Helping Hospitals prevent and reduce Healthcare Associated Infections (HAI)s -

Implementing a Pressurized Spaces Program using ASHRAE 170

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ASHE - TCHEA Chapter, Minneapolis

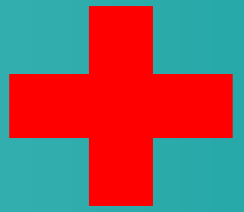
Learning Objectives

Description: To support infection control and clinical care teams, and, satisfy accreditation compliance requirements, facilities staff in hospitals operate and maintain a variety of critical and pressurized spaces. Unfortunately, the built environment may be having a negative impact on patient outcomes due to improper pressure relationships and infrequent inspection, testing, and maintenance activities.

1. Review the various regulatory standards for pressurized spaces for hospital facilities engineers.
2. Specify systems and equipment that support a monitoring program for pressurized spaces.
3. Educate the hospital facilities staff on how to create a pressurized spaces program.
4. Identify the available resources for hospital facilities engineers to develop a pressurized spaces program.

Helping Hospitals prevent and reduce Infections

Patient Safety



Staff Safety

Helping Hospitals maintain Compliance

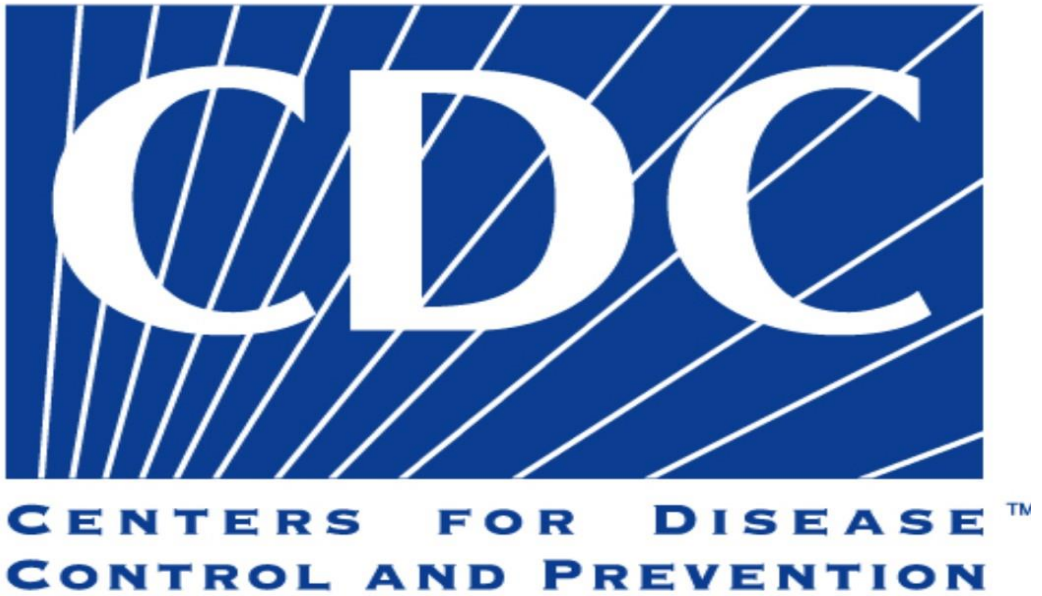
Healthcare & Infection Statistics

Centers for Disease Control and Prevention

Healthcare-associated infections (HAIs) are infections patients can get while receiving medical treatment in a healthcare facility. Working toward the elimination of HAIs is a CDC priority.

HAI data for nearly all U.S. hospitals are published on the Hospital Compare website.

- Approximately 1 in 25 hospital patients, or 2 million patients, per year in the U. S. acquire a HAI while in the hospital.
- Each HAI adds 19+ hospital days of care
- Average cost to treat is $43K+.
- $96-147B burden on the US Healthcare System annually.
- About 99,000 of these patients die each year because of their infection [(1)].
- About 20%+ of these deaths are attributed to airborne infections from construction and maintenance activities.

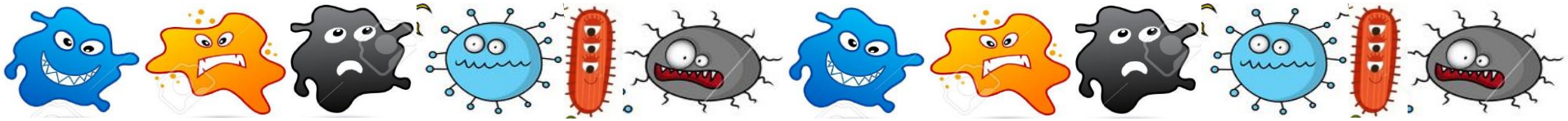


*(1) Klevens, R. Monina; Edwards, Jonathan R.; Richards, Chesley L.; Horan, Teresa C.; Gaynes, Robert P; Pollock, Daniel A.; Cardo, Denise M. (2007). "Estimating Healthcare-associated Infections and Deaths in U.S. Hospitals, 2002". Public Health Reports. **122** (2): 160–166.*

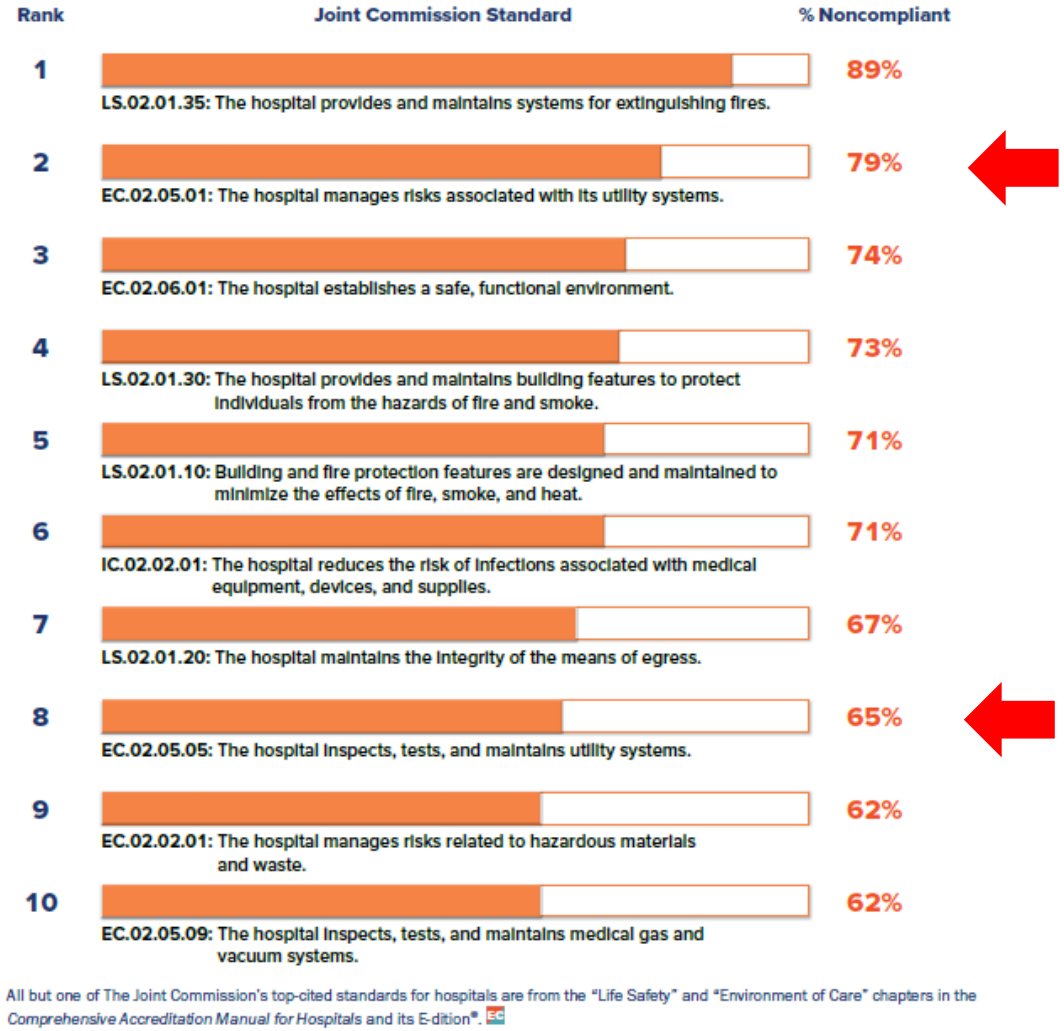
Why the focus on Pressurized Spaces?

