



RULE-MAKING ORDER PERMANENT RULE ONLY

CR-103P (December 2017) (Implements RCW 34.05.360)

CODE REVISER USE ONLY

OFFICE OF THE CODE REVISER
STATE OF WASHINGTON
FILED

DATE: January 08, 2020

TIME: 1:25 PM

WSR 20-03-041

Agency: State Building Code Council

Effective date of rule:

Permanent Rules

- 31 days after filing.
- Other (specify) July 1, 2020 (If less than 31 days after filing, a specific finding under RCW 34.05.380(3) is required and should be stated below)

Any other findings required by other provisions of law as precondition to adoption or effectiveness of rule?

- Yes No If Yes, explain:

Purpose: The purpose of this permanent rulemaking is to amend the 2018 International Mechanical Code, as directed by the state building code council on November 8, 2019. The implementation date is July 1, 2020.

Citation of rules affected by this order:

New: 3
Repealed:
Amended: 20
Suspended:

Statutory authority for adoption: RCW 19.27.031

Other authority: RCW 19.27.074

PERMANENT RULE (Including Expedited Rule Making)

Adopted under notice filed as WSR 19-16-155 on August 7, 2019 (date).
Describe any changes other than editing from proposed to adopted version:

SUMMARY OF CHANGES

2018 International Mechanical Code
Amendments to WAC 51-52-*

	WAC	Section	Changes in 2018	Discussion
1	51-52-403	403.4	Renumbered all of 403.8 to 403.4	Edit
2	51-52-403	Table 403.4.1	Strike Table	Edit
3	51-52-403	Table 403.4.2	Relocated and renumbered	Edit
4				
5	51-52-403	Table 403.4.3	Relocated and renumbered	Edit
6	51-52-403	Table 403.4.4	Strike Table	Edit
7	51-52-403	Table 403.4.5	Strike Table	Edit
8	51-52-403	403.8.5 – 403.8.5.2	Strike sections	These are covered in other sections of the code now.
9	51-52-403	Table 403.4.6.5	Renumbered and relocated	Edit

10	51-52-403	Table 403.4.7	Renumbered and relocated	Edit
11	51-52-403	403.8.7.1 Outdoor air	Strike	Edit
12	51-52-403	Table 403.4.7.2	Relocated and renumbered	Edit
13	51-52-403	403.8.8.1 – 403.8.11	Strike	These are covered in other sections of the code now.
14	51-52-1500	15-2019	Refrigeration standards	Addition

If a preliminary cost-benefit analysis was prepared under RCW 34.05.328, a final cost-benefit analysis is available by contacting:

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**Note: If any category is left blank, it will be calculated as zero.
No descriptive text.**

**Count by whole WAC sections only, from the WAC number through the history note.
A section may be counted in more than one category.**

The number of sections adopted in order to comply with:

Federal statute:	New	___	Amended	___	Repealed	___
Federal rules or standards:	New	___	Amended	___	Repealed	___
Recently enacted state statutes:	New	___	Amended	___	Repealed	___

The number of sections adopted at the request of a nongovernmental entity:

New	3	Amended	20	Repealed	___
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The number of sections adopted on the agency's own initiative:

New	___	Amended	___	Repealed	___
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The number of sections adopted in order to clarify, streamline, or reform agency procedures:

New	___	Amended	___	Repealed	___
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The number of sections adopted using:

Negotiated rule making:	New	___	Amended	___	Repealed	___
Pilot rule making:	New	___	Amended	___	Repealed	___
Other alternative rule making:	New	___	Amended	___	Repealed	___

Date Adopted: November 8, 2019

Signature:

Name: Doug Orth

A handwritten signature in black ink, appearing to read "Doug Orth", written in a cursive style.

Title: Chair, State Building Code Council

Chapter 51-52 WAC
STATE BUILDING CODE ADOPTION AND AMENDMENT OF THE ((2015)) 2018 EDI-
TION OF THE INTERNATIONAL MECHANICAL CODE

AMENDATORY SECTION (Amending WSR 16-01-148, filed 12/21/15, effective 7/1/16)

WAC 51-52-003 International Mechanical Code. The ((2015)) 2018 edition of the *International Mechanical Code* published by the International Code Conference is hereby adopted by reference with the exceptions noted in this chapter of the Washington Administrative Code (WAC).

AMENDATORY SECTION (Amending WSR 16-01-148, filed 12/21/15, effective 7/1/16)

WAC 51-52-008 Implementation. The International Mechanical Code adopted by chapter 51-52 WAC shall become effective in all counties and cities of this state on July 1, ((2016)) 2020.

AMENDATORY SECTION (Amending WSR 17-17-159, filed 8/23/17, effective 10/1/17)

WAC 51-52-0101 Section 101—General.

101.2 Scope. This code shall regulate the design, installation, maintenance, alteration and inspection of mechanical systems that are permanently installed and utilized to provide control of environmental conditions and related processes within buildings. This code shall also regulate those mechanical systems, system components, equipment and appliances specifically addressed herein. The installation of fuel gas distribution piping and equipment, fuel gas-fired appliances and fuel gas-fired appliance venting systems shall be regulated by the *International Fuel Gas Code*. References in this code to Group R shall include Group I-1, Condition 2 assisted living facilities licensed by Washington state under chapter 388-78A WAC and Group I-1, Condition 2 residential treatment facilities licensed by Washington state under chapter 246-337 WAC.

EXCEPTIONS:

1. Detached one- and two-family dwellings and multiple single-family dwellings (townhouses) not more than three stories high with separate means of egress and their accessory structures shall comply with the *International Residential Code*.
2. The standards for liquefied petroleum gas installations shall be the ((2014)) 2017 Edition of NFPA 58 (Liquefied Petroleum Gas Code) and the ((2015)) 2018 Edition of ANSI Z223.1/NFPA 54 (National Fuel Gas Code).

AMENDATORY SECTION (Amending WSR 16-01-148, filed 12/21/15, effective 7/1/16)

WAC 51-52-0202 Section 202—General definitions.

BALANCED WHOLE HOUSE VENTILATION. Any combination of concurrently operating residential unit mechanical exhaust and mechanical supply whereby the total mechanical exhaust airflow rate is within 10 percent or 5 cfm, whichever is greater, of the total mechanical supply airflow rate. Intermittent dryer exhaust, intermittent range hood exhaust, and intermittent toilet room exhaust airflow rates above the residential dwelling or sleeping unit minimum ventilation rate are exempt from the balanced airflow calculation.

DISTRIBUTED WHOLE HOUSE VENTILATION. A whole house ventilation system shall be considered distributed when it supplies outdoor air directly (not transfer air) to each dwelling or sleeping unit habitable space, (living room, den, office, interior adjoining spaces or bedroom), and exhausts air from all kitchens and bathrooms directly outside.

LOCAL EXHAUST. An exhaust system that uses one or more fans to exhaust air from a specific room or rooms within a residential dwelling or sleeping unit.

PERMANENT CONSTRUCTION. Construction that, if removed, would disturb the structural integrity of the building or the fire-resistance rating of a building assembly.

RELIEF AIR. Exhausted return air from a system that provides ventilation for human usage.

