HESNI Quarterly Meeting

13 April 2023

ASHRAE Standard 170 – Ventilation for Health Care Facilities, 2021 Edition

170 UPDATE - AGENDA

- Introductions
- History of ASHRAE 170
- Major changes between 170-2017 and 170-2021 - **REDLINE**
- New / current directions
  - Highlights of 170 meetings
- Guideline 43
- In Illinois, what directs you to Standard 170
- Summary / Q & A

Laurence V. Wilson, PE, ASHRAE HFDP

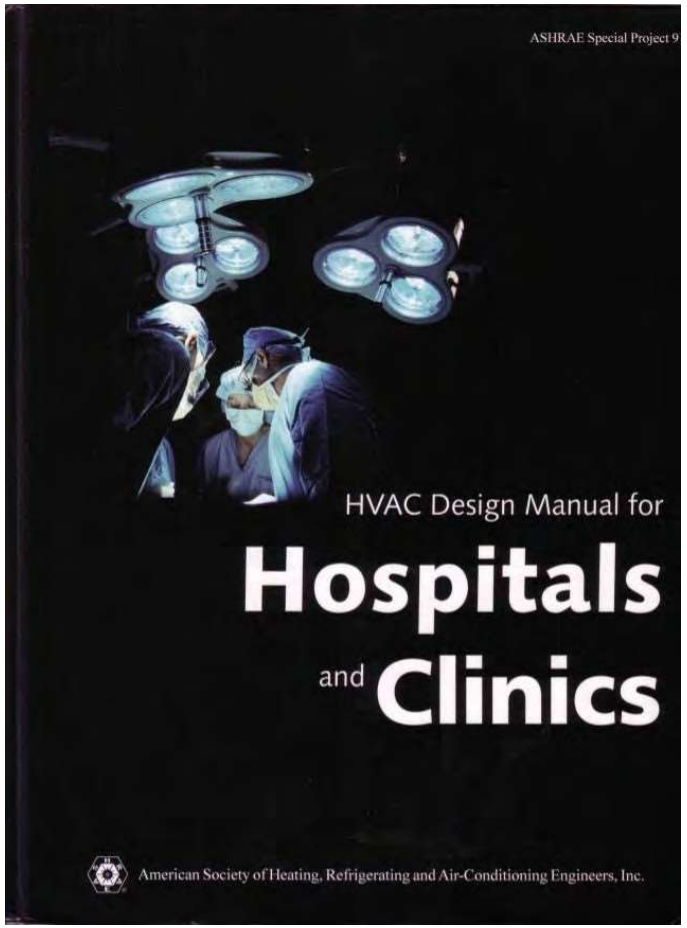
- Analyses and Design/Construction: 40 years
- New & Renovation: Healthcare & Lab Projects
- ASHE, HESNI, ASPE, NSPE, NFPA
- ASHRAE:
  - Member ASHRAE TC 9.6—Health Care
  - Member ASHRAE Standard 170
  - Judge: ASHRAE-IL Excellence in Engineering
- Presented at ASHE PDC, MWHCEC and HESNI

Kenneth A. Monroe, PE, MBA, CHC, PMP

- 25+ years in Healthcare “Bricks and Mortar
  - Construction
  - Operations and Maintenance
  - Compliance: The Joint Commission
- ASHRAE
  - Standards Committee
  - Standard 170 Committee
  - Standard 202 Committee - Commissioning

Hospital Design Manual for Hospitals and Clinics, 2003

First Edition

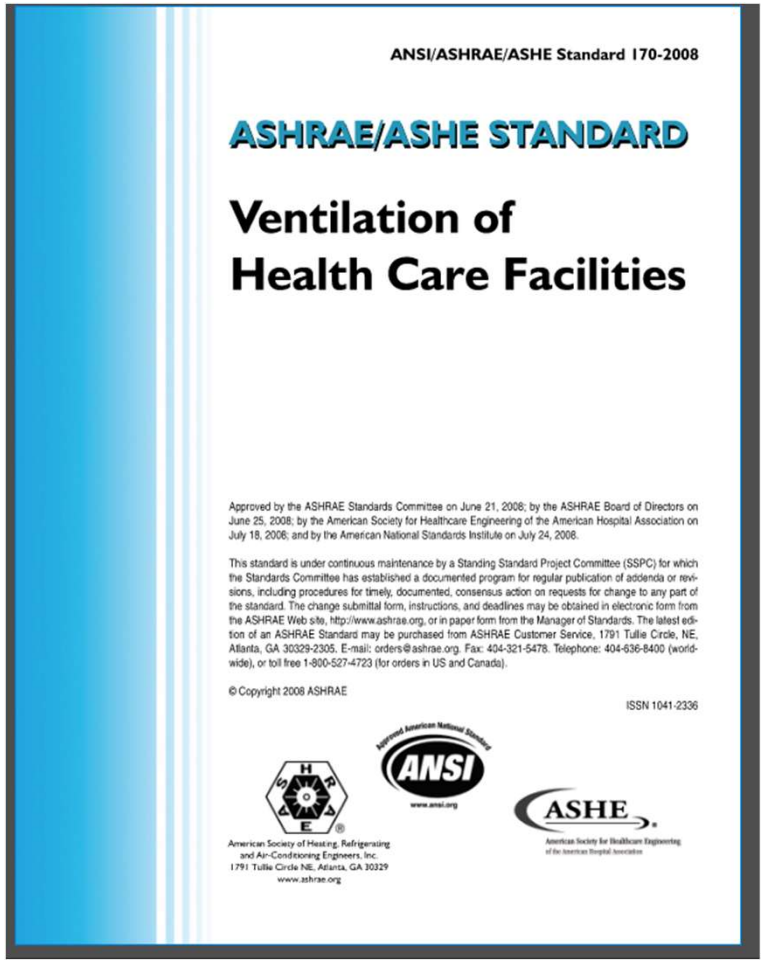


The Problem – WHY was Standard 170 created?

- Risk: AHJ's (Authorities Having Jurisdiction) invoke ASHRAE HVAC Design Manual for Hospitals and Clinics similar to way invoke ASHRAE Applications Handbook
- KEY: These documents are **not** standards
  - Create confusion, problems or liability
- Standard incorporates new research and technology without new book.
- The Design Manual complements the Standard.

The Solution

- First jointly sponsored standard by ASHRAE and ASHE - 2008!
- Consensus standard
- "continuous maintenance"
- continuous maintenance = continuous improvement
- Written so easily invoked by AHJ's



Hospital Design Manual for Hospitals and Clinics, 2013 and ASHRAE Standard 170-2013

<u>Second Edition</u>

Of both documents published the same year—sync'd up


STANDARD

ANSI/ASHRAE/ASHE Standard 170-2013
(Supersedes ANSI/ASHRAE/ASHE Standard 170-2008)
Includes ANSI/ASHRAE/ASHE addenda listed in Appendix C

Ventilation of Health Care Facilities

See Appendix C 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. The change submittal form, instructions, and deadlines may be obtained in electronic form from the ASHRAE Web site (www.ashrae.org) or in paper form from the Manager of Standards. The latest edition of an ASHRAE Standard may be purchased from the ASHRAE Web site (www.ashrae.org) or from ASHRAE Customer Service, 1791 Tullie Circle, NE, Atlanta, GA 30329-2305. E-mail: orders@ashrae.org. Fax: 678-539-2129. Telephone: 404-636-8400 (worldwide), or toll free 1-800-527-4723 (for orders in US and Canada). For reprint permission, go to www.ashrae.org/permissions.

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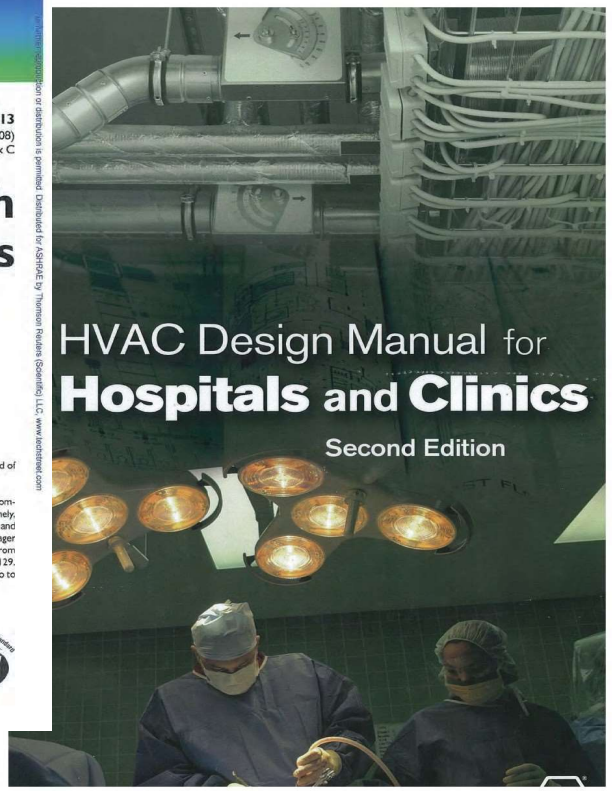
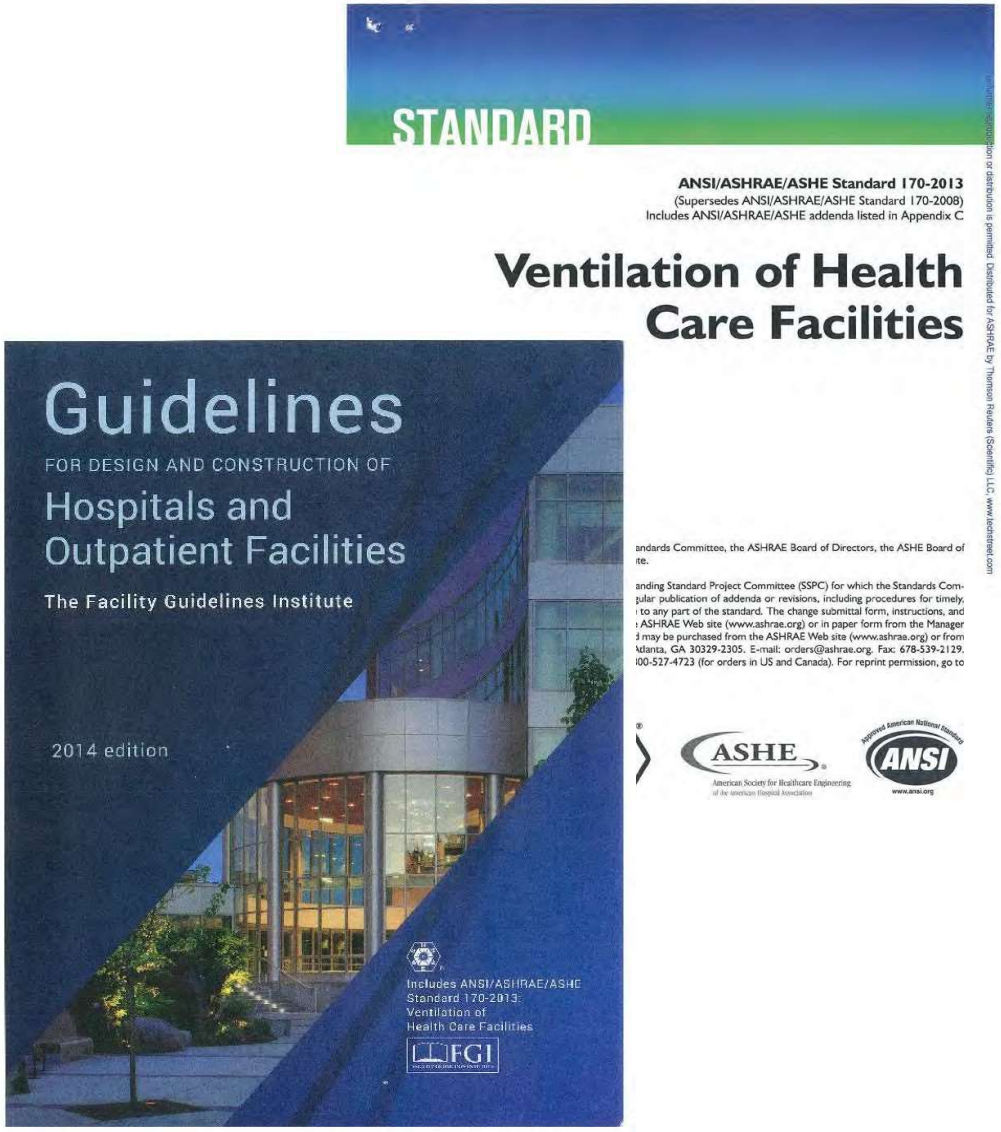
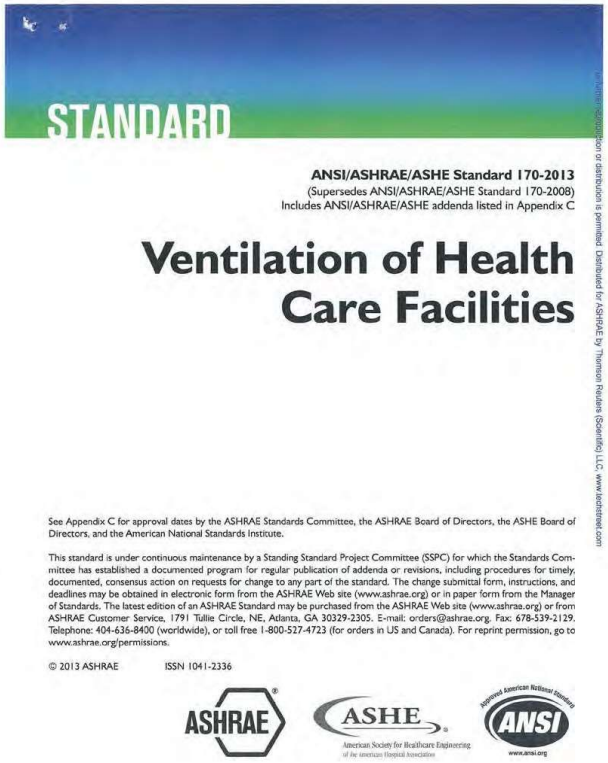


FGI Guidelines 2014 incorporates Standard 170-2013



What 170 IS :

- Agreement between ASHRAE and FGI
  - 170 = Best location for Ventilation requirement
  - ASHE also included
    - FIRST standard jointly sponsored by ASHRAE and ASHE
- Set of <u>MINIMUM</u> requirements intended for Code Enforcing Agencies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What 170 is NOT :

- NOT a design guide
- NOT a COMFORT Guide:
  Refer to ASHRAE Standard 55
  - 170:2.7 & Appendix B

Summary of Differences between 2017 and 2021 Editions of Standard 170

- Reference: **REDLINE** edition of Standard 170-2021, available from ASHRAE as downloadable .PDF or printed copy.
- Bread and Butter of the document:
  - Table 6-1, Intake relationships/distances
  - Table 7-1, Design Parameters, **Inpatient** Spaces - revised
  - Table 8-1, Design Parameters, **Specialized** Outpatient Spaces – revised
  - Table 8-2, Design Parameters, **General** Outpatient Spaces - NEW
  - Table 9-1, Design Parameters, **Residential Health, Care, and Support Specific Spaces** – revised
- New Sections for Outpatient (Section 8) & Residential (Section 9) to match the FGI Guidelines books.
- Added FGI section references to Rooms in Tables.

