Ventilation Management Program

Creating a Ventilation Management Program with ASHRAE/ASHE 43 Guideline

Monday September 30th

Speakers

Dana F. “Dino” Coliano

Dino Coliano is the Healthcare Vertical Market Leader for The Climate Control Group (CCG) based in Oklahoma City responsible for new business development. Prior to CCG, Dino was the Head of Healthcare for Siemens Smart Infrastructure where he worked in Sales and Marketing leadership roles for over 15 years. He also held Sales and Marketing leadership roles with Setra, Johnson Controls, STERIS, Premier GPO, and Baxter Healthcare over the prior 20 years.

Dino is a 27-year active member of the American Society for Healthcare Engineering. He is a national speaker on Space Ventilation Programs and has presented at ASHE and local ASHE chapters conferences and meetings over the last 7 years. He is a member of the ASHRAE/ASHE 170 & 43 Committees.

Dino earned his Master of Business Administration from the University of Notre Dame and his Bachelor of Science from Indiana University. He served honorably as a Captain in the United States Army Medical Service Corps.

Speakers

Jonathan Flannery, MHSA, CHFM, FASHE, FACHE

- Senior Associate Director, ASHE Regulatory Affairs

  American Society for Health Care Engineering

  American Hospital Association
- Certified Health Care Facility Manager
- Fellow American Society for Health Care Engineering
- Fellow American College of Healthcare Executives
- 35 Years of Health Care Facility Experience
- Voting Member of ASHRAE Standard 514
- Chair Health Care Work Group

Learning Objectives

1. Review the various standards and guidelines that have historically been incorporated into a Space Ventilation Program for healthcare facilities.

2. Discuss the new ASHRAE/ASHE 43 Operational Guideline (on the Ventilation of Health Care Facilities) and its' potential impact on existing Ventilation Management Program (VMP) plans.

3. Educate staff on how to create (or update), monitor, and maintain a VMP.

4. Identify the available resources and best practices to develop a VMP.

Background – The reason why we do it…

Hospital-Associated Infections (HAI)

- Kill ~75,000 people per year in the US (200 per day)
- ~15 deaths per hospital per year
- ~722,000 non-lethal infections per year, 150/hospital/yr
- 1 of 25 patients admitted to a hospital got HAI
- Surgical site infection in 1 of 50 operations (157,500 cases)
- Cost of each SSI ~$35,000
- Estimated 5%–10% are airborne (~ 35,000–70,000 incidents)
- $500 million–$1 billion/yr cost of airborne infections
- Major push by AHA and ACA, have dropped SSI 17% since 2008

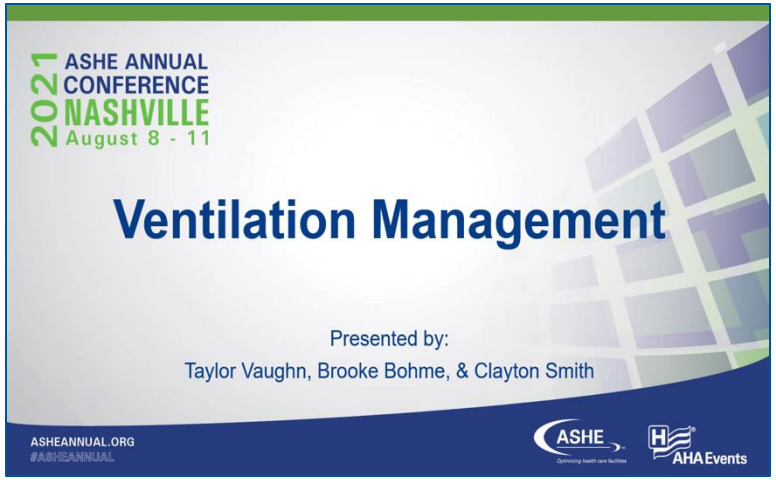
Source: CDC *National and State Healthcare Associated Infections Progress Report,* 2014, pub. 2016.