REPLACEMENT AIR. Outdoor air that is used to replace air removed from a building through an exhaust system. Replacement air may be derived from one or more of the following: Makeup air, supply air, transfer air, and infiltration. However, the ultimate source of all replacement air is outdoor air. When replacement air exceeds exhaust, the result is exfiltration.

WHOLE HOUSE VENTILATION SYSTEM. A mechanical ventilation system, including fans, controls, and ducts, which replaces, by direct (~~or indirect~~) means, air from the habitable rooms with *outdoor air*.

VENTILATION ZONE. Any indoor area that requires ventilation and comprises one or more spaces with the same occupancy category (see Table 403.3.1.1), occupant density, zone air distribution effectiveness (see Section 403.3.1.1.1.2), and design zone primary airflow per unit area.

AMENDATORY SECTION (Amending WSR 16-01-148, filed 12/21/15, effective 7/1/16)

WAC 51-52-0301 Section 301—(~~General~~) Reserved.

WAC 51-52-0306 Section 306—Access and service space.

306.5 Equipment and appliances on roofs or elevated structures. Where equipment requiring access or appliances are located on an elevated structure or the roof of a building such that personnel will have to climb higher than 16 feet (4877 mm) above grade to access such equipment or appliances, an interior or exterior means of access shall be provided. Such access shall not require climbing over obstructions greater than 30 inches (762 mm) in height or walking on roofs having a slope greater than 4 units vertical in 12 units horizontal (33 percent slope). Such access shall not require the use of portable ladders. Where access involves climbing over parapet walls, the height shall be measured to the top of the parapet wall.

Permanent ladders installed to provide the required access shall comply with the following minimum design criteria:

1. The side railing shall extend above the parapet or roof edge not less than 42 inches (1067 mm).

2. Ladders shall have rung spacing not to exceed 12 inches (305 mm) on center. The uppermost rung shall be a maximum of 24 inches below the upper edge of the roof hatch, roof or parapet, as applicable.

3. Ladders shall have a toe spacing not less than 7 inches (178 mm) deep.

4. There shall be a minimum of 18 inches (457 mm) between rails.

5. Rungs shall have a minimum 0.75-inch (19 mm) diameter and be capable of withstanding a 300-pound (136.1 kg) load.

6. Ladders over 30 feet (9144 mm) in height shall be provided with offset sections and landings capable of withstanding 100 pounds (488.2 kg/m²) per square foot. Landing dimensions shall be not less than 18 inches and not less than the width of the ladder served. A guardrail shall be provided on all open sides of the landing.

7. Climbing clearances. The distance from the centerline of the rungs to the nearest permanent object on the climbing side of the ladder shall be a minimum of 30 inches measured perpendicular to the rungs. This distance shall be maintained from the point of ladder access to the bottom of the roof hatch. A minimum clear width of 15 inches shall be provided on both sides of the ladder measured from the midpoint of and parallel with the rungs except where cages or wells are installed.

8. Landing required. The ladder shall be provided with a clear and unobstructed bottom landing area having a minimum dimension of 30 inches by 30 inches centered in front of the ladder.

9. Ladders shall be protected against corrosion by approved means.

10. Access to ladders shall be provided at all times.

Catwalks installed to provide the required access shall be not less than 24 inches (610 mm) wide and shall have railings as required for service platforms.

EXCEPTION: This section shall not apply to Group R-3 occupancies.

306.6 Appliances above ceilings. Appliances that are located above the ceiling shall (~~be accessible~~) have ready access for inspection, service and repair without removing *permanent construction*. Appliances

shall be (~~accessible from an access~~) provided with access to panel or removable ceiling tile with minimum nominal dimensions of 24 inches by 24 inches (609 mm x 609 mm).

The appliance is not required to be removable or replaceable through the access panel or removable ceiling tile. The appliance may be removed or replaced by removing the ceiling or wall assemblies adjacent to the appliance as long as they are *not permanent construction*.

EXCEPTIONS: 1. This section shall not apply to replacement appliances installed in existing compartments and alcoves where the working space clearances are in accordance with the equipment or appliance manufacturer's installation instructions.
2. A smaller access panel or removable ceiling tile shall be permitted when allowed by the equipment or appliance manufacturer's installation instructions.

AMENDATORY SECTION (Amending WSR 16-01-148, filed 12/21/15, effective 7/1/16)

WAC 51-52-0401 Section 401—General.

401.2 Ventilation required. Every occupied space other than enclosed parking garages and buildings used for repair of automobiles shall be ventilated in accordance with Section 401.2.1, 401.2.2 or 401.2.3. Enclosed parking garages and buildings used for repair of automobiles shall be ventilated by mechanical means in accordance with Sections 403 and 404.

401.2.1 Group R occupancies. Ventilation in Group R occupancies shall be provided in accordance with Section (~~(403.8)~~) 403.4.

401.2.2 Ambulatory care facilities and Group I-2 occupancies. Ambulatory care facilities and Group I-2 occupancies shall be ventilated by mechanical means in accordance with Section 407.

401.2.3 All other occupancies. Ventilation in all other occupancies shall be provided by natural means in accordance with Section 402 or by mechanical means in accordance with Sections 403.1 to 403.7.

401.3 When required. Group R occupancies shall be vented continuously or intermittently in accordance with Section (~~(403.8)~~) 403.4. Ventilation in all other occupancies shall be provided during the periods that the room or space is occupied.

401.4 Intake opening location. Air intake openings shall comply with all of the following:

1. Intake openings shall be located not less than 10 feet (3048 mm) from lot lines or buildings on the same lot. Lot lines shall not be defined as a separation from a street or public way.

2. Mechanical and gravity outdoor air intake openings shall be located not less than 10 feet (3048 mm) horizontally from any hazardous or noxious contaminant source, such as vents, streets, alleys, parking lots, and loading docks, except as specified in Item 3 or Section 501.3.1. Outdoor air intake openings shall be permitted to be located less than 10 feet (3048 mm) horizontally from streets, alleys, parking lots, and loading docks provided that the openings are located not less than 25 feet (7620 mm) vertically above such locations. Where openings front on a street or public way, the distance shall be measured from the closest edge of the street or public way.

3. Intake openings shall be located not less than 3 feet (914 mm) below contaminant sources where such sources are located within 10 feet (3048 mm) of the opening.

EXCEPTION: Separation is not required between intake air openings and living space environmental air exhaust air openings of an individual dwelling unit or sleeping unit where a factory-built intake/exhaust combination termination fitting is used to separate the air streams in accordance with the manufacturer's instructions. A minimum of 3 feet (914 mm) separation shall be maintained between other environmental air exhaust outlets and other dwelling or sleeping unit factory-built intake/exhaust combination termination fittings.

4. Intake openings on structures in flood hazard areas shall be at or above the elevation required by Section 1612 of the International Building Code for utilities and attendant equipment.

EXCEPTION: Enclosed parking garage and repair garage ventilation air intakes are permitted to be located less than 10 feet horizontally from or 25 feet vertically above a street, alley, parking lot, and loading dock.