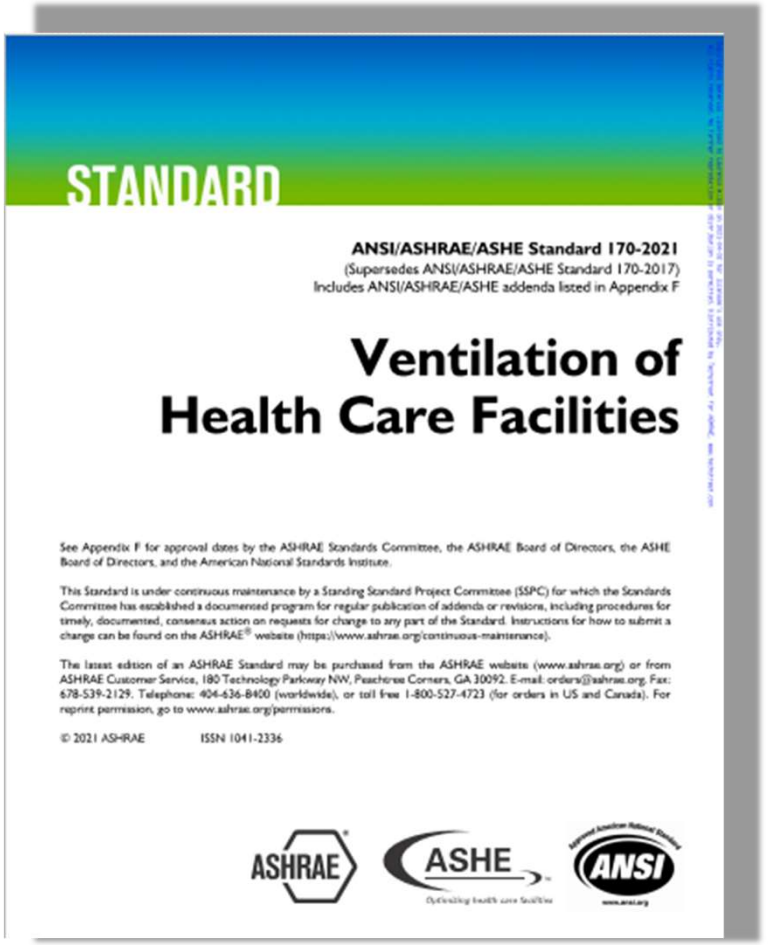
Improvements to the 2021 Edition of 170

- Improved guidance on thermal comfort conditions (hint: look elsewhere)
- Revised Outpatient and Residential sections
- New outpatient ventilation table: nonacute-type spaces
- Revisions to air filtration requirements
- New columns in vent tables: filtration requirement and unoccupied turndown
- New separation distance requirements for intakes and exhausts
  - coordinates with ASHRAE Standard 62.1 data (Table 6.1)
- Airborne infectious isolation (AII) room exhaust to general exhaust
- New ventilation requirements: anesthetic gas use
- Clarification of Class 1/Class 2/Class 3 imaging in coordination with FGI
- Revised definition of “invasive procedure”
- New section: behavioral and mental health

1.0 Purpose

Purpose is to define HVAC system ***design*** requirements that provide ***environmental control*** in health care facilities.

- Planning
- Design
- Construction
- Operations
- Maintenance



2.0 Scope

Applies to patient care areas, resident care areas and related support areas within (aligns w/ FGI now):

- Hospitals
- Outpatient Facilities
- Nursing Facilities

2.0 Scope

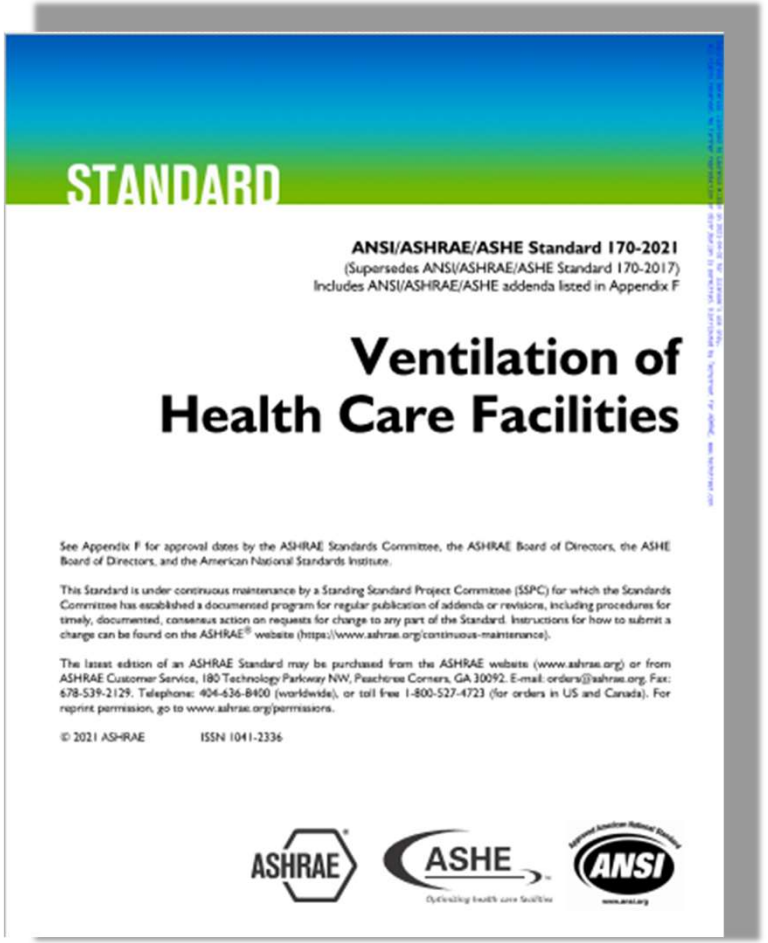
Applies to these kinds of projects:

- New buildings including additions
- Renovations of existing buildings
- Infrastructure upgrades

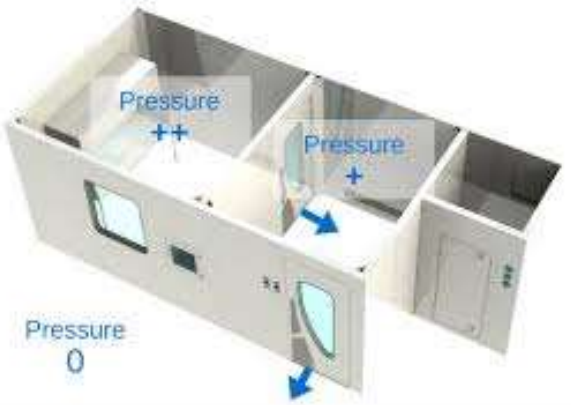
2.0 Scope

Considers:

- Contamination from particulates, VOC's (read: odor), chemical, biological; NOT radiological
- Dry bulb temperature and relative humidity
- Aseptic environmental
- Airflow rates (supply, outdoor, exhaust)
- NOT thermal comfort



2.0 Scope

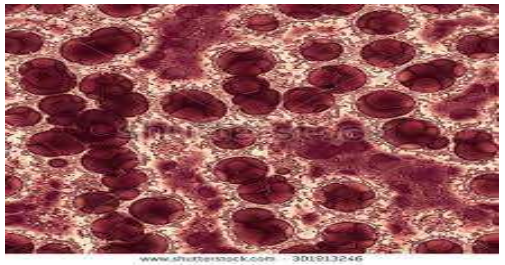


- Contamination Control = aseptic environment = state of being free from particulates, particularly biological matter such as bacteria, viruses and fungi….HVAC is dominant

is not the same as

- Infection Control = (dose x site x virulence x time)/(level of host defense)

……HVAC is secondary



2.0 Scope

TRANSMISSIONS OF INFECTIOUS PATHOGENS

TRANSMISSION TYPE	HOSPITAL ACQUIRED INFECTIONS (HAI)
CONTACT – Direct or Indirect (TOUCH)	85%
DROPLET (FALL)—between 1 and 5 micron	10%
AIRBORNE (FLOAT)—smaller than 1 micron	5%

- Mechanisms by which HVAC systems can impact airborne transmission **within the room**:
  - Airflow path
  - Dilution (air changes/hour)
  - Filtration
  - Temperature (dry bulb), relative humidity

2.0 Scope

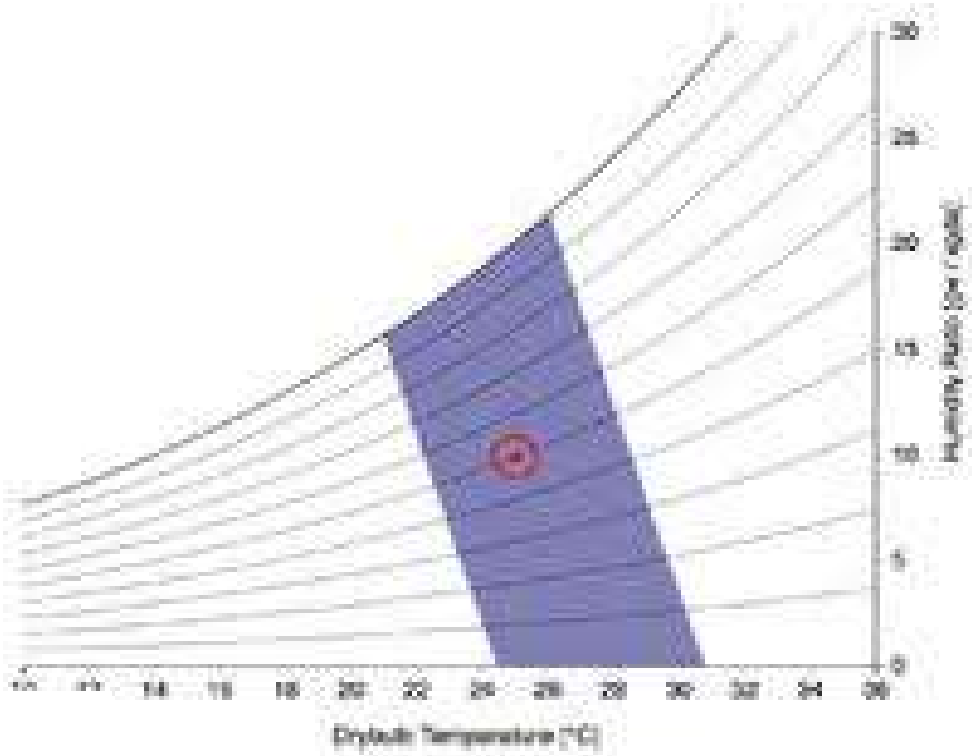
TRANSMISSIONS OF INFECTIOUS PATHOGENS

TRANSMISSION TYPE	HOSPITAL ACQUIRED INFECTIONS (HAI)
CONTACT – Direct or Indirect (TOUCH)	85%
DROPLET (FALL)—between 1 and 5 micron	10%
AIRBORNE (FLOAT)—smaller than 1 micron	5%

- Mechanisms by which HVAC systems can impact airborne transmission **outside the room**:
  - Pressurization at the room level
  - Pressurization at the system service area level

2.0 Scope

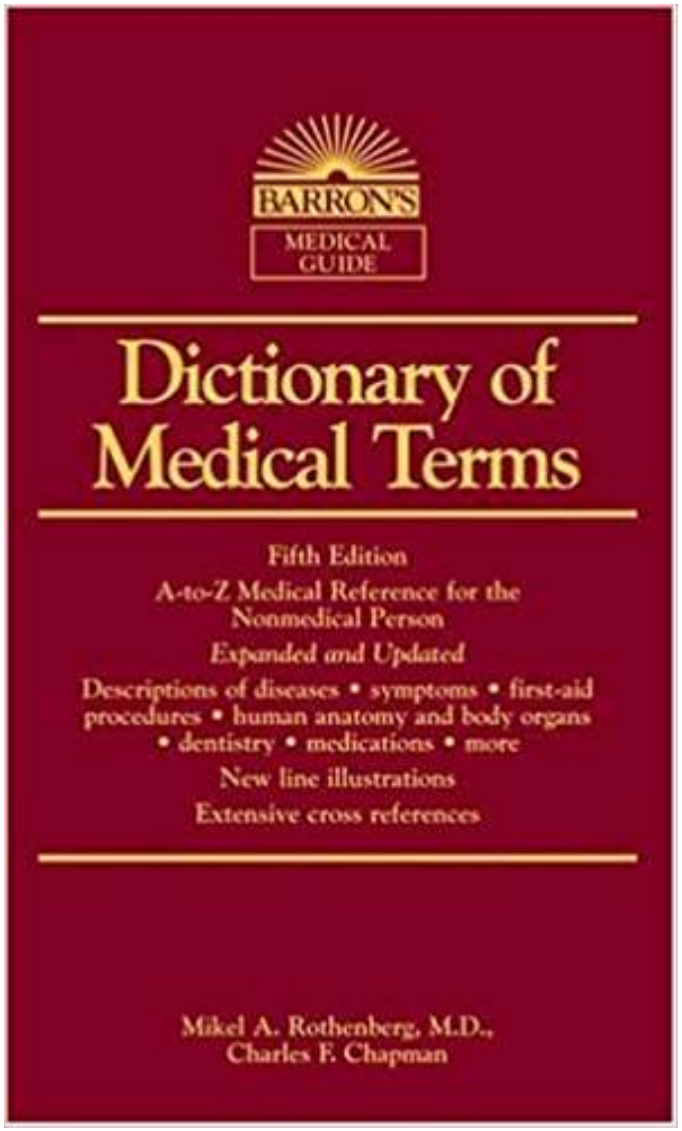
- *Compliance with ASHRAE Standard 170 does **not** guarantee compliance with ASHRAE Standard 55--Thermal Comfort* (Tdb, Tmrt, RH, draft)
- Compliance with ASHRAE Standard 170 does **not** guarantee compliance with ASHRAE Standard 62.1--- Acceptable Indoor Air Quality



3.0 Definitions

Definitions includes some very specific medical and technical terms; it's important for architects, engineers and health care workers to understand the vocabulary they'll need to use when communicating with each other about common goals/criteria/issues/problems despite the very different worlds they each work in!

