Fundamentals.

E) Filter frames shall be durable and shall provide an air-tight fit with the enclosing ductwork. All joints between filter segments and enclosing ductwork shall be gasketed or sealed to provide a positive seal against air leakage.

F) A local indicating device shall be installed across each filter bed serving central air systems to measure the static pressure drop across the bed.

e) Area Requirements

1) Administration, Public Area, Medical Records and Housekeeping Offices

A) Filters

i) Central ventilation systems shall be provided with prefilters having a MERV 8 rating.

ii) Units that recirculate air within a room shall be provided with filters having a MERV 4 rating.

B) Space Design Conditions

i) Temperature, measured via a dry bulb, shall be 75°F.

ii) The minimum relative humidity in winter shall be 30%.

iii) The maximum relative humidity in summer shall be 60%.

C) Air Circulation

i) Total air supplied to each space shall be as required to maintain space design conditions.

ii) Outdoor air supplied shall be not less than 20% of the total air supplied.

D) Space Pressurization. The ventilation system shall be designed and balanced so that space pressure, in relation to surrounding areas of the building, is neutral.

E) Recirculation of air within a room is permitted.

2) Laboratories

A) Filters

i) Central ventilation systems shall be provided with prefilters having a MERV 8 rating and final filters having a MERV 14 rating.

ii) Units that recirculate air within a room shall be provided with filters having a MERV 8 rating.

B) Space Design Conditions

i) Temperature, measured via a dry bulb, shall be 75°F.

ii) The minimum relative humidity, in winter, shall be 30%.

iii) The maximum relative humidity, in summer, shall be 60%.

C) Space Pressurization

The ventilation system shall be designed and balanced so that space pressure, in relation to surrounding areas of the building, is negative.

D) Recirculation of air within a room is permitted, except in areas listed in subsection (e)(2)(E), where all air must be exhausted directly to the outdoors.

E) Air from the following areas shall be exhausted directly to the outdoors:

i) All fume hoods;

ii) Histology;

iii) Bacteriology; and

iv) Glass-washing areas.

F) All air exhausted from fume hoods shall be made up with outside air.

G) Laboratory hoods shall meet the following general requirements:

i) Have an average face velocity of not less than 75 feet per minute;

ii) Be connected to an exhaust system that is separate from the building exhaust system;

iii) Have an exhaust duct system of noncombustible, corrosion-resistant material consistent with the usage of the hood; and

iv) Have an exhaust fan located at the discharge end of the duct system unless provided with a welded stainless steel duct from fan outlet to termination.

H) Laboratory hoods shall meet the following special requirements:

i) Each hood that processes infectious or radioactive materials shall have a minimum face velocity of 100 feet per minute, shall be connected to an independent exhaust system, shall be provided with filters with 99.97% efficiency (based on the dioctylphthalate test method as described in DOD Penetration Test Method MIL STD No. 282) in the exhaust system, and shall be designed and equipped to permit the safe removal, disposal and replacement of contaminated filters.

ii) Duct systems serving hoods in which radioactive and/or strong oxidizing agents such as prechloric or nitric acid are used shall be constructed of stainless steel and shall be equipped with wash-down facilities.

3) Radiology Suite; X-Ray Diagnostic, Fluoroscopy and Special Procedures

A) Filters

i) Central ventilation systems shall be provided with prefilters having a MERV 8 rating and final filters having a MERV 14 rating.

ii) Units that recirculate air within a room shall be provided with filters having a MERV 8 rating.

iii) The exhaust from isotope storage shall be provided with filters with 99.97% efficiency (based on the dioctylphthalate test methods as described in DOD Penetration Test Method MIL STD No. 282).

B) Space Design Conditions

i) Temperature, measured via a dry bulb, shall be 75°F.

ii) The minimum relative humidity, in winter, shall be 30%.

iii) The maximum relative humidity, in summer, shall be 60%.

C) Air Circulation

i) Total air supplied to each space shall be as required to maintain space design conditions.

ii) Outdoor air supplied shall be not less than 20% of the total air supplied.

D) Space Pressurization

The ventilation system shall be designed and balanced so that space pressure, in relation to surrounding areas of the building, is neutral.

E) The recirculation of air within a room is permitted.

4) Pharmacy Suite

A) Filters

i) Central ventilation systems shall be provided with prefilters having a minimum MERV 8 rating and final filters having a MERV 14 rating.

ii) Units that recirculate air within a room shall be provided with filters having a MERV 8 rating.

B) Space Design Conditions

i) Temperature, measured via a dry bulb, shall be 75°F.

ii) The minimum relative humidity, in winter, shall be 30%.

iii) The maximum relative humidity, in summer, shall be 60%.

C) Air Circulation

i) Total air supplied to each space shall be as required to maintain space design conditions.

ii) Outdoor air supplied shall be not less than 20% of the total air supplied.

D) Space Pressurization

The ventilation system shall be designed and balanced so that space pressure, in relation to surrounding areas of the building, is neutral.

E) The recirculation of air within a room is permitted.

5) Observation/Treatment Rooms

A) Filters

i) Central ventilation systems shall be provided with prefilters having a MERV 8 rating and final filters having a MERV 14 rating.

ii) Units that recirculate air within a room shall be provided with filters having a MERV 8 rating.