401.7 Testing and balancing. At the discretion of the building official, flow testing may be required to verify that the mechanical system(s) satisfies the requirements of this chapter. Flow testing may be performed using flow hood measuring at the intake or exhaust points of the system, in-line pitot tube, or pitot-traverse type measurement systems in the duct, short term tracer gas measurements, or other means approved by the building official.

AMENDATORY SECTION (Amending WSR 17-10-075, filed 5/3/17, effective 6/3/17)

WAC 51-52-0403 Section 403—Mechanical ventilation.

403.1 Ventilation system. Mechanical ventilation shall be provided by a method of supply air and return or *exhaust air*. The amount of supply air shall be approximately equal to the amount of return and *exhaust air*. The system shall not be prohibited from producing negative or positive pressure. The system to convey ventilation air shall be designed and installed in accordance with Chapter 6.

403.2 Outdoor air required. The minimum *outdoor airflow rate* shall be determined in accordance with Section 403.3.

EXCEPTIONS:

1. Where the registered design professional demonstrates that an engineered ventilation system design will prevent the maximum concentration of contaminants from exceeding that obtainable by the rate of *outdoor air* ventilation determined in accordance with Section 403.3, the minimum required rate of *outdoor air* shall be reduced in accordance with such engineered system design.
2. Alternate systems designed in accordance with ASHRAE Standard 62.1 Section 6.2, Ventilation Rate Procedure, shall be permitted.

403.2.1 Recirculation of air. The air required by Section 403.3 shall not be recirculated. Air in excess of that required by Section 403.3 shall not be prohibited from being recirculated as a component of supply air to building spaces, except that:

1. Ventilation air shall not be recirculated from one dwelling to another or to dissimilar occupancies.

2. Supply air to a swimming pool and associated deck areas shall not be recirculated unless such air is dehumidified to maintain the relative humidity of the area at 60 percent or less. Air from this area shall not be recirculated to other spaces where 10 percent or more of the resulting supply airstream consists of air recirculated from these spaces.

3. Where mechanical exhaust is required by Note b in Table 403.3.1.1, recirculation of air from such spaces shall be prohibited. All air supplied to such spaces shall be exhausted, including any air in excess of that required by Table 403.3.1.1.

~~((Item 4 is not adopted.))~~ 4. Where mechanical exhaust is required by Note g in Table 403.3.1.1, mechanical exhaust is required and recirculation from such spaces is prohibited where more than 10 percent of the resulting supply airstream consists of air recirculated from these spaces. Return air from such spaces shall only be permitted to be recirculated when returned to an energy recovery ventilation system complying with Section 514. Recirculation of air that is contained completely within such spaces shall not be prohibited.

403.3 Outdoor air and local exhaust airflow rates. Group ~~((R-2, R-3 and R-4))~~ R occupancies ~~((three stories and less in height above grade plane))~~ shall be provided with outdoor air and local exhaust in accordance with Section ~~((403.8))~~ 403.4. All other buildings intended to be occupied shall be provided with outdoor air and local exhaust in accordance with Section 403.3.1.

403.3.1.1 Outdoor airflow rate. Ventilation systems shall be designed to have the capacity to supply the minimum outdoor airflow rate determined in accordance with this section. In each occupiable space, the ventilation system shall be designed to deliver the required rate of outdoor airflow to the breathing zone. Outdoor air shall be supplied directly to each occupiable space from an air handling unit through a fully ducted path or ducted to within 12 inches of the return air opening of a fan-powered terminal unit used to transfer the outdoor air to the occupiable space. The occupant load utilized for design of the ventilation system shall not be less than the number determined from the estimated maximum occupant load rate indicated in Table 403.3.1.1. Ventilation rates for occupancies not represented in Table 403.3.1.1 shall be those for a listed occupancy classification that is most similar in terms of occupant density, activities and building construction; or shall be determined by an approved engineering analysis. The ventilation system, including transfer fan-powered terminal units shall be designed to supply the required rate of ventilation air continuously during the period the building is occupied, except as otherwise stated in other provisions of the code.

With the exception of smoking lounges, the ventilation rates in Table 403.3.1.1 are based on the absence of smoking in occupiable spaces. Where smoking is anticipated in a space other than a smoking lounge, the ventilation system serving the space shall be designed to provide ventilation over and above that required by Table 403.3.1.1 in accordance with accepted engineering practice.

EXCEPTION: Where occupancy density is known and documented in the plans, the outside air rate may be based on the design occupant density. Under no circumstance shall the occupancies used result in outside air less than one-half that resulting from application of Table 403.3.1.1 estimated maximum occupancy rates.

Table 403.3.1.1
REQUIRED OUTDOOR VENTILATION AIR

Occupancy Classification	Occupant Density #/1000 ft ^{2a}	People Outdoor Airflow Rate in Breathing Zone R_p cfm/Person	Area Outdoor Airflow Rate in Breathing Zone R_a cfm/ft ^{2a}	Exhaust Airflow Rate cfm/ft ^{2a}
Offices				
Conference rooms	50	5	0.06	—
Kitchenettes ^k	((—)) <u>25</u>	((—)) <u>5</u>	((—)) <u>0.06</u>	0.30
Office spaces	5	5	0.06	—
Reception areas	30	5	0.06	—
Telephone/data entry	60	5	0.06	—
Main entry lobbies	10	5	0.06	—

Occupancy Classification	Occupant Density #/1000 ft ^{2a}	People Outdoor Airflow Rate in Breathing Zone R_p cfm/Person	Area Outdoor Airflow Rate in Breathing Zone R_a cfm/ft ^{2a}	Exhaust Airflow Rate cfm/ft ^{2a}
Private dwellings, single and multiple				
Garages, common for multiple units ^b (Kitchens ^b)	— —	— —	— —	0.75 <u>$\frac{25(100^f)}{403.4.7}$</u>
Living areas ^c	((Based on the number of bedrooms. First bedroom, 2; each additional bedroom, 1)	See Tables 403.8.1 and 403.8.5.1)) See Table 403.4.2	—	—
Toilet rooms, bathrooms and laundry areas ^{g, i}	—	—	—	<u>$\frac{(20/50^f)}{403.4.7}$</u>
Public spaces				
Corridors serving other than Group R occupancies	—	—	0.06	—
Corridors serving Group R dwelling or sleeping units with whole house exhaust system	—	—	0.12	—
Corridors serving Group R dwelling or sleeping units with other than whole house exhaust system	—	—	0.06	—
Courtrooms	70	5	0.06	—
Elevator car	—	—	—	1
Elevator lobbies in parking garage	—	—	1.0	—
Legislative chambers	50	5	0.06	—
Libraries	10	5	0.12	—
Museums (children's)	40	7.5	0.12	—
Museums/galleries	40	7.5	0.06	—
Places of religious worship	120	5	0.06	—
Shower room (per showerhead) ^{g((k))}	—	—	—	50/20 ^f
Smoking lounges ^b	70	60	—	—
Toilet rooms—Public ^{g((k))}	—	—	—	50/70 ^e
Sports and amusement				
Disco/dance floors	100	20	0.06	—
Bowling alleys (seating areas)	40	10	0.12	—
Game arcades	20	7.5	0.18	—
Ice arenas, without combustion engines ^j	—	—	0.30	0.5
Gym, stadium, arena (play area) ^j	—	—	0.30	—
Spectator areas	150	7.5	0.06	—
Swimming pools (pool and deck area)	—	—	0.48	—
Health club/aerobics room	40	20	0.06	—
Health club/weight room	10	20	0.06	—
Storage				
Janitor closets, trash rooms, recycling rooms	—	—	—	1.0
Repair garages, enclosed parking garage ^{b, d}	—	—	—	0.75
Storage rooms, chemical	—	—	—	1.5
Warehouses	—	—	0.06	—
Workrooms				
Bank vaults/safe deposit	5	5	0.06	—
Darkrooms	—	—	—	1.0
Copy, printing rooms	4	5	0.06	0.5
Freezer and refrigerated spaces (<50°F)	0	10	0	0
Meat processing ^c	10	15	—	—
Pharmacy (prep. area)	10	5	0.18	—
Photo studios	10	5	0.12	—

