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5.16: UMHS - REQUIREMENTS FOR PRESSURE SENSITIVE ROOMS

GENERAL:

The following guidelines are prepared for detailing pressurized rooms. Please refer also to Design Guideline 5.13 “Healthcare Procedure Room Infection Control Types and Requirements”, 5.14 “Patient Care and Support Spaces Room Type Requirements” and 5.17 “MM Requirements for Pharmaceutical Drug Compounding Areas” for additional information on these types of rooms.

A complete list of pressurized room requirements Michigan Medicine (MM) is required to comply with can be found in the following codes, design standards and operating guidelines:

- State of Michigan Healthcare Code (2018 FGI/ ASHRAE 170 with State Amendments)
- CDC- “Guidelines for Environmental Infection Control in Health Care Facilities”
- AAMI ST79- *COMPREHENSIVE GUIDE TO STEAM STERILIZATION AND STERILITY ASSURANCE IN HEALTH CARE FACILITIES*
- USP Standards (797- *PHARMACEUTICAL COMPOUNDING, STERILE PREPARATIONS,* USP 800- *HAZARDOUS DRUGS, HANDLING IN HEALTHCARE SETTINGS & USP 825 RADIOPHARMACEUTICAL COMPOUNDING*)

The purpose of this guideline is to establish good design practice for the design and construction of all pressurized rooms.

MM has established four (4) classifications of pressurized rooms, Group A thru D.

Group A- Critical Patient Care Spaces

- Delivery Room (Caesarean)
- Emergency Department Decontamination
- Emergency Department Public Waiting Room
- Medical/ Anesthesia Gas Storage
- Newborn Intensive Care
- Operating Rooms (Type 1 Infection Control Room Type per SBA 5.13)
- Procedure Rooms (Type 2 & 3 Infection Control Room Type per SBA 5.13)
- Bronchoscopy Rooms (Type 6 Infection Control Room Type per SBA 5.13)
- Radiology Waiting Room
- Trauma Room
- Triage
- Airborne Infection Isolation Rooms & Anterooms
- Protective Environment Rooms & Anterooms
- Morgue/ Autopsy Rooms
- Endoscope Cleaning
- Clean Workroom (CSPD)
- Decontamination Room (CSPD)
- Sterile Storage Rooms

Group B - Patient Care Support Spaces- Tier I

- Laboratory (see ASHRAE 170 for list)
- Pharmacy (including Radiopharmaceutical) Compounding, Workroom and Storage Areas (see SBA 5.17)
- Nuclear Medicine Hot Labs
- Nuclear Medicine Treatment Room

Group C - Patient Care Support Spaces- Tier II

- Dialyzer Reprocessing Room
- Nonrefrigerated Body-Holding Room
- Sterilizer Equipment Room

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- Clean Linen Storage
- Soiled Linen Sorting & Storage
- Clean Workroom/ Holding
- Soiled Workroom/ Holding
- Hazardous Material Storage

Group D - Patient Care Support Spaces- Tier III

- Toilet
- Bathing Room
- Physical Therapy
- Darkroom
- Hydrotherapy
- Physical Therapy
- Bathroom
- Bedpan Room
- Janitor's Closet
- Laundry
- Linen and Trash Chute Room
- Warewashing

MM uses the above grouping in a database of all pressurized rooms, including the healthcare code function of the space and associated environmental requirements (ie minimum/ maximum temperatures, humidities, airflow and pressurization) within MM's Maximo Asset Management system. This database is used to ensure compliance with the minimum code requirements.

Completely enclosing the space and sealing the penetrations is key to the success of achieving the required pressure relationships. Each project must be approached individually. The following are examples of ways to seal the room(s) in order to achieve the required pressure relationships for critically pressurized rooms.

SIGNAGE:

MM Sign Shop has established a standard sign (ie, Positive or Negative Pressure Room, Keep Door Closed), to be installed adjacent to the entry door to this room. Signage is typically OF/OI.

ENCLOSURE:

The entire perimeter of the space must be sealed. This would include the walls, floor, and ceiling. Due to the number of penetrations in ceilings, even "hard ceilings" or gasketed lay-in ceilings tend to have numerous penetrations. Therefore, every effort should be made to extend the walls of the room to the structural deck above, and the joints between the wall and the floor, the walls and utility penetrations, and the wall and the structure above, must be sealed.

If it is not possible to extend the perimeter walls to the structure above, the ceiling system should be a "hard" ceiling such as gypsum board, as even sealed and gasketed lay-in ceilings are difficult to completely seal. Clipped down ceiling panels make maintenance very difficult, and over time tend to not be re-clipped as needed. The ceiling system must be carefully designed to be as air-tight as possible, and all utilities, such as light fixtures and sprinkler heads, should be gasketed. Any access doors should be gasketed. Light fixtures should be sealed type fixtures with gaskets at the perimeter.

The use of joint assemblies that have been tested and are listed for smoke tightness in cold conditions will help ensure the air-tightness of the space. Sealants and joints that rely upon intumescence are not acceptable. Fire stopping, or a smoke and acoustic sealant, rated for air leakage of less than 1 CFM per linear foot should be installed at all joints between materials above the ceiling or otherwise hidden from view.

