CLIMA 2019
Built environment facing climate change
REHVA 13th HVAC World Congress
26 - 29 May, Bucharest, Romania
BUILT ENVIRONMENT FACING CLIMATE CHANGE

ASHRAE 62.1 Indoor Air Quality Procedure vs. ASHRAE 62.2 Approach

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Session no. 18: ISIAQ-REHVA Workshop/29 May 2019

Outline

- Introduction – ASHRAE Ventilation Standards
- ASHRAE Standard 62.1
  - *Current Indoor Air Quality Procedure (62.1-2016)*
  - *Exhaust requirements*
  - *Addendum 62.1-2016 aa regarding Indoor Air Quality Procedure*
- ASHRAE Standard 62.2-2016 ventilation requirement
- Conclusion

Introduction

- ASHRAE standards
  - *Consensus standards developed by balanced committees*
  - *Development process governed by ANSI procedures – public review, responses to comments, change proposals*
  - *ASHRAE approves title, purpose and scope, not contents*
- History
  - *1973 – First Standard 62 published*
  - *2003 – 62 becomes 62.1 for non-residential buildings with first publication of 62.2 for residential buildings*
  - *Additional standards deal with specialized environments, e.g., healthcare facilities (Standard 170)*

Introduction

- Both 62.1 and 62.2 are perceived air quality standards with similar definitions of acceptable indoor air quality
- ASHRAE 62.1-2016:

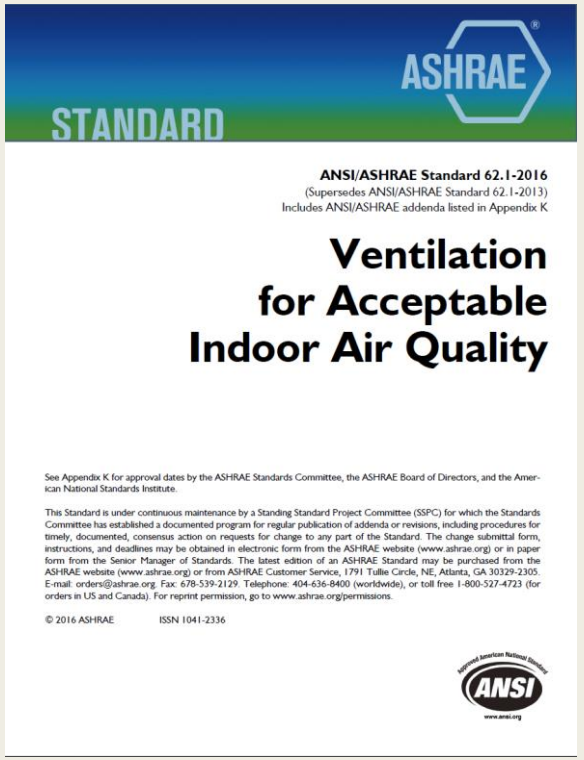
  (A)ir in which there are no known contaminants at harmful concentrations as determined by cognizant authorities and with which a substantial majority (80% or more) of the people exposed do not express dissatisfaction

- ASHRAE 62.2-2016

  (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

ASHRAE Standard 62.1

- Compliance paths
  - Ventilation Rate Procedure (VRP, prescriptive)
  - Indoor Air Quality Procedure (IAQP, performance)
  - Natural Ventilation Procedure (prescriptive)
- Major changes have been proposed to IAQP in Addendum aa to standard 62.1-2016



ASHRAE 62.1-2016 IAQP (Section 6.3)

- Identify contaminants of concern, safe limits, indoor/outdoor sources and emission rates – use sum of concentration/safe limit < 1 for mixtures
- Determine design level of acceptability (%) – may be adapted and/or unadapted
- Do mass balance calculations to determine required ventilation rate – <u>including effect of air cleaners</u>
- Required ventilation rate is greater of mass balance calculation and either
  - *Post-occupancy subjective evaluation, or*
  - *Rate required for a similar zone for which subjective evaluation has been done*
- May use VRP to determine minimum outside air and IAQP to determine additional outside air required to meet criteria for specific contaminants

ASHRAE 62.1-2016 Exhaust Requirements (Section 6.5)

- Exhaust is treated somewhat analogously to outside air
- Requirements maybe be met by
  - *Complying with flows in table 6.5 (prescriptive)*
  - *As with IAQP, identify contaminants of concern, safe concentrations, sources, source strengths and automatically control to achieve them*

