

ASHRAE 62.2: What's New in 2016

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What We Will Talk About

- Overview of mechanics of 62.2-2016.
 - Logic behind the Standard.
 - Sizing local ventilation (exhaust-only).
 - Alternative Compliance Path.
 - Sizing whole-dwelling ventilation.
 - Alternative Compliance Path.
 - Infiltration credit.
 - Additional selected requirements.
- Changes to 62.2-2016 version.

Overview of 62.2 Standard

RED ASHRAE 62.2-2016 Ventilation Reset Print i

New or existing construction

Dwelling unit is

Use infiltration credit

Closest weather station

Weather and shielding factor [1/hr] = 0.51

Floor area []

Number of occupants

Building height []

Measured leakage @ 50Pa []

Use Advanced Blower Door Inputs

Use Local Ventilation Alternative Compliance

Whole-Dwelling Ventilation Results

Effective annual avg infiltration rate [] = 37

Total required ventilation rate, Q_{tot} [] = 58.5

Infiltration credit, Q_{inf} [] = 37

Required mechanical ventilation rate, Q_{fan} [] = 21

Whole-Dwelling Ventilation Run-Time Solver

Fan capacity []

Fan run-time per hour [] = 16

Whole-Dwelling Leakage Rate Solver

Target mechanical ventilation rate []

Corresponding building leakage @ 50Pa [] = 1630

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What's New in 2016

RED free web application

www.ResidentialEnergyDynamics.com

www.REDcalc.com

ASHRAE 62.2-2016 Ventilation Reset Print

New or existing construction

Dwelling unit is

Use infiltration credit

Closest weather station

Weather and shielding factor [1/hr] = 0.51

Floor area []

Number of occupants

Building height []

Measured leakage @ 50Pa []

Use Advanced Blower Door Inputs

Use Local Ventilation Alternative Compliance

Kitchen included # Baths included

	Fan Flow [<input type="text" value="CFM"/>]	Openable Window	Deficit [<input type="text" value="CFM"/>]
Kitchen	<input type="text" value="0"/>	<input checked="" type="checkbox"/>	80
Bath #1	<input type="text" value="25"/>	<input type="checkbox"/>	25

Total deficit [] = 105

Whole-Dwelling Ventilation Results

Effective annual avg infiltration rate [] = 37

Total required ventilation rate, Q_{tot} [] = 58.5

Alternative compliance supplement [] = 26.25

Infiltration credit, Q_{inf} [] = 37

Required mechanical ventilation rate, Q_{fan} [] = 47

Whole-Dwelling Ventilation Run-Time Solver

Fan capacity []

Fan run-time per hour [] = 36

Whole-Dwelling Leakage Rate Solver

Target mechanical ventilation rate []

Corresponding building leakage @ 50Pa [] = 2620

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2: What's New in 2016

Free ASHRAE 62.2-2016

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Logic Behind the Standard

Background and Logic

- Natural infiltration rates are variable.
- Dwellings have different contaminants.
- People react differently.
- Epidemiological effects are uncertain, especially at low contaminant levels.

Building has a ventilation system

Balanced ventilation rate [CFM] 0

Sensible recovery efficiency (SRE) % 68

Unbalanced ventilation rate [CFM] 38

Method for combining with infiltration Quadrature

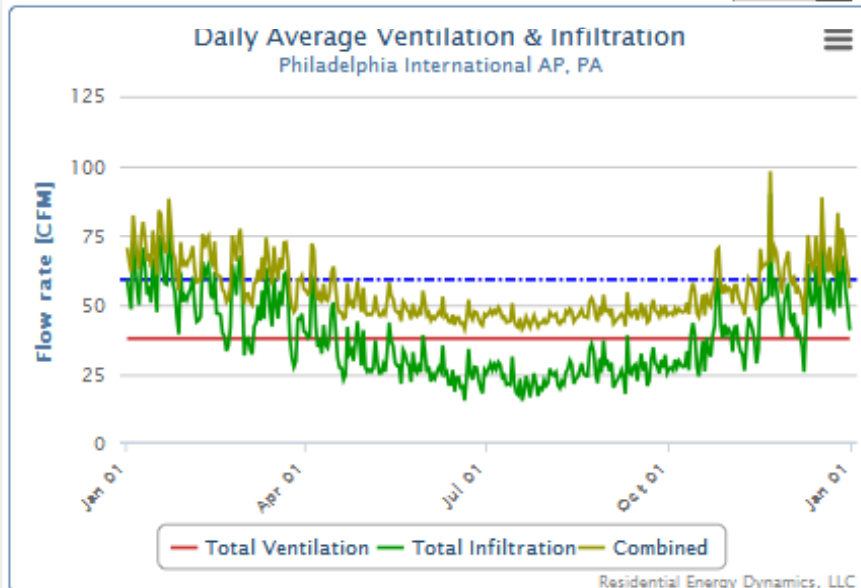
Date range for all the following results:

January 1 to December 31

Hourly Flow [CFM]	Low	Average	High
Stack infiltration	0	28.9	69.3
Wind infiltration	0	22	140.3
Total infiltration	0.373	38.1	142.8
Ventilation & Infiltration	38	55	147.8

Show infiltration chart

Show ventilation & infiltration chart Chart units CFM



Reference flow rate displayed in chart [CFM] 59

What's New in 2016

Infiltration is variable!

ResidentialEnergyDynamics.com
Advanced Infiltration tool

Background and Logic

- Some studies show that increased ventilation can reduce DALYs lost:

Table 1. Energy use (E) in 10^{-3} quads and DALYs (D) per 100,000 households per year

<i>Ventilation Cases</i>	<i>Energy (quads /10⁻³)</i>	<i>ΔE (ΔE/E_{base-case})</i>	<i>DALYs lost (years)</i>	<i>ΔD (ΔD/D_{base-case})</i>
Base Case-Infiltration only	3.5	-----	160	-----
Unbalanced Mechanical Ventilation	4.0	5 (14%)	90	70 (-41%)
Balanced Mechanical Ventilation	4.3	8 (21%)	70	90 (-54%)

Assumes DALYs lost per 100,000 California homes,
(assuming an occupancy of 4 people per home)

Background and Logic

- Local bathroom ventilation reduces moisture and odors.
- Local kitchen ventilation reduces moisture, odors, and many harmful contaminants.

Background and Logic

- Whole-dwelling ventilation reduces general odors and contaminants.
 - Some studies show that DALYs are lengthened with ventilation.

ASHRAE 62.2: What's New in 2016

Cost to Operate Ventilation is Low

RED Ventilation Electrical Usage Reset Print i

Power rating [**W**] 20
Days per year in use 365
Hours per day in use 24
Minutes per hour in use 60
Avg cost per kWh 0.16

Annual usage time [**hr**] = 8760
Annual electrical usage [**kWh**] = 175.2
Annual electrical cost = 28

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Cost to operate motor every day, every hour

2.2: What's New in 2016

Philadelphia, PA
1400 CFM₅₀
Single-story dwelling, 1200 ft²
Thermostat at 68 and 75
One year

Increased heating and cooling loads per year in therms for ventilation

Building has a ventilation system

Balanced ventilation rate [CFM] 0

Sensible recovery efficiency (SRE) % 68

Unbalanced ventilation rate [CFM] 38

Method for combining with infiltration Quadrature

Date range for all the following results:
January 1 to December 31

Hourly Flow [CFM]	Low	Average	High
Stack infiltration	0	28.9	69.3
Wind infiltration	0	22	140.3
Total infiltration	0.373	38.1	142.8
Ventilation & Infiltration	38	55	147.8

Show infiltration chart

Show ventilation & infiltration chart Chart units CFM

Reference flow rate displayed in chart [CFM] 59

Infiltration heating load [therm] = 54.8

Increased load due to ventilation [therm] = 8.4

Combined heating load [therm] = 63.2

Infiltration sensible cooling load [therm] = 8.99

Increased load due to ventilation [kWh] = 164

Combined sensible cooling load [therm] = 14.58

Show energy load chart

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Local Ventilation (bathrooms and kitchen)

Exhaust Only Fans

Local Ventilation

- Exhaust the worst air in the dwelling as quickly as possible.
 - Bathrooms.
 - Kitchens.



Local Ventilation Requirements

- Local exhaust fans must be installed in bathrooms and kitchen.
 - Bathrooms (not half bathrooms)
 - 50 CFM demand-controlled, or
 - 20 CFM continuous.
 - Kitchen
 - 100 CFM demand-controlled*.

* Vented range hood required if flow rate is less than 5 kitchen ACH.

Local Kitchen Ventilation



This does not help the installer's reputation!

