ROOM PRESSURE RELATIONSHIPS

LUNCH & LEARN

JANUARY 13, 2022

Wisconsin Healthcare Engineering Association

RING & DuCHATEAU CONSULTING ENGINEERS

HEALTHCARE ROOM PRESSURE RELATIONSHIPS

HVAC PRESENTER

RING & DuCHATEAU
HVAC DEPARTMENT
EXPERIENCE

651

YEARS

Spencer Cook, P.E.
HVAC Project Manager &
Mechanical Engineer

HEALTHCARE ROOM PRESSURE RELATIONSHIPS

OVERVIEW

- What are room pressure relationships?
- Why are room pressure relationships required?
- Code requirements
- Space requirements
- Construction & Architectural impacts
- Testing & Balancing
- Other Considerations

HEALTHCARE ROOM PRESSURE RELATIONSHIPS

ROOM PRESSURE RELATIONSHIPS

What is a room pressure relationship?

- Difference in pressure between one space and the adjacent spaces around it.

How are room pressure relationships accomplished?

- Pressure differentials are created by airflow differentials within the space. Airflow always moves from higher pressure to lower pressure.

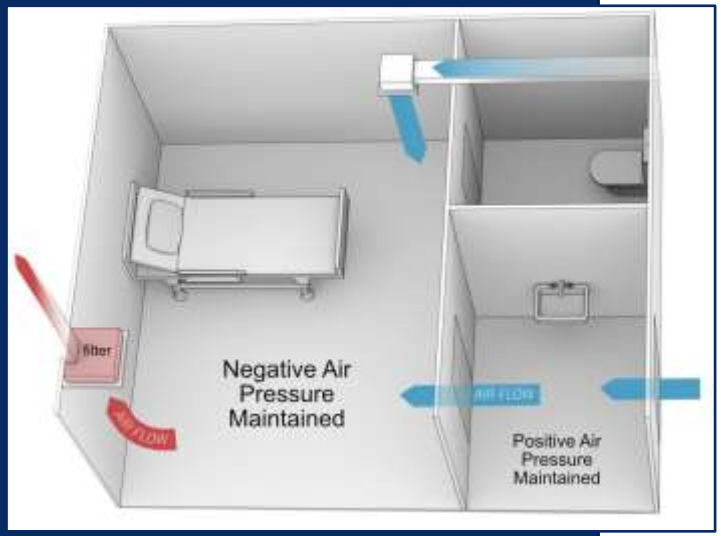


Image Source: sonicu.com

HEALTHCARE ROOM PRESSURE RELATIONSHIPS

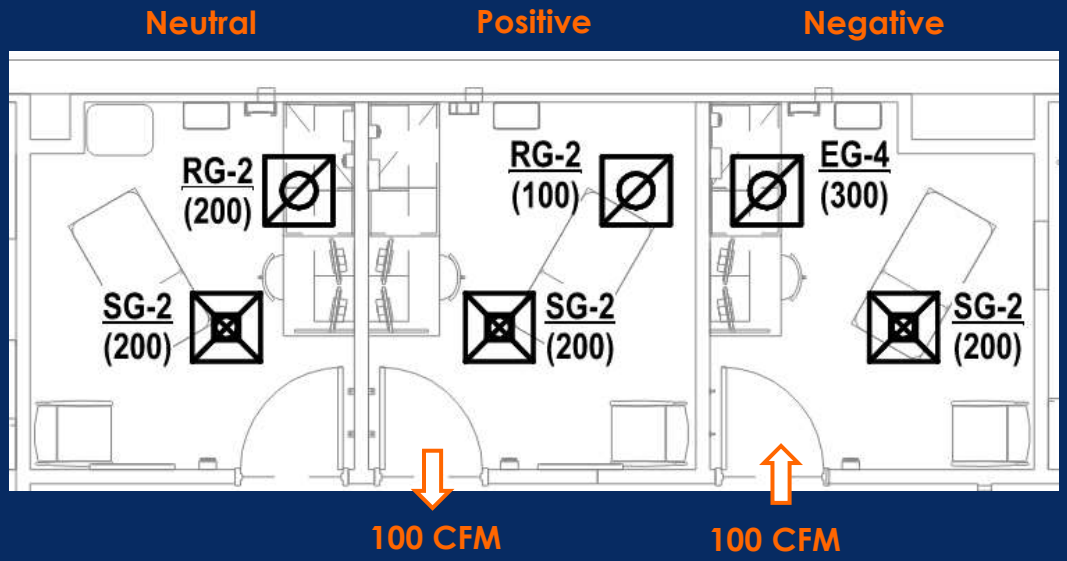
ROOM PRESSURE RELATIONSHIPS

Three Types

- Neutral
  - Equal air in and out
- Positive
  - More air in than out
- Negative
  - More air out than in

HEALTHCARE ROOM PRESSURE RELATIONSHIPS

ROOM PRESSURE EXAMPLES

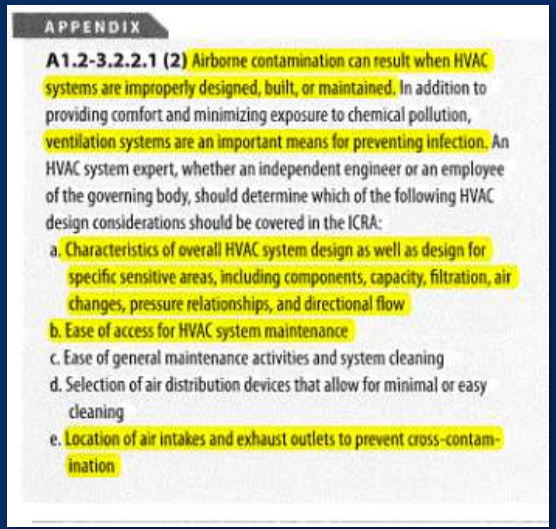


HEALTHCARE ROOM PRESSURE RELATIONSHIPS

WHY PRESSURE RELATIONSHIPS?