Background – Building the VMP Concept

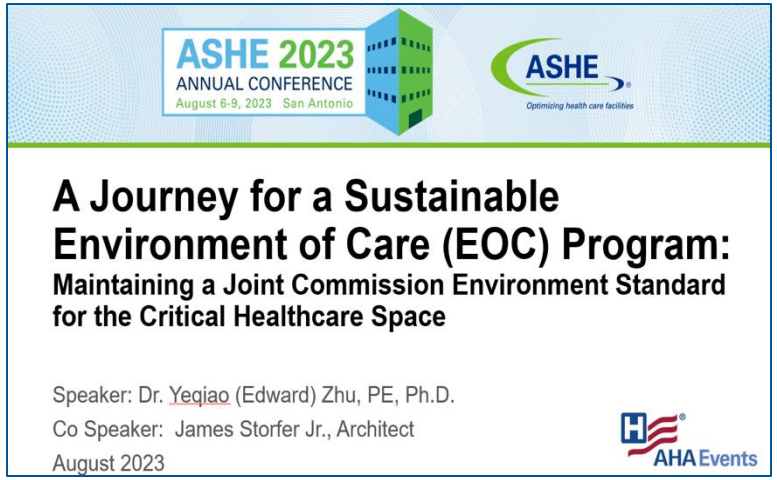
2017

2019

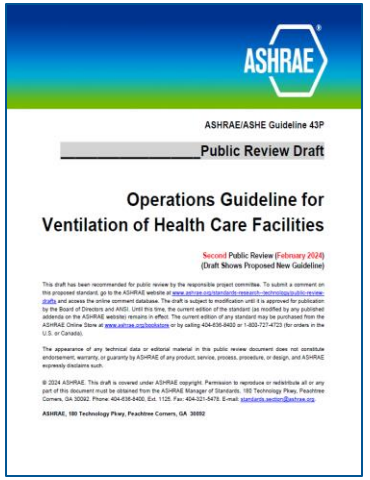
2023



2021



2023



2024

2024 FPC

Background – Building the VMP Concept

TJC EOC Standards
EP.02.05.01 EP 15 & 16

+

DNV.PE.8.SR7 Standard

=

5,000+ Hospitals
400+ Health Systems

2,000+ Programs?

Background – Building the VMP – Compliance

- **The Joint Commission – Consistent EOC Standards Findings**:
  - **Top 5 for 2022 & 2023 - 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.
    - For new and existing health care facilities, or altered, renovated, or modernized portions of existing systems or individual components (constructed or plans approved on or after July 5, 2016), heating, cooling, and ventilation are in accordance with NFPA 99-2012, which includes 2008 ASHRAE 170, or state design requirements if more stringent.
  - **EC.02.05.05, EP 5** – The hospital inspects, tests, and maintains the following; infection control utility system components of the inventory. The completion date and 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.

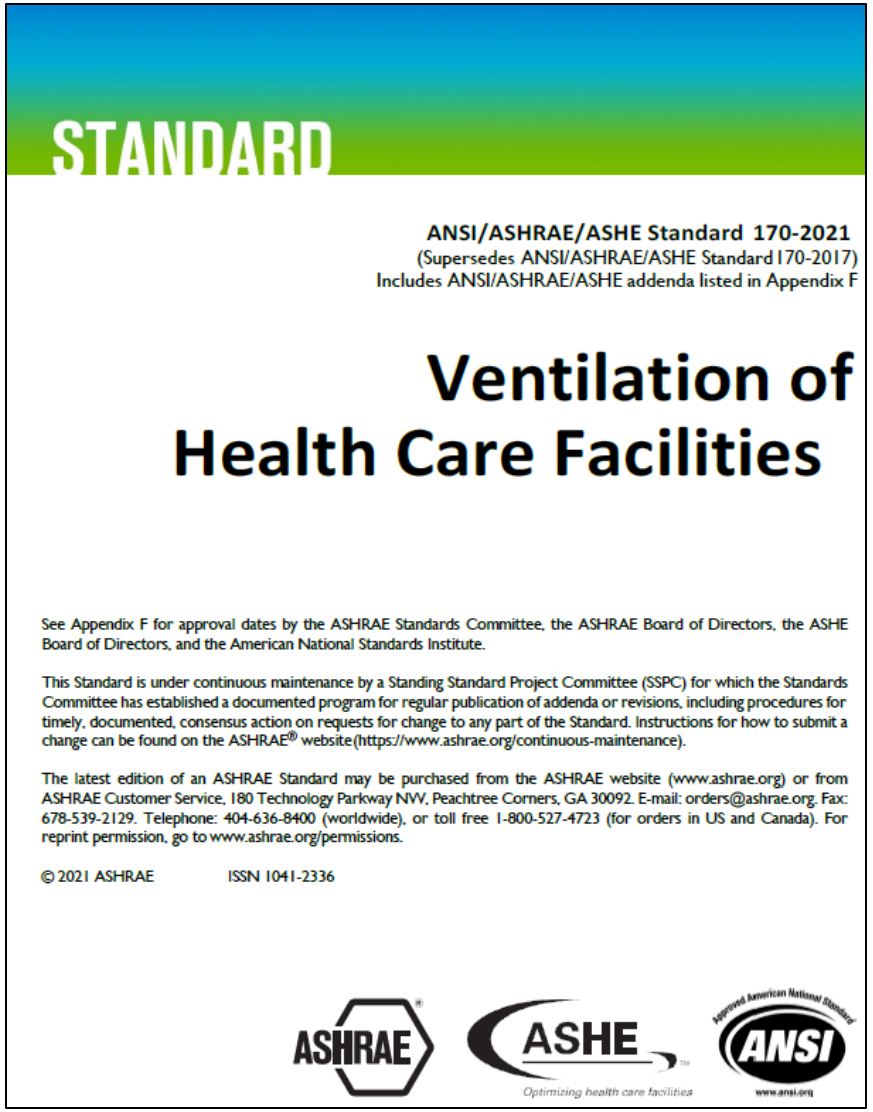
*(Source – Top 5 most challenging requirements for 2023. The Joint Commission website, 4/3/24)

- **DNV – Consistent Top 10 Physical Environment Findings**
  - **PE.8 Utility Management Standard – SR.7** – The Utility Management System shall require proper ventilation, light and temperature controls in patient care areas, operating rooms, sterile supply rooms, special procedures, isolation and protective isolation rooms, pharmaceutical food preparation, and other appropriate areas. (Source – HFM article, December 2023)
  - Improper air pressure relationships (NFPA 99-2012 & ASHRAE/ASHE 170, 2008).