Occupancy Classification	Occupant Density #/1000 ft ^{2a}	People Outdoor Airflow Rate in Breathing Zone R_p cfm/Person	Area Outdoor Airflow Rate in Breathing Zone R_a cfm/ft ^{2a}	Exhaust Airflow Rate cfm/ft ^{2a}
Computer (without printing)	4	5	0.06	—

For SI: 1 cubic foot per minute = 0.0004719 m³/s, 1 ton = 908 kg, 1 cubic foot per minutes per square foot = 0.00508 m³/(s·m²), °C = [(°F) -32]/1.8, 1 square foot = 0.0929 m².

- a. Based upon *net occupiable floor area*.
- b. Mechanical exhaust required and the recirculation of air from such spaces is prohibited. Recirculation of air that is contained completely within such spaces shall not be prohibited (see Section 403.2.1, Item 3).
- c. Spaces unheated or maintained below 50°F are not covered by these requirements unless the occupancy is continuous.
- d. Ventilation systems in enclosed parking garages shall comply with Section 404.
- e. Rates are per water closet or urinal. The higher rate shall be provided where the exhaust system is designed to operate intermittently. The lower rate shall be permitted only where the exhaust system is designed to operate continuously while occupied.
- f. Rates are per room unless otherwise indicated. The higher rate shall be provided where the exhaust system is designed to operate intermittently. The lower rate shall be permitted only where the exhaust system is designed to operate continuously while occupied.
- g. Mechanical exhaust is required and recirculation (~~(is prohibited)~~) from such spaces is prohibited except that recirculation shall be permitted where the resulting supply airstream consists of not more than 10 percent air recirculated from these spaces. Return air from such spaces only be permitted to be recirculated when returned to an energy recovery ventilation system complying with Section 514. Recirculation of air that is contained completely within such spaces shall not be prohibited (see Section 403.2.1, Items 2 and 4).
- h. For nail salons, each manicure and pedicure station shall be provided with a *source capture system* capable of exhausting not less than 50 cfm per station. Exhaust inlets shall be located in accordance with Section 502.20. Where one or more required source capture systems operate continuously during occupancy, the exhaust rate from such systems shall be permitted to be applied to the exhaust flow rate required by Table 403.3.1.1 for the nail salon.
- i. A laundry area within a kitchen or bathroom is not required to have local exhaust. For the laundry area to qualify as being within the kitchen, the laundry room door must open directly into the kitchen and not into an adjacent corridor. Where there are doors that separate the laundry area from the kitchen or bathroom the door shall be louvered.
- j. When combustion equipment is intended to be used on the playing surface, additional dilution ventilation and/or source control shall be provided.
- k. Kitchenettes require exhaust when they contain a domestic cooking appliance range or oven that is installed in accordance with Table ((507.2.2)) 507.2.1. Kitchenettes that only contain a microwave ((oven)) cooking appliance are not required to have ((mechanical)) exhaust. A kitchenette may not contain commercial cooking appliances that require Type I or Type II exhaust as these occupancies are required to be exhausted to the kitchen category in Table 403.3.1.1.

403.3.1.1.2.3 Multiple zone recirculating systems. For ventilation systems wherein one or more air handlers supply a mixture of outdoor air and recirculated air to more than one ventilation zone, the outdoor air intake flow (V_{ot}) shall be determined in accordance with Sections 403.3.1.1.2.3.1 through 403.3.1.1.2.3.4.

403.3.1.1.2.3.1 Uncorrected outdoor air intake. The uncorrected outdoor air intake flow (V_{ot}) shall be determined in accordance with Equation 4-5.

$$V_{ou} = D \sum_{all\ zones} (R_p \times P_z) + \sum_{all\ zones} (R_a \times A_z) \quad \text{(Equation 4-5)}$$

403.3.1.1.2.3.1.1 Occupant diversity. The occupant diversity ratio (D) shall be determined in accordance with Equation 4-6 to account for variations in population within the ventilation zones served by the system.

$$D = P_s / \sum_{all\ zones} P_z \quad \text{(Equation 4-6)}$$

where:

P_s = System population: The total population in the area served by the system.

EXCEPTION: Alternative methods to account for occupant diversity shall be permitted, provided the resulting V_{ou} value is no less than that determined using Equation 4-5.

403.3.1.1.2.3.1.2 Design system population. Design system population (P_s) shall equal the largest (peak) number of people expected to occupy all ventilation zones served by the ventilation system during use.

Note: Design system population is always equal to or less than the sum of design zone population for all zones in the area served by the system because all zones may or may not be simultaneously occupied at design population.

403.3.1.1.2.3.2 System ventilation efficiency. The system ventilation efficiency (E_v) shall be determined in accordance with Section 403.3.1.1.2.3.3 for the Simplified Procedure or Appendix A of ASHRAE 62.1 for the Alternative Procedure.

Note: These procedures also establish zone minimum primary air-flow rates for VAV systems.

403.3.1.1.2.3.3 Simplified procedure.

403.3.1.1.2.3.3.1 System ventilation efficiency. System ventilation efficiency (E_v) shall be determined in accordance with Equation 4-6a or 4-6b.

$$E_v = 0.88 \times D + 0.22 \text{ for } D < 0.60 \text{ (Equation 4-6a)}$$

$$E_v = 0.75 \text{ for } D \geq 0.60 \text{ (Equation 4-6b)}$$

403.3.1.1.2.3.3.2 Zone minimum primary airflow. For each zone, the minimum primary airflow (V_{pz-min}) shall be determined in accordance with Equation 4-7.

$$V_{pz-min} = V_{Oz} \times 1.5 \text{ (Equation 4-7)}$$

403.3.1.1.2.3.4 Outdoor air intake. The design outdoor air intake flow (V_{ot}) shall be determined in accordance with Equation 4-8.

$$V_{ot} = V_{Ov}/E_v \text{ (Equation 4-8)}$$

403.3.2 Group R-2, R-3 and R-4 occupancies. This section is not adopted. See Section ((403.8)) 403.4.

403.3.2.1 Outdoor air for dwelling units. This section is not adopted.

403.3.2.2 Outdoor air for other spaces. This section is not adopted.

403.3.2.3 Local exhaust. This section is not adopted.

~~((403.8 Ventilation systems for Group R occupancies. Each dwelling unit or sleeping unit shall be equipped with local exhaust and whole house ventilation systems and shall comply with Sections 403.8.1 through 403.8.11. All occupied spaces, including public corridors, other than the Group R dwelling and sleeping unit, that support the Group R occupancy shall meet the ventilation requirements of Section 402 or the applicable rates from Table 403.3.1.1.~~

