

**Seminar 37: Creating a Program to Identify and Monitor Pressurized Spaces in a Hospital**

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**Controlling Contaminants with Space Pressurization**

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### Learning Objectives

- Select and specify control strategies for various pressurized spaces by applying the physics of air infiltration to infection control objectives
- Explain the standard requirements for various pressurized spaces from the viewpoint of a facilities engineer
- Specify systems and equipment that support a monitoring plan for pressurized spaces
- Train the facilities staff about monitoring of pressurized spaces and the requirements as specified in the standards

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### Agenda

- **Requirements:** The Centers for Medicare & Medicaid Services (CMS) and The Joint Commission (TJC)
- **Importance:** Why focus on pressurization within hospitals?
- **Standard:** What standard should a hospital adopt?
- **Nomenclature:** Room name, type, and function
- **The Plan:** Adopt a standard, match room names to room function and requirements, educate and monitor
- **Monitoring:** What do you monitor? How do you monitor?
- **Manage/Maintain:** How do you manage and maintain the program?

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### Room Pressurization Hospital Requirements

- **The Joint Commission (TJC) Environment of Care (EOC):** As of 9 Jan 17

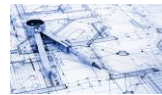
- ▶ EC.02.05.01: The hospital manages risks associated with its utility systems.
  - ▶ EP 15: In **critical care areas** designed to control airborne contaminants (such as biological agents, gases, fumes, dust), the ventilation system provides appropriate **pressure relationships, air-exchange rates, filtration efficiencies, temperature & humidity.**
  - ▶ EP 16: In **non-critical care areas**, the ventilation system provides required **pressure relationships, temperature, and humidity.**

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### Room Pressurization Hospital Requirements

- **The Joint Commission (TJC) Environment of Care (EOC):** As of 9 Jan 17

- ▶ EC.02.06.05: The hospital manages its environment during demolition, renovation, or new construction to **reduce risk** to those in the organization.
  - ▶ EP 01: When planning for new, altered, or renovated space, the hospital uses one of the following **design criteria**:
    - State rules and regulations
    - **Guidelines for Design and Construction of Health Care Facilities, 2014 edition**.....
    - When above rules, regulations, & guidelines do not meet specific design needs, use other **reputable standards & guidelines** that provide equivalent design criteria.



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### Room Pressurization Hospital Requirements

- ▶ 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 percent.
- ▶ Must **maintain records** 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**.

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## Room Pressurization – Why?

- The term **nosocomial infection** is applied to infections which are acquired and transmitted by patients within a hospital. Pressure dependent 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. **Pressure** dependent 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



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## Room Pressurization – 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.
- **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.

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## Room Pressurization – Hospital Standards

\* **Background:** Health care organizations are currently being challenged to meet a series of conflicting and sometimes unclear heating, ventilation, and air-conditioning (HVAC) standards and guidelines established by a variety of professional organizations. These organizations include the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE), the American Society for Healthcare Engineering (ASHE), the Association for the Advancement of Medical Instrumentation (AAMI), the Association for Professional in Infection Control and Epidemiology (APIC), the Association of perioperative Registered Nurses (AORN), and the Facility Guidelines Institute (FGI).

\* HVAC in the Operating Room and Sterile Processing Department, 21 Sep 2015, Joint Interim Guidance Task Force that included representatives from APIC, AORN, AAMI, ASHRAE, ASHE, FGI, TJC, CMS, Kaiser Permanente, and IAHCSSM.

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## Room Pressurization – MORE Hospital Standards

- 2003 Centers for Disease Control and Prevention (CDC) Guidelines for Environmental Infection Control in Health-Care Facilities
- Federal Occupational Safety and Health Administration (OSHA)
- The Texas Administrative Code (TAC) – Local State Requirements
  - **Title 25 Texas Administrative Code (TAC) Chapter 133, 25 TAC 133.169 (c) Table 3 Ventilation Requirements for Hospitals & Outpatient Clinics**
- USP 797/800 Pharmaceutical Compounding – Sterile Prep.
- 2012 NFPA 99 para 9.3.1.1 references ASHRAE 170-2008
- Association for Healthcare Resource and Materials Management (AHRMM)

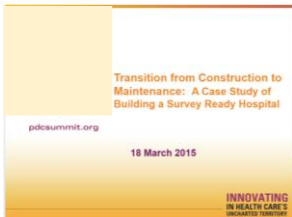
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## Room Pressurization – Hospital Standards

- **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**

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## Room Pressurization – Design vs. Operations



- If TJC showed up on the first day the new hospital sees a patient, what would they look for under the EOC standards?
- Review EOC Management Plans to understand how the owner manages to the EOC requirements, i.e., how they conduct business
- Owner is responsible to provide requirements to design team!!

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## Room Pressurization – 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    7.5.1 Morgue and Autopsy Rooms
  - ▶ 7.2.2 Protective Environment (PE) rooms    7.5.2 Bronchoscopy
  - ▶ 7.3.1 Wound Intensive-Care Units (Burn Units)    7.6    Psychiatric Patient Areas
  - ▶ 7.4.1 Operating Rooms
  - ▶ 7.4.2 Sterilization Rooms
  - ▶ 7.4.3 Imaging Procedure Rooms



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## Room Pressurization – Building Automation System



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## Room Pressurization – The PLAN!

- 1.1 Adopt a nationally recognized standard and create a hospital policy.
- 1.2 Match room names with room functions with requirements
- 1.3 Continually perform room audits (names, functions, requirements)
- 1.4 Maintain an inventory of pressure dependent spaces
- 2.1 Continually ensure infrastructure meets requirements of the rooms
- 2.2 Develop policies and procedures to manage repurposing of rooms
- 3.1 Determine how pressure dependent spaces will be monitored
- 3.2 Educate clinical staff, maintenance staff, and infection control on room systems and requirements
- 3.4 Monitor, Measure, Maintain

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## Conclusion and Lessons for Design

1. Understand the intended function of the space
2. Understand the hospital's adopted standard/policy
3. Understand the clinical standards and requirements. Do not assume the owner knows them all.
4. Commission, Test and Balance
5. Evaluate the entire suite, floor and building
6. Operators need monitors. Design them in.

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## Room Pressurization – Monitoring Examples

- ▶ 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 ability to report to a BAS
- ▶ Tier III: **Locally Monitor Pressure Only**
  - ▶ Visual device
- ▶ Tier IV: **Monitor Construction Site Pressure**
  - ▶ Portable is good



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## Questions?

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