- Contaminant Control
  - Infection Control
  - Odor Control
  - Hazard Control
- Neutral (No Requirement)
  - Where contaminants are not anticipated to pose a risk.
- Positive
  - To keep contaminants from entering the space.
- Negative
  - To keep contaminants from leaving the space.

Infection Control Risk Mitigation Recommendations (ICRMRs) from FGI



APPENDIX

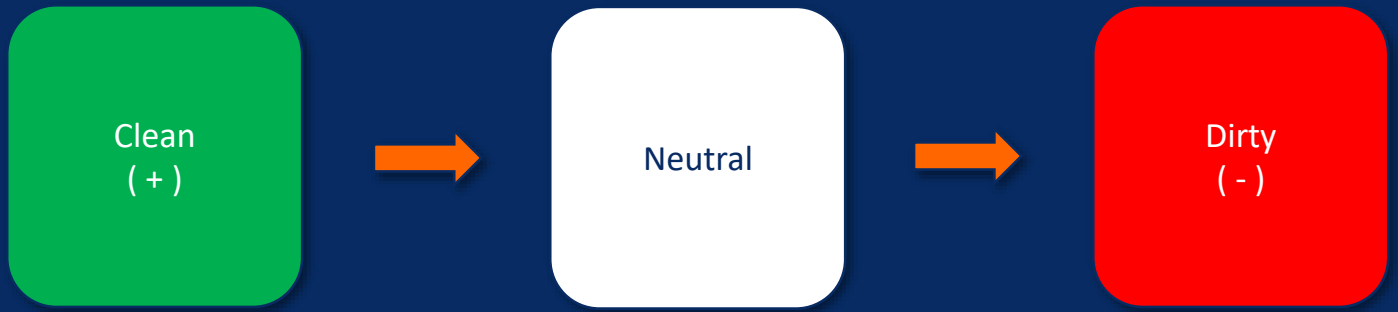
A1.2-3.2.2.1 (2) Airborne contamination can result when HVAC systems are improperly designed, built, or maintained. In addition to providing comfort and minimizing exposure to chemical pollution, ventilation systems are an important means for preventing infection. An HVAC system expert, whether an independent engineer or an employee of the governing body, should determine which of the following HVAC design considerations should be covered in the ICRA:

a. Characteristics of overall HVAC system design as well as design for specific sensitive areas, including components, capacity, filtration, air changes, pressure relationships, and directional flow
b. Ease of access for HVAC system maintenance
c. Ease of general maintenance activities and system cleaning
d. Selection of air distribution devices that allow for minimal or easy cleaning
e. Location of air intakes and exhaust outlets to prevent cross-contamination

HEALTHCARE ROOM PRESSURE RELATIONSHIPS

WHY PRESSURE RELATIONSHIPS?

- Create Air Movement from Cleanest Spaces to Dirtiest Spaces



HEALTHCARE ROOM PRESSURE RELATIONSHIPS

CODE REQUIREMENTS

- **State of Wisconsin SPS 364.0300 Health care facilities.**

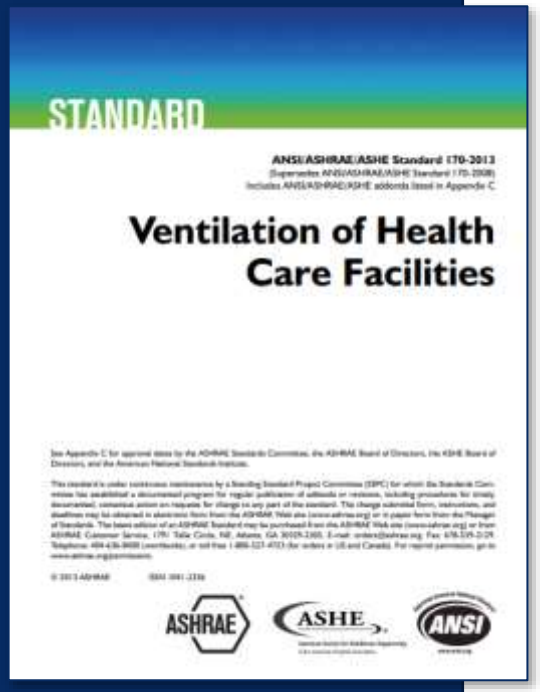
(1) This is a department rule in addition to the requirements in IMC chapter 3: In addition to the requirements in chs. SPS 361 to 366, **the heating and ventilation systems for health care facilities only shall conform to the applicable provisions of FGI Guidelines for Design and Construction of Hospitals and Outpatient Facilities 2014**, except as provided in sub. (2).

(2)
(a) The requirements in parts 1 and 5 of FGI guidelines are not included as part of this chapter.
(b) This is a department rule in addition to the requirements in part 6 of the FGI guidelines: Addenda a, b, d, e and f for ASHRAE 170 are included as part of this chapter, except as provided in sub. 2.
(c) Substitute the following definition for the corresponding definition listed in ASHRAE 170 section 3: "Alteration", has the meaning as givein in IEBC section 202.
Note: IEBC section 202 defines "alteration" as "any construction or renovation to an existing structure other than a repair or addition. Alterations are listed as Level 1, Level 2, and Level 3."