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PENETRATIONS:

Penetrations through the membrane of the walls, floor and structure above must be completely sealed. Piping, ductwork, conduit and other materials penetrating the wall membrane should be sealed; specifying a UL smoke rated penetration assembly will help ensure the air-tightness of the space.

Electrical outlet boxes and other breaks in the membrane within Group A & B rooms should be gasketed to prevent air leakage, including the use of gasketed cover plates at power, communications, light switches, and other junction boxes.

DOORS:

The perimeter of all doors should be gasketed. Double doors should have solid astragals, and air-tight automatic door bottom seals should be considered (seals that lower when the door is closed and rise when the door is opened). Unless there is heavy wheeled traffic, automatic door bottoms should be paired with a threshold. Doors must have closers. Note that doors with automatic operators will stand open a certain length of time and will allow the room to lose its required pressure relationships. The use of vestibules is best practice at entry locations and should be included whenever possible. At doors that are only used in emergency situations, the vestibule can be omitted.

If required programmatically for “Clean Rooms” and other locations, the vestibule doors may be required to interlock to only allow one door at a time to be open under normal operation, to maintain pressure relationships between rooms. Emergency egress codes would apply.

See “Mechanical” below for information on door contacts reporting to the room pressurization monitors.

OPERABLE WINDOWS OR EQUIPMENT PENETRATIONS:

Operable windows in the perimeter should be avoided. Pass-thru windows, where required operationally, should be of the "air-lock" type, utilizing a double pass-thru assembly that prevents the simultaneous opening of both windows at once. Flexible strip doors or windows may be supplemental to hard doors and solid windows, but should not be relied upon to maintain air pressure.

All equipment that penetrates the perimeter, such as washers and tray returns, must be designed with a sealed perimeter, and seals integral to the operable portions of the equipment.

ELEVATORS:

Elevators or lifts that are open to these pressured rooms can wreak havoc on maintaining pressure. They act like large pistons, pushing and pulling air in and out of the room. If elevators are required operationally in pressure sensitive rooms, an elevator vestibule/airlock should be included. If this is not possible, all elevator doors should have airtight seals and the elevator shaft should be designed with some means of pressure/ airflow relief to minimize the impact elevators have on pressurized rooms.

MECHANICAL:

Air change rates for positive pressure spaces shall be based on the total supply airflow reading into the space, unless noted otherwise. Air change rates for negative pressure spaces shall be based on the total exhaust airflow reading out of the space, unless noted otherwise. The exception to this is pharmacy compounding spaces, which derive air change rate based off the supply airflow, regardless if its a positive or negative pressure space (see SBA 5.17).

A/E shall clearly state the room pressurization requirement on the design drawings and indicate a means of achieving pressurization (i.e. throttle airflow). In all cases, pressurized rooms shall be designed and balanced to the Room Design Pressurization value listed below to ensure the space is not always on the

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edge of being out of compliance. MM's standards for room pressure are as follows (positive or negative per code):

Room Type	Room Design Pressurization
Operating Rooms (Type 1) & Procedure Rooms (Type 2 & 3)	+0.03" to +0.05" wc
Pharmacy & Radiopharmaceutical Compounding Areas	See SBA 5.17
All other positive pressurized spaces	+0.02" to +0.06" wc
All other negative pressurized spaces	-0.02" to -0.03" wc

Refer to standard detail D230905H-13 – "DDC Point, Alarm and Trend Requirements" for MM's alarm & trend requirements for typical equipment and critical room applications. A/E shall include the appropriate DDC points to monitor and alarm this equipment/ spaces to meet this standard detail.

Group A & B Room Requirements:
All Group A & B pressurized rooms defined in this guideline shall be provided with DDC terminal VAV's on the supply, return and exhaust branches serving the space, integrated into the hospital BMS and alarmed/ trended per the hospital's requirements set forth under DG 230905-H.

All Group A & B pressurized rooms shall be provided with local Room Pressure Monitors (RPM) (see masterspec 230905-H MECHANICAL SYSTEMS CONTROLS (HOSPITAL PROJECTS)) and fully concealed door contacts set to monitor and alarm the relevant room pressure. Room pressure monitor shall be wall mounted outside the room immediately adjacent to the door into the room (See SBA 5.13, 5.14 & 5.17). In some special cases like Operating Rooms (Type 1), Procedure Rooms (Type 2 & 3) and Pharmacy Compounding Rooms, room pressure monitors shall also be mounted within the space (See SBA 5.13 & SBA 5.17). All room pressure monitors shall be integrated into the hospital's building management system (BMS).

Group C Room Requirements:
All Group C pressurized rooms defined in this guideline shall be provided with a Room Pressure Indicator (RPI) (see masterspec 230905-H MECHANICAL SYSTEMS CONTROLS (HOSPITAL PROJECTS)). The Room Pressure Indicator shall be a digital, local display and alarm of the room pressure and does not need to be integrated into the hospital's BMS.

COMMISSIONING:

AE shall specify a means to test the air-tightness of all pressurized rooms, i.e. "blower door" test.

Minimum leakage should be specified in order to maintain the pressurizations listed above, and/or required programmatically. Refer to "ASTM E779-10 Standard Test Method for Determining Air Leakage Rate by Fan Pressurization" and NEEB (National Environmental Balancing Bureau) publications.