(Source – HFM article, July 2024)

Background – Use of ASHRAE/ASHE 170

- This standard is under continuous maintenance by a Standing Standard Project Committee (SSPC) program for which there is a documented program for regular publication of addenda or revisions, etc. "Future input from the Public is always welcome".
- The purpose of the standard is to define ventilation system design requirements that provide environmental control in health care facilities.
- This standard does not constitute a design guide. ***Rather it comprises a set of minimum requirements intended for adoption by code-enforcing agencies.***
- **Planning – 5.2.a - Prepare a space program**, including the clinical service expected in each space and specific user equipment to be used. The program shall include space names and paragraph number references to respective FGI Guidelines for each space in the program. Specify needs for temperature, humidity, air filtration, localized and general exhaust, and pressure control that are not covered or are different than the requirements in this standard.
- Utilities – 6.1.1 – The space ventilation and pressure relationships requirements of Tables 7.1, 8.1, and 9.1 shall be maintained for the following spaces, even in the event of loss of normal electrical power: All rooms, PE rooms, and Operating Rooms to include delivery rooms.
- Air distribution Systems – 6.7.1 – General – Maintain the pressure relationships required in Tables 7.1, 8.1, and 9.1 in all modes of HVAC system operation, except as noted in the tables.
- 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.
- **ASHRAE 170 is not an Operations Guide but provides requirements to build local policies and procedures and a program around it (in the absence of operations guidelines).**


STANDARD

ANSI/ASHRAE/ASHE Standard 170-2021
(Supersedes ANSI/ASHRAE/ASHE Standard 170-2017)
Includes ANSI/ASHRAE/ASHE addenda listed in Appendix F

Ventilation of Health Care Facilities

See Appendix F for approval dates by the ASHRAE Standards Committee, the ASHRAE Board of Directors, the ASHE Board of Directors, and the American National Standards Institute.

This Standard is under continuous maintenance by a Standing Standard Project Committee (SSPC) for which the Standards Committee has established a documented program for regular publication of addenda or revisions, including procedures for timely, documented, consensus action on requests for change to any part of the Standard. Instructions for how to submit a change can be found on the ASHRAE® website (https://www.ashrae.org/continuous-maintenance).

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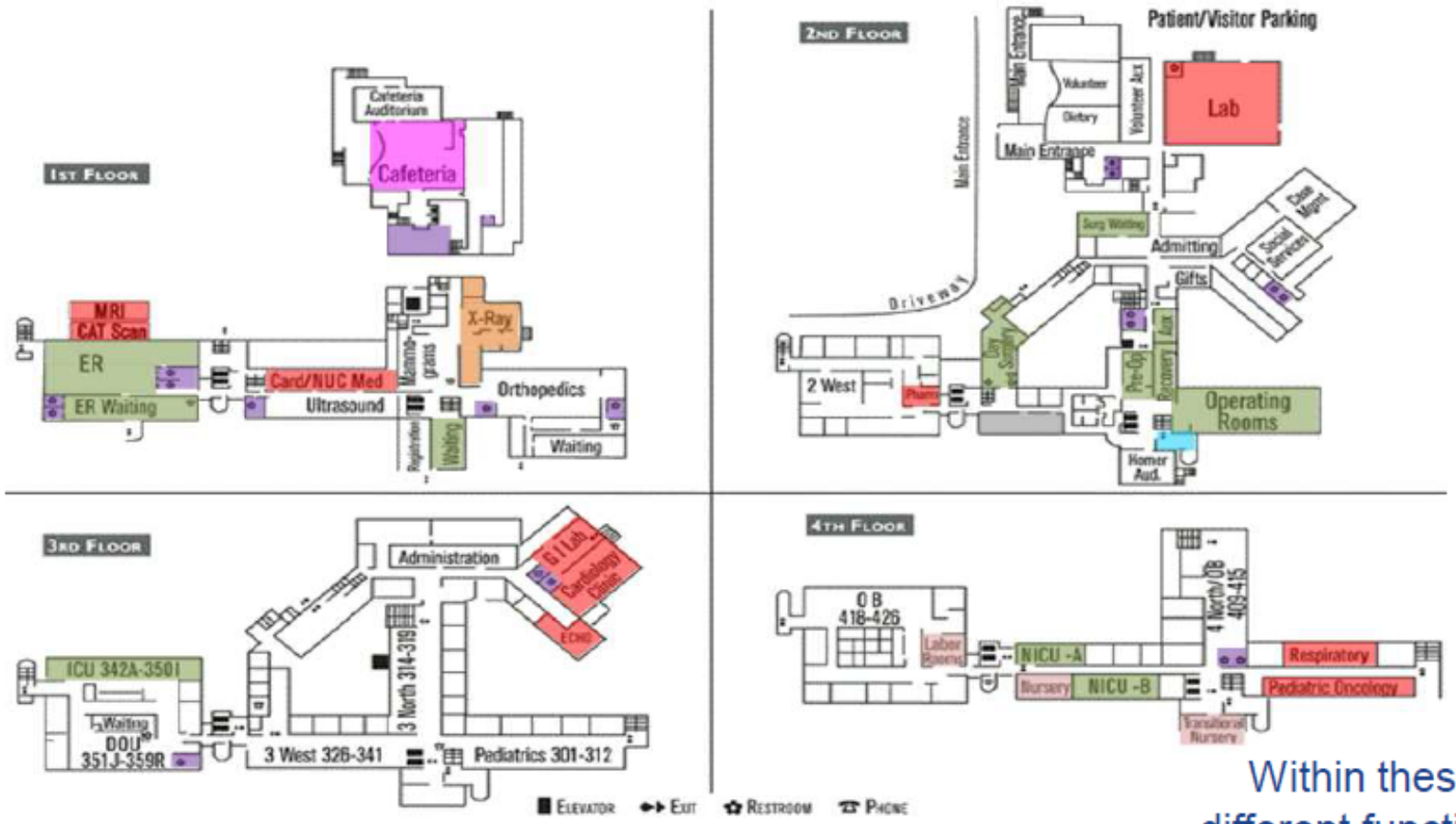
ASHRAE ASHE Optimizing health care facilities ANSI Approved American National Standard www.ansi.org