~~**403.8.1 Minimum ventilation performance.** Ventilation systems shall be designed and installed to satisfy the ventilation requirements of Table 403.3.1.1 or Table 403.8.1. Breathing zone ventilation rates from Table 403.3.1.1 shall be calculated per Section 403.3.1.1 and corrected per zone air distribution effectiveness requirements per Section 403.3.1.2.~~

Table 403.8.1

~~VENTILATION RATES FOR ALL GROUP R PRIVATE DWELLINGS, SINGLE AND MULTIPLE
(CONTINUOUSLY OPERATING SYSTEMS)~~

Floor Area (ft ²)	Bedrooms ¹				
	0-1	2-3	4-5	6-7	≥5
<500	30	40	45	55	60
500-1000	45	55	60	70	75
1001-1500	60	70	75	85	90

Floor Area (ft ²)	Bedrooms ¹				
	0-1	2-3	4-5	6-7	≥5
1501-2000	75	85	90	100	105
2001-2500	90	100	105	115	120
2501-3000	105	115	120	130	135
3001-3500	120	130	135	145	150
>3500	135	145	150	160	165

¹Ventilation rates in table are minimum outdoor airflow rates measured in cfm.

403.8.2 Control and operation.

1. Location of controls. Controls for all ventilation systems shall be readily accessible by the occupant.

2. Instructions. Operating instructions for whole house ventilation systems shall be provided to the occupant by the installer of the system.

3. Local exhaust ventilation systems. Local exhaust ventilation systems shall be controlled by manual switches, dehumidistats, timers, or other approved means.

4. Continuous whole house ventilation systems. Continuous whole house ventilation systems shall operate continuously and be equipped with an override control. A "fan on" switch shall be permitted as an override control. Controls shall be capable of operating the ventilation system without energizing other energy-consuming appliances. A clearly visible label shall be affixed to the controls that reads "Whole House Ventilation (see operating instructions)."

5. Intermittent whole house ventilation systems. Intermittent whole house ventilation systems shall comply with the following:

5.1 They shall be capable of operating intermittently and continuously.

5.2 They shall have controls capable of operating the exhaust fans, forced-air system fans, or supply fans without energizing other energy-consuming appliances.

5.3 The ventilation rate shall be adjusted according to the exception in Section 403.8.5.1.

5.4 The system shall be designed so that it can operate automatically based on the type of control timer installed.

5.5 The intermittent mechanical ventilation system shall operate at least one hour out of every four.

5.6 The system shall have a manual control and automatic control, such as a 24-hour clock timer.

5.7 At the time of final inspection, the automatic control shall be set to operate the whole house fan according to the schedule used to calculate the whole house fan sizing.

5.8 A label shall be affixed to the control that reads "Whole House Ventilation (see operating instructions)."

EXCEPTION: Engineered central ventilation systems serving dwelling units or sleeping units are not required to have individual controls for each dwelling unit or sleeping unit when designed for continuous operation and approved by the code official.

403.8.3 Outdoor air intake locations. Outdoor air intakes shall be classified as either operable openings or mechanical air intakes and shall be located per the following criteria. The intake locations for operable openings and mechanical air intakes shall comply with the following:

1. Openings for mechanical air intakes shall comply with Section 401.4. Operable openings shall comply with Section 401.4 items 2 and 4 only.

2. Intake openings shall not be located closer than 10 feet from an appliance vent outlet unless such vent outlet is 3 feet above the outdoor air inlet. The vent shall be permitted to be closer if specifically allowed by Chapter 8 or by the International Fuel Gas Code.

3. Intake openings shall be located where they will not pick up objectionable odors, fumes, or flammable vapors.

4. Intake openings shall be located where they will not take air from a hazardous or unsanitary location.

5. Intake openings shall be located where they will not take air from a room or space having a fuel-burning appliances.

6. Intake openings shall not be located closer than 10 feet from a vent opening of a plumbing drainage system unless the vent opening is at least 3 feet above the air inlet.

7. Intake openings shall not be located where they will take air from an attic, crawl space, or garage.

8. Intake openings shall not be located on asphalt roofs unless it is shown that no other location is permissible. In such cases, the inlet opening shall be located a minimum of 2 feet from the nearest surface of the asphalt roofing, measured from the intake opening.

403.8.4 Local exhaust ventilation requirements. Local exhaust ventilation systems shall exhaust at least the volume of air required for exhaust in Table 403.3.1.1. Exhaust shall be provided in each kitchen, bathroom, water closet, laundry area, indoor swimming pool, spa, and other room where water vapor or cooking odor is produced.

403.8.4.1 Local exhaust systems. Exhaust systems shall be designed and installed to meet all of the criteria below:

1. Local exhaust shall be discharged outdoors.

2. Exhaust outlets shall comply with Section 501.3.

3. Pressure equalization shall comply with Section 501.4.

4. Exhaust ducts in systems which are designed to operate intermittently shall be equipped with back-draft dampers.

5. All exhaust ducts in unconditioned spaces shall be insulated to a minimum of R-4.

6. Terminal outlet elements shall have at least the equivalent net free area of the ductwork.

7. Terminal outlet elements shall be screened or otherwise protected as required by Section 501.3.2.

8. Exhaust fans in separate dwelling units or sleeping units shall not share common exhaust ducts unless the system is engineered for this operation.

9. Where permitted by Chapter 5, multiple local exhaust ducts may be combined. If more than one of the exhaust fans in a dwelling unit or sleeping unit shares a common exhaust duct then each exhaust fan shall be equipped with a back-draft damper to prevent the recirculation of exhaust air from one room to another room via the exhaust ducting system.

403.8.4.2 Local exhaust fans. Exhaust fan construction and sizing shall meet the following criteria.

1. Exhaust fans shall be tested and rated in accordance with the airflow and sound rating procedures of the Home Ventilating Institute (HVI 915, HVI Loudness Testing and Rating Procedure, HVI 916, HVI Airflow Test Procedure, and HVI 920, HVI Product Performance Certification Procedure).

EXCEPTION: Where a range hood or down draft exhaust fan is used for local exhaust for a kitchen, the device is not required to be rated per these standards.

2. Installation of the system or equipment shall be carried out in accordance with manufacturers' installation instructions.

3. Fan airflow rating and duct system shall be designed and installed to deliver at least the exhaust airflow required by Table 403.3.1.1. The airflows required refer to the delivered airflow of the system as installed and tested using a flow hood, flow grid, or other airflow measurement device.

EXCEPTIONS: 1. An exhaust airflow rating at a pressure of 0.25 in. w.g. may be used, provided the duct sizing meets the prescriptive requirements of Table 403.8.4.2.
2. Where a range hood or down draft exhaust fan is used to satisfy the local exhaust requirements for kitchens, the range hood or down draft exhaust shall not be less than 100 cfm at 0.10 in. w.g.