Remember that there's no such thing as a stupid question!



3.0 Definitions

Key Definition Additions:

- **Class 1 imaging room**: natural orifice entry and do not pierce or penetrate natural protective membranes.
- **Class 2 imaging room**: diagnostic and therapeutic procedures such as coronary, neurological, or angiography and similar procedures.
- **Class 3 imaging room**: invasive procedures and any Class 2 procedure where patient will require physiological monitoring and might require active life support.
- **Invasive Fluoroscopy:** therapeutic or diagnostic invasive procedures that require fluoroscopic imaging
- **Inpatient**: stay 24 hours or more
- **Outpatient**: stay less than 24 hours

3.0 Definitions

INVASIVE

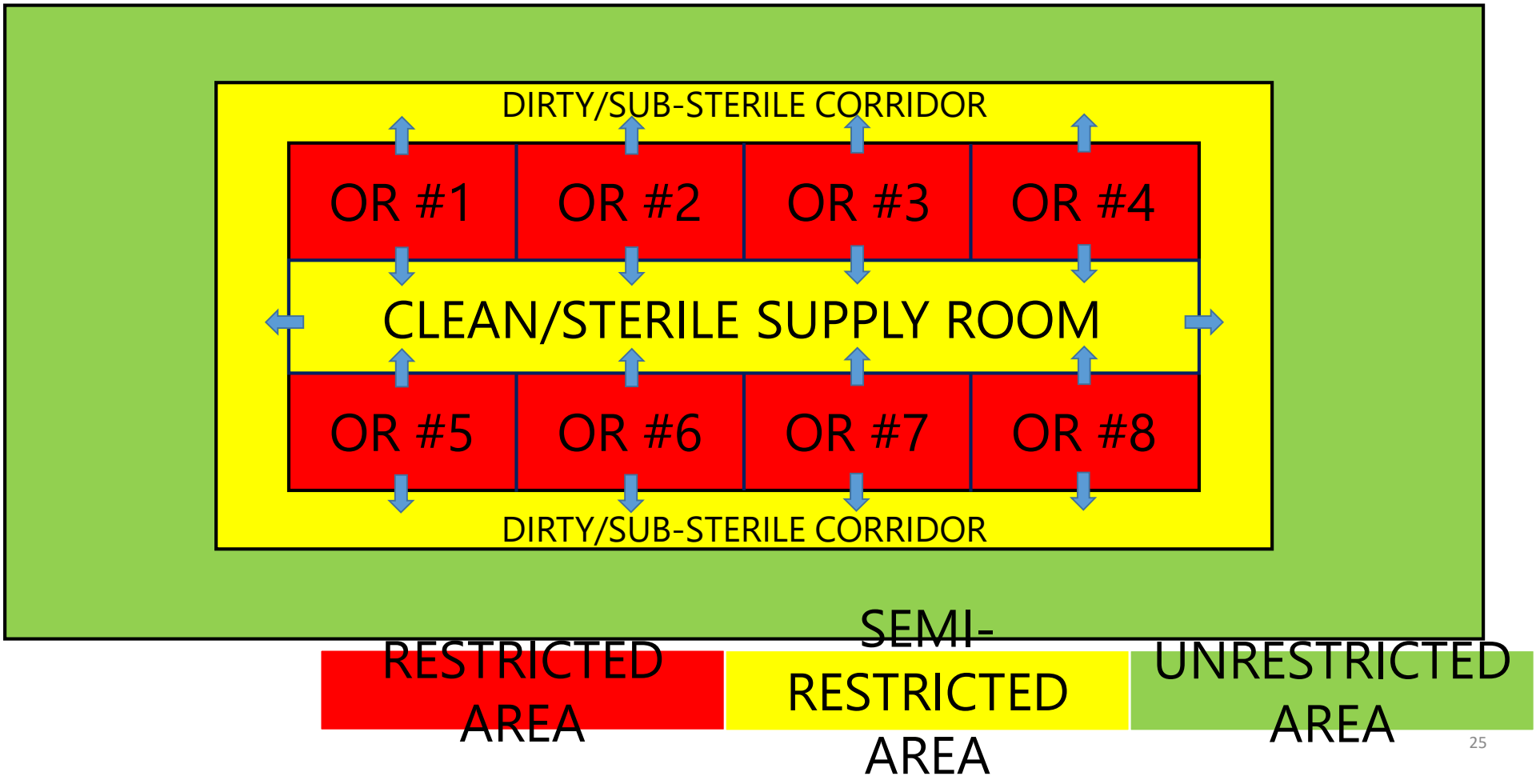
OPERATING ROOM

NON-INVASIVE

PROCEDURE ROOM

3.0 Definitions—check FGI for restricted vs. semi-restricted

INVASIVE – OPERATING SUITE LAYOUT



4.0 Compliance

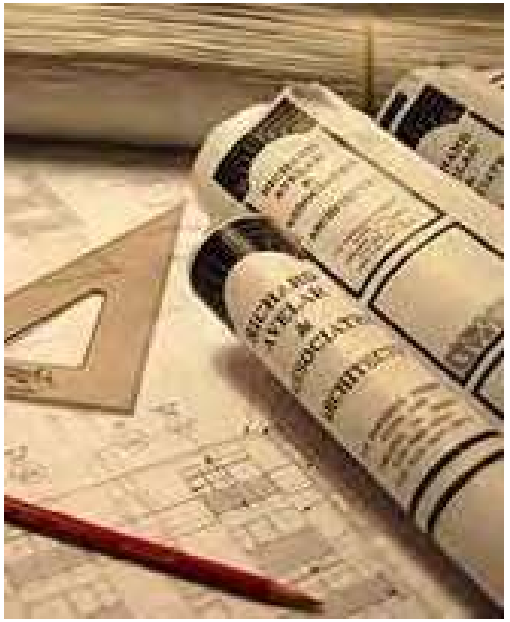
Compliance applies to both new buildings as well as additions and alterations to existing buildings, systems and spaces (including infrastructure upgrades)

Documentation required includes:

--***<u>Basis of Design with calcs</u>***

--Plans

--Specs

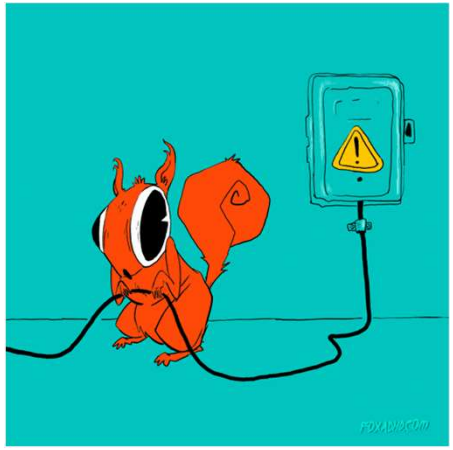


Alternates to prescriptive criteria can always be presented to the AHJ in a timely manner for their consideration and approval

5.0 Planning (focus on planning & space allocation)

Planning requires that the ***Owner*** prepare a detailed Program; ASHRAE defines this as an Owners Program Requirement (OPR):

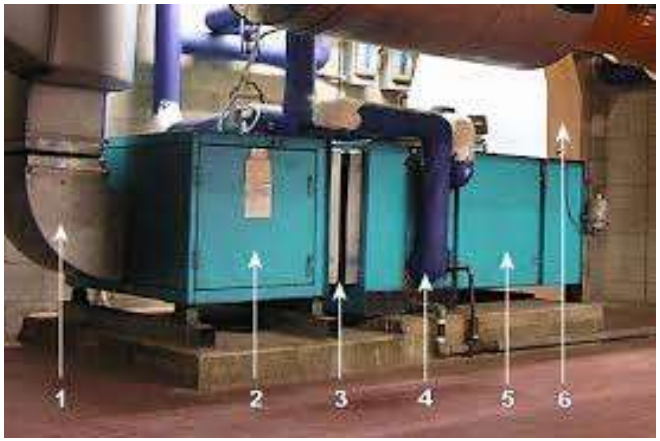
- define a space-by-space program including what clinical services are to be provided and what FF&E is expected in the space
- room names per FGI (ASHRAE aligned with FGI now)
- define risk categories per NFPA 99
- define operational plan for an extended power or fuel outage



5.0 Planning (new facility)

System **Sources** (Steam, Heating, Cooling, AHU's)

- away from clinical spaces
- space for O&M (pm's, repairs, minor overhauls, major overhauls, replacement)
- safe access (catwalks, ladders, lifts, etc.)
- seal all floor penetrations
- note to engineers-you ***must*** involve facilities team



5.0 Planning (new facility)

System **Distribution** (Steam, Heating, Cooling, AHU's)

- Integrate all MEP systems into ceiling plenums
  (integrate is proactive; coordinate is reactive)
- Integrate all MEP systems into shafts providing for access to any and all dampers and valves
- Make composite MEP drawings in 3-D

5.0 Planning (existing facility)

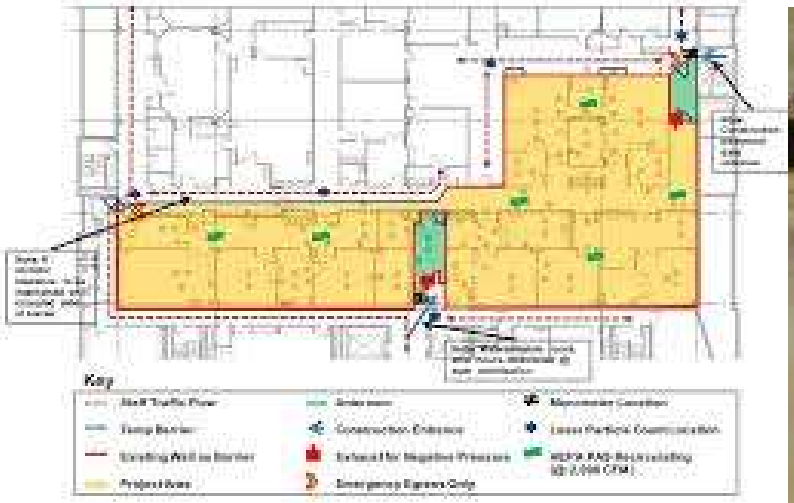
System **Source + Distribution** (Steam, Heating, Cooling, AHU's)

- Assess existing systems to determine if they have the capability to be re-used to handle renovated spaces
- Visual inspection and dynamic testing/monitoring required

5.0 Planning (existing facility)

Infection Control and Risk Assessment (ICRA)

- Goal is to minimize disruption to the patients and staff
- Goal is to maximize contamination control in order to maximize infection control



5.0 Planning (new or existing facility)

Planning for HVAC System Operation during Construction

- *Owner and design team shall determine if, and under what conditions, the permanent HVAC systems can be used for providing temporary heating, cooling, and/or dehumidifying during construction. Refer to Section 10.1.4.3(b).*

6.0 Systems and Equipment (refer to this during BoD prep)

- 6.1 Utilities
- 6.2 Air Handling Unit (AHU) Design
- 6.3 Outdoor Air Intakes and Exhaust Air Outlets
- 6.4 Filtration (particulates only)
- 6.5 Heating and Cooling Systems
- 6.6 Humidifiers
- 6.7 Air Distribution Systems
- 6.8 Energy Recovery Systems
- 6.9 Insulation and Duct Lining

6.0 Systems and Equipment-6.1 Utilities

Ventilation Systems That Must be Connected to the Appropriate Branch of the Essential Power System (EPS):

- All Rooms
- PE Rooms
- OR's including C- Section and Cysto
- Keep in mind that if space heating is accomplished by moving air, all those AHU's must also be connected to the EPS ('cause hospitals tend to use single path all-air systems)

6.0 Systems and Equipment – 6.1 Utilities

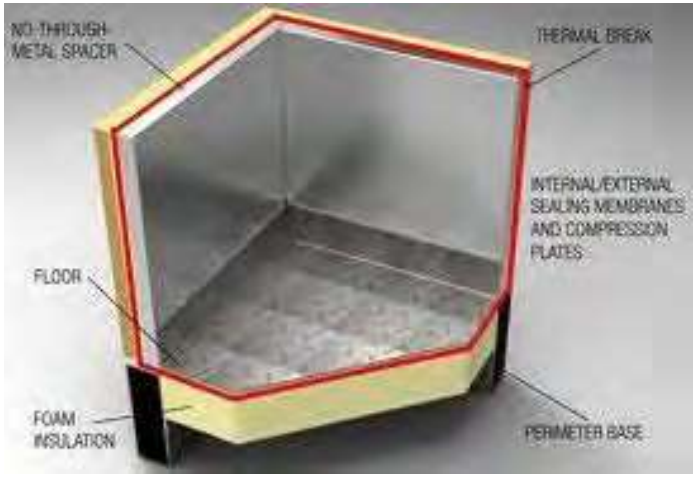
- Reserve Capacity (n+1) Required for DHW, Sterilization, Dietary, Humidification and Seasonal Space Heating for Operating, Delivery, Birthing, Labor, Recovery, Intensive Care, Nursery, and Inpatient Rooms
- Reserve Capacity (n+1) is <u>not</u> required if the ASHRAE 99% dry bulb is greater than or equal to 25 F; <u>however; Reserve Capacity (n+1) is still</u> <u>required for DHW, Sterilization, Humidification and Dietary</u>

6.0 Systems and Equipment – 6.1 Utilities

- Reserve Capacity (n + 1) Required for Enough of the Space Cooling Load to Meet the Owners' Program if the Seasonal Space Cooling Load and Process Cooling Load is Greater Than 400 Tons (serious discussion needed between Owner and Engineer)
- Don't forget about connection to the EPS!
- Don't forget about those heat recovery chillers, too –they do heating!!!