Background – Use of ASHRAE/ASHE 170



9 Functional Space Categories

- Surgical and Critical Care (17)
- Inpatient Nursing (9)
- Radiology (3)
- Diagnostic & Treatment (23)
- Sterilizing (1)
- Central Medical and Surgical Supply (SPD) (3)
- Service (10)
- Support Space (3)
- Skilled Nursing Facility (5)

Within these 9 space categories, there are 74 different functions of (room) space. **57 room types require pressure relationships** to adjacent areas and humidity and temperature requirements.

Backgr

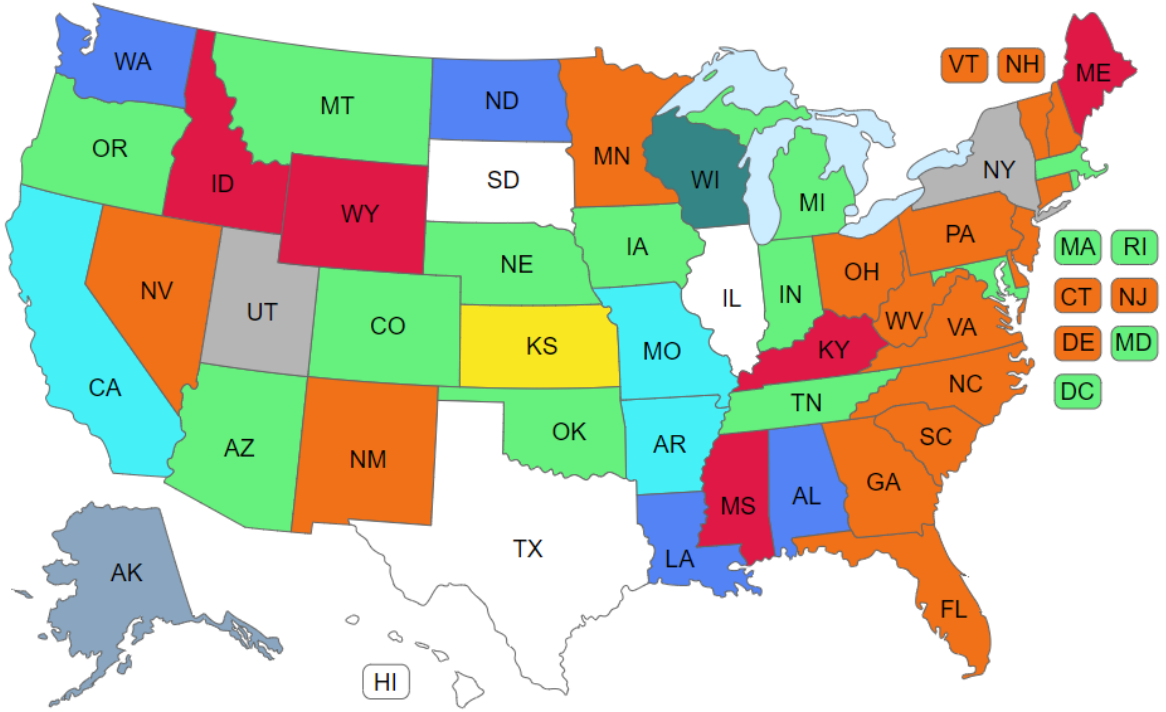
WayFind	PDC Naming	Suggested FP naming revision (ATG)	ASHRAE 170 Function of Space	Temperature Range (I) F/C	Temp. Risk Ranking	Temp. Testing Frequency	Weekly work order coun	Quarterly work order count	Annual work order coun
B1281	Medication	0	Medication Room	75	2	Quarterly	0	1	0
B1304	Trauma	0	Trauma room (crisis or shock) (c)	70-75	3	Annually	0	0	1
B1306	Trauma	0	Trauma room (crisis or shock) (c)	70-75	3	Annually	0	0	1
B1409	Medication	0	Medication Room	75	2	Quarterly	0	1	0
B3322	Clean Holding	Medication	Medication Room	75	2	Quarterly	0	1	0
B4227	Medication	0	Medication Room	75	2	Quarterly	0	1	0
B4353	Medication	0	Medication Room	75	2	Quarterly	0	1	0
B5358	Medication	0	Medication Room	75	2	Quarterly	0	1	0
B6011	Procedure	Procedure	Class A Operating/Procedure room (o), (d)	70-75	2	Quarterly	0	1	0
B6126	Medication	0	Medication Room	75	2	Quarterly	0	1	0
B6215	Ante Room	0	USP Class 7 Positive Pressure	0	3	Annually	0	0	1
B6215.A	CHEMO	IV Prep Cleanroom	USP Class 7 Negative Pressure	0	3	Annually	0	0	1
B6215.B	CHEMO	0	USP Class 7 Positive Pressure	0	3	Annually	0	0	1
BL204	Trauma	0	Trauma room (crisis or shock) (c)	70-75	3	Annually	0	0	1
BL227	Medication	0	Medication Room	75	2	Quarterly	0	1	0
C10225	Medication	0	Medication Room	75	2	Quarterly	0	1	0
C10240	Medication	0	Medication Room	75	2	Quarterly	0	1	0
C1249	Medication	0	Medication Room	75	2	Quarterly	0	1	0
C2270	Storage	Medication	Medication Room	75	2	Quarterly	0	1	0