- The term **nosocomial infection** is applied to infections which are acquired and transmitted by patients within a hospital. **Pressurized spaces** are necessary to support infection control.

- Spaces are designed to reduce the risk of infection, with the flow of air from clean to less clean. **Pressurized** spaces can be negatively pressured (i.e., Isolation Rooms), or positively pressured (i.e., Operating Rooms).
  - Positive pressure keeps germs out of the room the patient or clean supplies are in
  - Negative pressure keeps germs of the patient or soiled items contained in the room



The Joint Commission's Environment of Care Standards



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The second most frequently cited EC finding in the realm of "high likelihood to harm" was "Critical Area Pressure Relationships" (EC.02.05.01, EP 15), Monroe noted. He warned that during a Joint Commission survey, hospitals need to make sure that doors to critical areas—such as operating rooms, intensive care units, and airborne-infection isolation rooms—have been shut for a considerable amount of time prior to pressure inspection.

After a door is shut, "it's going to take a while for [the mechanical systems] to reach stasis and everything to be settled out and at the right pressure relationship and temperature," Monroe explained. "This doesn't happen as soon as you close the door."

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Environment of Care® News, April 2019, Volume 22, Issue 4

2019 ASHE Construction Survey – Room Pressure Sensors

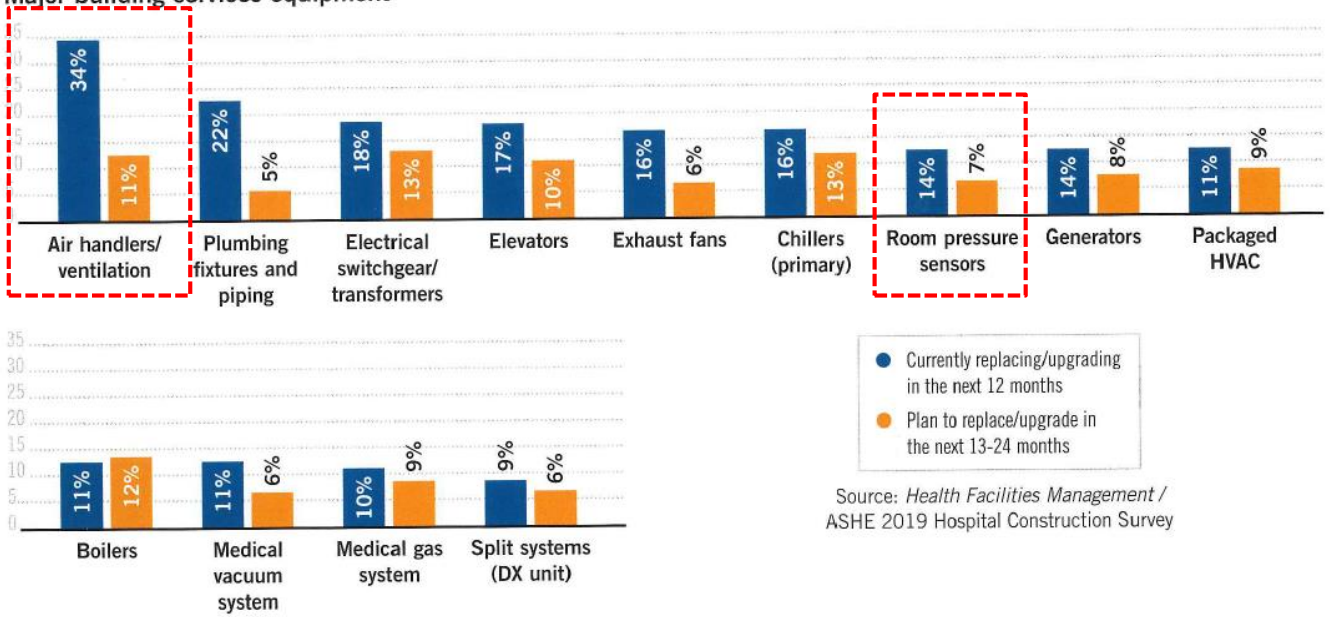
COVER STORY // 2019 HOSPITAL CONSTRUCTION SURVEY

INFRASTRUCTURE PROJECTS

34% of hospitals are replacing or upgrading their **air handler/ventilation systems** in the next 12 months.

28% of hospitals are replacing or upgrading their **security system** in the next 12 months.

Major building services equipment



Source: *Health Facilities Management* / ASHE 2019 Hospital Construction Survey

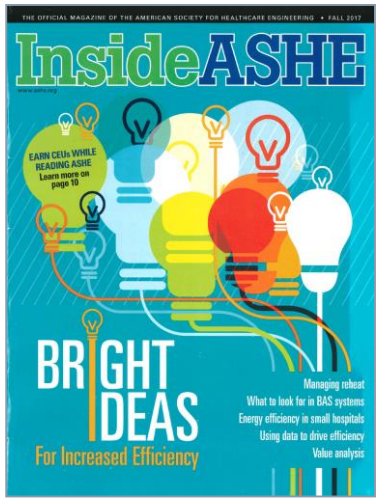
Services/department projects

	Currently under construction	Planned in the next 3 years
Imaging	12%	12%
Pharmacy	11%	13%
Emergency department	9%	11%
Behavioral health services	9%	9%
Surgery	8%	10%
Ambulatory care	8%	10%
Laboratory	6%	6%
Interventional suites (surgery and imaging)	5%	6%
Cancer center	5%	10%
Cardiology	5%	7%
Critical care	4%	4%
Isolation/clean rooms	4%	2%
Clinical observation units	4%	2%
Women's health/obstetrics	3%	7%
Rehabilitation services	3%	5%