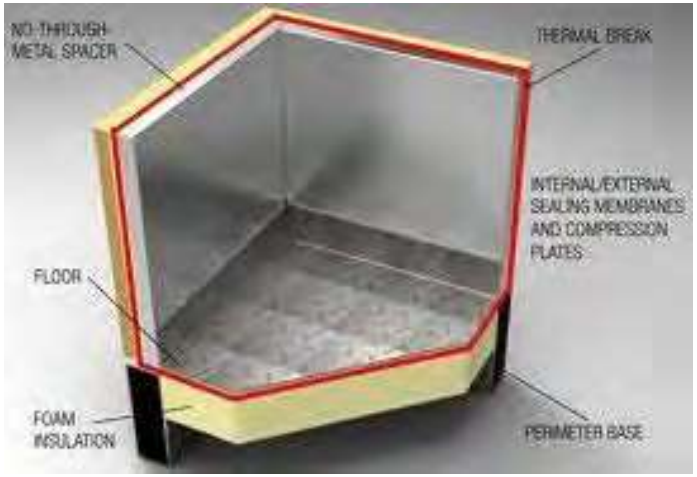
6.0 Systems & Equipment – 6.2 AHU Design

- Air Handling Unit Casing
  - Prevent Water Intrusion
  - Resist Corrosion
  - Permit Access for O&M
- Air Handling Unit Interior Surfaces
  - Comply with ASHRAE Standard 62.1
  - Resistant to Mold Growth
  - Resistant to Erosion



6.0 Systems & Equipment – 6.2 AHU Design

- Air Handling Unit Interior Surfaces [suggestion]
  - Consider Solid, SS Inner Wall adjacent to any Cooling Coil
  - Consider Perforated Inner Wall u.s. of Final Filter
  - Use Solid Inner Wall d.s. of Final Filter

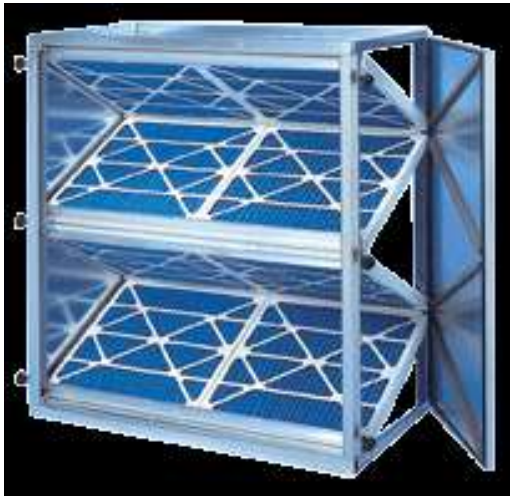


6.0 Systems & Equipment – 6.3 OAI & EAO—overhauled – 62.1

- OAI must be at least 25 feet from cooling towers and exhaust discharges
- OAI must be at least 6 feet above grade and 3 feet above a roof
- OAI must be protected from public access (moderate and high- risk)
- OAI must prevent entrainment of wind-driven rain with features to drain away precipitation
- OAI must have birdscreen mesh (no smaller than ½ inch)
- Mention matrix of available references and varying distances—use most stringent

6.0 Systems & Equipment – 6.4 Filtration

- Filter Bank 1 (minimum of MERV 8) must be upstream of heating and cooling coils such that all mixed air is filtered
- An intermediate Filter Bank is often installed between 1 and 2 in order to extend the life and cleanliness of Filter Bank 2—LCC analysis needed
- Filter Bank 2 must be downstream of Cooling Coils and Supply Fans and shall have Sealing Interface Surfaces (***refer to Table 7-1; table deleted***)
- Blank –off panels must be permanently attached to the filter frame
- Emphasis on eliminating bypassed supply air
- Leakage should be tested by Cx Agent [suggestion]

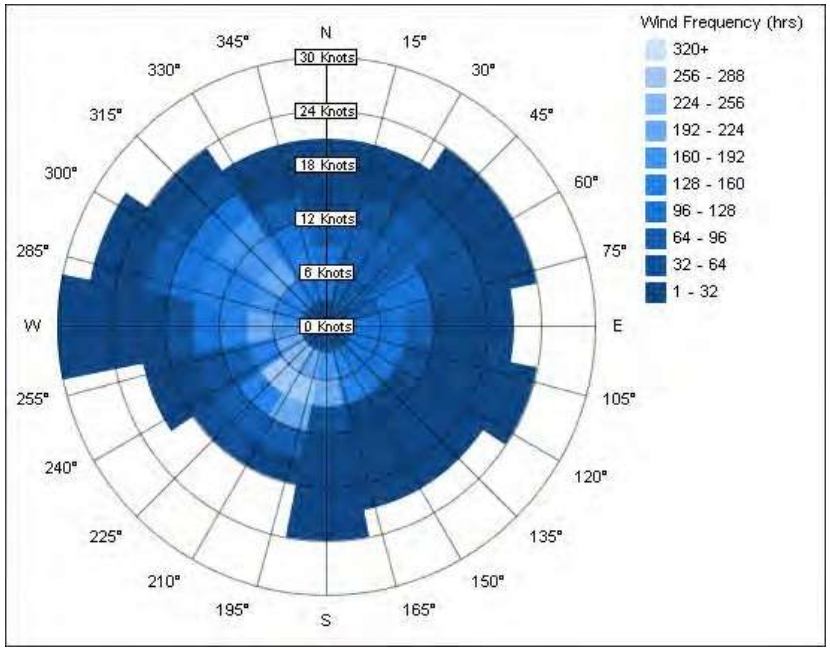


6.0 Systems & Equipment – 6.5 Heating and Cooling Systems

- Ceiling-mounted radiant heating and cooling panels in All Rooms, PE Rooms, and Burn Units must have smooth, flat, cleanable surfaces; radiant floors may also be used
- Chilled water temperature must be above the dewpoint temperature of the space and the ceiling plenum.

6.0 Systems & Equipment – 6.5 Heating and Cooling Systems

Consider wind speed, direction and frequency when locating cooling towers in order to avoid drift from entering OAI's or otherwise causing a nuisance



6.0 Systems & Equipment – 6.6 Humidifiers

- Humidifiers are required when internal moisture sources are insufficient to maintain minimum RH levels indicated in Table 7.1
- WICU requires an RH level of 40%—check potential for condensation on interior of envelope at center-of-glass, edge-of- glass, mullion)
- NICU may require an RH level of 40%
- Local humidifiers no longer needed at OR's because 40% RH is no longer required—in fact, not even 30%---use 20% (addenda (d) to Standard 170—2008 edition

6.0 Systems & Equipment – 6.6 Humidifiers

- Chemical additives must comply with FDA requirements (clean steam not required any more)
- High RH limit set at 90% is required
- Humidifier control valves must close when the AHU is not operating

6.0 Systems & Equipment – 6.6 Humidifiers

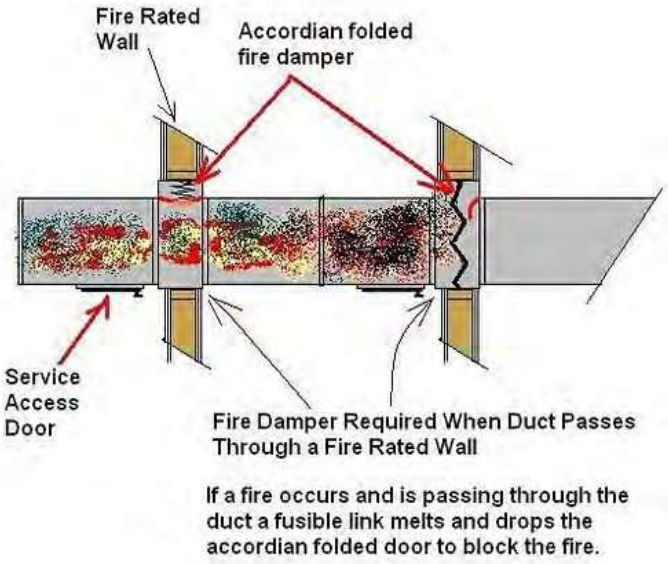
- Adiabatic high pressure water atomizing humidifiers are now allowed (decarbonization)
- Must use RO water
- Must use a UV-C sterilization light
- Must use a sub-micron filter
- Check with local AHJ's before using this type of humidifier
- Compressed air nozzle, centrifugal atomizer and ultrasonic humidifiers are not acceptable
- Water temperature per legionella risk management plan
- Adjust heating coil capacity up; lengthen AHU

6.0 Systems & Equipment – 6.7 Air Distribution Systems

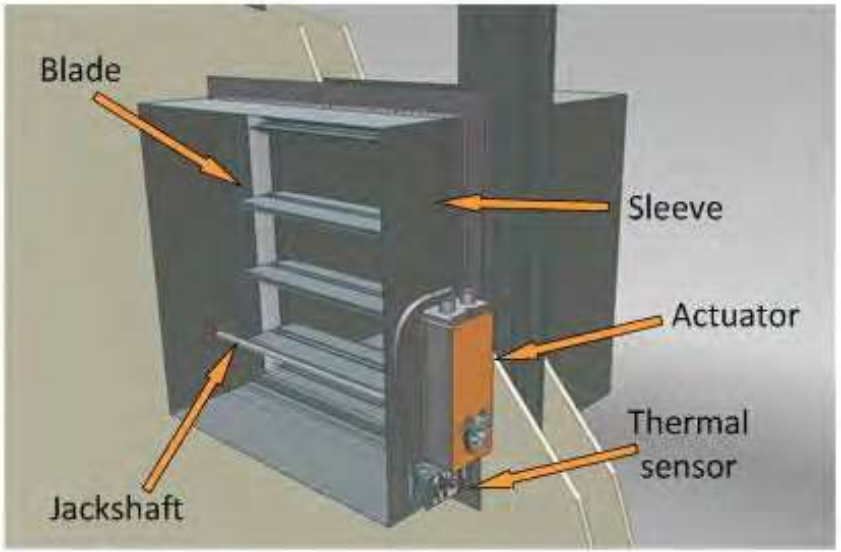
- Maintain pressure relationships as specified in Table 7.1 in all modes of operation
- Provide fully ducted return air paths for all rooms that are (+) or (-); need terminal units on supply and return/exhaust
- Provide fully ducted return air paths for several other rooms such as PACU and ICU rooms; need terminal units on supply and return
- Design must account for filter loading
- Access doors required for inspection and cleaning (refer to NFPA 90-A)
- Positive pressure—ac/hr = supply airflow
- Negative pressure—ac/hr = exhaust airflow

6.0 Systems & Equipment – 6.7 Air Distribution Systems

- Protect openings in fire-rated walls with fire damper
- Protect openings in smoke barriers with smoke dampers (try to minimize use of smoke dampers by matching HVAC zones with smoke compartments

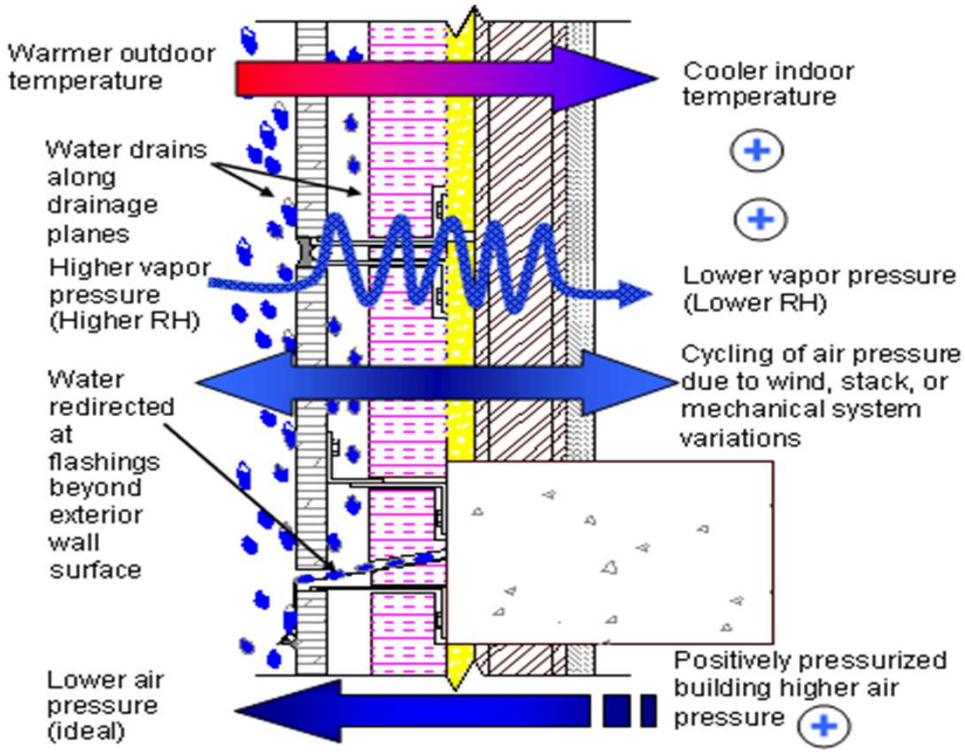


HVAC DUCTING THROUGH A FIREWALL



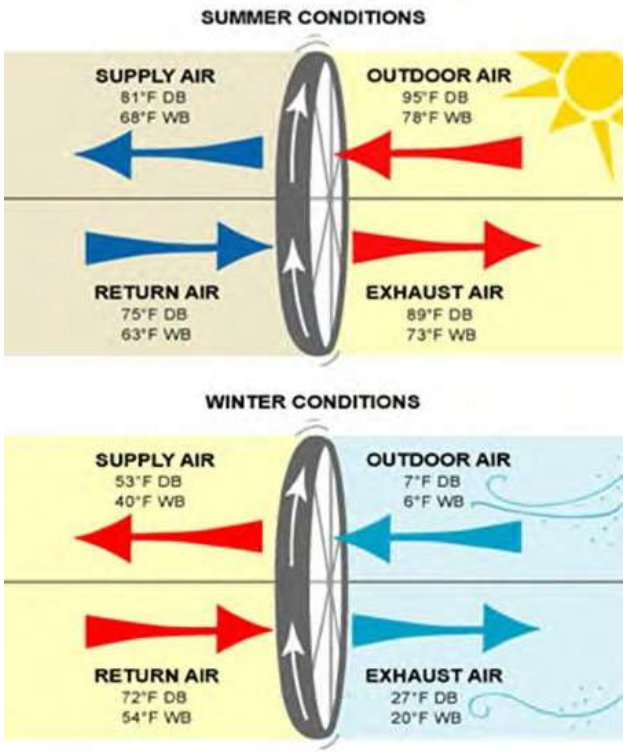
6.0 Systems & Equipment – 6.7 Air Distribution Systems

