



Update to ASHRAE Ventilation Standards

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- Stephanie Reiniche, ASHRAE Manager of Standards

Synopsis

- Introduction
 - ASHRAE standards process
 - ASHRAE ventilation standards and guidelines
- ASHRAE ventilation guidelines and standards
- Status of key standards
 - Non-residential buildings
 - Residential buildings
 - Health care facilities
- Conclusion

ASHRAE Standards Process

- American National Standards Institute (ANSI) compliant
- Consensus process – balanced committee, public review
- Essentially independent committees
- Periodic or continuous maintenance
 - Three-year publication cycle
 - Mid-cycle (18 month) publication of continuous maintenance addenda

ASHRAE Ventilation Guidelines

- 23P – Guideline for the Design and Application of Heating, Ventilation and Air Conditioning Equipment for Rail Passenger Vehicles
- 24-2008 – Ventilation and Indoor Air Quality In Low-Rise Residential Buildings
- 28-2012 – Air Quality within Commercial Aircraft
- 10-2011 – Interactions Affecting the Achievement of Acceptable Indoor Environments

ASHRAE Ventilation Standards

- 62.1-2013 – Ventilation for Acceptable Indoor Air Quality
- 62.2-2013 – Ventilation and Acceptable Indoor Air Quality in Low-Rise Residential Buildings
- 154-2011 – Ventilation for Commercial Cooking Operations
- 161-2013 – Air Quality Within Commercial Aircraft
- 170-2013 – Ventilation of Health Care Facilities
- 217P – Non-Emergency Ventilation in Enclosed Road, Rail and Mass Transit Facilities

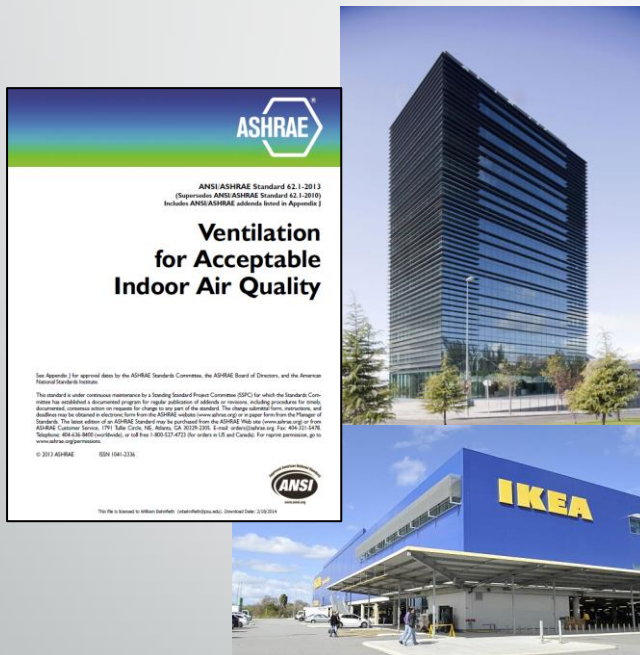
ASHRAE Ventilation Standards

- ***62.1-2013 – Ventilation for Acceptable Indoor Air Quality***
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- 161-2013 – Air Quality Within Commercial Aircraft
- ***170-2013 – Ventilation of Health Care Facilities***
- 217P – Non-Emergency Ventilation in Enclosed Road, Rail and Mass Transit Facilities

Objectives

- Standards 62.1 and 62.2 seek “acceptable” IAQ
 - 62.1 - (A)ir in which there are no known contaminants at harmful concentrations as determined by cognizant authorities and with which a substantial majority (80% or more) of the people exposed do not express dissatisfaction.
 - 62.2 - (A)ir toward which a substantial majority of occupants express no dissatisfaction with respect to odor and sensory irritation and in which there are not likely to be contaminants at concentrations that are known to pose a health risk.
- Standard 170 - “design requirements that provide environmental control for comfort, asepsis, and odor in health care facilities.”

ANSI/ASHRAE 62.1-2013



- Published since 1973
- Non-low rise residential buildings
- Outside air quality requirements
- Specify ventilation by
 - Natural ventilation
 - Prescriptive method (VRP)
 - Performance method (IAQP)
- Exhaust
- System design requirements including particulate filters

TABLE 6.2.2.1 Minimum Ventilation Rates in Breathing Zone (Continued)
(This table is not valid in isolation: it must be used in conjunction with the accompanying notes.)