HEALTHCARE ROOM PRESSURE RELATIONSHIPS

CODE REQUIREMENTS

- ANSI/ASHRAE/ASHE 170-2013 – Ventilation for Healthcare Facilities
  - Included as part of 2014 FGI, as adopted by the State of Wisconsin.
  - Most detailed HVAC information is located in this standard.



HEALTHCARE ROOM PRESSURE RELATIONSHIPS

CODE REQUIREMENTS

- ASHRAE 170 – Table 7.1 Design Parameters

TABLE 7.1 Design Parameters

Function of Space	Pressure Relationship to Adjacent Areas (a)	Minimum Outdoor ach	Minimum Total ach	All Room Air Exhausted Directly to Outdoors (j)	Air Recirculated by Means of Room Units (a)	Design Relative Humidity (k), %	Design Temperature (l), °F/°C
SURGERY AND CRITICAL CARE							
Operating room (Class B and C) (e), (n), (o)	Positive	4	20	NR	No	20–60	68–75/20–24
Operating surgical cystoscopic rooms, (m), (n) (o)	Positive	4	20	NR	No	20–60	68–75/20–24
Delivery room (Caesarean) (m), (n), (o)	Positive	4	20	NR	No	20–60	68–75/20–24
Sub-sterile service area	NR	2	6	NR	No	NR	NR
Recovery room	NR	2	6	NR	No	20–60	70–75/21–24
Critical and intensive care	NR	2	6	NR	No	30–60	70–75/21–24
Intermediate care (o)	NR	2	6	NR	NR	max 60	70–75/21–24
Wound intensive care (burn unit)	NR	2	6	NR	No	40–60	70–75/21–24
Newborn intensive care	Positive	2	6	NR	No	30–60	72–78/22–26
Treatment room (p)	NR	2	6	NR	NR	20–60	70–75/21–24
Trauma room (crisis or shock) (o)	Positive	3	15	NR	No	20–60	70–75/21–24
Medical anesthesia gas storage (r)	Negative	NR	8	Yes	NR	NR	NR
Laser eye room	Positive	3	15	NR	No	20–60	70–75/21–24
ER waiting rooms	Negative	2	12	Yes (q)	NR	max 65	70–75/21–24
Triage	Negative	2	12	Yes (q)	NR	max 60	70–75/21–24
ER decontamination	Negative	2	12	Yes	No	NR	NR
Radiology waiting rooms	Negative	2	12	Yes (q), (w)	NR	max 60	70–75/21–24
Procedure room (Class A surgery) (o), (d)	Positive	3	15	NR	No	20–60	70–75/21–24
Emergency department exam/treatment room (p)	NR	2	6	NR	NR	max 60	70–75/21–24

HEALTHCARE ROOM PRESSURE RELATIONSHIPS

CODE REQUIREMENTS

- Spaces Requiring Negative Pressure per ASHRAE 170-2013
  - Medical/anesthesia gas storage
  - ER waiting rooms
  - Triage
  - ER decontamination
  - Radiology waiting rooms
  - Toilet rooms
  - All room (Airborne infectious isolation)
  - Physical therapy
  - Bathing room
  - Darkroom (Radiology)
  - Bronchoscopy, sputum collection, and pentamidine administration
  - Laboratory (general, bacteriology, biochemistry, cytology, glasswashing, histology, microbiology, nuclear medicine, pathology, serology, sterilizing)
  - Nonrefrigerated body-holding room
  - Autopsy room
  - Endoscope cleaning
  - Hydrotherapy
  - Dialyzer reprocessing room
  - Nuclear medicine hot lab
  - Nuclear medicine treatment room
  - Sterilizer equipment room
  - Soiled or decontamination room
  - Warewashing
  - Laundry
  - Soiled linen sorting and storage
  - Linen & trash chute room
  - Bedpan room
  - Bathroom
  - Janitor's closet
  - Soiled workroom or soiled holding
  - Hazardous material storage