- New section on air balancing
- Considers pre-testing defined by design engineer and carried out by a qualified contractor
- Considers post-construction defined by design engineer and carried out by a qualified contractor
- Considers building pressurization---a complicated analysis that needs to done by a <u>design engineer</u>



6.0 Systems & Equipment – 6.8 Energy Recovery Systems

- Air-to-air energy recovery wheels must be located upstream of filter bank #1 and #2
- Air-to-air energy recovery wheels can be used with exhaust air with no more than 5% leakage (keep in mind that air-to-air energy recovery cannot be used with AII room or other exhaust systems moving toxic/noxious Class 4 air)



6.0 Systems & Equipment – 6.9 Insulation and Duct Lining

- Vapor barrier required for all ductwork carrying cold air
- Don't forget to insulate local duct risers in the corners of OR's carrying return air (the return can be as cold as 58-62 F); use vapor barrier, too
- Converting dual duct to single duct VAV requires examination of insulation on the old hot duct

6.0 Systems & Equipment – 6.9 Insulation and Duct Lining

- No duct lining downstream of filter bank #2
- No duct lining within 15 feet of humidifiers (this refers to duct- mounted humidifiers) – good engineering practice is to comply with the statement above throughout the system (i.e. no duct lining anywhere downstream of filter bank #2)
- Inside face of air handling units should not have perforated panels downstream of filter bank #2

7.0 Space Ventilation

- 7.1 General
- 7.2 Room Specific Requirements
- 7.3 Critical Care Units
- 7.4 Surgery Rooms
- 7.5 Support Spaces
- 7.6 Behavioral and Mental Health

7.0 Space Ventilation – 7.1 General

- Table 7.1 defines several design parameters—added two (2) columns
- --unoccupied turndown
- -final filter
- Air movement should always be from clean to less clean
- VAV systems cannot compromise pressure relationships or minimum air change requirements
- Air changes can be reduced when a space becomes unoccupied provided that required air pressure relationship is maintained, if allowed
- Higher air change rates may be required to maintain room temperatures
- Recirculating room HVAC units can be used where allowed per Table 7.1 such as Passive Chilled Beam, Active Chilled Beam or Fan Coil Units but must be provided with a MERV 6 filter upstream of any cooling coil (keeps the cooling clean)

7.0 Space Ventilation – 7.1 General

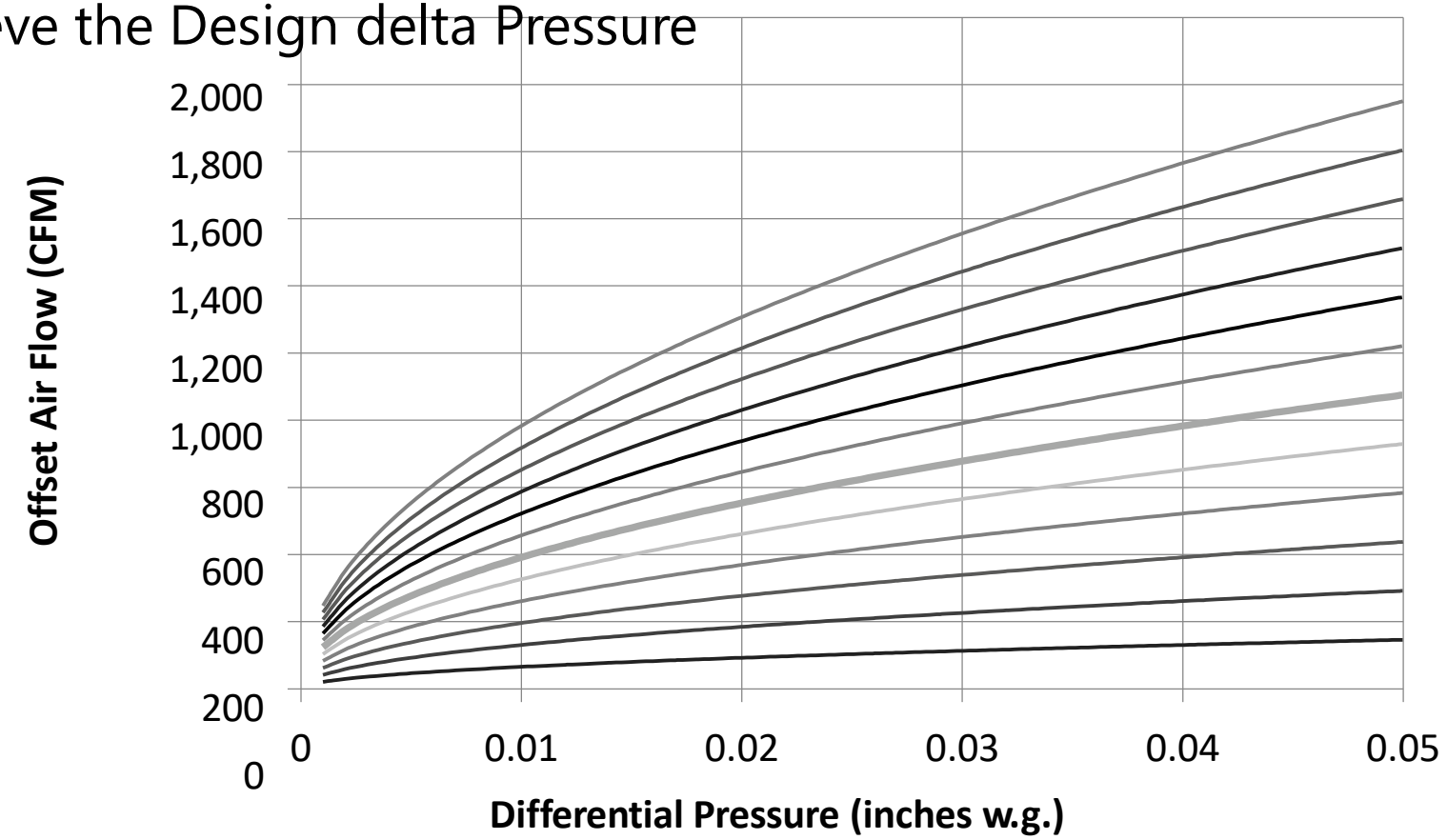
- ASHRAE Standard 62.1-2007 and earlier additions had very limited information related to how much outdoor air must be provided to various spaces within a health care facility – that information lived in various ASHRAE handbooks and some codes (all were a little light)
- ASHRAE Standard 170 resolved this important issue – very specific OA data for dozens of room types!
- ASHRAE 62.1-2010 and more current editions now simply refer the designer to ASHRAE Standard 170 for outdoor air flow rates

7.0 Space Ventilation – 7.1 General

- Designer must recognize that room-by-room pressurization is a separate issue from building pressurization; building pressurization is handled at the AHU level (the goal being, in this climate, to positively pressurize the building envelope when the outdoor dewpoint is higher than the indoor dewpoint and to negatively pressurize the building envelope when the outdoor dewpoint is lower than the indoor dewpoint)

7.0 Space Ventilation – 7.1 General

Room Porosity Determines delta Airflow Required to Achieve the Design delta Pressure



7.0 Space Ventilation – 7.2 Room Specific Requirements-AII

- Permanently installed device required in order to constantly monitor differential pressure
- Local visual monitor required
- AII air to be exhausted directly outdoors (12 AC/HR)
- Dedicated exhaust system is required for AII rooms (multiple rooms can, and should, be serviced by a single system)
- Exhaust grilles should be positioned behind the patients' bed
- Room envelope must be sealed
- Differential pressure should be at least -0.01" w.g. (-2.5 Pa); [design .03" --- alarm .01"] as measured between the patient room and the corridor
- Anterooms not required but preferred
- Airflow from corridor to anteroom to patient room

7.0 Space Ventilation – 7.2 Room Specific Requirements-PE

- Permanently installed device required in order to constantly monitor differential pressure
- Local visual monitor required
- Supply air diffusers should be positioned above the patients' bed (12 AC/HR)
- Return air grilles should be positioned near the patient room door
- Room envelope must be sealed
- Differential pressure should be at least -0.01" w.g. (-2.5 Pa); [design .03"---alarm .01"] as measured between the patient room and the corridor
- Anterooms not required but preferred
- Airflow from patient room to anteroom to corridor

7.0 Space Ventilation – 7.3 Room Specific Requirements

WICU

Burn unit patient rooms (WICU) require booster humidifiers in order to achieve a relative humidity level of 40% ; this assumes that the central AHU provides a 30% level of relative humidity across its' entire service area

Neonatal intensive care rooms (NICU) may need to be provided with booster humidifiers in order to achieve a relative humidity level of 40% [suggestion]

Space Ventilation – 7.4 Room Specific Requirements

- Sterilization Rooms
  - Exhaust hoods shall be provided for steam and ETO sterilizers (less common now?)
- Imaging Procedure Rooms
  - Ventilation same as Operating Rooms if Anesthetic Gasses are Administered

Space Ventilation – 7.4 Room Specific Requirements

Surgery Rooms

- At least 0.01”w.g. positive pressure at all times; [design .03”---alarm .01”]
- Primary supply diffuser array must extend 12” beyond the footprint of the surgical table; additional supply diffusers may be located elsewhere in the OR
- At least 70% of the area associated with the 12” extension must be diffusers (implies that 100% of the area associated with the surgical table must be diffusers)

TABLE 6.7.2 Supply Air Outlets

Space Designation (According to Function)	Supply Air Outlet Classification[a]
Operating rooms, procedure rooms (all class A, B, and C surgeries[b])	Primary supply diffusers Group E, nonaspirating additional supply diffusers, Group E
Protective environment (PE) rooms	Group E, nonaspirating
Wound intensive-care units (burn units)	Group E, nonaspirating
Trauma rooms (crisis or shock)	Group E, nonaspirating
All rooms	Group A or Group E
Single-bed patient rooms[c]	Group A, Group D, or Group E
All other patient-care spaces	Group A or Group E
All other spaces	No requirement

Notes:

a. Refer to the 2009 *ASHRAE Handbook—Fundamentals*, Chapter 20 (see ASHRAE [2009] in Informative Appendix B), for definitions related to outlet classification and performance.

b. Surgeons may require alternate air distribution systems for some specialized surgeries. Such systems shall be considered acceptable if they meet or exceed the requirements of this standard.

c. Air distribution systems using Group D diffusers shall meet the following requirements:
   1. The system shall be designed according to “Design Guidelines” in Chapter 7 of *ASHRAE System Performance Evaluation and Design Guidelines for Displacement Ventilation*.[11]
   2. The supply diffuser shall be located where it cannot be permanently blocked (e.g., opposite the foot of the bed.)
   3. The room return/exhaust grille shall be located in the ceiling, approximately above the head of the patient bed.
   4. The transfer grille to the toilet room shall be located above the occupied zone.

Space Ventilation – 7.4 Room Specific Requirements

Surgery Rooms

Primary supply diffusers at a speed of 25 to 35 ft/min w/ unidirectional flow (term "laminar flow" is N/A; parallel streamlines likes straws in a box)
At least two (2) low sidewall return grilles (bottom at 8"AFF) on opposite sides of room; wall-mounted return air grilles located high as well as ceiling-mounted returns outside the sterile field are preferred (current research supports these flow patterns)

8. Space Ventilation – Outpatient Spaces

- Does NOT provide for comfort, odors, airborne transmission
- NEW: Table 8-1 Design Parameters – **Specialized** Outpatient Spaces
- NEW: Table 8-1: Column: Minimum filter Efficiencies
- NEW: Table 8-2: Design Parameters – **General** Outpatient Spaces
- Night Setback / unoccupied:
  - 55 degF – 85 DegF / 65% RH - max

8.1 – Specialized Outpatient Facility

- Specialized Defined as:
  - Surgical
  - Endoscopy
  - Infusion
  - Renal Dialysis
  - Freestanding emergency departments
  - Class 2 and Class 3 imaging
- Ventilation as listed.
  - If not listed, by function or ASHRAE 62.1
- Minimum Filter: MERV **8** (was 6)

Table 8-1 NEW

- READ the NOTES!
- b. - Pharm. prep: Minimum efficiency filters per USP 795, USP 797, USP 800
- g. – Diagnostic Imaging: ICRA governs or else ASHRAE 62.1
- s. – Sterile equipment: MERV 14 – minimum
- t., u. – Where anesthetic gases used: Air changes are 6
- ff. – Facility to tell designer the class of imaging room

8.2 General Outpatient Facility Requirements

- ASHRAE standards are often basis of state and local building codes.
  - BUT: Regional conditions and interests.
  - THEREFORE: Follow local codes as possible.
- For positive or negative pressure areas, air changes can be reduced when unoccupied as long as pressure relationship is maintained.
- A lot **new**, including Table 8-2
- READ the NOTES: many new.
  - Notes tell when to refer to Table 8-1

8. - continued

- 8.5.3 - Gas Storage Rooms: Ventilation complies with NFPA 99
- 8.6 - Behavioral Health: HVAC systems and controls secured as in risk assessment
- 8.7 - Nuclear Medicine: refer to Table 8-2
  - Deal with Treatment areas and hot labs

9. Space Ventilation – Resident Health, Care and Support Spaces - NEW

- Does NOT protect from discomfort, odors, airborne
- **New** Table 9-1
  - Read the NOTES
- **New** Columns:
  - Unoccupied Turndown
  - Minimum Filter Efficiencies
- If area not covered, refer to ASHRAE 62.1 or 62.2
- 9.4.2 – Food prep: Make up air

10. (REVISED) ~~Planning,~~ Construction and System Start-Up

- 10.1 – Protect materials in transit and on site
- 10.1.4 - Use ICRA as required or section 5.5

10.1.4.3 – HVAC During Construction - NEW

- Prevent microbial growth
- If permanent HVAC equipment is used during construction:
  - 1. Supply 100% outdoor air
  - 2. Provide pressure relief
  - 3. Provide final level of filtration in air-handling units (AHUs).
  - 4. Cover supply duct openings when air-handler(s) are OFF.
  - 5. Provide prefilters over outdoor air
  - 6. Clean air-handling components prior to occupancy.
  - 7. Operate AHU(s) only if safety devices and sequences are in place and operational.
- After testing and balancing is complete, isolate system

10.2 – System Start Up - NEW

- Test and balance per national standards
- Testing of Drain Pans:
  - Issue: water stagnation & microbial growth: verify function
- Follow manufacturer's start-up recommendations and requirements.