Occupancy Category	People Outdoor Air Rate R_p		Area Outdoor Air Rate R_a		Notes	Default Values			Air Class
						Occupant Density (see Note 4)	Combined Outdoor Air Rate (see Note 5)		
	cfm/ person	L/s· person	cfm/ft²	L/s·m²		#/1000 ft² or #/100 m²	cfm/ person	L/s·person	
Retail									
Sales (except as below)	7.5	3.8	0.12	0.6		15	16	7.8	2
Mall common areas	7.5	3.8	0.06	0.3		40	9	4.6	1
Barbershop	7.5	3.8	0.06	0.3		25	10	5.0	2
Beauty and nail salons	20	10	0.12	0.6		25	25	12.4	2

TABLE 6.2.2.2 Zone Air Distribution Effectiveness

Air Distribution Configuration	E_z
Ceiling supply of cool air	1.0
Ceiling supply of warm air and floor return	1.0
Ceiling supply of warm air 15°F (8°C) or more above space temperature and ceiling return	0.8
Ceiling supply of warm air less than 15°F (8°C) above space temperature and ceiling return provided that the 150 fpm (0.8 m/s) supply air jet reaches to within 4.5 ft (1.4 m) of floor level	1.0
Note: For lower velocity supply air, $E_z = 0.8$.	
Floor supply of cool air and ceiling return, provided that the vertical throw is greater than 50 fpm (0.25 m/s) at a height of 4.5 ft (1.4 m) or more above the floor	1.0
Floor supply of cool air and ceiling return, provided low-velocity displacement ventilation achieves unidirectional flow and thermal stratification, or underfloor air distribution systems where the vertical throw is less than or equal to 50 fpm (0.25 m/s) at a height of 4.5 ft (1.4 m) above the floor	1.2
Floor supply of warm air and floor return	1.0

TABLE 6.2.5.2 System Ventilation Efficiency

Max (Z_p)	E_v
≤0.15	1.0
≤0.25	0.9
≤0.35	0.8

- 62.1 VRP accounts for
 - Breathing zone requirement in space
 - Room air distribution
 - Distribution system effect
 - Diversity

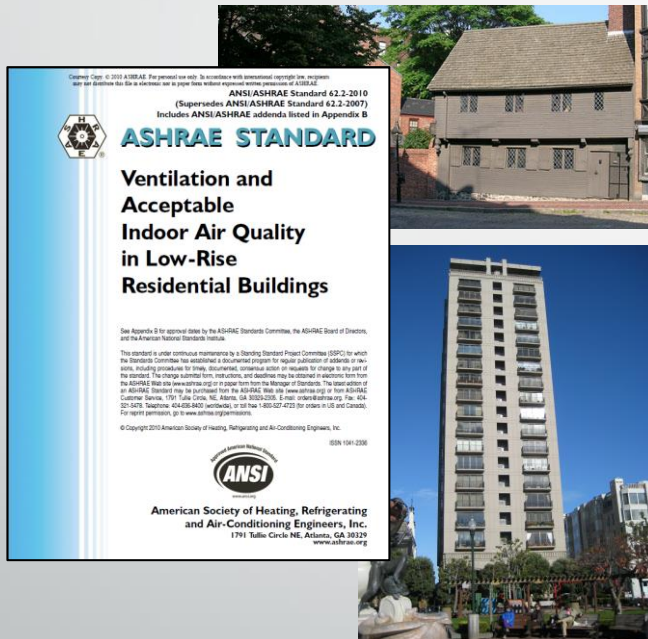
ANSI/ASHRAE 62.1

- Addenda to 62.1-2013 (in effect)
 - All residential units now covered by 62.2 but common areas must comply with 62.1 (reciprocal change to 62.2)
 - ETS definition now includes cannabis and e-cigarettes
 - IAQ procedure now recognizes contaminant mixtures, reducing allowable concentrations $\sum_{i=1}^n \frac{C_i}{C_{limit}} \leq 1$
 - Air class of lab hoods raised to 4, but official may assign lower class to permit energy recovery wheel use

ANSI/ASHRAE 62.1

- Addenda for 62.1-2016 (next full publication)
 - Ventilation allowed to be zero when occupancy sensor indicates space is unoccupied (approved)
 - Exception to MERV 8 filter requirement when cooling coil is actively controlled for sensible cooling only (approved)
 - “Simplified” ventilation rate procedure (in development)
 - Retrofits (incomplete info) and small buildings (small rate)
 - Conservative relative to full VRP

ANSI/ASHRAE 62.2-2013



- Published since 2003
- Originally low-rise residential
- Primary requirements
 - Ventilation
 - Exhaust
 - Source control
- Secondary requirements – ducting, noise, leakage, combustion safety...
- Simplified compared to 62.1
- Treatment of infiltration significant – historically gave credit

$$Q_{tot} = 0.15A_{floor} + 3.5(N_{br} + 1) \quad (\text{SI}) \quad (4.1b)$$

where

Q_{tot} = total required ventilation rate, L/s

A_{floor} = floor area of residence, m²

N_{br} = number of bedrooms (not to be less than 1)

$$Q_{fan} = Q_{tot} - Q_{inf} \quad (4.6)$$

where

Q_{fan} = required mechanical ventilation rate, cfm (L/s)