**TABLE 403.8.4.2
PRESCRIPTIVE EXHAUST DUCT SIZING**

Fan Tested cfm at 0.25 inches w.g.	Minimum Flex Diameter	Maximum Length in Feet	Minimum Smooth Diameter	Maximum Length in Feet	Maximum Elbows ^a
50	4 inches	25	4 inches	70	3
50	5 inches	90	5 inches	100	3
50	6 inches	No Limit	6 inches	No Limit	3
80	4 inches ^b	NA	4 inches	20	3
80	5 inches	15	5 inches	100	3
80	6 inches	90	6 inches	No Limit	3
100	5 inches ^b	NA	5 inches	50	3
100	6 inches	45	6 inches	No Limit	3
125	6 inches	15	6 inches	No Limit	3
125	7 inches	70	7 inches	No Limit	3

a. For each additional elbow, subtract 10 feet from length.
b. Flex ducts of this diameter are not permitted with fans of this size.

403.8.5 Whole house ventilation requirements. Each dwelling unit or sleeping unit shall be equipped with one of the following four types of mechanical whole house ventilation systems: A system using exhaust fans (see Section 403.8.6); a system integrated with forced-air systems (see Section 403.8.7); a system using supply fans (see Section 403.8.8); or a heat or energy recovery ventilation system (see Section 403.8.9). The whole house exhaust system is permitted to be one of the local exhaust systems required by Section 403.8.4 as long as the requirements of this section, in addition to the requirements of Section 403.8.5, are met.

EXCEPTION: Additions, alterations, renovations or repairs to a mechanical system that is part of a building addition with less than 500 square feet of conditioned floor area are exempt from the requirements for whole house ventilation systems, Section 403.8.5.

403.8.5.1 Outdoor air. Outdoor air shall be distributed to each habitable space.

Where outdoor air supply intakes are separated from exhaust vents by doors, means shall be provided to ensure airflow to all separated habitable spaces by installing distribution ducts, installed grilles, transoms, doors undercut to a minimum of 1/2-inch above the surface of the finish floor covering, or other similar means where permitted by the *International Building Code*.

The mechanical system shall operate continuously to supply at least the volume of outdoor air required in Table 403.3.1.1 or Table 403.8.1.

EXCEPTION: Intermittently operating ventilation systems: The whole-house mechanical ventilation system is permitted to operate intermittently where the system has controls that enable operation for not less than 25 percent of each 4-hour segment and the ventilation rate prescribed in Table 403.3.1.1 or Table 403.8.1 is multiplied by the factor determined in accordance with Table 403.8.5.1.

**TABLE 403.8.5.1
INTERMITTENT WHOLE HOUSE MECHANICAL VENTILATION RATE FACTORS^{a, b}**

RUN-TIME PERCENTAGE IN EACH 4-HOUR SEGMENT	25%	33%	50%	66%	75%	100%
Factor ^a	4	3	2	1.5	1.3	1.0

^aFor ventilation system run-time values between those given, the factors are permitted to be determined by interpolation.

^bExtrapolation beyond the table is prohibited.

403.8.5.2 Whole house supply system general requirements. Whole house ventilation systems integrated with a forced-air system, systems using supply fans and systems using a heat or energy recovery ventilation system shall comply with the following.

1. *Outdoor air* louvers shall be adequately sized for the required airflow and shall comply with Section 401.5. *Outdoor air* intake locations shall comply with mechanical air intakes requirements of Section 403.8.3.

2. *Outdoor air* ducts for dedicated or central supply systems and exhaust ducts for heat or energy recovery systems shall be provided with a means for balancing the system to the required airflow via balance dampers or other devices.

3. *Outdoor air* ducts for dedicated or central systems shall be provided with motorized dampers.

EXCEPTIONS: 1. *Outdoor air* ducts at heat or energy recovery ventilation systems are not required to have motorized dampers.
2. *Outdoor air* ducts at continuous ventilation systems are not required to have motorized dampers.

4. *Outdoor air* ducts in the conditioned space shall be insulated to a minimum of R-4. In heat or energy recovery ventilation systems, ducts upstream of the heat exchanger shall also be insulated to at least R-4.

5. All *outdoor air* ducts shall be designed and installed to deliver at least the outdoor airflow required by Section 403.8.5.1. The airflows required refer to the delivered airflow of the system as installed and tested using a flow hood, flow grid, or other airflow measurement device.

EXCEPTION: The *outdoor air* duct for supply fan systems and heat or energy recovery systems may be prescriptively sized per Table 403.8.5.2 for dedicated *outdoor air* ducts upstream of the supply fan. Supply fans shall have the capacity to provide the amount of *outdoor air* required by Section 403.8.5.1 at 0.40 in. w.g. as per HVI 916 (April 1995). When prescriptively sized the system shall be tested and balanced using a flow hood, flow-grid, or other airflow measurement device.

6. Whole house ventilation controls for intermittent operation shall allow concurrent operation of the forced-air fan and the associated outdoor air motorized damper.

7. Whole house ventilation controls for continuous operation shall be provided at the forced-air fan.

EXCEPTION: Engineered central ventilation systems serving dwelling units or sleeping units are not required to have individual controls for each dwelling or sleeping unit when designed for continuous operation and approved by the code official.

**TABLE 403.8.5.2
PRESCRIPTIVE SUPPLY FAN DUCT SIZING**

Supply Fan Tested cfm at 0.40" w.g.		
Specified Volume from Table 408.1	Minimum Smooth Duct Diameter	Minimum Flexible Duct Diameter
50 - 90 cfm	4 inch	5 inch
90 - 150 cfm	5 inch	6 inch
150 - 250 cfm	6 inch	7 inch
250 - 400 cfm	7 inch	8 inch

403.8.6 Whole house ventilation with exhaust fan systems. This section establishes minimum requirements for mechanical whole house ventilation systems using exhaust fans.

403.8.6.1 Outdoor air. Exhaust fan only ventilation systems shall provide outdoor air to each occupiable space through one of the following methods:

1. Outdoor air may be drawn through air inlets installed in exterior walls or windows. The air inlets shall comply with all of the following:

1.1. Inlets shall have controllable, secure openings and shall be designed to not compromise the thermal properties of the building envelope.

1.2. Inlets shall be accessible to occupants, including compliance with Section 1109.13 of the *International Building Code* for designated accessible units, Type A units and Type B units.

1.3. Inlets shall be screened or otherwise protected from entry by insects, leaves, or other material.

1.4. Inlets shall provide not less than 4 square inches of net free area of opening for each 10 cfm of outdoor air required in Table 403.3.1.1 or Table 403.8.1.

1.5. Any inlet or combination of inlets which provide 10 cfm at 10 Pascals as determined by the Home Ventilation Institute Air Flow Test Standard (HVI 901 (November 1996)) are deemed equivalent to 4 square inches of net free area.

1.6. Each occupiable space shall have a minimum of one air inlet that has a minimum of 4 square inches of net free area.

2. Outdoor air may be drawn in through operable openings to the outdoors. Each habitable space shall be provided with operable openings with an openable area of not less than 4 square inches of net free area of opening for each 10 cfm of outdoor air required by Table 403.3.1.1 or Table 403.8.1. Doors exiting to a corridor, court or public way shall not be used to provide outdoor air. The operable openings shall comply with the following:

2.1. Openings shall be controllable, securable, and shall be designed to not compromise the thermal properties of the building envelope.