Alternative Compliance Supplement (Path) for Existing Dwellings ONLY

Appendix A

Alternative Compliance Path

- For existing dwellings only.
- Provides alternative method of meeting local exhaust requirements in kitchens and bathrooms that do not have the existing LOCAL fan flow required by ASHRAE 62.2-2010/2013/2016.

Existing Dwellings ONLY

Sizing Whole-Dwelling Ventilation

Exhaust, Supply, or
Balanced

ASHRAE 62.2 Requirements

- Whole-dwelling ventilation:
 - “A mechanical exhaust system, supply system, or combination thereof shall be installed for each dwelling unit to provide whole-building ventilation. . . .”

Whole-Dwelling Ventilation

- Assumes two occupants in master bedroom and one in the other bedrooms. Over this density, increase ventilation by 7.5 CFM/person.
- Ventilation air must come directly from the outdoors.
- Infiltration credit is allowed for envelope air leakage

ASHRAE 62.2-2013

$$Q_{\text{tot}} = 0.03A_{\text{floor}} + 7.5(N_{\text{bedroom}} + 1)$$

Basic whole-dwelling ventilation equation

IRC - 2012 and 2015

No Whole-House requirement in IRC - 2009

- Mechanical Ventilation, Section M1507
 - Continuous Whole-House Rate

TABLE M1507.3.3(1) CONTINUOUS WHOLE-HOUSE MECHANICAL VENTILATION SYSTEM AIRFLOW RATE REQUIREMENTS

DWELLING UNIT FLOOR AREA (square feet)	NUMBER OF BEDROOMS				
	0 - 1	2 - 3	4 - 5	6 - 7	> 7
< 1,500	30	45	60	75	90
1,501 - 3,000	45	60	75	90	105
3,001 - 4,500	60	75	90	105	120
4,501 - 6,000	75	90	105	120	135
6,001 - 7,500	90	105	120	135	150
> 7,500	105	120	135	150	165

Lower than ASHRAE 62.2-2013

May operate intermittently, if runs at least once every 4 hours

Required by IECC-2015, R403.6

Required by IMC-2012 and 2015, R403.3

ASHRAE 62.2: What's New in 2016

TABLE 4.1a (I-P) Ventilation Air Requirements, cfm

Floor Area, ft ²	Bedrooms				
	1	2	3	4	5
<500	30	38	45	53	60
501–1000	45	53	60	68	75
1001–1500	60	68	75	83	90
1501–2000	75	83	90	98	105
2001–2500	90	98	105	113	120
2501–3000	105	113	120		
3001–3500	120	128	135		
3501–4000	135	143	150		
4001–4500	150	158	165		
4501–5000	165	173	180		

DWELLING UNIT FLOOR AREA (square feet)	NUMBER OF BEDROOMS				
	0 – 1	2 – 3	4 – 5	6 – 7	> 7
	Airflow in CFM				
< 1,500	30	45	60	75	90
1,501 – 3,000	45	60	75	90	105
3,001 – 4,500	60	75	90	105	120
4,501 – 6,000	75	90	105	120	135
6,001 – 7,500	90	105	120	135	150
> 7,500	105	120	135	150	165

IECC - 2015

No Whole-House requirement in IRC - 2009

- Mechanical ventilation fan efficiency, Section R403.6

TABLE R403.6.1 MECHANICAL VENTILATION SYSTEM FAN EFFICACY

FAN LOCATION	AIR FLOW RATE MINIMUM (CFM)	MINIMUM EFFICACY (CFM/WATT)	AIR FLOW RATE MAXIMUM (CFM)
Range hoods	Any	2.8 cfm/watt	Any
In-line fan	Any	2.8 cfm/watt	Any
Bathroom, utility room	10	1.4 cfm/watt	< 90
Bathroom, utility room	90	2.8 cfm/watt	Any

Not a requirement of ASHRAE 62.2-2013

Whole-Dwelling Ventilation

- The whole-dwelling ventilation requirements of the Standard may be satisfied by **intermittent** operation
- Example:
 - HRV rated at 150 CFM capacity.
 - Whole house requirement is 50 CFM.
 - Operate HRV on a timer for 20 minutes out of every hour to get 50 CFM average.