HEALTHCARE ROOM PRESSURE RELATIONSHIPS

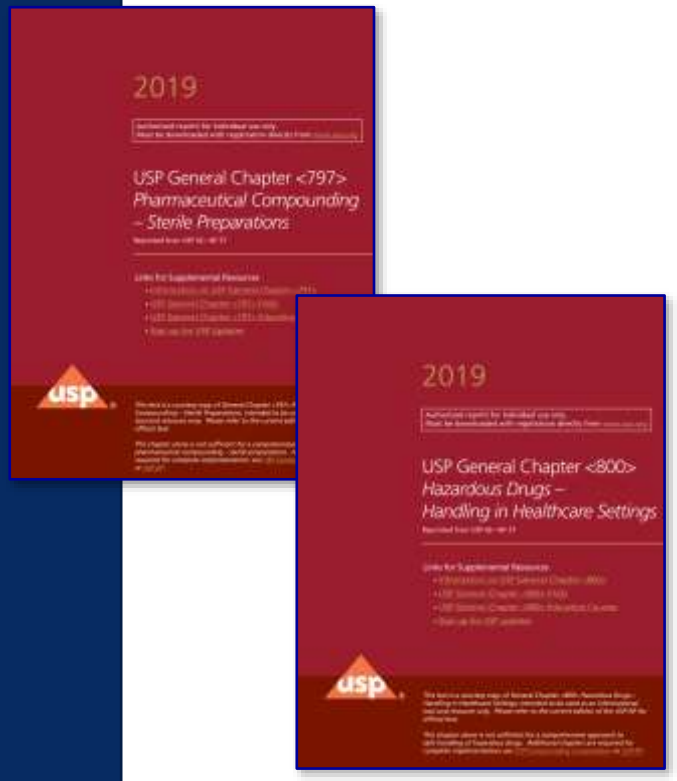
CODE REQUIREMENTS

- **Spaces Requiring Positive Pressure per ASHRAE 170-2013**
  - Operating room (Class B & C)
  - Operating/surgical cystoscopic rooms
  - Delivery room (Caesarean)
  - Newborn intensive care (NICU)
  - Trauma Room (crisis or shock)
  - Laser eye room
  - Procedure room (Class A surgery)
  - Protective environment room (PE Room)
  - Combination AII/PE room
  - X-ray (surgery/critical care and catheterization)
  - Laboratory (media transfer)
  - Pharmacy
  - Clean workroom
  - Sterile storage
  - Clean linen storage
  - Clean workroom or clean holding

HEALTHCARE ROOM PRESSURE RELATIONSHIPS

OTHER REQUIREMENTS

- Pharmacies
  - USP 797 – Pharmaceutical Compounding – Sterile Preparations
  - USP 800 – Hazardous Drugs – Handling in Healthcare Settings



HEALTHCARE ROOM PRESSURE RELATIONSHIPS

SPACE REQUIREMENTS

- 7.2.1 Airborne Infection Isolation (AII) Rooms
- Sometimes referred to as "negative pressure rooms"
- Keep contaminants from infected patients away from all other areas
- Room Pressure Monitor required.

7.2 Additional Room-Specific Requirements

7.2.1 Airborne Infection Isolation (AII) Rooms. Ventilation for AII rooms shall meet the following requirements whenever an infectious patient occupies the room:

a. Each AII room shall comply with requirements of Tables 6.4, 6.7.2, and 7.1. AII rooms shall have a permanently installed device and/or mechanism to constantly monitor the differential air pressure between the room (when occupied by patients with a suspected airborne infectious disease) and the corridor, whether or not there is an anteroom. A local visual means shall be provided to indicate whenever negative differential pressure is not maintained.

b. All air from the AII room shall be exhausted directly to the outdoors.

c. All exhaust air from the AII rooms, associated anterooms, and associated toilet rooms shall be discharged directly to the outdoors without mixing with exhaust air from any other non-AII room or exhaust system.

d. Exhaust air grilles or registers in the patient room shall be located directly above the patient bed on the ceiling or on the wall near the head of the bed unless it can be demonstrated that such a location is not practical.

e. The room envelope shall be sealed to limit leakage airflow at 0.01 in. wc (2.5 Pa) differential pressure across the envelope.

f. Differential pressure between AII rooms and adjacent spaces that are not AII rooms shall be a minimum of –0.01 in. wc (–2.5 Pa). Spaces such as the toilet room and the anteroom (if present) that are directly associated with the AII room and open directly into the AII room are not required to be designed with a minimum pressure difference from the AII room but are still required to maintain the pressure relationships to adjacent areas specified in Table 7.1.

g. When an anteroom is provided, the pressure relationships shall be as follows: (1) the AII room shall be at a negative pressure with respect to the anteroom, and (2) the anteroom shall be at a negative pressure with respect to the corridor.

HEALTHCARE ROOM PRESSURE RELATIONSHIPS

SPACE REQUIREMENTS

- 7.2.2 Protective Environment (PE) Rooms
- Sometimes referred to as "positive pressure rooms"
- Keep contaminants away from immunocompromised patients

7.2.2 Protective Environment (PE) Rooms. Ventilation for PE rooms shall meet the following requirements:

a. The room envelope shall be sealed to limit leakage airflow at 0.01 in. wc (2.5 Pa) differential pressure across the envelope.

b. Each PE room shall comply with the requirements of Tables 6.4, 6.7.2, and 7.1. PE rooms shall have a permanently installed device and/or mechanism to constantly monitor the differential air pressure between the room and the corridor when occupied by patients requiring a protective environment regardless of whether there is an anteroom. A local visual means shall be provided to indicate whenever positive differential pressure is not maintained.

c. Air distribution patterns within the protective environment room shall conform to the following:

1. Supply air diffusers shall be above the patient bed unless it can be demonstrated that such a location is not practical. Diffuser design shall limit air velocity at the patient bed to reduce patient discomfort. (See ASHRAE Standard 55 [2010a] in Informative Appendix B.)

2. Return/exhaust grilles or registers shall be located near the patient room door.

d. Differential pressure between PE rooms and adjacent spaces that are not PE rooms shall be a minimum of +0.01 in. wc (+2.5 Pa). Spaces such as the toilet room and the anteroom (if present) that are directly associated with the PE room and open directly into the PE room are not required to be designed with a minimum pressure difference from the PE room but are still required to maintain the pressure relationships to adjacent areas specified in Table 7.1.

e. PE rooms retrofitted from standard patient rooms may be ventilated with recirculated air, provided that air first passes through a HEPA filter and the room complies with parts "a" through "d" of Section 7.2.2.

f. When an anteroom is provided, the pressure relationships shall be as follows: (1) the PE room shall be at a positive pressure with respect to the anteroom and (2) the anteroom shall be at a positive pressure with respect to the corridor.