Source – Health Facilities Management Magazine, March 2019

Pressurized Spaces Program – original concept - Dennis Ford

August 2017

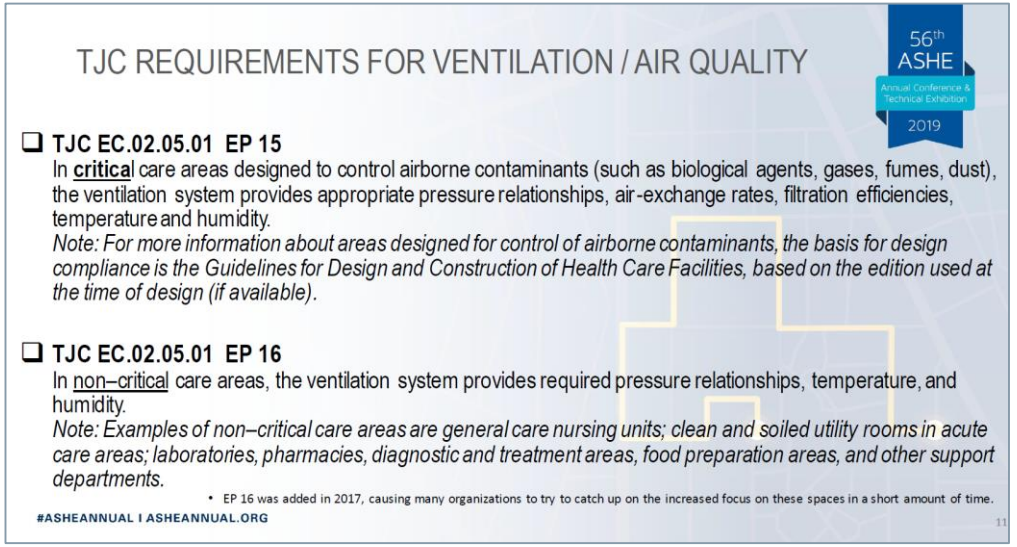


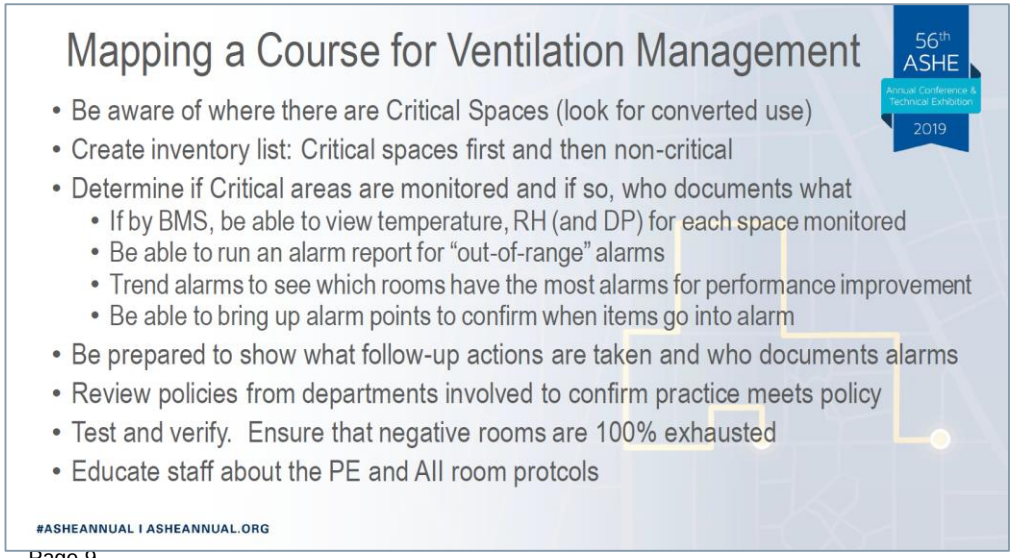
January 2019

September 2019

Pressurized & Non-Pressurized Spaces Program - Example

July 2019





Pressurized Spaces – A program approach

1 Create the Program

- Review your Hospital's Infection Control policies and procedures.
- Review national & state policies and standards (ASHRAE 170, The Joint Commission's Environment of Care, Department of Health, etc.)
- Form a multidisciplinary team to include Infection Control, Nursing, Pharmacy, Laboratory, Safety, Security, etc.
- Match existing rooms to room names in the adopted standards.
- Perform an and audit of existing rooms, room names, functions, equipment, and devices.
- Create an inventory of all rooms to include all pressurized spaces.

2 Implement the Program

- Develop a process to review room usage against requirements of adopted standards (periodic audits).
- Ensure space management policies and procedures include list of standardized room names and signage; process for ensuring repurposed spaced meet adopted standards.
- Ensure all spaces to include pressurized spaces meet the requirements of the adopted standards.
    - Determine how spaces will be monitored for pressure, temperature, humidity, and air exchanges.
    - Determine the frequency of inspection, testing, balancing and maintenance of spaces and monitoring devices.

Implement ASHRAE 170

3 Monitor & Measure to the Program

- Define standards for the monitoring equipment and devices.
    - Determine how your equipment and devices will be monitored, i.e., visual or via a Building Automation System (BAS).
- Create a pilot project.
    - Determine type and location of equipment and devices
    - Ensure support of departmental leaders of pilot area
- Define the compliance documentation requirements in your policies and procedures.

4 Train & Maintain to the Program

- Develop a training program to ensure all stakeholders to recognize spaces with pressure requirements
- Create ownership with all stakeholders to monitor space utilization and standardization.
- Automate and repeat the processes to monitor, measure, and maintain all spaces per your policies.
- Document all activities to ensure proper documentation control.

Source - modified version of "*Creating a Program to Identify & Monitor Pressure Dependent Spaces",* Dennis Ford, Director of Facilities, Texas Children's Hospital , Houston, Texas, 2017 ASHE Annual Conference, Indianapolis

Create the Program – Identify Hospital Standards

- **ANSI/ASHE/ASHRAE Standard 170:** "Surgeons or surgical procedures may require room temperatures, ventilation rates, humidity ranges, and/or distribution methods that exceed the minimum indicated ranges."
- **2014 FGI Guidelines for Design and Construction references ASHRAE Standard 170-2013**
- **ANSI/AAMI ST79 (sec 3) 2017:** Comprehensive Guide to Steam Sterilization…
  - References ASHRAE 170
  - Recommends establishing "policies and procedures for monitoring and maintaining HVAC parameters within the sterile processing areas."
  - "Procedures should include maintaining records of monitoring…."
- **APIC – Understanding the OR Environment:** "evidence suggesting a relationship between ambient room temperature in the OR and infections is weak to nonexistent." For burn patient surgeries, "OR room temperatures can be set to exceed 100 degrees."
- **AORN Guideline for a Safe Environment of Care**

Create the Program – Identify Hospital Standards

- The ASHRAE 170 standard and FGI guidelines are intended to establish the minimum **design requirements** and criteria that must be met to construct an HVAC system that will support clinical functions during the life of a building.
- The AAMI and AORN guidelines are intended to guide the **daily operation** of the HVAC system and clinical practice once the health care facility is occupied.
- 2003 Centers for Disease Control and Prevention (**CDC)** Guidelines for Environmental Infection Control in Health-Care Facilities
- Federal Occupational Safety and Health Administration (**OSHA**)
- **2012 NFPA 99** para 9.3.1.1 references ASHRAE 170-2008 which is also used by The Joint Commission

Why is ASHRAE 170 so important?

- The purpose of the standard is to define ventilation system design requirements that provide environmental control for comfort, asepsis, and odor in health care facilities.

- This standard applies to new buildings, additions to existing buildings, and alterations to existing buildings identified within this standard.

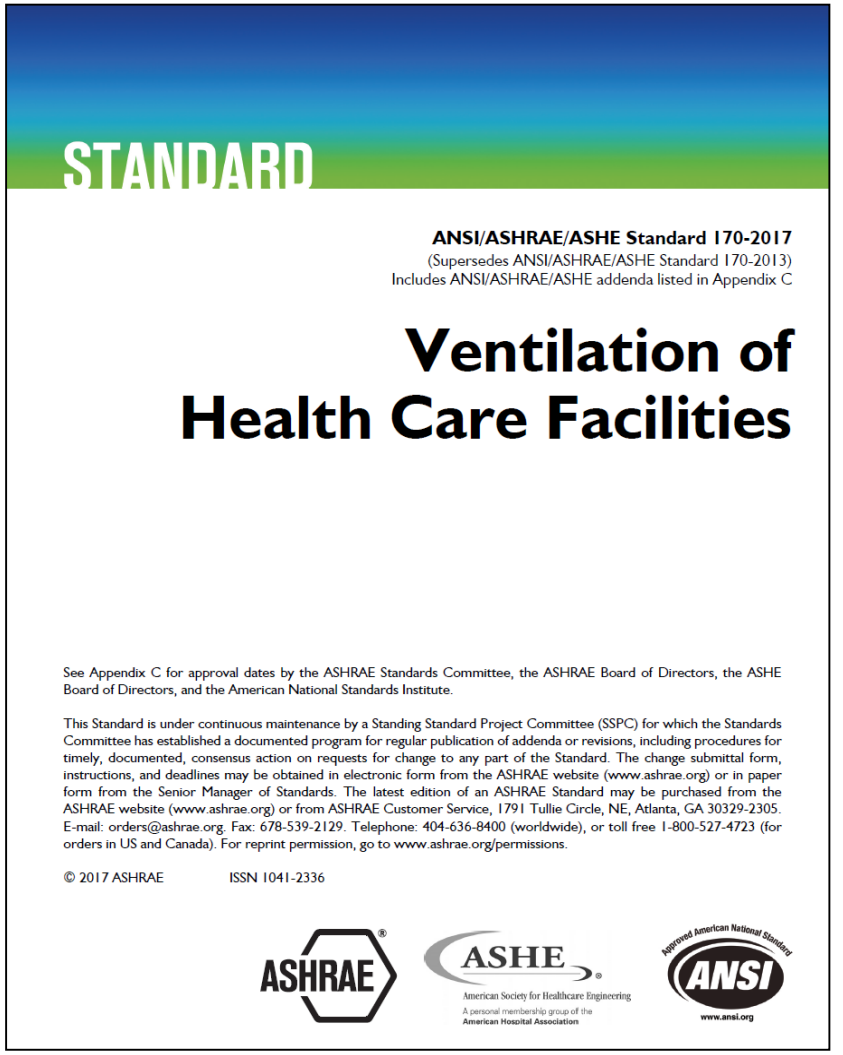
- **This standard does not constitute a design guide. *Rather it comprises a set of minimum requirements intended for adoption by code-enforcing agencies.***