At least once every 3 hours

Infiltration Credit
for
Existing and New
Dwellings

Whole-Dwelling Ventilation New Dwellings

$$Q_{\text{tot}} = 0.03A_{\text{floor}} + 7.5(N_{\text{bedroom}} + 1)$$

Total Required Ventilation Rate, Q_{tot}

- Infiltration Credit, Q_{inf} *

- Required Mechanical Ventilation Rate, Q_{fan}

* Maximum of 2/3 of Q_{tot}

Whole-Dwelling Ventilation Existing Dwellings

$$Q_{\text{tot}} = 0.03A_{\text{floor}} + 7.5(N_{\text{bedroom}} + 1)$$

Total Required Ventilation Rate, Q_{tot}
+ Alternative Compliance Supplement
- Infiltration Credit, Q_{inf} *
Required Mechanical Ventilation Rate, Q_{fan}

* Full amount

Existing Dwellings ONLY



ASHRAE 62.2-2016 Ventilation

Reset Print

New or existing construction **Existing**

Dwelling unit is **Detached**

Use infiltration credit **Yes**

Closest weather station **United States**
New York
Glens Falls AP

Weather and shielding factor [1/hr] = 0.51

Floor area [**ft²**] 1200
Number of occupants **3**
Building height [**ft**] 8.2
Measured leakage @ 50Pa [**CFM**] 1400

Use Advanced Blower Door Inputs

Use Local Ventilation Alternative Compliance

Whole-Dwelling Ventilation Results

Effective annual avg infiltration rate [**CFM**] = 37
Total required ventilation rate, Q_{tot} [**CFM**] = 58.5
Infiltration credit, Q_{inf} [**CFM**] = 37
Required mechanical ventilation rate, Q_{fan} [**CFM**] = 21

Whole-Dwelling Ventilation Run-Time Solver

Fan capacity [**CFM**] 80
Fan run-time per hour [**min**] = 16

Whole-Dwelling Leakage Rate Solver

Target mechanical ventilation rate [**CFM**] 15
Corresponding building leakage @ 50Pa [**CFM**] = 1630

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ASHRAE 62.2-2016 Ventilation

Reset Print

New or existing construction **New**

Dwelling unit is **Detached**

Use infiltration credit **Yes**

Closest weather station **United States**
New York
Glens Falls AP

Weather and shielding factor [1/hr] = 0.51

Floor area [**ft²**] 1200
Number of occupants **3**
Building height [**ft**] 8.2
Measured leakage @ 50Pa [**CFM**] 1000

Use Advanced Blower Door Inputs

Whole-Dwelling Ventilation Results

Effective annual avg infiltration rate [**CFM**] = 27
Total required ventilation rate, Q_{tot} [**CFM**] = 58.5
Infiltration credit, Q_{inf} [**CFM**] = 27
Required mechanical ventilation rate, Q_{fan} [**CFM**] = 32

Whole-Dwelling Ventilation Run-Time Solver

Fan capacity [**CFM**] 80
Fan run-time per hour [**min**] = 23.9

Whole-Dwelling Leakage Rate Solver

Target mechanical ventilation rate [**CFM**] 15
Corresponding building leakage @ 50Pa [**CFM**] = 1630

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New or existing construction [Existing]
 Dwelling unit is [Detached]
 Use infiltration credit [Yes]

Closest weather station [United States]
 [New York]
 [Glens Falls AP]

Weather and shielding factor [1/hr] = 0.51

Floor area [ft2] [1200]
 Number of occupants [3]
 Building height [ft] [8.2]
 Measured leakage @ 50Pa [CFM] [1400]

Use Advanced Blower Door Inputs

Use Local Ventilation Alternative Compliance

Kitchen included [checked] # Baths included [1]

Table with 4 columns: Room, Fan Flow [CFM], Operable Window, Deficit [CFM]. Rows: Kitchen (0, checked, 80), Bath #1 (25, unchecked, 25)

Total deficit [CFM] = 105

Whole-Dwelling Ventilation Results

Whole-Dwelling Ventilation Results

Effective annual avg infiltration rate [CFM] = 37
 Total required ventilation rate, Qtot [CFM] = 58.5
 Alternative compliance supplement [CFM] = 26.25
 Infiltration credit, Qinf [CFM] = 37
 Required mechanical ventilation rate, Qfan [CFM] = 47

Whole-Dwelling Ventilation Run-Time Solver

Fan capacity [CFM] [80]
 Fan run-time per hour [min] = 36

Whole-Dwelling Leakage Rate Solver

Target mechanical ventilation rate [CFM] [15]
 Corresponding building leakage @ 50Pa [CFM] = 2620

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Additional Selected Requirements of Standard 62.2

Attached Garages

- Must prevent migration of contaminants to the adjoining occupiable space.
 - All joints, seams, penetrations, and openings must be sealed or gasketed.
- Any ducts in the garage must leak less than 6% of total heating/cooling system air flow.
 - 90 CFM of leakage for a 1500 CFM system.