Appendix A – Operations and Maintenance Proceducres: Guideline 43 – proposed – watch for comment period!

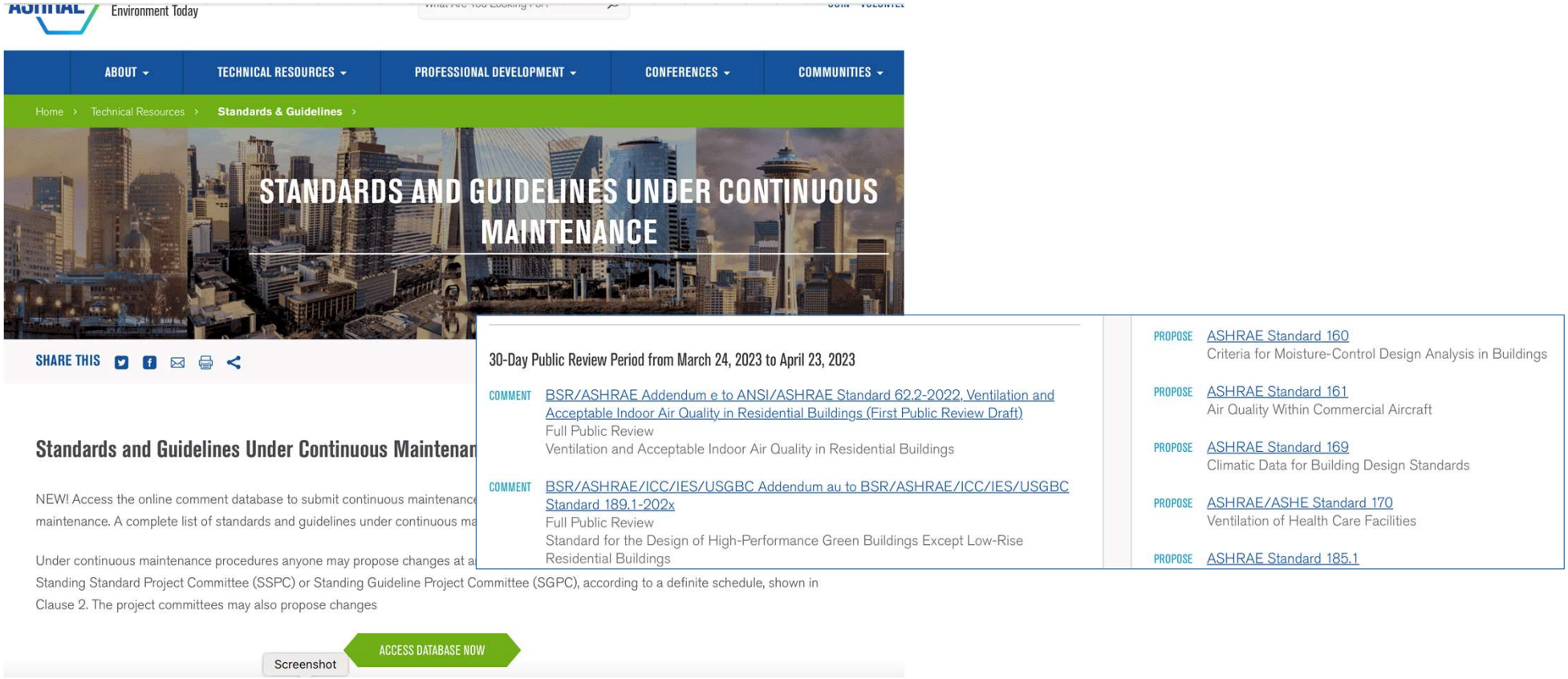
PURPOSE

- Operation of HVAC systems in health care facilities

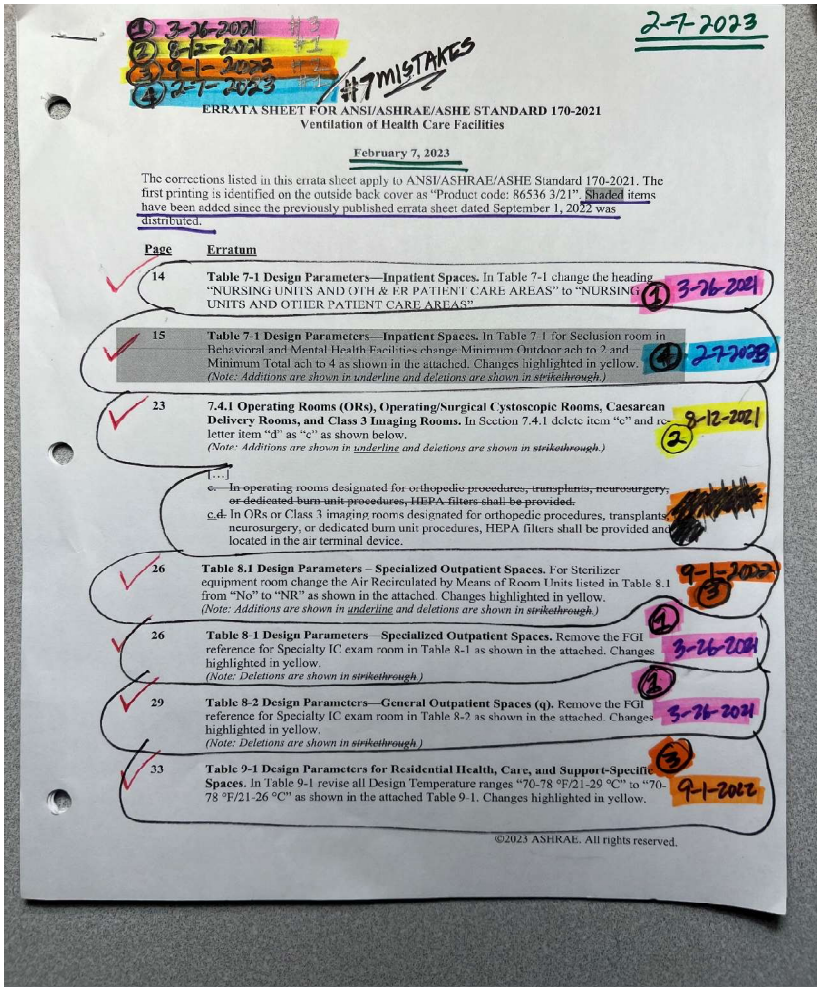
SCOPE:

- Operation of health care facility HVAC systems and equipment, maintenance, and energy conservation.
- Operation and preventative maintenance, and risks, including infection prevention
- Health care spaces to monitor, what to monitor and the means of monitoring and recording.
  - ranges in monitored spaces
  - time-dependent protocols when out of range.
- Emergency operations: continuity of service and resiliency planning.
- Does not cover new design

170 – Addenda - Errata – Interpretations: Download for FREE from ASHRAE



2021 Edition---Errata



2-7-2023

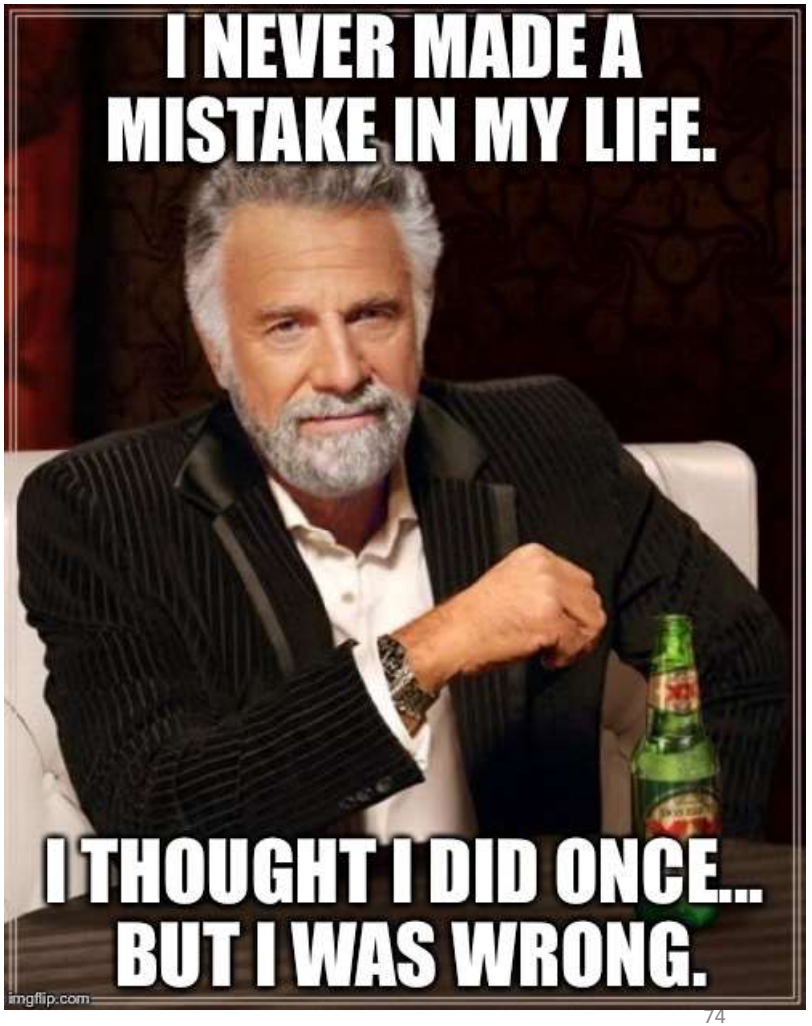
#7 MISTAKES

ERRATA SHEET FOR ANSI/ASHRAE/ASHE STANDARD 170-2021
Ventilation of Health Care Facilities

February 7, 2023

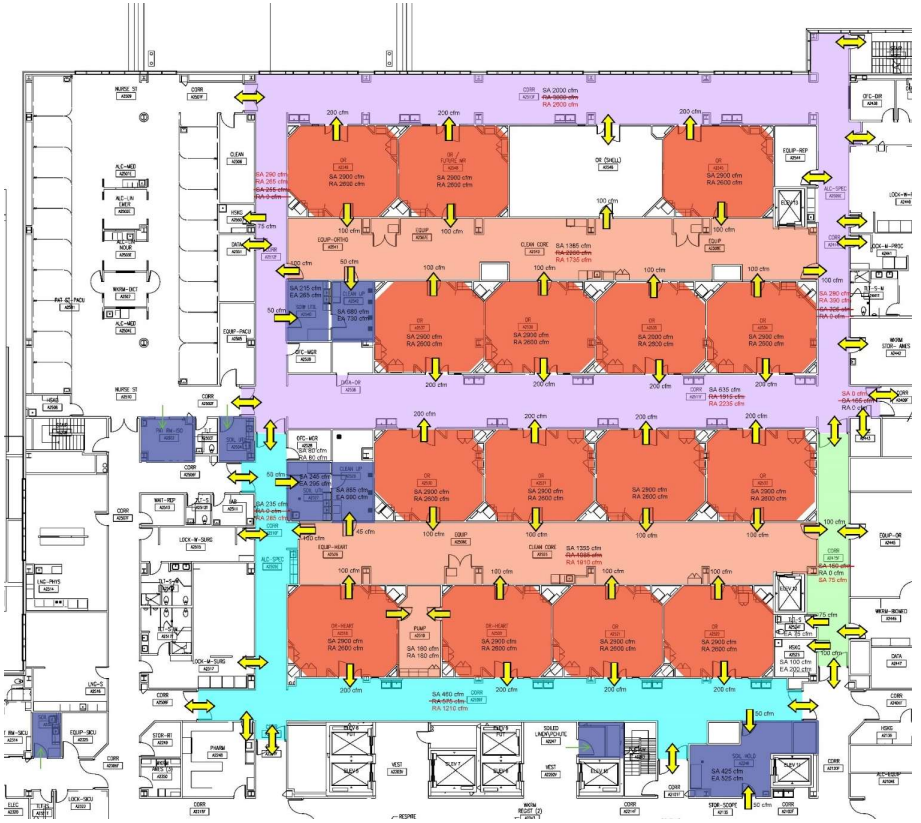
The corrections listed in this errata sheet apply to ANSI/ASHRAE/ASHE Standard 170-2021. The first printing is identified on the outside back cover as "Product code: 86536 3/21". Shaded items have been added since the previously published errata sheet dated September 1, 2022 was distributed.