2.2. Openings shall be accessible to occupants, including compliance with Section 1109.13 of the *International Building Code* for designated accessible units, Type A units and Type B units.

2.3 Openings shall be screened or otherwise protected from entry by leaves or other material.

3. For interior adjoining spaces without outdoor air openings, one of the following two options shall be used to ventilate the interior adjoining space:

3.1. Provide a whole house transfer fan at the interior adjoining space sized to provide a minimum of the ventilation rate required per Section 403.8.5.1. The transfer fan shall circulate air between the interior room or space and the adjacent habitable space. The transfer fan may operate continuously or intermittently using controls per Section 403.8.2.

3.2. Provide a permanent opening to the interior adjoining space. Opening shall be unobstructed and shall have an area of not less than 8 percent of the floor area of the interior adjoining space, but not less than 25 square feet.

403.8.6.2 Outside air intake locations. All outside air intake opening types described in Section 403.8.6.1 shall be classified operable openings and shall not be classified as mechanical air intakes. The intake locations shall comply with Section 403.8.3.

403.8.6.3 Whole house exhaust system. Whole house exhaust system shall be designed and installed to meet all of the applicable criteria below:

1. Whole house ventilation exhaust shall be discharged outdoors.
2. Exhaust outlets shall comply with Section 501.2.
3. Exhaust ducts in systems which are designed to operate intermittently shall be equipped with back-draft dampers.
4. All exhaust ducts in unconditioned spaces shall be insulated to a minimum of R-4.5. Terminal outlet elements shall have at least the equivalent net free area of the ductwork.
5. Terminal outlet elements shall be screened or otherwise protected as required by Section 501.2.2.
6. One of the required local exhaust fans for the laundry room or bathroom may be designated as the whole house exhaust fan.
7. Exhaust fans in separate dwelling units or sleeping units shall not share common exhaust ducts unless the system is engineered for this operation.
8. Where permitted by Chapter 5 whole house exhaust ducts may be combined with other local exhaust ducts. If more than one of the exhaust fans in a dwelling unit or sleeping unit shares a common exhaust duct then each exhaust fan shall be equipped with a back-draft damper to prevent the recirculation of exhaust air from one room to another room via the exhaust ducting system.

403.8.6.4 Whole house exhaust and transfer fans. Exhaust fan construction and sizing shall meet the following criteria.

1. Exhaust and transfer fans shall be tested and rated in accordance with the airflow and sound rating procedures of the Home Ventilating Institute (HVI 915, HVI Loudness Testing and Rating Procedure, HVI 916, HVI Airflow Test Procedure, and HVI 920, HVI Product Performance Certification Procedure).
2. Installation of system or equipment shall be carried out in accordance with manufacturers' design requirements and installation instructions.
3. Fan airflow rating and duct system shall be designed and installed to deliver at least the outdoor airflow required by Table 403.3.1.1 or Table 403.8.1. The airflows required refer to the delivered airflow of the system as installed and tested using a flow hood, flow grid, or other airflow measurement device.

EXCEPTION: An airflow rating at a pressure of 0.25 in. w.g. may be used, provided the duct sizing meets the prescriptive requirements of Table 403.8.5.2.

403.8.6.5 Fan noise. Whole house exhaust and transfer fans located 4 feet or less from the interior grille shall have a sone rating of 1.0 or less measured at 0.10 inches water gauge. Manufacturer's noise ratings shall be determined as per HVI 915. Remotely mounted fans shall be acoustically isolated from the structural elements of the building and from attached ductwork using insulated flexible duct or other approved material.

403.8.7 Whole house ventilation integrated with forced-air systems. This section establishes minimum requirements for mechanical whole house ventilation systems using forced-air system fans.

403.8.7.1 Outdoor air. Forced-air system fan ventilation systems shall provide outdoor air through one of the following methods:

1. A dedicated outdoor air louver and outdoor air duct for each dwelling unit or sleeping unit shall supply outdoor air to the return side of the forced-air system fan; or

~~2. A central outdoor air delivery system that supplies multiple dwelling units or sleeping units shall supply outdoor air to the return side of the forced air system fan.~~

~~3. For interior adjoining spaces without outdoor air openings, one of the following two options shall be used to ventilate the interior adjoining space:~~

~~3.1. Provide a whole house transfer fan at the interior adjoining space sized to provide a minimum of the ventilation rate required per Section 403.8.5.1. The transfer fan shall circulate air between the interior room or space and the adjacent habitable space. The transfer fan may operate continuously or intermittently using controls per Section 403.8.2.~~

~~3.2. Provide a permanent opening to the interior adjoining space. Opening shall be unobstructed and shall have an area of not less than 8 percent of the floor area of the interior adjoining space, but not less than 25 square feet.~~

403.8.7.2 Whole house forced-air system. ~~Where outdoor air is provided to each habitable dwelling unit or sleeping unit by a forced-air system, the outdoor air duct shall be connected to the return air stream at a point within 4 feet upstream of the forced-air unit. It shall not be connected directly to the forced-air unit cabinet in order to prevent thermal shock to the heat exchanger. At a minimum, filtration of the outdoor air shall be provided at the forced-air unit. The filter shall be accessible for regular maintenance and replacement. The filter shall have a Minimum Efficiency Rating Value (MERV) of at least 6.~~

~~Each habitable space in the dwelling or sleeping unit shall be served by a forced-air system with outdoor air connection.~~

403.8.8 Whole house ventilation with supply fan systems. ~~This section establishes minimum requirements for mechanical whole house ventilation systems using supply fan systems.~~

403.8.8.1 Outdoor air. ~~Supply fan ventilation systems shall provide outdoor air through one of the following methods:~~

~~1. A dedicated outdoor air louver and outdoor air duct for each dwelling unit or sleeping unit shall supply outdoor air to a supply fan; or~~

~~2. A central outdoor air supply fan system shall distribute unconditioned or conditioned air to multiple dwelling units or sleeping units.~~

~~3. For interior adjoining spaces without outdoor air openings, one of the following two options shall be used to ventilate the interior adjoining space:~~

~~3.1. Provide a whole house transfer fan at the interior adjoining space sized to provide a minimum of the ventilation rate required per Section 403.8.5.1. The transfer fan shall circulate air between the interior room or space and the adjacent habitable space. The transfer fan may operate continuously or intermittently using controls per Section 403.8.2.~~

~~3.2. Provide a permanent opening to the interior adjoining space. Opening shall be unobstructed and shall have an area of not less than 8 percent of the floor area of the interior adjoining space, but not less than 25 square feet.~~

403.8.8.2 Whole house supply system. ~~Where outdoor air is provided to each habitable dwelling unit or sleeping unit by supply fan systems the outdoor air shall be filtered.~~

The system filter may be located at the intake device or inline with the fan. The filter shall be accessible for regular maintenance and replacement. The filter shall have a Minimum Efficiency Rating Value (MERV) of at least 6.