- Owners/managers of health care facilities shall prepare a detailed program that shall include the clinical service expected in each space, the specific user equipment expected to be used in each space, and any special clinical needs for temperature, humidity, and pressure control (during the planning phase of design).

- *ASHRAE Standard 170 Table 7.1 provides room names, temperature, humidity, pressure relationships, minimum outdoor ACH, minimum total ACH, and requirement to exhaust to the outside or re-circulate air.*

- The requirements are linked to the room name. The hospital needs to understand the function and procedures performed in each room.

The Joint Commission is aligned to the 2012 edition of NFPA 99, Health Care Facilities Code. ASHRAE 170, Ventilation of Health Care Facilities, 2008, is a referenced publication in 2.3.2 and 9.3.1.1.



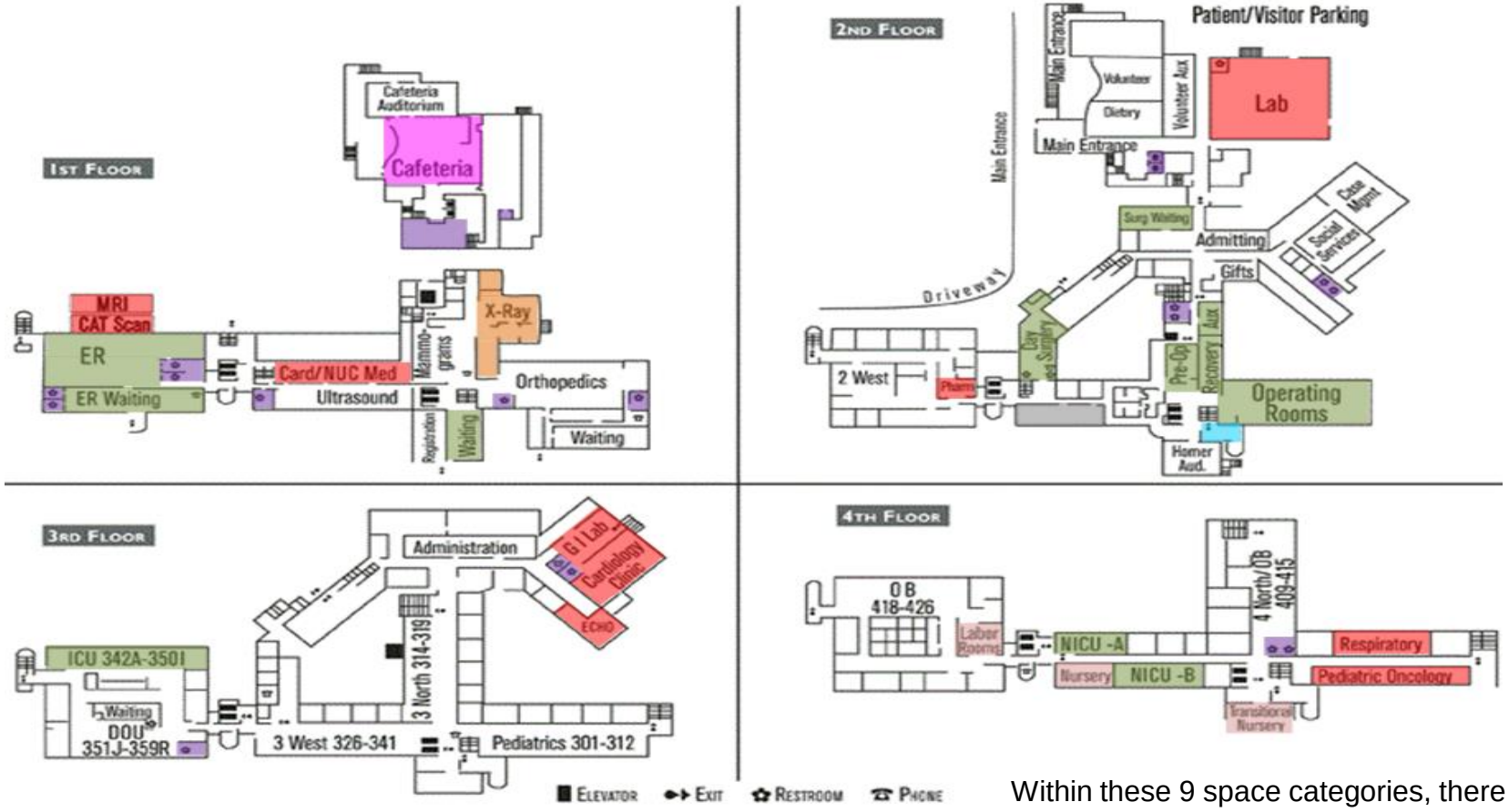
Understanding ASHRAE 170

Table 7.1 Design Parameters—Hospital Spaces

Function of Space	Pressure Relationship to Adjacent Areas (n)	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							
Critical and intensive care	NR	2	6	NR	No	30–60	70–75/21–24
Delivery room (Caesarean) (m), (o)	Positive	4	20	NR	No	20–60	68–75/20–24
Emergency department decontamination	Negative	2	12	Yes	No	NR	NR
Emergency department exam/treatment room (p)	NR	2	6	NR	NR	Max 60	70–75/21–24
Emergency department public waiting area	Negative	2	12	Yes (q)	NR	Max 65	70–75/21–24
Intermediate care (s)	NR	2	6	NR	NR	Max 60	70–75/21–24
Laser eye room	Positive	3	15	NR	No	20–60	70–75/21–24
Medical/anesthesia gas storage (r)	Negative	NR	8	Yes	NR	NR	NR
Newborn intensive care	Positive	2	6	NR	No	30–60	72–78/22–26
Operating room (m), (o)	Positive	4	20	NR	No	20–60	68–75/20–24
Operating/surgical cystoscopic rooms (m), (o)	Positive	4	20	NR	No	20–60	68–75/20–24
Procedure room (o), (d)	Positive	3	15	NR	No	20–60	70–75/21–24
Radiology waiting rooms	Negative	2	12	Yes (q), (w)	NR	Max 60	70–75/21–24
Recovery room	NR	2	6	NR	No	20–60	70–75/21–24
Substerile service area	NR	2	6	NR	No	NR	NR
Trauma room (crisis or shock) (c)	Positive	3	15	NR	No	20–60	70–75/21–24
Treatment room (p)	NR	2	6	NR	NR	20–60	70–75/21–24
Triage	Negative	2	12	Yes (q)	NR	Max 60	70–75/21–24
Wound intensive care (burn unit)	NR	2	6	NR	No	40–60	70–75/21–24
INPATIENT NURSING							
AII anteroom (u)	(e)	NR	10	Yes	No	NR	NR
AII room (u)	Negative	2	12	Yes	No	Max 60	70–75/21–24
Combination AII/PE anteroom	(e)	NR	10	Yes	No	NR	NR
Combination AII/PE room	Positive	2	12	Yes	No	Max 60	70-75/21-24

Note: NR = no requirement

Understanding ASHRAE 170



9 Functional Space Categories

- Surgical and Critical Care (19)
- Inpatient Nursing (13)
- Radiology (3)
- Diagnostic & Treatment (27)
- Sterilizing (1)
- Sterile Processing Department (3)
- Service (10)
- Support Space (3)
- Nursing Facility (6)

Critical Areas Required to Report Temperatures, Humidity, Pressure, & Air Flow

Within these 9 space categories, there are 85 different functions of (room) space. **60 room types require pressure relationships** to adjacent areas and humidity and temperature requirements.