Function of Space	Air ed y rs (j)	Air Recirculated by Means of Room Units (a)	RH (k), %	Design Temperature (l), °F/°C
SURGERY AND CRITICAL CARE				
Classes B and C operating rooms, (m), (n), (o)		N/R	max 60	70–75/21–24
Operating/surgical cystoscopic rooms, (m), (n) (o)		N/R	max 60	70–75/21–24
Delivery room (Caesarean) (m), (n), (o)		No	30-60	68–73/20–23
Substerile service area		No	N/R	N/R
Recovery room		N/R	max 60	70–75/21–24
Critical and intensive care		N/R	N/R	72–80/22–27
Wound intensive care (burn unit)		N/R	Max 65	72–80/22–27
Newborn intensive care				
Treatment room (p)		No	N/R	N/R
Trauma room (crisis or shock) (c)				
Medical/anesthesia gas storage (r)		No	N/R	72–78/22–26
Laser eye room		No	max 60	72–78/22–26
ER waiting rooms (q)		N/R	max 60	72–78/22–26
Triage				
ER decontamination		No	N/R	72–78/22–26
Radiology waiting rooms (q)		No	N/R	N/R
Class A Operating/Procedure room (o), (d)		No	N/R	72–78/22–26
INPATIENT NURSING		No	N/R	N/R
Patient room (s)		No	N/R	N/R
Toilet room		N/R	N/R	72–78/22–26
Newborn nursery suite		No	N/R	N/R
Protective environment room (f), (n), (t)		No	N/R	N/R
AII room (e), (n), (u)		No	N/R	72–78/22–26
AII isolation anteroom (t) (u)		No	N/R	N/R
Labor/delivery/recovery/postpartum (LDRP) (s)		N/R	N/R	N/R
Labor/delivery/recovery (LDR) (s)		No	N/R	N/R

Note: N/R = no requirement

Background – State Health Care Standards

Last updated 2/7/24



Key	
2022	
2018	
2014	
2010	
2006	
2001	
1996-97	
Equivalency*	
HVAC Only	

- **43 states have adopted some edition of the *Guidelines*** (this includes Wisconsin, which has adopted only the HVAC requirements).
- **6 states (Idaho, Kansas, Maine, Mississippi, New Hampshire, New York)** that adopt the *Guidelines* permit use of a more recent edition than that adopted in some instances.
- **3 states do not adopt but allow use of the *Guidelines*** as an alternate path to compliance in some instances.
- **4 states do not use the *Guidelines* in any official capacity,** although most of these appear to use the documents for reference.