HEALTHCARE ROOM PRESSURE RELATIONSHIPS

SPACE REQUIREMENTS

- 7.2.3 Combination Airborne Infectious Isolation/Protective Environment (AII/PE) Rooms
- These are NOT “switchable” rooms
- Keep contaminants away from the public produced by immunocompromised patients

7.2.3 Combination Airborne Infectious Isolation/Protective Environment (AII/PE) Rooms. Ventilation for AII/PE rooms shall meet the following requirements:

a. Supply air diffusers shall be located above the patient bed.

b. Exhaust grilles or registers shall be located near the patient room door.

c. The pressure relationship to adjacent areas for the required anteroom shall be one of the following:

1. The anteroom shall be at a positive pressure with respect to both the AII/PE room and the corridor or common space.

2. The anteroom shall be at a negative pressure with respect to both the AII/PE room and the corridor or common space.

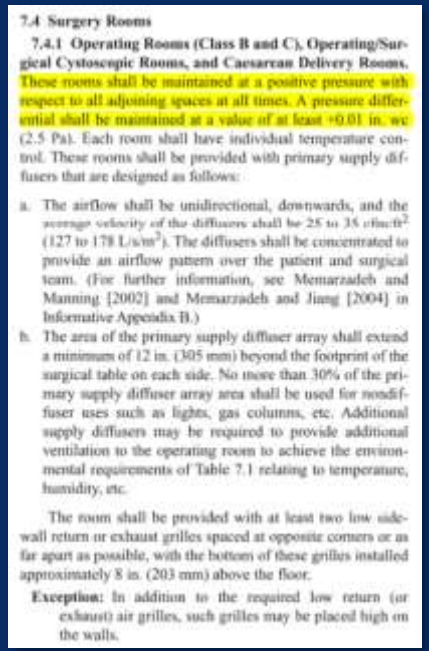
d. AII/PE rooms shall have two permanently installed devices and/or mechanisms to constantly monitor the differential air pressure. One device and/or mechanism shall monitor the pressure differential between the AII/PE room and the anteroom. The second device and/or mechanism shall monitor the pressure differential between the anteroom and the corridor or common space. For each device and/or mechanism, a local visual means shall be provided to indicate whenever differential pressure is not maintained.

HEALTHCARE ROOM PRESSURE RELATIONSHIPS

SPACE REQUIREMENTS

- 7.4.1 Operating Rooms (Class B and C), Operating/Surgical Cystopic Rooms, and Caesarean Delivery Rooms

- Typically provided with Room Pressure Monitor for trending in the Building Automation System, and to alert users if there is an HVAC issue.



7.4 Surgery Rooms

7.4.1 Operating Rooms (Class B and C), Operating/Surgical Cystoscopic Rooms, and Caesarean Delivery Rooms. These rooms shall be maintained at a positive pressure with respect to all adjoining spaces at all times. A pressure differential shall be maintained at a value of at least +0.01 in. wc (2.5 Pa). Each room shall have individual temperature control. These rooms shall be provided with primary supply diffusers that are designed as follows:

a. The airflow shall be unidirectional, downwards, and the average velocity of the diffusers shall be 25 to 35 cfm/ft^2 (127 to 178 L/s/m^2). The diffusers shall be concentrated to provide an airflow pattern over the patient and surgical team. (For further information, see Memarzadeh and Manning [2002] and Memarzadeh and Jiang [2004] in Informative Appendix B.)

b. The area of the primary supply diffuser array shall extend a minimum of 12 in. (305 mm) beyond the footprint of the surgical table on each side. No more than 30% of the primary supply diffuser array area shall be used for nondiffuser uses such as lights, gas columns, etc. Additional supply diffusers may be required to provide additional ventilation to the operating room to achieve the environmental requirements of Table 7.1 relating to temperature, humidity, etc.

The room shall be provided with at least two low sidewall return or exhaust grilles spaced at opposite corners or as far apart as possible, with the bottom of these grilles installed approximately 8 in. (203 mm) above the floor.

Exception: In addition to the required low return (or exhaust) air grilles, such grilles may be placed high on the walls.

HEALTHCARE ROOM PRESSURE RELATIONSHIPS

SPACE REQUIREMENTS

- Other Space Requirements with Pressurization

7.4.3 Imaging Procedure Rooms. If invasive procedures occur in this type of room, ventilation shall be provided in accordance with the ventilation requirements for procedure rooms (Class A surgery). If anesthetic gases are administered, ventilation shall be provided in accordance with the ventilation requirements for operating rooms (Class B or C surgery).

7.5 Support Spaces

7.5.1 Morgue and Autopsy Rooms. Ventilation for morgue and autopsy rooms shall meet the following requirements:

a. Low sidewall exhaust grilles shall be provided unless exhaust air is removed through an autopsy table designed for this purpose.
b. All exhaust air from autopsy, nonrefrigerated body-holding, and morgue rooms shall be discharged directly to the outdoors without mixing with air from any other room or exhaust system.
c. Differential pressure between morgue and autopsy rooms and any adjacent spaces that have other functions shall be a minimum of –0.01 in. wc (–2.5 Pa).

7.5.2 Bronchoscopy

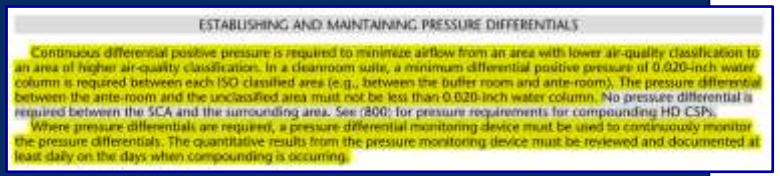
a. Differential pressure between bronchoscopy procedure and sputum induction rooms and any adjacent spaces that have other functions shall be a minimum of –0.01 in. wc (–2.5Pa).
b. Local exhaust shall be provided for sputum collection procedures.