Create the Program – Identify Hospital Standards

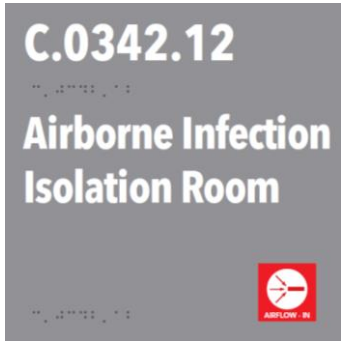
- **Centers for Medicare & Medicaid (CMS) Conditions of Participation 482.41 (c) (4)**
- A-0726 (Rev. 99, 01-31-14). There must be proper ventilation, light, and temperature….
- **Temperature, humidity and airflow** in anesthetizing locations must be maintained within **acceptable standards** to inhibit microbial growth, reduce risk of infection, control odor, and promote patient comfort. Hospitals must maintain relative humidity (RH) levels at 35 percent or greater in each anesthetizing location, unless the hospital elects to use the CMS categorical waiver, which permits it to maintain a RH of at least 20 present.
- Must **maintain records and documentation** that demonstrate required levels are achieved.
- Acceptable **standards**, i.e., from the Association of Operating Room Nurses (AORN) or the FGI should be incorporated into **hospital policy**.

Create the Program – More Hospital Standards

- Local State Requirements - Examples
  - Texas - Title 25 Texas Administrative Code (TAC) Chapter 133, 25 TAC 133.169 (c) Table 3 Ventilation Requirements for Hospitals & Outpatient Clinics
  - California – CA 2010 California Mechanical Code - California Code of Code Regulations Title 24, Part 4
    - Table 4A - Pressure Relationship & Ventilation Requirements for General Acute Care Hospitals
- USP 797/800 – For your Pharmacies - Sterile Compounding of Medications
- **THE PLAN**: *Form a multidisciplinary team to perform a risk assessment of the affected areas. The team should enter the values/parameters they will follow on a day-to-day basis into their organization's HVAC system policy, along with appropriate corrective measures to mitigate risk and restore the HVAC system to the desired parameters when conditions fall outside of those values.*

Create the Program – Room Names and Functions

- ASHRAE Standard 170 Table 7.1 provides room names, pressure relationships, min outdoor ACH, min total ACH, requirement to exhaust to the outside or recirculate air, humidity & temperature.
- **The requirements are linked to the room name.**
- You need to understand the **function and procedures performed** in the room.
- Additional ASHRAE requirements are outlined for the following sample rooms:
  - 7.2.1 Airborne Infection Isolation rooms
  - 7.2.2 Protective Environment (PE) rooms
  - 7.3.1 Wound Intensive-Care Units (Burn Units)
  - 7.4.1 Operating Rooms
  - 7.4.2 Sterilization Rooms
  - 7.4.3 Imaging Procedure Rooms
  - 7.5.1 Morgue and Autopsy Rooms
  - 7.5.2 Bronchoscopy
  - 7.6 Psychiatric Patient Areas



Create the Program - Understanding The Joint Commission's Environment of Care Standards

- **EC.02.05.01, EP 3** – The hospital maintains a written inventory of all operating components of utility systems.
  - Inventory may include all components of the utility systems *or* select operating components categorized based on risk
  - Inventory by type (3 categories) – High Risk Equipment, Infection Control Equipment, and Non-High Risk Equipment

- **EC.02.05.01, EP 5** – The hospital identifies the activities and associated frequencies, in writing, for inspecting, testing, and maintaining all operating components of utility systems on the inventory. These activities and frequencies are in accordance with manufacturer's recommendations or with strategies of an alternative equipment maintenance (AEP) program.

- **EC.02.05.01, EP 15*** - In critical care areas designed to control airborne contaminants, the ventilation system provides appropriate pressure relationships, air-exchange rates, filtration efficiencies, temperature and humidity.

- **EC.02.05.01, EP 16** - In non-critical care areas, the ventilation system provides required pressure relationships, temperature and humidity.

- **EC.02.05.05, EP 5** – The hospital inspect, tests, and maintains the following; Infection control utility system components of the inventory. The completion date and the results of the activities are documented.

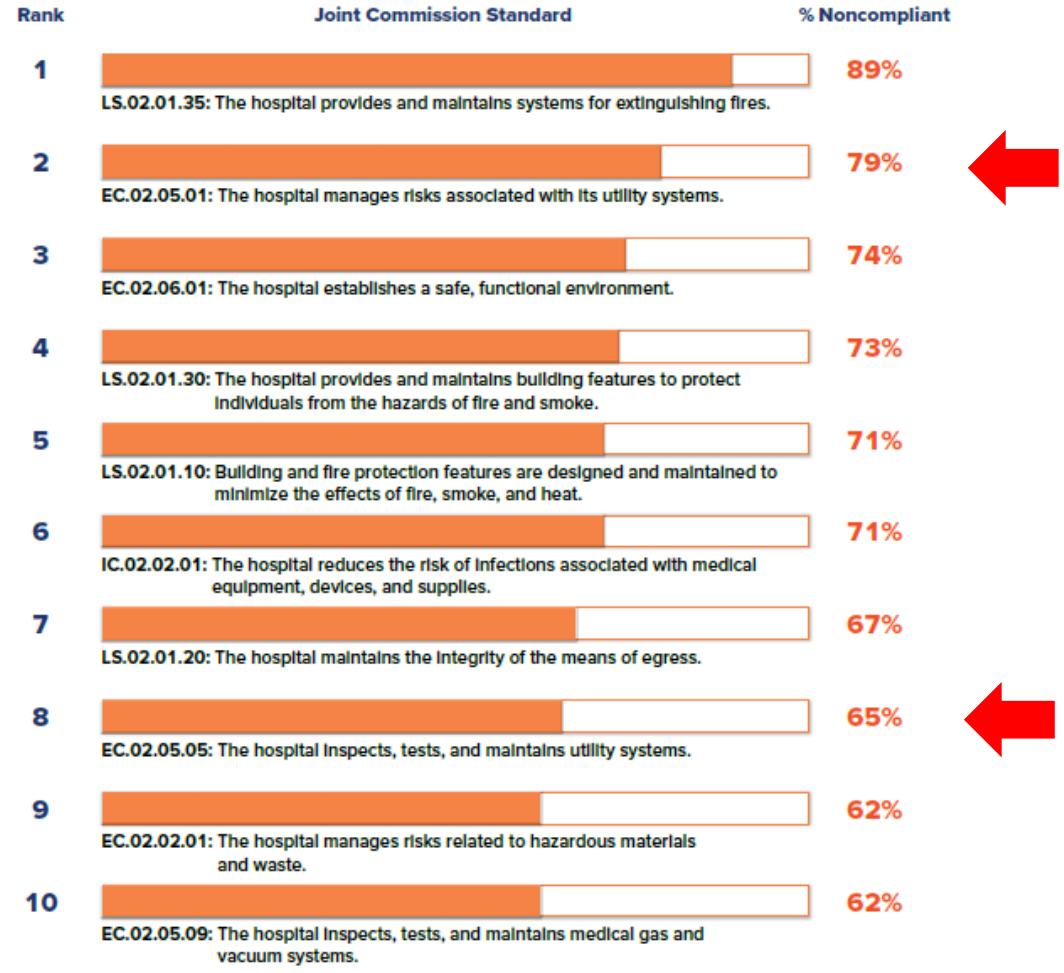
- **EC.02.06.05 –** The hospital manages its environment during demolition, renovation, or new construction to reduce risk to those in the organization.