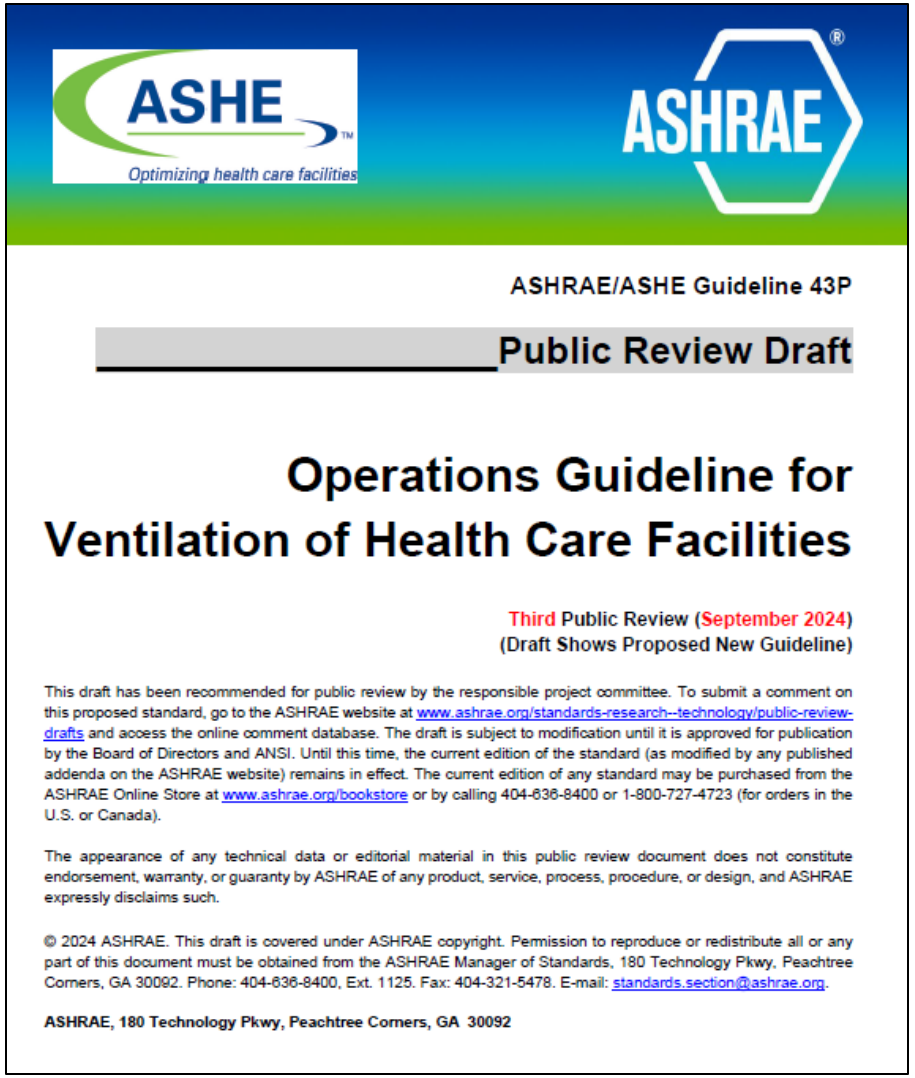
Competing Codes – HVAC in the OR & SPD

Background: Health care organizations are challenged to meet a series of conflicting HVAC standards and guidelines established by a variety of professional organizations:

- The American Society of Heating, Refrigerating and Air-Conditioning Engineers (**ASHRAE**) Standard 170
- The American Society for Healthcare Engineering (**ASHE**)
- The Association for the Advancement of Medical Instrumentation (**AAMI**) *ST79 Guide to Steam Sterilization and Sterility Assurance*
- The Association for Professional in Infection Control and Epidemiology (**APIC**)
- The Association of periOperative Registered Nurses (**AORN**) *Guideline for a Safe Environment of Care, Part 2*
- The Facility Guidelines Institute (**FGI**) *Guidelines for Design and Construction of Hospitals and Outpatient Facilities*

- ASHRAE/ASHE Standard 170-2013 - Addendum h revised design temperature ranges
- 2015 Joint Interim Guidance - HVAC in the OR & SPD
- *2019 – ASHRAE Technical Committee 9.6 – Humidity Control Events in Perioperative Care Areas*

ASHRAE/ASHE Guideline 43 - Introduction



ASHE
Optimizing health care facilities

ASHRAE

ASHRAE/ASHE Guideline 43P

Public Review Draft

Operations Guideline for Ventilation of Health Care Facilities

Third Public Review (September 2024)
(Draft Shows Proposed New Guideline)

This draft has been recommended for public review by the responsible project committee. To submit a comment on this proposed standard, go to the ASHRAE website at www.ashrae.org/standards-research--technology/public-review-drafts and access the online comment database. The draft is subject to modification until it is approved for publication by the Board of Directors and ANSI. Until this time, the current edition of the standard (as modified by any published addenda on the ASHRAE website) remains in effect. The current edition of any standard may be purchased from the ASHRAE Online Store at www.ashrae.org/bookstore or by calling 404-636-8400 or 1-800-727-4723 (for orders in the U.S. or Canada).

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ASHRAE, 180 Technology Pkwy, Peachtree Corners, GA 30092

Operations *Guideline* for the Ventilation of Health Care Facilities

- Purpose: to provide *recommendations* for the operations of heating, ventilation and air conditioning (HVAC) systems that provide environmental control in health care facilities for the safety and comfort of health care facility occupants.

- Scope: The operation of health care facility HVAC systems and equipment, their normal and routine maintenance, major tasks of periodic maintenance, and energy conservation.

ASHRAE/ASHE Guideline 43 – Table of Contents

ASHRAE/ASHE Guideline 43 – Chapter 4

- **Chapter 4 - Operating Practices**
- Consistently balance day-to-day unscheduled outages or repairs
- Scheduled regulatory and maintenance needs
- Ongoing building rehabilitation and construction projects
- Long-term visioning and capital planning
- Baseline practices for ensuring optimal performance
  - Operating Conditions
  - Normal Operations
  - Maintenance Operations
  - Excursion Response
  - Energy Management
  - Emergency Response
  - Construction

ASHRAE/ASHE 43 Guideline – Chapter 5

- **Chapter 5: Monitored Spaces - categorized based on risk of harm**
  - **Critically Ventilated Spaces**
    - Those spaces ***used for invasive or high-risk procedures***, infection control isolation, or any space where loss of required air flow, temperature, humidity, and/or pressurization ***could result in harm, injury or death to patients, visitors or staff***.
  - **Generally Ventilated Spaces**
    - Those spaces ***not used for invasive or high-risk procedure areas***, not used for infection control isolation, and where loss of required air flow, temperature, humidity, and/or pressurization ***would not result in harm, injury or death to patients, visitors or staff***.