HEALTHCARE ROOM PRESSURE RELATIONSHIPS

SPACE REQUIREMENTS

- Pharmacy Space Requirements
  - Most stringent for pharmaceutical requirements.
  - USP 797 & 800 Requirements
  - Both negative (Hazardous Drugs Mixing) and positive (Sterile Compounding) spaces, interacting in close proximity with temperature, filtration, and humidity requirements.
  - Airlocks & interlocking doors.
  - Room Pressure Monitor requirements.
  - Certified by 3rd party certifier every 6 months or if pressure relationships are lost for 60 mins.

USP-797



ESTABLISHING AND MAINTAINING PRESSURE DIFFERENTIALS

Continuous differential positive pressure is required to minimize airflow from an area with lower air-quality classification to an area of higher air-quality classification. In a cleanroom suite, a minimum differential positive pressure of 0.020-inch water column is required between each ISO classified area (e.g., between the buffer room and ante-room). The pressure differential between the ante-room and the unclassified area must not be less than 0.020-inch water column. No pressure differential is required between the SCA and the surrounding area. See (800) for pressure requirements for compounding HD CSPs.

Where pressure differentials are required, a pressure differential monitoring device must be used to continuously monitor the pressure differentials. The quantitative results from the pressure monitoring device must be reviewed and documented at least daily on the days when compounding is occurring.

USP-800

Table 2. Engineering Controls for Nonsterile HD Compounding

C-PEC	C-SEC Requirements
• Externally vented (preferred) or redundant-HEPA filtered in series • Examples: CVE, Class I or II BSC, CAC	• Externally vented • 12 ACPH • Negative pressure between 0.01 and 0.03 inches of water column relative to adjacent areas

HEALTHCARE ROOM PRESSURE RELATIONSHIPS

SPACE REQUIREMENTS

- Pharmacy Space Requirements

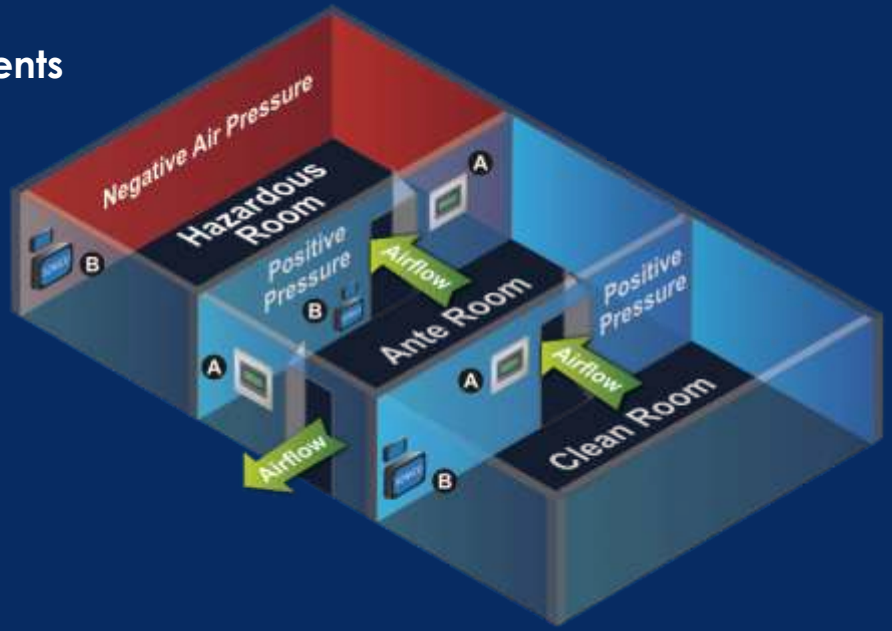


Image Source: sonicu.com

HEALTHCARE ROOM PRESSURE RELATIONSHIPS

COVID-19 RECOMMENDATIONS

- **ASHE ON COVID-19**
  - **ASHE Temporary COVID-19 Facilities within a Healthcare Facility.**
  - **Common requirement is negative pressure.**
  - **No regulatory requirements. For how long?**
  - **ASHRAE has COVID-19 recommendations and statements for most other facilities**

Source: https://www.ashe.org/negative-pressure-rooms

Negative pressure has become a hot button topic for all those in the front lines working with patients afflicted with the SARS-CoV-2 (COVID-19) virus. **There is a significant amount of guidance from various organizations and regulatory agencies for temporary solutions along with explanations of why facilities should attempt to provide temporary negative pressure spaces.** Specifically, the CDC recommends placing COVID-19 positive patients in a single patient room and keep the door closed. Additionally, the CDC recommends:

- Limiting transport and movement of the patient outside of the room to medically essential purposes.
- Housing patients in the same room for the duration of their stay.
- Whenever possible, perform procedures/tests in the patient's room.
- **Reserve Airborne Infection Isolation Rooms (AIIRs) for patients who will be undergoing aerosol-generating procedures.**