- **EC.04.01.01** – The hospital collects information to monitor conditions in the environment.

- **NFPA 99, 2012 -** The Joint Commission is aligned to the 2012 edition of NFPA 99, Health Care Facilities Code. ASHRAE 170, Ventilation of Health Care Facilities, 2008, is a referenced publication in 2.3.2 and 9.3.1.1.

**The #2 most cited deficiency in 2018, source, Joint Commission Resources.*

Create the Program - Understanding The Joint Commission's Environment of Care Standards



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After a door is shut, "it's going to take a while for [the mechanical systems] to reach stasis and everything to be settled out and at the right pressure relationship and temperature," Monroe explained. "This doesn't happen as soon as you close the door."

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Environment of Care® News, April 2019, Volume 22, Issue 4

Pressurized Spaces Program – Strategies for Compliance

Managing Utility Risks

VENTILATION SYSTEM STRATEGIES

The ventilation system plays a crucial role in a busy medical facility. In addition to controlling temperature and air quality, it's responsible for filtering, isolating, and eliminating airborne contaminants and pathogens. A compromised ventilation system can impede your organization's efforts to provide a safe physical environment for patients, staff, and visitors.

Standard EC.02.05.01

The hospital manages risks associated with its utility systems.

Element of Performance 15

In critical care areas designed to control airborne contaminants (such as biological agents, gases, fumes, dust), the ventilation system provides appropriate pressure relationships, air-exchange rates, filtration efficiencies, temperature, and humidity.

Barriers to compliance

Stephen Turner, CHSP, consultant for Joint Commission Resources in Oak Brook, Illinois, says EP 15 is particularly challenging for several reasons. "These range from insufficient resources, system and equipment performance problems, lack of a clearly defined process for compliance, an incomplete understanding of guidelines, absence of hospital-adopted and enforced guidelines, and a program that was not based on decisions and implementations defined through a multidisciplinary process," Turner says.

In addition, organizations may lack proper documentation. "Surveyors might check air pressure levels in high-risk areas and ask to see that temperatures and humidity are properly maintained," Turner points out. "They will ask what was done when a monitored condition was out of range. This is where a written procedure and documented follow-up become very important."

Strategies for compliance

To adhere to EP 15 and the rest of EC.02.05.01, Turner recommends the following steps:

STRATEGY: Formally adopt air pressure, temperature, and humidity requirements. For guidance on air pressure, temperature, and humidity considerations, refer to guidelines from the FGI, the US Centers for Medicare & Medicaid Services (CMS), and state and local agencies. Turner notes that CMS has prescribed temperature and relative humidity requirements as part of CoP 482.41 Physical Environment in Transmittal 99, dated January 31, 2014.

STRATEGY: Create and implement a clearly defined ventilation system monitoring program. "Indicate which parameters are monitored locally versus through a BAS," says Turner.

STRATEGY: Develop a written step-by-step procedure that describes what action will be taken when air pressure, temperature, or humidity is out of range. "This includes the same steps taken when an alarm occurs in the BAS," Turner says.

"A step-by-step procedure is also needed when any of the systems or equipment fails or if the equipment needs to be taken offline for scheduled maintenance."

Turner says that surgeons or surgical procedures may require room temperatures, ventilation rates, humidity ranges, and/or air distribution methods that exceed the minimum indicated ranges.

STRATEGY: Create an inventory of all high-risk areas where air pressure, temperature, and humidity levels are required to be maintained. Indicate the ranges required in each high-risk area. "The most common high-risk areas are operating rooms; clean surgical corridors; sterile processing, decontamination, and high-level disinfection areas; and negative-pressure patient isolation rooms," says Turner. "Your inventory should also include rooms and spaces that open into high-risk areas."

STRATEGY: Manually verify air pressure, temperature, and humidity for all high-risk areas. "Systems and equipment operations can change or fail, so this task should be scheduled and performed monthly," he says.

STRATEGY: Adopt a procedure that states no case will begin in an operating room until all of the room conditions are in the acceptable/compliant range.

STRATEGY: Strictly adhere to heating, ventilation, and air conditioning system scheduled maintenance tasks prescribed by the manufacturer. "Calibration of sensors needs to be included in the scope of the scheduled maintenance tasks," says Turner.

STRATEGY: Train staff on the conditions they're monitoring. Be sure staff understand what can lead to noncompliance, such as not keeping doors closed when required. EC

Implement the Program – Create Policies & Procedures

MICHIGAN MEDICINE
UNIVERSITY OF MICHIGAN

2101 Commonwealth Blvd, Suite B
Ann Arbor, MI 48105-5759
www.med.umich.edu/facilities/plan/

5.16: UMHHC - REQUIREMENTS FOR CRITICAL PRESSURE SENSITIVE ROOMS

GENERAL:

The following guidelines are prepared for detailing critically pressurized rooms. Please refer also to Design Guideline 5.13 "Healthcare Procedure Room Infection Control Types and Requirements" and 5.14 "Patient Care and Support Spaces Room Type Requirements" for additional information on these types of rooms.

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

- 2007 MINIMUM DESIGN STANDARDS FOR HEALTH CARE FACILITIES IN MICHIGAN
- ASHRAE STANDARD 170- *VENTILATION OF HEALTH CARE FACILITIES*
- AAMI ST79- *COMPREHENSIVE GUIDE TO STEAM STERILIZATION AND STERILITY ASSURANCE IN HEALTH CARE FACILITIES*
- USP 797- *PHARMACEUTICAL COMPOUNDING, STERILE PREPARATIONS* and USP 800- *HAZARDOUS DRUGS, HANDLING IN HEALTHCARE SETTINGS*

The purpose of this guideline is to establish good design practice for the design and construction of all pressurized rooms. In addition, UMHHC has established a list of "critical" pressurized rooms that can have a direct impact on patient care and safety and hence need to be held to a higher standard:

CRITICAL PRESSURIZED ROOMS

- 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)
- Airborne Infection Isolation Room
- Protective Environment Rooms
- Pharmacies
- Cleanrooms (i.e. ISO-7, etc.)
- Nuclear Medicine Labs, including Hot Labs
- Instrument Processing- Clean Workroom, Sterile Storage and Decontamination
- Autopsy Rooms
- Laboratories

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:

UMHS Sign Shop has established a standard sign, to be installed adjacent to the entry door to these 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.

CRITICAL PRESSURIZED ROOMS

- 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)
- Airborne Infection Isolation Room
- Protective Environment Rooms
- Pharmacies
- Cleanrooms (i.e. ISO-7, etc.)
- Nuclear Medicine Labs, including Hot Labs
- Instrument Processing- Clean Workroom, Sterile Storage and Decontamination
- Autopsy Rooms
- Laboratories

MECHANICAL:

All critical pressurized rooms defined in this guideline shall be provided with local room pressure monitors 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 5.14). In some special cases like Operating Rooms (Type 1) and Procedure Rooms (Type 2 & 3), room pressure monitor shall be mounted within the space (See SBA 5.13).

All room pressure monitors shall be integrated into the hospital's building management system (BMS).

For Operating Rooms (Type 1) and Procedure Rooms (Type 2 & 3), all doors into the space shall be monitored with fully concealed door contacts, specified by the mechanical engineer and provided by the mechanical systems controls contractor. Door contacts shall relay door position to the room pressure monitor. See SBA 5.13.