ASHRAE/ASHE 43 Guideline – Chapter 5

- **Chapter 5: Verification of Space Conditions based frequency of tasks**

  - **Prescribed Frequencies** - Space environmental conditions should be physically verified for pressure, temperature, humidity, and airflow as in Table 5.1.

  - **Risk-based management** – Space testing and verification frequency should be based on reliability factors and facilities risk of failure with adjustments on:

    - Critically of asset/equipment
    - Age of equipment
    - Function of equipment and variability
    - Risk of failure based on equipment type
    - Manufacturer requirements
    - Frequency of PMs performed
    - Allocation/availability of spare parts
    - Data and documentation
    - Patient Outcomes

ASHRAE/ASHE 43 Guideline

- **Chapter 6: Implementation**

  - Define the responsible party for compliance
  - Develop a Ventilation Management Program (VMP) plan
  - Define the elements of the program.
    - Program Objectives
    - Inventory of items to be inspected and maintained
    - Maintenance plan of inspection and work to be performed
    - Condition Indicators for systems and equipment to be developed

  - Other Considerations
    - Operational Plan in the Event of Outages and/or IRMM
    - Unoccupied Turndown
    - Revisions of the VMP

Creating a Ventilation Management Plan

1) Form a Committee
   - Utilize a multidisciplinary group of leaders across the organization: engineering, planning, design and construction, accreditation, infection prevention, nursing, pharmacy, lab, and perioperative services should all be represented
   - Include leaders from all applicable campuses and buildings

2) Determine the Code reference
   - Currently, CMS references the 2012 edition of NFPA 99, Health Care Facilities Code, which references the 2008 edition of ASHRAE Standard 170
   - Check state and other local requirements for conflicting requirements

3) Develop a Source of Truth
   - Develop a comprehensive list of all the spaces in the facility with ventilation requirements
   - Ensure the room usage, room name, and the room name on the life safety plans align

Creating a Ventilation Management Plan

ASHRAE 170-2008

Function of Space	Pressure Relationship to Adjacent Areas (n)	Pressure Risk Category	Relative Humidity (k),%	Humidity Risk Category	Design Temperature (l) F°/°C	Temperature Risk Category
SURGERY AND CRITICAL Care						
Classes B and C operating room, (m), (n), (o)	Positive	1	30-60	1	68-75	1
Operating/surgical cystopic rooms, (m), (n), (o)	Positive	1	30-60	1	68-75	1
Delivery room (Caesarean) (m), (n), (o)	Positive	1	30-60	1	68-75	1
Critical and intensive care	Positive	2	30-60	3	70-75	4
Newborn intensive care	Positive	2	30-60	3	70-75	4
Treatment Room (p)	N/R	-	30-60	4	70-75	4
Trauma room (crisis or shock) (c)	Positive	1	30-60	1	70-75	3
Medical/anesthesis gas storage (r)	Negative	1	N/R	-	N/R	-
ER waiting room (q)	Negative	3	max 65	-	70-75	4
Triage	Negative	3	max 60	-	70-75	4
ER decontamination	Negative	3	N/R	-	N/R	-
Radiology waiting rooms (q)	Negative	2	max 60	3	70-75	3
Class A Operating/Procedure room (o), (d)	Positive	2	30-60	2	70-75	2
INPATIENT NURSING						
Patient rooms (s)	N/R	-	max 60	4	70-75	4
Toilet room	Negative	4	N/R	-	N/R	-
Protective environment room (f), (n), (t)	Positive	1	max 60	4	70-75	4
All room (e), (n), (u)	Negative	1	max 60	4	70-75	4
All isolation room (t), (u)	N/R	1	N/R	-	N/R	-

Category 1 Risks
Category 2 Risks
Category 3 Risks
Category 4 Risks

Creating a Ventilation Management Plan

5) Create a Response Plan

- During testing or day-to-day operations, if there are any deficiencies, the excursion response plan should be followed, and the deficiency should be documented with a work order
- Follow Addendum O from ASHRAE 170
- Consider proactive escalation during occurrences of extreme weather or equipment failure

6) Provide Education

- Dedicate one of the early VMC meetings to educate the clinical leaders on ventilation related definitions, such as the basic elements of room pressurization, the relationship between temperature and humidity, and the purpose of air changes
- Consider creating ventilation maps for pressure, temperature, and humidity and assigning colors to spaces based on the element risk ranking and use arrows to show the direction of airflow
- Install identifiers on the outside of each room

Creating a Ventilation Management Plan

7) Develop the Policy

- The VMP will need to be defined and published so that it can be referenced by employees in the hospital. It should include the committee members and details, the code references, basic ventilation term definitions, testing frequencies and the excursion response plan
- Review existing policies that have ventilation requirements and modify them to reference the VMP, rather than indicating requirements in a separate policy

8) Seek Approval

- Any approvals from the committee on policies or risk assessments should be recorded in committee meeting minutes

9) Maintain the Plan

- Update the room list as change requests are submitted and approved
- As part of routine rounding, each space should be evaluated to ensure that activities in the room or the room signage have not changed

ASHRAE/ASHE Guideline 43

- Change Management Plans
  - Review current Space Ventilation Program using 170 vs 43 Guideline
  - Engage your EOC & VMC to discuss options
  - O&M Staff education
  - Clinical Staff education

Training: With O&M staff on response plans

THE UNIVERSITY OF TEXAS MD Anderson Cancer Center

Last Revised: 11/02/2020

Patient Care & Prevention Facilities Procedure – Emergency Response to Critical Space Air Flow, Temperature, Humidity, and Pressure Alarm

PCPF/O&M ER-623

Purpose The purpose of this procedure is to establish step by step procedures when responding to critical space air flow and pressure alarm (Tier I space with QAPI program).