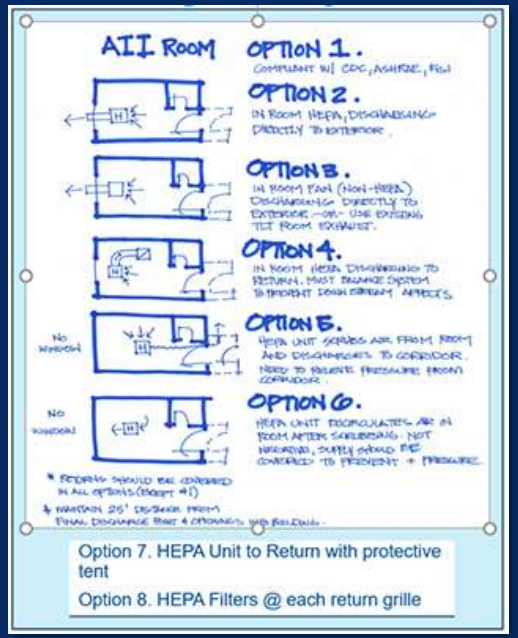
Even with these recommendations, the risk of aerosol propagation of COVID-19 within the patient room increases. **Temporary negative pressure rooms help mitigate the transmission of the aerosolized virus to adjacent spaces, containing contaminates and particles.** How to achieve temporary negative pressure in a room will significantly depend on the design of the patient room and the ventilation system serving the patient room. The ASHE COVID-19 Negative Pressure webpage offers different negative pressure room concepts. **Since these temporary negative pressure patient rooms and spaces are not a normally recognized health care space, there are not established requirements.** As frontline clinical staff continue to be at the forefront of this battle with the virus, it is important that facilities leaders weigh the impacts of temporary negative pressure; what impact is it having on the building and how to continue to provide a safe environment while maintaining regulatory compliance if temporary negative pressure was implemented.

HEALTHCARE ROOM PRESSURE RELATIONSHIPS

COVID-19 RECOMMENDATIONS

- **ASHRAE ON COVID-19**
  - "Layered Approach – A Variety of Options"
  - Eight (8) options for temporary COVID-19 patient rooms in hospitals
  - Common requirement is negative pressure
  - No regulatory requirements. For how long?

Source: https://www.ashrae.org/technical-resources/healthcare



HEALTHCARE ROOM PRESSURE RELATIONSHIPS

ROOM PRESSURE MONITORS

- Where required & where typically provided
- Types
  - Past & current technologies
  - Time Delays (30-45 seconds)
- Locations
  - Inside room vs outside room
  - Staff/Facility preference
- Uses
  - Visual/audial notifications
  - Logging
  - Typically not used to control HVAC

HEALTHCARE ROOM PRESSURE RELATIONSHIPS

DESIGN REQUIREMENTS

- Airflow calculations to meet room air change requirements + heating/ cooling loads

- Estimating room construction leakage
  - Standard Practice: 100-150 CFM offset per door
  - Is the space existing and leaks?
    - We have seen as much as 700 CFM offset to maintain pressures.
    - We have seen as little as 25 CFM offset to maintain pressures in clean room/pharmacy spaces
  - Take our best estimate based on anticipated room construction

HEALTHCARE ROOM PRESSURE RELATIONSHIPS

HVAC REQUIREMENTS

What devices are utilized to maintain pressure relationships via airflow?

- Supply Air
  - -Air Terminal Unit (CAV,VAV Box or Air Valve)
  - -Balance dampers w/ reheat coils

- Return/Exhaust Air
  - -Air Terminal Unit (CAV,VAV Box or Air Valve)
  - -Balance dampers

Image Source: triatek.com

HEALTHCARE ROOM PRESSURE RELATIONSHIPS

CONSTRUCTION/ARCHITECTURAL REQUIREMENTS

- Sealing of Room
  - Ceiling type (ACT, gasketed ACT, gypsum wall board)
  - Gasketed/sealed light fixtures
  - Sealing of back boxes and wall penetrations
  - Door sweeps
  - Epoxy Paint (especially in humidified spaces)
  - Anywhere air can escape
  - More critical in rooms where pressure is being monitored and required to be maintained at a certain level (±0.01"W.C.)

HEALTHCARE ROOM PRESSURE RELATIONSHIPS

FIELD CONDITION ALTERATIONS

- Testing & Balancing
  - Values shown on drawings vs. balanced data
  - Offset of supply vs. return/exhaust
  - Additional sealing required

- DHS Compliance Statement – HVAC
  - Need TAB Report
  - Need Room Pressure Monitors to be functioning

DEPARTMENT OF HEALTH SERVICES

STATE OF WISCONSIN

Division of Quality Assurance

F-82466 (08/2020)

COMPLIANCE STATEMENT

- Completion and submission of this form is required by Wis. Admin. Code § DHS 381.40 prior to initial occupancy of a new building or addition and prior to final occupancy of an alteration of an existing building.
- This form must be completed and available at the time of the final construction inspection.
- This form is to be completed by the supervising professional responsible for building, HVAC, fire protection, building systems, or partial completion. A project may require multiple supervising professionals to complete and submit this form for each of their particular areas of responsibility.
- The supervising architect, engineer, or designer shall file this form with the Department of Health Services (DHS) certifying that construction of the portion to be occupied has been performed in substantial compliance with the approved plans and specifications.
- If you have questions about completion or use of this form, call (414) 227-4930, email DHSDQAPlanReview@wi.gov, or contact your DSA representative.

I. PROJECT INFORMATION

Name – Facility | DHS/DSA Project/Plan No.

Building Occupancy and Use

Location – Street Address | City | Zip Code | County

Project Description (Briefly describe scope of project.)

II. OWNER / ENTITY INFORMATION

Name – Owner or Representative | Email Address

Name – Entity | Email Address

Street Address | City | State | Zip Code

III. PURPOSE OF STATEMENT

Check the appropriate box and provide any other applicable information to indicate compliance with the approved plans and specifications. Attach additional pages, if necessary.