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, critical pressurized rooms shall be designed and balanced to a room pressure that exceeds the minimum code required value so that the space is not always on the edge of being out of compliance. UMH's standards for critical room pressure are as follows (positive or negative per code):

Room Type	Room Design Pressurization	Room Pressure Alarm Setpoint
Operating Rooms (Type 1) & Procedure Rooms (Type 2 & 3)	0.04" - 0.06" wc	0.01" wc
Pharmacies, including Cleanrooms	0.03" - 0.06" wc	0.02" wc
Nuclear Medicine Labs	0.03" - 0.06" wc	0.02" wc
All other critical pressurized spaces	0.02" - 0.06"wc	0.01" wc

Source – Google; UMHHC 5.16 – Requirements for Critical Pressure Sensitive Rooms, March 2017

Monitor & Measure the Program – Prioritize Spaces

- **Tier I: Most Critical Spaces**
  - Pressure, Temperature, Humidity and Air Exchanges
  - Centrally (BAS) and locally (screen) monitored
  - Touch Panels are nice
- **Tier II: Monitor Pressure Only**
  - With the ability to report to the Building Automation System
- **Tier III: Locally Monitor Pressure Only**
  - Visual device
- **Tier IV: Monitor Construction Site Pressure**
  - Portable is ideal

Monitor & Measure the Program – Use your BAS

Monitor & Measure the Program – Customer Compliance Reports

Inventory of Rooms and Operating Policy

Customer Name: Lawton Hospital System
Site Name: Kell West Hospital
Address: 1407 Whise Dr, Duncan, OK 73113
Name of the Activity: Testing of Hospital Critical Environment Rooms
Date of Current Inventory: 02/01/2019
Date of Previous Inventory: 06/01/2018

Standard: EC.02.05.01
Standard Text: The hospital manages risks associated with its utility systems.

Element of Performance: EP3: The hospital identifies the activities and associated frequencies, in writing, for inspecting, testing, and maintaining all operating components of utility systems on the inventory. These activities and associated frequencies are in accordance with manufacturers' recommendations or with strategies of an alternative equipment maintenance (AEM) program. D

CoP: 42 CFR §482.41(d)(2), 42 CFR §482.42
K-Tag: K

Standard(s) referenced for the activity: ASHRAE Standard 170-2008, Table 7-1: Design Parameters – Hospital Spaces

Name and contact information, including affiliation, of the person who performed the activity:

Testing Company Name: Siemens Industry, Inc.
Address: Address, City, State, Zip
Telephone: 555-555-1212
Siemens Contract Number: 2600007390

Inventory Count:

Total Qty	Prev Qty
118	00

Inventory by Space Category:

Total Qty	Prev Qty	Room Category
5	0	CENTRAL MEDICAL AND SURGICAL SUPPLY
20	0	DIAGNOSTIC AND TREATMENT
32	0	INPATIENT NURSING
10	0	SERVICE
1	0	SUPPORT SPACE
50	0	SURGERY AND CRITICAL CARE

Refer to section inventories for detailed inventory list and changes

Inventory by Space Category and Function:

Total Qty	Prev Qty	Function of Space	Pressure Relation	Minimum Outside Air ACH	Minimum Total Air ACH	Relative Humidty %	Design Temp. °F
Room Category: CENTRAL MEDICAL AND SURGICAL SUPPLY							
1	0	Clean workroom	Positive	2	4	N/R - 60	72 - 78
2	0	Soiled or decontamination room	Negative	2	6	N/R - N/R	72 - 78
2	0	Sterile storage	Positive	2	4	N/R - 60	72 - 78
Room Category: DIAGNOSTIC AND TREATMENT							
7	0	Examination room	N/R	2	6	N/R - 60	70 - 75
1	0	Laboratory general	Negative	2	6	N/R - N/R	70 - 75
1	0	Laboratory histology	Negative	2	6	N/R - N/R	70 - 75

Inventory only includes spaces inspected under contract identified

Summary of Room Inspection
OR2
Room #: OR2

Customer Name: Lawton Hospital System
Site Name: Kell West Hospital
Address: 1407 Whise Dr, Duncan, OK 73113
Name of the Activity: Testing of Hospital Critical Environment Rooms
Inspection Date: MM/DD/YYYY

Standard: EC.02.05.01
Standard Text: The hospital manages risks associated with its utility systems.

Element of Performance: EP15 : In critical care areas designed to control airborne contaminants (such as biological agents, gases, fumes, dust), the ventilation system provides appropriate pressure relationships, air-exchange rates, filtration efficiencies, temperature and humidity.

Element of Performance: EP16: In non-critical care areas, the ventilation system provides required pressure relationships, temperature, and humidity.

Standard: EC.02.05.05
Standard Text: The hospital inspects, tests and maintains its utility systems.

Element of Performance: EP5: The hospital inspects, tests, and maintains the following: Infection control utility system components on the inventory. The completion date and the results of the activities are documented. D

CoP: 42 CFR §482.42, 42 CFR §482.41(d)(4), 42 CFR §482.41(d)(2)
K-Tag: K

Standard(s) referenced for the activity: ASHRAE Standard 170-2008, Table 7-1: Design Parameters – Hospital Spaces
Frequency of the activity: Annual

Name and contact information, including affiliation, of the person who performed the activity:

Testing Company Name: Siemens Industry, Inc.
Address: Address, City, State, Zip
Telephone: 555-555-1212
Activity performed by: D. Ruffin
Siemens Contract Number: 2600007390
Notification Number: 22222222

Space Equipment Inventory

Customer Name: Lawton Hospital System
Site Name: Kell West Hospital
Address: 1407 Whise Dr, Duncan, OK 73113
Name of the Activity: Testing of Hospital Critical Environment Rooms
Report Date: 02/01/2019

Standard: EC.02.05.01
Standard Text: The hospital manages risks associated with its utility systems.

Element of Performance: EP3: The hospital maintains a written inventory of all operating components of utility systems.
For hospitals that do not use Joint Commission accreditation for deemed status purposes: The hospital maintains a written inventory of all operating components of utility systems or maintains a written inventory of selected operating components of utility systems based on risks for infection, occupant needs, and systems critical to patient care (including all life-support systems). The hospital evaluates new types of utility components before initial use to determine whether they should be included in the inventory. D

CoP: 42 CFR §482.41(d)(2)
K-Tag: K

Name and contact information, including affiliation, of the person who performed the activity:

Testing Company Name: Siemens Industry, Inc.
Address: Address, City, State, Zip
Telephone: 555-555-1212
Siemens Contract Number: 2600007390

Equipment Inventory By Space #:

Room#	Room Name	Equip ID	Equipment	Location	Department /Sub Location
A110	Waiting Room			1	Emergency
		AHU-16	AHU w/ SA & RA AFMS	B36	Col C15.5
		DP-110	Sensor: Differential	A110	
		HT-110	Sensor: Humidity	A110	
		RT-110	Sensor: Temperature	A110	
A112A	Trama 1			1	Emergency
		AHU-16	AHU w/ SA & RA AFMS	B36	Col C15.5
		DP-112A	Sensor: Differential	A100	
		HUM-112A	Supply Humidifier	A100	Ceiling
		VAV-112A	VAV Box: Supply	A100	Ceiling
A112B	Trama 2			1	Emergency
		AHU-16	AHU w/ SA & RA AFMS	B36	Col C15.5
		DP-112B	Sensor: Differential	A100	
		HT-112B	Sensor: Humidity	A100	Ceiling
		HUM-112B	Supply Humidifier	A100	Ceiling
		VAV-112B	VAV Box: Supply	A100	
A112C	Trama 3			1	Emergency
		AHU-16	AHU w/ SA & RA AFMS	B36	Col C15.5
		DP-112C	Sensor: Differential	A100	
		HT-112C	Sensor: Humidity	A100	
		HUM-112C	Supply Humidifier	A100	Ceiling

Inventory only includes equipment inspected under contract identified

Pressurized Spaces – A program approach

1 Create the Program

- Review your Hospital's Infection Control policies and procedures.
- Review national & state policies and standards (ASHRAE 170, The Joint Commission's Environment of Care, Department of Health, etc.)
- Form a multidisciplinary team to include Infection Control, Nursing, Pharmacy, Laboratory, Safety, Security, etc.
- Match existing rooms to room names in the adopted standards.
- Perform an and audit of existing rooms, room names, functions, equipment, and devices.
- Create an inventory of all rooms to include all pressurized spaces.