Scope This shall apply to Critical Space including OR's, SPD, All, USP797 Pharmacy and all other critical spaces (for 1.0).

Procedure

1.0 Normal troubleshooting for room level (critical space)
- Check BAS Graphics
- Check the operation of HVAC system and correct any issues
- Check terminal box for mechanical issues and correct issues
- Once corrected, test room for room pressure
- Document corrections on Work order

Normal troubleshooting for AHU level (critical space)
- Check BAS Graphics
- Check the operation of HVAC system including AHU and correct issues.
- Once corrected, verify BAS system is normal and test critical rooms for room pressure
- Document corrections on Work order

2.0 Alarm parameters are documented in departmental procedure IC-210 and BAS set up per the QAPI program

2.1 Escalation process for OR and Pharmacy of the air flow, temperature, humidity, and/or pressure problem on room level
- For single room level, if it cannot be resolved in 1.5 hour, notify the surgical OR, clinical or pharmacy team. Clinical or pharmacy team will act on accordingly.

2.2 Escalation of the air flow, temperature, humidity and/or pressure problem on AHU level
- For AHU level, if it cannot be resolved in 1.0 hour, notify the surgical OR, clinical or pharmacy team and call FOC on Building Emergency. Clinical or pharmacy team will act on accordingly.

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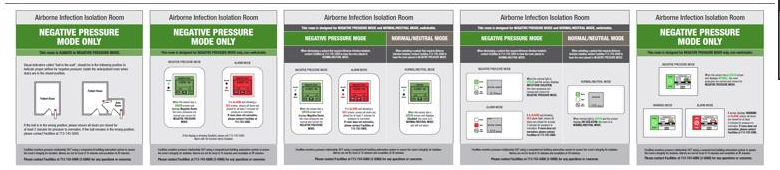
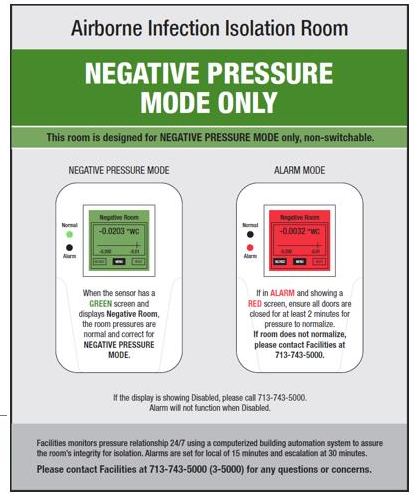
Training: Job Aids – Signage (Airborne Infectious Isolation)

- Training with Nursing and O&M on signage for different room types as well as appropriate responses to issues





ASHE Optimizing health care facilities

Courtesy of Dr. Edward Zhu and James Storfer, UTMDACC, Houston, "A Journey for a Sustainable (EOC) Program", 2023 ASHE Annual Conference

Reviewing the data to improve Patient Outcomes

OUTCOME: Environment of Care – QAPI DATA (monitoring & reporting)

QAPI started in 2019 135 locations

EOC QAPI Compliance Map

October, 2019

	Temp	RH	ACH	DP
OR		97.66%	99.93%	97.27%
USP	65.14%	90.98%	51.85%	94.55%
SPD	93.10%	63.25%	100%	100%
All				100%

2022 476 tiered I,II,III locations + 250 support locations for pressure and total of 726

EOC QAPI Compliance Map

October, 2022

Room Type (Count)	Temp	RH	ACH	DP
OR (44)		100.00%	99.84%	100.00%
USP (43)	99.71%	99.25%	99.88%	100.00%
SPD (6)	100.00%	99.89%	100.00%	100.00%
All (76+4)				98.51%
Tier II - Procedure, IR (23)				100.00%
Tier III -(Clean and Dirty Utilities) (215)				98.13%

Courtesy of Dr. Edward Zhu and James Storfer, UTMDACC, Houston, "A Journey for a Sustainable (EOC) Program", 2023 ASHE Annual Conference

Available Resources

- ASHRAE/ASHE 170, 2008 enforced by CMS
- Applicable state or local codes
- ASHRAE/ASHE Guideline 43 (in final review, preparing for a fall publication)
- ASHE Annual past presentations on this topic
  - 2017 – Texas Children Hospital - “Pressure Dependent Spaces Program”
  - 2019 – IU Health - “Managing Ventilation Requirements”
  - 2021 – Childrens Health (Dallas) - “Creating a Ventilation Management Plan”
  - 2023 – UT MD Anderson - “A Journey for a Sustainable EOC Program”

- HFM Magazine article – March 2021 – “Nine steps to improving health care HVAC system compliance….(by developing a ventilation management plan)”

Questions?

- **Thank you for attending!**
- Please remember to check in to the session and complete the evaluation to receive CEC.