Instructions and Labeling

- Provide to owner or occupant of dwelling unit:
 - Information on ventilation systems installed;
 - Instructions on proper operation; and
 - Instructions on proper maintenance.
- Controls shall be labeled as to their function.

Ventilation Operation Manual

- Customer education is very important.
- Make up an operation manual for occupants. Have extra copies available.
 - Purpose of ventilation.
 - Proper operation of ventilation system, whole building and local.
 - Maintenance suggestions.

ASHRAE 62.2: What's New in 2016

Provide Owner's Manual



Sound Ratings for Fans

- The sound ratings of installed ventilation equipment shall meet the requirements of the Standard.
- 1 sone maximum for continuously operating fans.
- 3 sone maximum occupant-controlled fans.
- Already-installed fans in existing homes exempt.

Ventilation Ducting

- If outside thermal envelope, insulate.
- Rigid ductwork preferred.
- Flexible duct specifications.
- Support properly.

ASHRAE 62.2: What's New in 2016

Not good!



Changes to 2016 Version

Overview

- ASHRAE Standard 62.2 is a “continuous maintenance” standard
 - New changes are always being discussed
 - New full editions every 3 years
 - Next edition in 2016
-
- This session is a preview of what will appear in the 2016 edition.

Square Footage

- All enclosed above- and below-grade finished areas suitable for year-round use. Include basements, or parts thereof, only if they are finished in a manner similar to the rest of the dwelling.

Square footage

- Addendum a implication:
 - Many have asked whether to include the square footage of a basement. This addendum clarifies that the standard includes finished areas but not unfinished areas.

de minimis

- Addendum b:
 - Homes using Appendix A do not require whole-dwelling ventilation if the fan flow requirement is 15 CFM or less.

- Implication: fewer fans need to be installed



Existing Dwellings ONLY

Kitchen Local Exhaust Ventilation

■ Addendum c:

- Demand-controlled, enclosed kitchen
 - Range hood - 100 CFM min.
 - Other, including downdraft - 300 CFM min. or 5 ACH (kitchen volume)
- Demand-controlled, non-enclosed kitchen
 - Range hood - 100 CFM min.
 - Other, including downdraft - 300 CFM min
- Demand-controlled bathroom
 - 50 CFM [no change]

Kitchen Local Exhaust Ventilation

- Addendum c:
 - Continuous operation
 - May be part of balanced mechanical system
 - Self-operating with accessible override
 - Enclosed kitchen - 5 ACH (kitchen volume)
 - Bathroom - 20 CFM [no change]

Makeup air systems

- Addendum d:
 - Prohibits the use of gravimetric or barometric dampers in non-powered makeup air systems (Section 6.4).
- Mainly an issue for homes with large kitchen exhaust.
- Would need either a motorized damper OR a powered makeup air system (e.g. fan).

Multifamily Compartmentalization

- Addendum e:

- Changes the metric for multifamily compartmentalization from 0.2 CFM₅₀/square foot of enclosure (6-sides) area, to 0.3 CFM₅₀ /square foot of enclosure area (Section 8.4.1.1)



50

Existing Multifamily

Multifamily Compartmentalization

- Rationale
 - 0.3 seemed more achievable.
 - 0.3 still appeared to provide good protection from neighbors.
- Implication
 - Nominally would require air sealing between units
 - Not a bad idea, not going to save energy
- There is a recognition that this is not achievable in many retrofit projects, still being worked on.

Multifamily Scope Change

- Addendum g:

- Brings all multifamily dwelling units into the purview of 62.2 regardless of building height
- Leaves common spaces/mechanical rooms/elevators/etc. in the hands of 62.1



All Multifamily

Multifamily Scope Change

- Addendum g implication:
 - Provides clear direction of what standard to point to for larger multifamily buildings and ventilation.
 - Previously neither 62.1 nor 62.2 covered these buildings in the retrofit context.

Multifamily Scope Change

- Addendum g implication:
 - Title now: *Ventilation and Acceptable Indoor Air Quality in ~~Low-Rise Residential Buildings~~*.