2 Implement the Program

- Develop a process to review room usage against requirements of adopted standards (periodic audits).
- Ensure space management policies and procedures include list of standardized room names and signage; process for ensuring repurposed spaced meet adopted standards.
- Ensure all spaces to include pressurized spaces meet the requirements of the adopted standards.
    - Determine how spaces will be monitored for pressure, temperature, humidity, and air exchanges.
    - Determine the frequency of inspection, testing, balancing and maintenance of spaces and monitoring devices.

Implement ASHRAE 170

3 Monitor & Measure to the Program

- Define standards for the monitoring equipment and devices.
    - Determine how your equipment and devices will be monitored, i.e., visual or via a Building Automation System (BAS).
- Create a pilot project.
    - Determine type and location of equipment and devices
    - Ensure support of departmental leaders of pilot area
- Define the compliance documentation requirements in your policies and procedures.

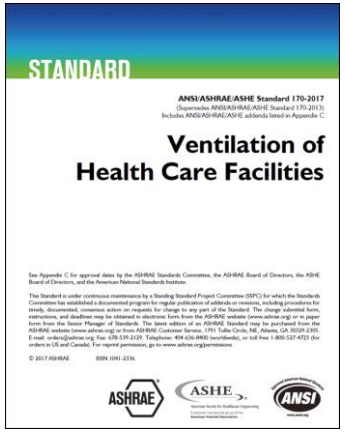
4 Train & Maintain to the Program

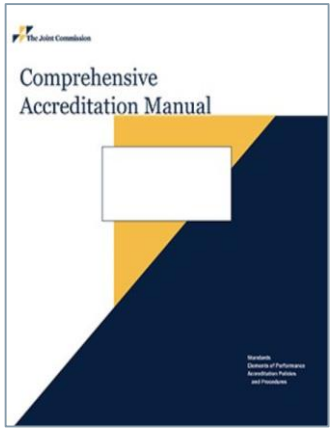
- Develop a training program to ensure all stakeholders to recognize spaces with pressure requirements
- Create ownership with all stakeholders to monitor space utilization and standardization.
- Automate and repeat the processes to monitor, measure, and maintain all spaces per your policies.
- Document all activities to ensure proper documentation control.

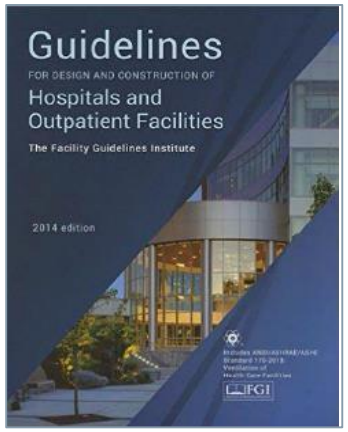
Source - modified version of "*Creating a Program to Identify & Monitor Pressure Dependent Spaces",* Dennis Ford, Director of Facilities, Texas Children's Hospital , Houston, Texas, 2017 ASHE Annual Conference, Indianapolis

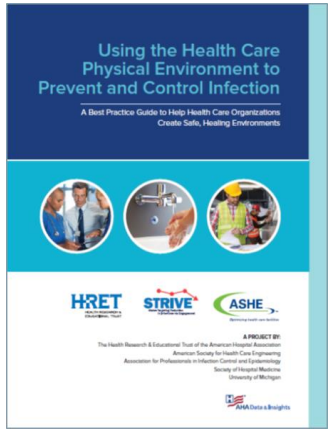
Resources

- ANSI/ASHRAE/ASHE 170 – Ventilation of Health Care Facilities
- ASHE Document – Using the Health Care Physical Environment to Prevent and Control Infection
- The Joint Commission Standards – Environment of Care
- Joint Commission Resources - Environment of Care News
- DNV Standards – Physical Environment
- FGI - Guidelines for Design and Construction of Hospitals



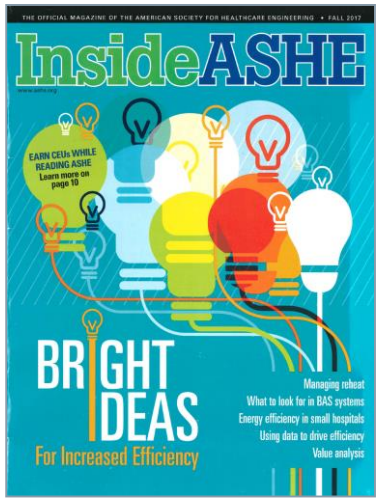






Resources

August 2017



January 2019

July 2019

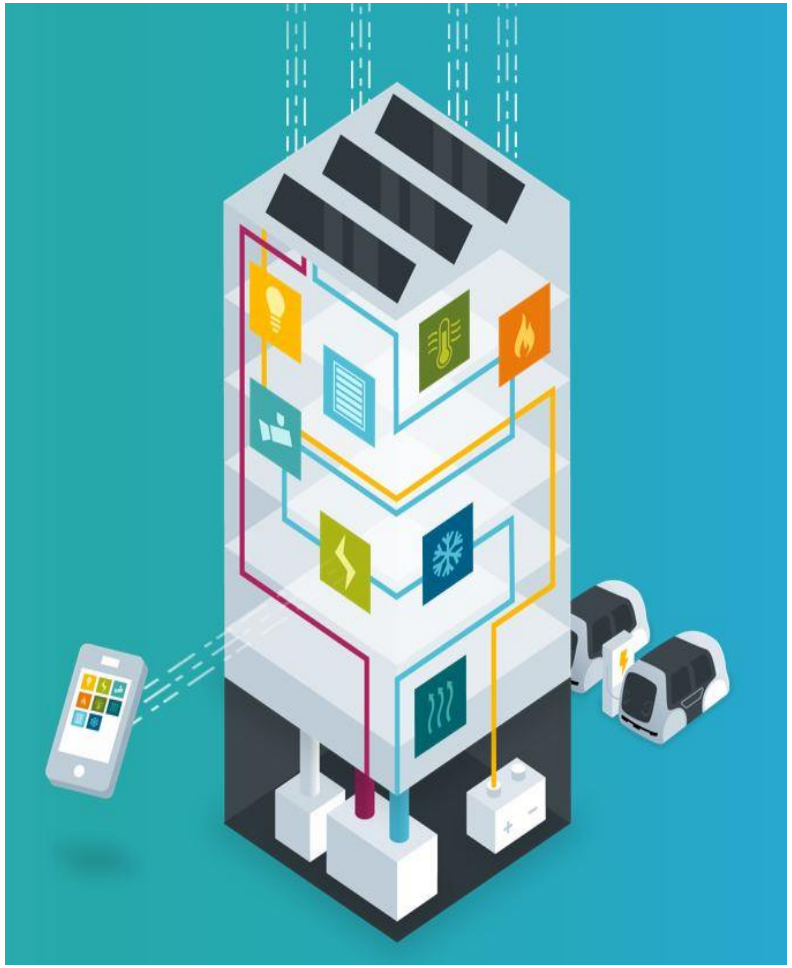
September 2019

January 2020

Conclusion and Lessons

- Understand the intended function of the space.
- Understand the clinical standards and requirements. Do not assume the owners know them all.
- Understand all applicable standards.
- Review & update your policies and procedures.
- Create an Inventory of your Utility Systems and Critical Spaces.
- Add your Inventory of Spaces and Equipment to your CMMS.
- Review available resources from ASHE, ASHRAE, etc.
- Create your Pressurized Spaces Program.
- Implement your program.
- Monitor and measure your program.
- Train and maintain your program with your clinical and facilities staff.
- Adjust and refine your program.
- Document, Document, Document.
- Repeat!

Implementing a Pressurized Spaces Program – Contacts



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