☐ Building ☐ HVAC ☐ Fire Protection System ☐ Discrete Electrical System ☐ Kitchen Hood System ☐ Special Locking System

☐ Partial Completion – Specify:

☐ Other – Specify:

IV. STATEMENT OF SUBSTANTIAL COMPLIANCE – SUPERVISING PROFESSIONAL

To the best of my knowledge and belief and based on site observations and testing, this project has been completed in substantial compliance with the approved plans and specifications.

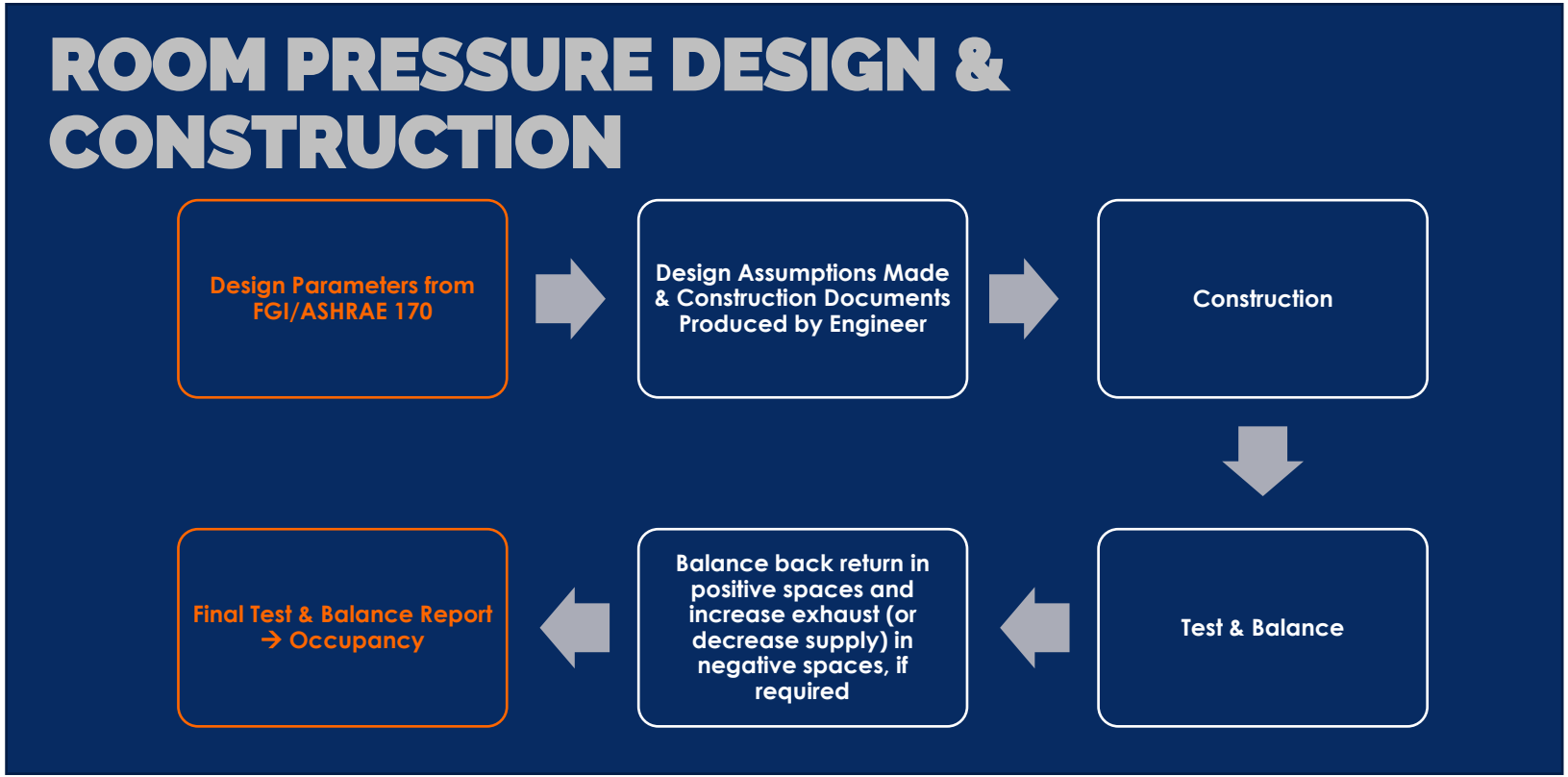
SIGNATURE – Supervising Professional | Date Signed (MM/DD/YYYY) | Wisc. Professional License No.

Name – Supervising Professional (Print or type.) | Name – Company

Mailing Address – Street or P.O. Box | City | State | Zip Code

Telephone No. | Email Address

HEALTHCARE ROOM PRESSURE RELATIONSHIPS



HEALTHCARE ROOM PRESSURE RELATIONSHIPS

TROUBLESHOOTING

- Why is my pressure relationship not being maintained?
  - Supply air issue
  - Return/exhaust air issue
  - Doors held open too long
  - VAV box actuator issue
  - Sealing degradation
  - Access panel leakage
  - Room pressure monitor out of calibration

- Ongoing Maintenance
  - Testing of rooms (monthly)
  - Calibration of room pressure monitors (annually)

HEALTHCARE ROOM PRESSURE RELATIONSHIPS

OTHER CONSIDERATIONS

- Zone pressurization
- Building pressurization impacts
- Maintaining pressure relationships
- Indoor Air Quality (IAQ) importance

QUESTIONS/ ANSWERS

Wisconsin Healthcare Engineering Association

RING & DuCHATEAU CONSULTING ENGINEERS

YOUR PARTNERS IN HEALTHCARE MEPT DESIGN

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