Page	Erratum
14	**Table 7-1 Design Parameters—Inpatient Spaces.** In Table 7-1 change the heading "NURSING UNITS AND OTH & ER PATIENT CARE AREAS" to "NURSING UNITS AND OTHER PATIENT CARE AREAS" (1) 3-26-2021
15	**Table 7-1 Design Parameters—Inpatient Spaces.** In Table 7-1 for Seclusion room in Behavioral and Mental Health Facilities change Minimum Outdoor ach to 2 and Minimum Total ach to 4 as shown in the attached. Changes highlighted in yellow. *(Note: Additions are shown in underline and deletions are shown in ~~strikethrough~~.)* (4) 2-7-2023
23	**7.4.1 Operating Rooms (ORs), Operating/Surgical Cystoscopic Rooms, Caesarean Delivery Rooms, and Class 3 Imaging Rooms.** In Section 7.4.1 delete item "c" and re-letter item "d" as "c" as shown below. *(Note: Additions are shown in underline and deletions are shown in ~~strikethrough~~.)* (2) 8-12-2021 […] c. ~~In operating rooms designated for orthopedic procedures, transplants, neurosurgery, or dedicated burn unit procedures, HEPA filters shall be provided.~~ c.d. In ORs or Class 3 imaging rooms designated for orthopedic procedures, transplants, neurosurgery, or dedicated burn unit procedures, HEPA filters shall be provided and located in the air terminal device.
26	**Table 8.1 Design Parameters – Specialized Outpatient Spaces.** For Sterilizer equipment room change the Air Recirculated by Means of Room Units listed in Table 8.1 from "No" to "NR" as shown in the attached. Changes highlighted in yellow. *(Note: Additions are shown in underline and deletions are shown in ~~strikethrough~~.)* (3) 9-1-2022
26	**Table 8-1 Design Parameters – Specialized Outpatient Spaces.** Remove the FGI reference for Specialty IC exam room in Table 8-1 as shown in the attached. Changes highlighted in yellow. *(Note: Deletions are shown in ~~strikethrough~~.)* (1) 3-26-2021
29	**Table 8-2 Design Parameters—General Outpatient Spaces (q).** Remove the FGI reference for Specialty IC exam room in Table 8-2 as shown in the attached. Changes highlighted in yellow. *(Note: Deletions are shown in ~~strikethrough~~.)* (2) 3-26-2021
33	**Table 9-1 Design Parameters for Residential Health, Care, and Support-Specific Spaces.** In Table 9-1 revise all Design Temperature ranges "70-78 °F/21-29 °C" to "70-78 °F/21-26 °C" as shown in the attached Table 9-1. Changes highlighted in yellow. (3) 9-1-2022



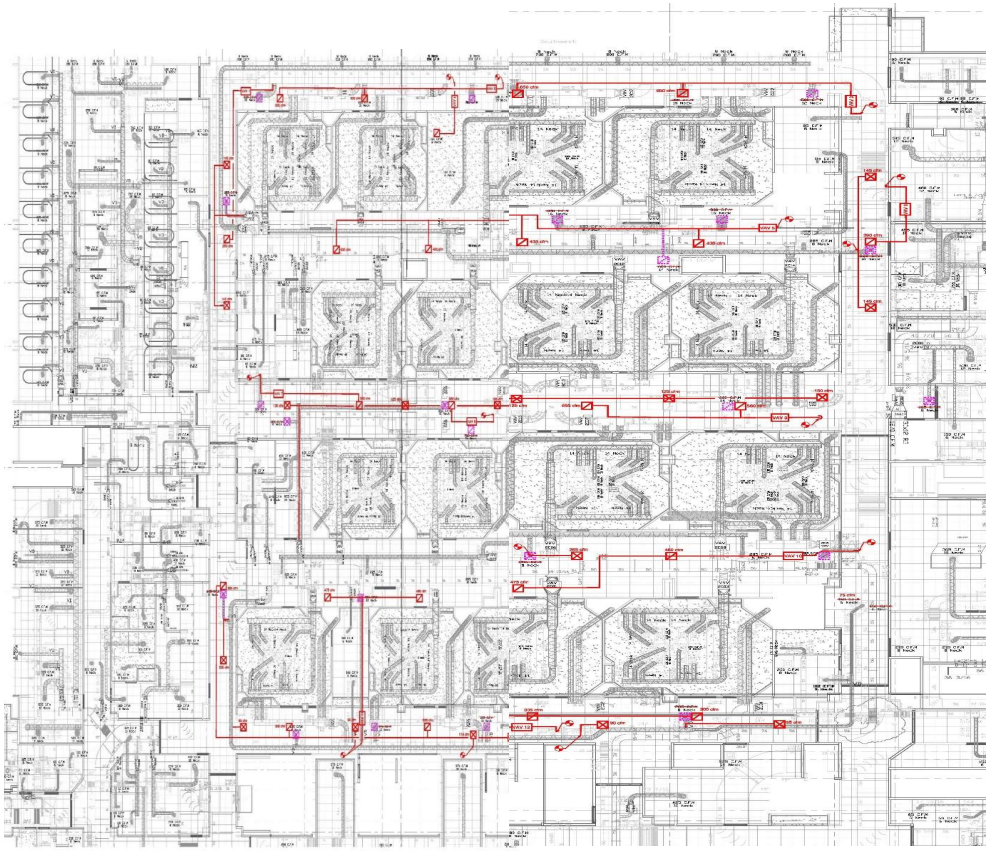
Case Study

- ***Problem:***
- BAS detected dP going negative in each OR from time to time
- Airflow testing confirmed a few negative OR's
- Design engineer consulted to problem solve
- Uncovered two (2) issues:
  - 1. no active control of return air
  - 2. improper diffuser locations in corridor w.r.t. OR door



Case Study

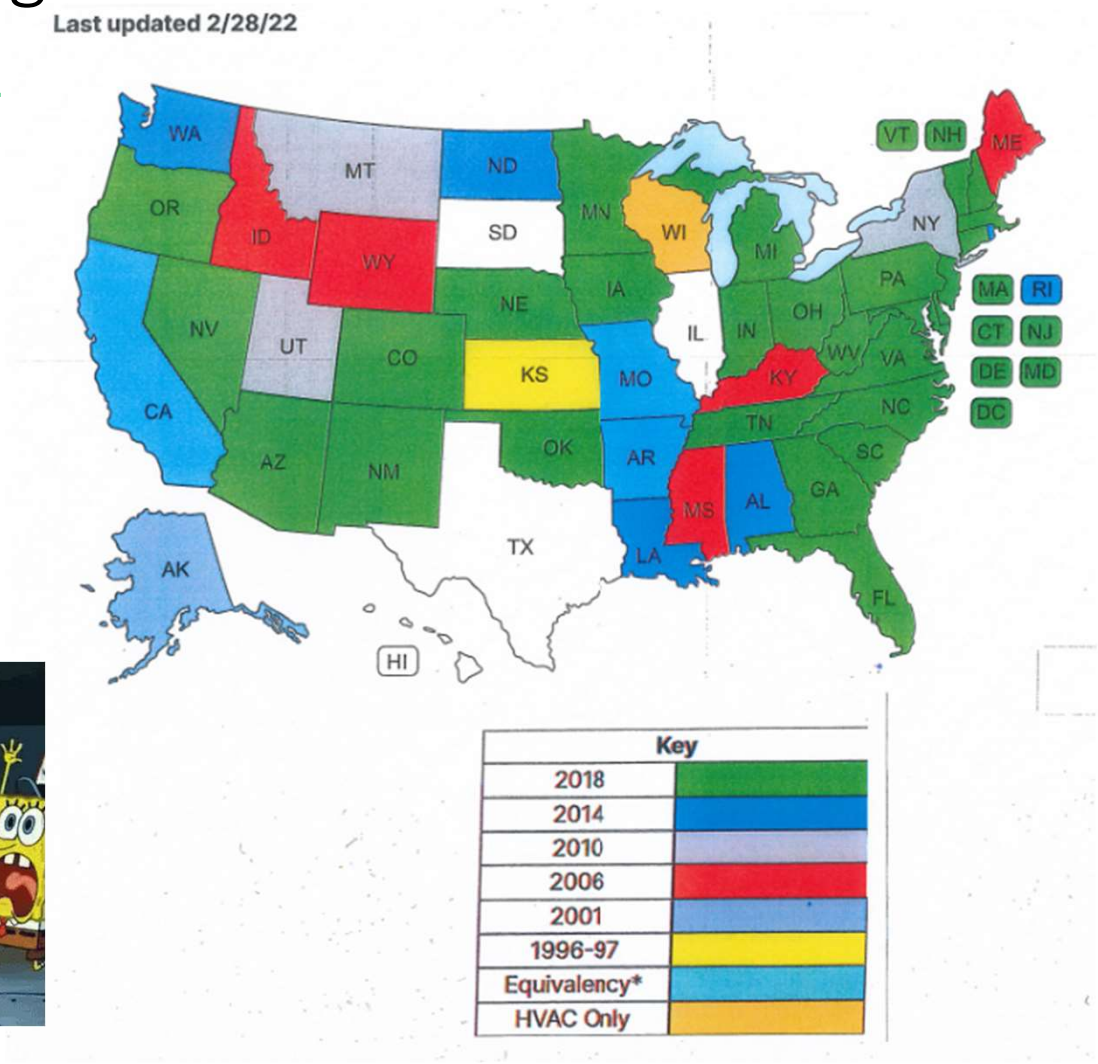
- ***Solution:***
- F/I terminal units on return air system; tricky design and construction
- Reconfigure supply and return air diffusers in semi-restricted corridor outside the OR's
- BAS trends proved compliance
- Airflow testing proved compliance



HVAC Systems – Basis of Design

Laws/Codes/Standards/Guidelines

- **Hmmmmm…… …… what do I do now?? Illinois seems to be one of the four states that hasn't yet adopted the FGI Guidelines.**



HVAC Systems – Basis of Design

Laws/Codes/Standards/Guidelines

- **Hmmmmm…….**
  I guess I better check w/ IDPH

Illinois Department of PUBLIC HEALTH

Illinois Department of PUBLIC HEALTH

Section 250.105

Last updated by IDPH on 9-1-2022

TITLE 77: PUBLIC HEALTH
CHAPTER I: DEPARTMENT OF PUBLIC HEALTH
SUBCHAPTER b: HOSPITALS AND AMBULATORY CARE FACILITIES
PART 250 HOSPITAL LICENSING REQUIREMENTS

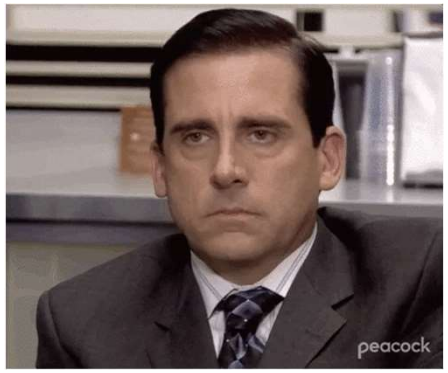
The General Assembly's Illinois Administrative Code database includes only those rulemakings that have been permanently adopted. This menu will point out the Sections on which an emergency rule (valid for a maximum of 150 days, usually until replaced by a permanent rulemaking) exists. The emergency rulemaking is linked through the notation that follows the Section heading in the menu.

SUBPART A: GENERAL PROVISIONS

- **NewSection 250.1 COVID-19 Emergency Provisions for Hospitals (Effective 2/10/23; Expires 5/11/23) EMERGENCY - 47 Ill. Reg. 2862**
- **NewSection 250.2 COVID-19 Emergency Provisions for Hospitals: Seclustion and Testing Modifications (Effective 11/9/22; Expires 4/7/23) EMERGENCY - 46 Ill. Reg. 18902**
- **New Section 250.3 COVID-19 Emergency Provisions - At-Home Patient Care (Effective 1/28/23; Expires 6/26/23) EMERGENCY - 47 Ill. Reg. 2189**
- Section 250.100 Definitions
- Section 250.105 Incorporated and Referenced Materials
- Section 250.110 Application for and Issuance of Permit to Establish a Hospital
- Section 250.120 Application for and Issuance of a License to Operate a Hospital
- Section 250.130 Administration by the Department
- Section 250.140 Hearings
- Section 250.150 Definitions (Renumbered)
- Section 250.160 Incorporated and Referenced Materials (Renumbered)

Illinois Department of PUBLIC HEALTH

- **Hmmmmm……**
- **what do I do now??**
- **guess I have to go get NFPA 101-2012 and look in there now……**

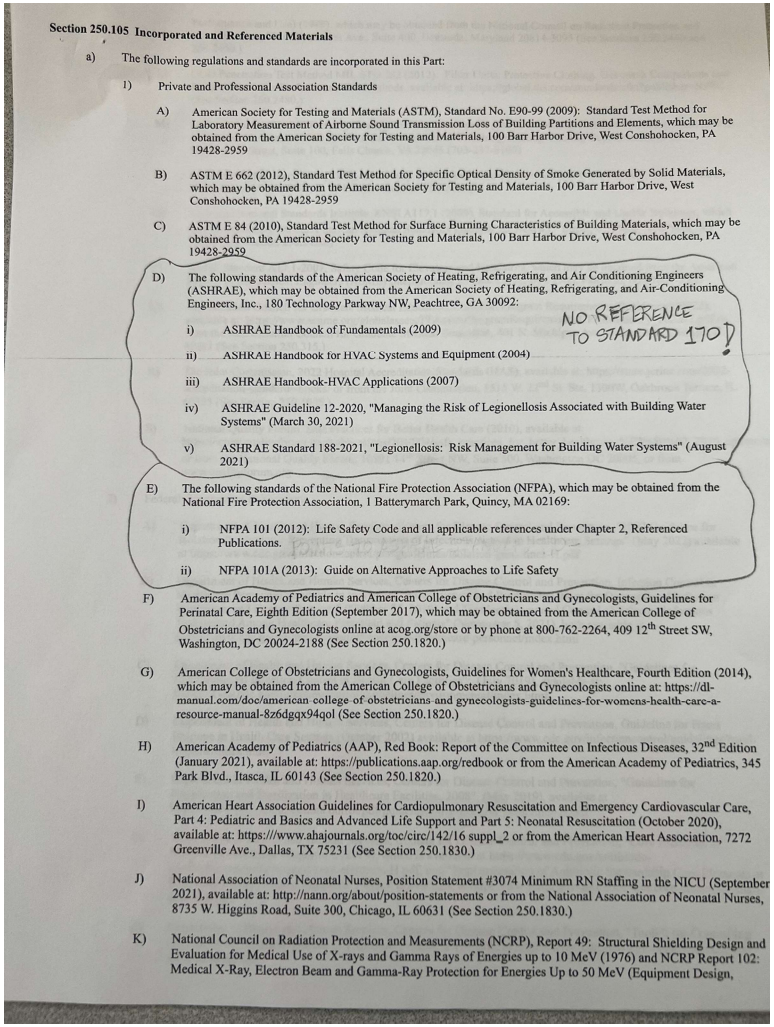


Section 250.105 a) D) i)-v)