Addendum aa to ASHRAE Standard 62.1-2016

- Addendum aa is a major proposed revision to the IAQP
- Three public review drafts issued, latest in Feb 2019
- Addresses perceived weakness in existing IAQP
  - *Identifying contaminants of concern*
  - *Identifying safe limits and periods of exposure*
  - *Specifying percentage satisfied*
- Approach
  - *Design compounds and $PM_{2.5}$ limits specified*
  - *Specific mixture for which mixture compliance is needed are identified*
  - *Eight hour time period for exposure assessment*
  - *80% acceptable criterion specified*

Design Compounds/PM2.5

Compound or PM2.5
Acetaldehyde
Acetone
Benzene
Dichloromethane
Formaldehyde
Naphthalene
Phenol
Tetrachloroethylene
Toluene
1,1,1-trichloroethane
Xylene, total
Carbon dioxide
Carbon monoxide
PM2.5
Ozone
Ammonia

Mixtures

Upper Respiratory Tract Irritation	Eye Irritation	Central Nervous System
acetaldehyde	acetaldehyde	acetone
acetone	acetone	dichloromethane
xylene, total	xylene, total	xylene, total
ozone	ozone	1,1,1-trichloroethane
	formaldehyde	toluene

Note – Information on this slide taken from First Public Review Draft – addendum may not be approved and if approved final content may differ

ASHRAE Standard 62.2

- Ventilation requirements are prescriptive
  - *Number of bedrooms*
  - *Floor area*

$$Q_{tot}[\mathrm{l/s}] = 0.15[l/s/m^2]A_{floor}[\mathrm{m^2}] + 3.5[l/s/br](N_{br} + 1)$$

- Can take credit for infiltration if leakage has been measured
- Can adjust for differences in assumed occupancy, time average occupancy
- Currently no performance path

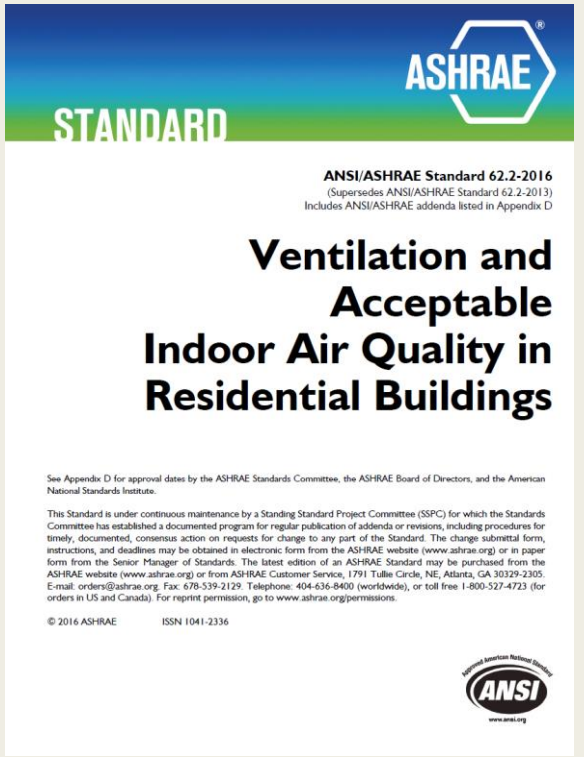


TABLE 4.1b (SI) Ventilation Air Requirements, L/s

	Bedrooms				
Floor Area, m^2	**1**	**2**	**3**	**4**	**5**
<47	14	18	21	25	28
47–93	21	24	28	31	35
94–139	28	31	35	38	42
140–186	35	38	42	45	49
187–232	42	45	49	52	56
233–279	49	52	56	59	63
280–325	56	59	63	66	70
326–372	63	66	70	73	77
373–418	70	73	77	80	84
419–465	77	80	84	87	91

Conculsion

- ASHRAE Standard 62.1 for non-residential buildings has had a performance path for many years, but perception of most designers has been that it is difficult and *risky* to use.
- 62.1 IAQP is undergoing a major update, but it has been contentious, mainly because of views of committee members and other interested parties about air cleaners
- ASHRAE Standard 62.2 takes a prescriptive approach like 62.1 although somewhat simplified.
- There is substantial interest in expanding the performance approach but concern about the knowledge base available to support it

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Thank you!

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