Combined Inlet/Outlets

- Addendum h:
 - Allows combined inlet/outlet terminations to be used without minimum separation when the manufacturer establishes that there is no more than 10 percent of the intake air comes from the exhaust.

Multifamily Infiltration Credit

- Addendum j:
 - Allows for an infiltration credit to be taken for horizontally-attached multifamily homes, which includes common walls, subject to a reduction factors.



Horizontally-Attached Multifamily

Multifamily Infiltration Credit

- Addendum j implication:
 - For the first time SOME multifamily units can get an infiltration credit.
- How it is calculated:
 - Do a blower door test of the unit.
 - Calculate the fraction of enclosure area (6-sides) that is NOT attached to other units or garages.
 - Multiply infiltration estimate from blower door test by this fraction.

$$Q_{fan} = Q_{tot} - (Q_{inf} * A_{ext})$$

$$A_{ext} = \frac{\text{exterior surface}}{\text{total envelope surface}}$$



Reset

Print



New or existing construction

Dwelling unit is

Only walls are in common with other dwelling units

Use infiltration credit

Closest weather station

Weather and shielding factor [1/hr] = 0.51

Floor area []

Number of occupants

Building height []

Area of common walls []

Envelope area adjoining garage []

Remaining envelope area []

Total envelope area [] = 1600

Measured leakage @ 50Pa []

Use Advanced Blower Door Inputs

Use Local Ventilation Alternative Compliance

Use Local Ventilation Alternative Compliance

Whole-Dwelling Ventilation Results

Effective annual avg infiltration rate [] = 37

Total required ventilation rate, Q_{tot} [] = 58.5

Infiltration credit, Q_{inf} [] = 23.3

Required mechanical ventilation rate, Q_{fan} [] = 35.2

Whole-Dwelling Ventilation Run-Time Solver

Fan capacity []

Fan run-time per hour [] = 26.4

Whole-Dwelling Leakage Rate Solver

Target mechanical ventilation rate []

Corresponding building leakage @ 50Pa [] = 2610

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Horizontally-Attached Multifamily

Ventilation Controls

- Addendum n:
 - Whole-dwelling ventilation
 - Readily accessible manual On-Off control (i.e., fan switch or dedicated branch-circuit overcurrent devices).
 - Controls shall include text or an icon indicating the systems function.
 - Exception: For multifamily dwelling units, On-Off not required to be readily accessible.

Ventilation Controls

- Addendum n:
 - Local exhaust ventilation, demand-controlled.
 - Readily accessible manual On-Off control shall be provided for each system.
 - Automatic devices, such as humidity sensors are permitted as long as they provide On-Off control.
 - Exception: For multifamily dwelling units, automatic control devices are permitted to override manual OFF control, but not manual ON control.

Ventilation Label Change

- Addendum o:
 - Whole-building (whole-house) ventilation changed to “whole-dwelling”.
- Implications:
 - Accommodates single-family AND multifamily buildings.

Demand-Controlled Local Exhaust

- Addendum p:
 - Requires multi-speed fans to have at least one speed that operates at less than 3 sones.

- Implications:
 - Closes a loophole, especially for multi-speed range hoods.

Ventilation System Airflow Measurement Location

- Addendum r:
 - Provides guidance for airflow measurement.
 - Aligns with BSR/RESNET/ICC 380, “Standard for Testing Airtightness of Building Enclosures, Airtightness of Heating and Cooling Air Distribution Systems, and Airflow of Mechanical Ventilation Systems”.

Unvented Space Heater Scope Change

■ Addendum t:

- Brings unvented space heaters into the scope of the standard.
- Allows 62.2 to set requirements related to these devices.



Intermittent Ventilation and Equivalency

- Addendum v:
 - Addresses intermittent ventilation.
 - Addresses equivalency.
 - Establishes a short-term exposure limit of 5 times the long-term exposure limit.
 - Establishes Normative Appendix C with relative exposure calculation.

Intermittent Ventilation and Equivalency

- Addendum v implications:
 - Allows innovative ventilation systems and controls.
 - Uses Section 4.1 as target ventilation rate for exposure calculation.

Reference Updates

- Addendum w:
 - Brings Section 10 References up to date.

Conclusion

- ASHRAE Standard 62.2 is a “continuous maintenance” standard
- New changes are always being discussed
- New full editions every 3 years
- **Get involved with the process.**