Q_{tot} = total required ventilation rate, cfm (L/s)

Q_{inf} = may be no greater than $2/3 \cdot Q_{tot}$ (see Normative Appendix A for exceptions for existing buildings and Section 8.2.1)

TABLE 4.1b (SI) Ventilation Air Requirements, L/s

Floor Area, m ²	Bedrooms				
	1	2	3	4	5
<47	14	18	21	25	28
47–93	21	24	28	31	35
93–139	28	31	35	38	42
140–186	35	38	42	45	49
186–232	42	45	49	52	56
232–279	49	52	56	59	63
279–325	56	59	63	66	70
325–372	63	66	70	73	77
372–418	70	73	77	80	84
418–465	77	80	84	87	91

ANSI/ASHRAE 62.2-2013

- 8 major addenda incorporated into 62.2-2013, including
 - Treatment of infiltration (2)
 - Now assume zero infiltration
 - Credit to reduce prescriptive mechanical ventilation for infiltration based on a leakage test
 - Intermittent operation (2)
 - For fan cycle time < 3 hours, required fan flow is continuous rate/fractional run time
 - Carbon monoxide alarms – required

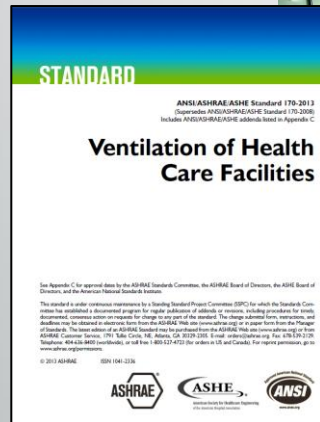
ANSI/ASHRAE 62.2-2013

- 2010 to 2013 changes, continued
 - Equivalent ventilation (performance compliance path)
 - Previously approved by licensed professional but procedure undefined
 - Now, annual dose from constant source in well-mixed zone equal or less than result of prescriptive ventilation
 - Multifamily buildings
 - Previously, required “substantially airtight” partitions, but undefined
 - Added leakage metric, system details, corridor and garage ventilation requirements

ANSI/ASHRAE 62.2-2013

- Mid-term addenda approved
 - Fan exemption for requirements < 15 cfm (7 L/s)
 - Include all multi-family dwelling units in scope
 - Add unvented space heaters to scope
- Addenda under development for future
 - Improved integration of multifamily
 - Various ventilation credits to reduce required fan flow
 - Mandatory particulate matter control
 - Health-based equivalence
 - Requirements for unvented space heaters

ANSI/ASHRAE/ASHRAE 170-2013



- First published in 2008
- Specifies
 - Total and outdoor air ACH – up to 20 total ACH for operating room
 - Pressure relationships
 - Temperature and humidity
 - Filtration requirements – up to MERV 7 before coil + HEPA

TABLE 7.1 Design Parameters

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							
Operating room (Class B and C) (m), (n), (o)	Positive	4	20	NR	No	20–60	68–75/20–24
Operating/surgical cystoscopic rooms, (m), (n) (o)	Positive	4	20	NR	No	20–60	68–75/20–24
Delivery room (Caesarean) (m), (n), (o)	Positive	4	20	NR	No	20–60	68–75/20–24
Substerile service area	NR	2	6	NR	No	NR	NR
Recovery room	NR	2	6	NR	No	20–60	70–75/21–24
Critical and intensive care	NR	2	6	NR	No	30–60	70–75/21–24
Intermediate care (s)	NR	2	6	NR	NR	max 60	70–75/21–24
Wound intensive care (burn unit)	NR	2	6	NR	No	40–60	70–75/21–24
Newborn intensive care	Positive	2	6	NR	No	30–60	72–78/22–26
Treatment room (p)	NR	2	6	NR	NR	20–60	70–75/21–24
Trauma room (crisis or shock) (c)	Positive	3	15	NR	No	20–60	70–75/21–24
Medical/anesthesia gas storage (r)	Negative	NR	8	Yes	NR	NR	NR
Laser eye room	Positive	3	15	NR	No	20–60	70–75/21–24

ANSI/ASHRAE/ASHRAE 170-2013

- Update philosophy
 - Adapt to changes in technology
 - Focus on reducing cost
- Recent and future changes
 - Reduce unoccupied space air flow but increase patient room ACH from 4 to 6
 - Allow fan coils
 - Allow induction units

Conclusion

- ASHRAE ventilation standards cover multiple stationary occupancies as well as transportation
- Main standards are non-residential (62.1), residential (62.2) and health care (170)
- 62.1 and 62.2 are mainly perceived air quality basis but moving toward health-based performance
- 170 focused on infection control
- Approach and development trends reflect unique market sector issues – stringency/simplicity/cost/
- Open process – your contributions are welcome!



Thank You!



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