B) Space Design Conditions

i) Temperature, measured via a dry bulb, shall be 75°F.

ii) The minimum relative humidity, in winter, shall be 30%.

iii) The maximum relative humidity, in summer, shall be 60%.

C) Air Circulation (Patient Rooms)

i) The total air supplied per bed shall be 15 cubic feet per minute (cfm).

ii) The outdoor air supplied per bed shall be 10 cfm.

D) Air Circulation

i) Total air supplied to each space shall be as required to maintain space design conditions.

ii) Outdoor air supplied shall be not less than 20% of the total air supplied.

E) Space Pressurization

The ventilation system shall be designed and balanced so that space pressure, in relation to surrounding areas of the building, is neutral.

F) Recirculation of air within a room is permitted.

G) Isolation Rooms

These rooms may be used two ways: to protect the patient from the facility environment or to protect the facility environment from the patient. Isolation rooms shall have the same conditions as other treatment rooms, except that the air flow shall be capable of being either into the room or out of the room. When isolation procedures are in place (pursuant to the Control of Communicable Diseases Code), all air shall be exhausted directly to the outdoors.

6) Central Sterile Supply

A) Filters

Central ventilation systems shall be provided with prefilters having a MERV 8 rating and final filters having a MERV 14 rating.

B) Space Design Conditions

i) The temperature, measured via a dry bulb, shall be 75°F.

ii) The minimum relative humidity, in winter, shall be 30%.

iii) The maximum relative humidity, in summer, shall be 60%.

C) Air Circulation

i) Total air supplied to each space shall be as required to maintain space design conditions.

ii) Outdoor air supplied shall be not less than 20% of the total air supplied.

D) Air flow shall be from the clean area toward the soiled or decontamination area.

E) Sterilization Room

i) Where only steam autoclaves are installed, the air exhausted from the sterilizer area for heat control may be recirculated through a central system that is provided with filters having a MERV 14 rating.

ii) Where ethylene oxide sterilizers are used, all air contaminated with ethylene oxide above 1 part per million (PPM) shall be exhausted directly outdoors. No air shall be recirculated that has more than 1 PPM of ethylene oxide present.

7) Linen Services; Laundry

A) Filters

Central ventilation systems shall be provided with prefilters having a MERV 8 rating and final filters having a MERV 13 rating.

B) Space Design Conditions: The temperature, measured via a dry bulb in winter, shall be 70°F.

C) All air from the soiled storage and sorting area shall be exhausted directly to outdoors.

D) Air flow shall be from the clean area to the soiled area. Air from the clean area may be used to make up air exhausted from the soiled area.

E) Air from the clean area may be recirculated within the laundry complex, but shall pass through a lint screen or trap before returning to the air handling unit.

F) The entire laundry ventilation system shall be controlled so that air flow is into the laundry from the FEC.

G) Circulation and ventilation rates may be variable, but sufficient outside air shall be supplied to make up for exhaust. Minimum circulation of unconditioned air at summer design conditions shall be 2 cfm (cubic feet per minute) per square foot or 12 air changes per hour, whichever is larger.

8) Miscellaneous Supporting Areas

Space temperatures in these areas shall be maintained for occupant comfort. Ventilation systems shall be designed and balanced so that air flows into these spaces from adjacent areas.

A) Anesthesia Storage Rooms

i) All air shall be exhausted directly to the outdoors.

ii) Minimum exhaust ventilation rates shall be six air changes per hour.

iii) The ventilation system shall comply with NFPA 99, including the option to provide a gravity (non-mechanical) ventilation system.

iv) Supply air makeup for exhaust requirements may be provided from a mechanical ventilation system or by transfer from adjacent areas.

B) Soiled Holding and Work Rooms

i) All air shall be exhausted directly to the outdoors.

ii) Minimum exhaust ventilation rates shall be 10 air changes per hour.

iii) Supply air makeup for exhaust requirements may be provided from a mechanical ventilation system or by transfer from adjacent areas.

C) Toilet Rooms

i) Exhaust air may be recirculated through a central ventilation system that is provided with final filters having a MERV 14 rating. Otherwise, all air shall be exhausted directly to the outdoors.

ii) Minimum exhaust ventilation rate shall be 1.5 cfm per square foot of floor area, but no less than 50 cfm.

iii) Supply air makeup for exhaust requirements may be provided from a mechanical ventilation system or by transfer from adjacent areas.

D) Janitor Closets, Linen and Trash Chute Rooms

i) All air shall be exhausted directly to the outdoors.

ii) Minimum exhaust ventilation rate shall be 1.5 cfm per square foot of floor area, but not less than 50 cfm.

iii) Supply air makeup for exhaust requirements may be provided from a mechanical ventilation system or by transfer from adjacent areas.

E) Boiler rooms shall be provided with sufficient outdoor air to maintain combustion rates of equipment and limit temperatures in working stations to 97°F effective temperature (97°F and 50% relative humidity or its equivalent) as defined by ASHRAE Handbook – Fundamentals.

F) Rooms containing heat-producing equipment, such as boiler rooms, heater rooms, food preparation centers, laundries or sterilizer or mechanical equipment rooms, shall be insulated and ventilated to prevent any floor surface above from exceeding a temperature of 100°F.

(Source: Amended at 33 Ill. Reg. 8317, effective June 4, 2009)