No reference to Standard 170

Section 250.105 a) E) i)-ii)

Reference to NFPA 101-2012



Section 250.105 Incorporated and Referenced Materials

a) The following regulations and standards are incorporated in this Part:

1) Private and Professional Association Standards

A) American Society for Testing and Materials (ASTM), Standard No. E90-99 (2009): Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements, which may be obtained from the American Society for Testing and Materials, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959

B) ASTM E 662 (2012), Standard Test Method for Specific Optical Density of Smoke Generated by Solid Materials, which may be obtained from the American Society for Testing and Materials, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959

C) ASTM E 84 (2010), Standard Test Method for Surface Burning Characteristics of Building Materials, which may be obtained from the American Society for Testing and Materials, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959

D) The following standards of the American Society of Heating, Refrigerating, and Air Conditioning Engineers (ASHRAE), which may be obtained from the American Society of Heating, Refrigerating, and Air-Conditioning Engineers, Inc., 180 Technology Parkway NW, Peachtree, GA 30092:

NO REFERENCE TO STANDARD 170!

i) ASHRAE Handbook of Fundamentals (2009)

ii) ASHRAE Handbook for HVAC Systems and Equipment (2004)

iii) ASHRAE Handbook-HVAC Applications (2007)

iv) ASHRAE Guideline 12-2020, "Managing the Risk of Legionellosis Associated with Building Water Systems" (March 30, 2021)

v) ASHRAE Standard 188-2021, "Legionellosis: Risk Management for Building Water Systems" (August 2021)

E) The following standards of the National Fire Protection Association (NFPA), which may be obtained from the National Fire Protection Association, 1 Batterymarch Park, Quincy, MA 02169:

i) NFPA 101 (2012): Life Safety Code and all applicable references under Chapter 2, Referenced Publications.

ii) NFPA 101A (2013): Guide on Alternative Approaches to Life Safety

F) American Academy of Pediatrics and American College of Obstetricians and Gynecologists, Guidelines for Perinatal Care, Eighth Edition (September 2017), which may be obtained from the American College of Obstetricians and Gynecologists online at acog.org/store or by phone at 800-762-2264, 409 12th Street SW, Washington, DC 20024-2188 (See Section 250.1820.)

G) American College of Obstetricians and Gynecologists, Guidelines for Women's Healthcare, Fourth Edition (2014), which may be obtained from the American College of Obstetricians and Gynecologists online at: https://dl-manual.com/doc/american-college-of-obstetricians-and-gynecologists-guidelines-for-womens-health-care-a-resource-manual-826dgqx94qol (See Section 250.1820.)

H) American Academy of Pediatrics (AAP), Red Book: Report of the Committee on Infectious Diseases, 32nd Edition (January 2021), available at: https://publications.aap.org/redbook or from the American Academy of Pediatrics, 345 Park Blvd., Itasca, IL 60143 (See Section 250.1820.)

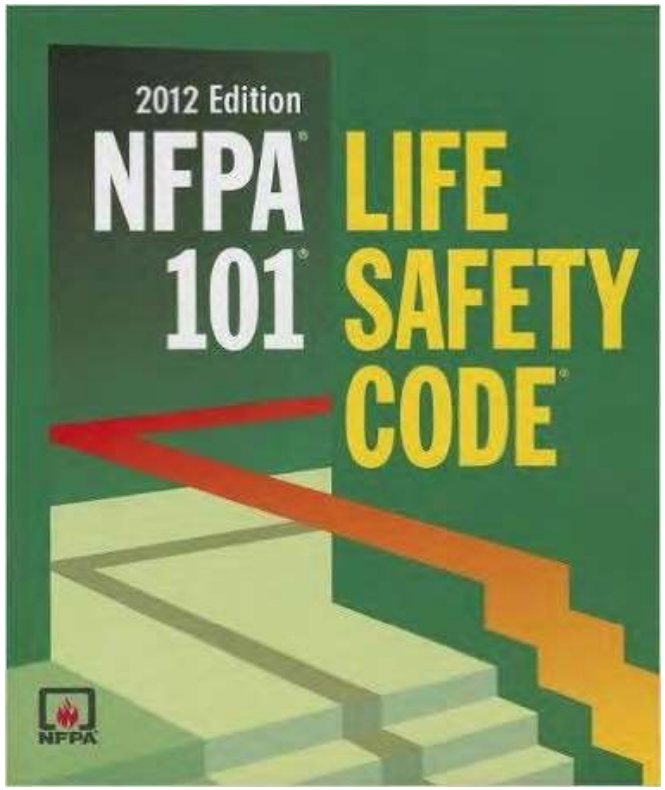
I) American Heart Association Guidelines for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care, Part 4: Pediatric and Basics and Advanced Life Support and Part 5: Neonatal Resuscitation (October 2020), available at: https://www.ahajournals.org/toc/circ/142/16 suppl_2 or from the American Heart Association, 7272 Greenville Ave., Dallas, TX 75231 (See Section 250.1830.)

J) National Association of Neonatal Nurses, Position Statement #3074 Minimum RN Staffing in the NICU (September 2021), available at: http://nann.org/about/position-statements or from the National Association of Neonatal Nurses, 8735 W. Higgins Road, Suite 300, Chicago, IL 60631 (See Section 250.1830.)

K) National Council on Radiation Protection and Measurements (NCRP), Report 49: Structural Shielding Design and Evaluation for Medical Use of X-rays and Gamma Rays of Energies up to 10 MeV (1976) and NCRP Report 102: Medical X-Ray, Electron Beam and Gamma-Ray Protection for Energies Up to 50 MeV (Equipment Design,

HVAC Systems – Basis of Design

Laws/Codes/Standards/Guidelines



- **Hmmmmm……**
- **I found something interesting……**

CMS
CENTERS for MEDICARE & MEDICAID SERVICES

May 3, 2016

In the Spotlight

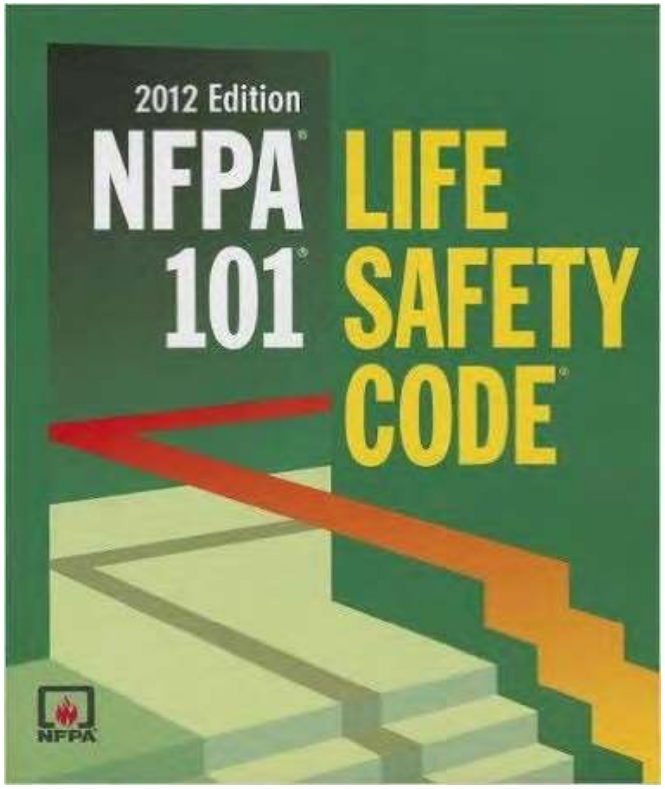
CMS adopts 2012 *Life Safety Code*®

The Centers for Medicare & Medicaid Services (CMS) has adopted the 2012 editions of NFPA 101 and NFPA 99, effective July 5. CMS made several changes to the code. For example, the emergency preparedness chapter of NFPA 99 is not included in the adoption. An ASHE Advocacy Alert sent to members earlier today outlines the changes. The alert, the full rule from CMS, and rule excerpts specific to hospitals are available on the ASHE website. ASHE will continue to keep members informed about the latest developments on this topic.

Continue reading

HVAC Systems – Basis of Design

Laws/Codes/Standards/Guidelines 101-99-170



NFPA 101-2012 references NFPA 99-2012
NFPA 99-2012 references ASHRAE 170-2008

- Hmmmmm……
- What do I do now?
- CMMS invokes the 2012 edition of NFPA 101 which, in turn, points all the way back to the 2008 edition of ASHRAE Standard 170…….
- But it's 2023 today……..and ASHRAE has a 2021 edition available for us….
- Seems like a weak link at best…..

HVAC Systems – Basis of Design

Laws/Codes/Standards/Guidelines 101-99-170

- Consider that more current editions of NFPA 99 cite more current editions of ASHRAE 170 (ex. NFPA 99-2021 cites ASHRAE Standard 170-2017
- Consider that TJC and other accrediting agencies that stipulate that the latest edition of FGI be used (FGI 2022 points to ASHRAE 2021)
- Consider "risk management" and "good engineering practice"

Interested?
GET INVOLVED!!!

Here's How…..

FGI Guidelines - 2026

TWO open review periods:

1. Public proposal period
February 1 through June 30, 2023.

2. Comment Period
July 1 through September 30, 2024

STANDARDS AND GUIDELINES UNDER CONTINUOUS MAINTENANCE

Standards and Guidelines Under Continuous Maintenance

NEW! Access the online comment database to submit continuous maintenance proposals on standards and guidelines on continuous maintenance. A complete list of standards and guidelines under continuous maintenance can be found in the online comment database.

Under continuous maintenance procedures anyone may propose changes at any time. Each change will be considered by the appropriate

New Standard 90.1

STANDARDS ACTIONS

NOTE: All Standards Actions issues are in PDF format.

ASHRAE Standards Actions contains announcements including public review drafts open for comment, call for members on ASHRAE committees, publications, new errata and interpretations, and other information related to ASHRAE standards and standards related activities.

CURRENT STANDARDS ACTIONS

Screenshot

SIGN UP

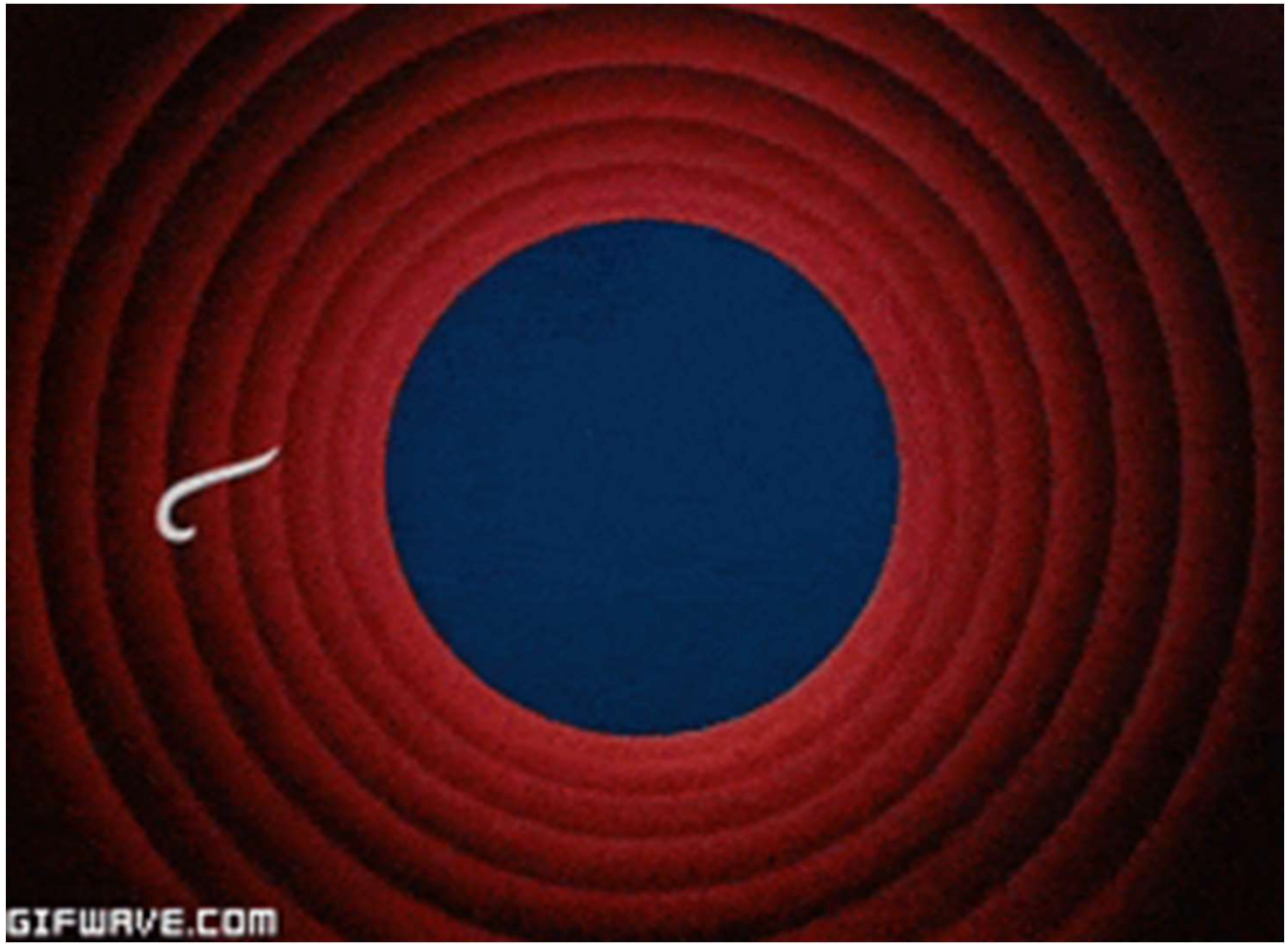
Next Steps….
A deeper dive into 170…
Coming soon … if you want…

Contact:

- Larry Wilson
- Ken Monroe
- Don Doherty – ASHRAE Office

Summary: ASHRAE 170 Update

- 170 Background
- What has changed / improved / deleted
- Guideline 43
- How does Illinois point to 170
- How to get involved


GIFWAVE.COM

Questions?
Comments?

170-2021 Update - Presenters

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