403.8.9 Whole house ventilation with heat recovery or energy recovery ventilation systems. This section establishes minimum requirements for mechanical whole house ventilation systems using heat recovery or energy recovery ventilation systems.

403.8.9.1 Outdoor air. Heat recovery or energy recovery ventilation systems shall provide outdoor air through one of the following methods:

1. A dedicated outdoor air louver and outdoor air duct for each dwelling unit or sleeping unit shall supply outdoor air to the heat recovery or energy recovery ventilator; or

2. A central outdoor air heat recovery or energy recovery unit shall distribute conditioned air to multiple dwelling units or sleeping units.

3. For interior adjoining spaces without outdoor air openings, one of the following two options shall be used to ventilate the interior adjoining space:

3.1. Provide a whole house transfer fan at the interior adjoining space sized to provide a minimum of the ventilation rate required per Section 403.8.5.1. The transfer fan shall circulate air between the interior room or space and the adjacent habitable space. The transfer fan may operate continuously or intermittently using controls per Section 403.8.2.

3.2. Provide a permanent opening to the interior adjoining space. Opening shall be unobstructed and shall have an area of not less than 8 percent of the floor area of the interior adjoining space, but not less than 25 square feet.

403.8.9.2 Whole house heat recovery ventilator system. Where outdoor air is provided to each habitable dwelling unit or sleeping unit by heat recovery or energy recovery ventilator the outdoor air shall be filtered. The filter shall be located on the upstream side of the heat exchanger in both the intake and exhaust airstreams with a Minimum Efficiency Rating Value (MERV) of at least 6. The system filter may be located at the intake device or inline with the fan. The filter shall be accessible for regular maintenance and replacement.

Each habitable space in the dwelling or sleeping unit shall be served by a heat recovery ventilator with outdoor air connection.

403.8.10 Local exhaust ventilation and whole house ventilation alternate performance or design requirements. In lieu of complying with Sections 403.8.4 or 403.8.5 compliance with the section shall be demonstrated through engineering calculations by an engineer licensed to practice in the state of Washington or by performance testing. Documentation of calculations or performance test results shall be submitted to and approved by the building official. Performance testing shall be conducted in accordance with approved test methods.

403.8.11 Alternate systems. When approved by the code official, systems designed in accordance with ASHRAE Standard 62.2 shall be permitted.) **403.4 Group R whole house mechanical ventilation system.** Each dwelling unit or sleeping unit shall be equipped with a whole house mechanical ventilation system that complies with Sections 403.4.1 through 403.4.6. Each dwelling unit or sleeping unit shall be equipped

with local exhaust complying with Section 403.4.7. All occupied spaces, including public corridors, other than the Group R dwelling units and/or sleeping units, that support these Group R occupancies shall meet the ventilation requirement of natural ventilation requirements of Section 402 or the mechanical ventilation requirements of Sections 403.1 through 403.3.

403.4.1 System design. The whole house ventilation system shall consist of one or more supply fans, one or more exhaust fans, or an ERV/HRV with integral fans; and the associated ducts and controls. Local exhaust fans shall be permitted to serve as part of the whole house ventilation system when provided with the proper controls in accordance with Section 403.4.5. The systems shall be designed and installed to supply and exhaust the minimum outdoor airflow rates per Section 403.4.2 as corrected by the balanced and/or distributed whole house ventilation system coefficients in accordance with Section 403.4.3 where applicable.

Table 403.4.2
WHOLE HOUSE MECHANICAL VENTILATION AIRFLOW RATE
(CONTINUOUSLY OPERATING SYSTEMS)

Floor Area (ft ²)	Bedrooms ¹				
	1	2	3	4	≥5
<500	30	30	35	45	50
500 - 1000	30	35	40	50	55
1001 - 1500	30	40	45	55	60
1501 - 2000	35	45	50	60	65
2001 - 2500	40	50	55	65	70
2501 - 3000	45	55	60	70	75
3001 - 3500	50	60	65	75	80
3501 - 4000	55	65	70	80	85
4001 - 4500	60	70	75	85	90
4501 - 5000	65	75	80	90	95

¹ Minimum airflow (Q_r) is set at not less than 30 cfm for each dwelling units.

403.4.2 Whole house mechanical ventilation rates. The sleeping unit whole house mechanical ventilation minimum outdoor airflow rate shall be determined in accordance with the breathing zone ventilation rates minimum outdoor airflow rate shall be determined in accordance with the breathing zone ventilation rates requirements of Section 403.3.1.1.1.2 using Equation 4-2. The dwelling unit whole house mechanical ventilation minimum outdoor airflow rate shall be determined in accordance with Equation 4-10 or Table 403.4.2.

$$Q_r = 0.01 * A_{\text{floor}} + 7.5 * (N_{\text{br}} + 1) \quad \text{(Equation 4-10)}$$

where:

Q_r = Ventilation airflow rate, cubic feet per minute (cfm) but not less than 30 cfm for each dwelling unit.

A_{floor} = Conditioned floor area, square feet (ft²)

N_{br} = Number of bedrooms, not less than one.

Table 403.4.3
SYSTEM COEFFICIENT (C_{system})

<u>System Type</u>	<u>Distributed</u>	<u>Not Distributed</u>
<u>Balanced</u>	<u>1.0</u>	<u>1.25</u>
<u>Not Balanced</u>	<u>1.25</u>	<u>1.5</u>

403.4.3 Ventilation quality adjustment. The minimum whole house ventilation rate from Section 403.4.2 shall be adjusted by the system coefficient in Table 403.4.3 based on the system type not meeting the definition of a balanced whole house ventilation system and/or not meeting the definition of a distributed whole house ventilation system.

$$Q_v = Q_r * C_{\text{system}} \quad \text{(Equation 4-11)}$$

where:

Q_v = Quality-adjusted ventilation airflow rate in cubic feet per minute (cfm)

Q_r = Ventilation airflow rate, cubic feet per minute (cfm) from Equation 4-10 or Table 403.4.1

C_{system} = System coefficient from Table 403.4.3

403.4.4 Whole house ventilation residential occupancies. Residential dwelling and sleeping unit whole house ventilation systems shall meet the requirements of Sections 403.4.4.1 or 403.4.4.2 depending on the occupancy of the residential unit.

403.4.4.1 Whole house ventilation in Group R-2 occupancies. Residential dwelling and sleeping units in Group R-2 occupancies system shall include supply and exhaust fans and be a balanced whole house ventilation system in accordance with Section 403.4.6.3. The system shall include a heat or energy recovery ventilator with a sensible heat recovery effectiveness as prescribed in Section C403.3.6 of the *Washington State Energy Code*. The whole house ventilation system shall operate continuously at the minimum ventilation rate determined in accordance with Section 403.4. The whole house supply fan shall provide ducted outdoor ventilation air to each habitable space within the residential unit.

403.4.4.2 Whole house ventilation for other than Group R-2 occupancies. Residential dwelling and sleeping units in other than Group R-2 occupancies, including I-1 condition 2 occupancies, shall have a whole house mechanical ventilation system with supply and exhaust fans in accordance with Section 403.4.6.1, 403.4.6.2, 403.4.6.3, or 403.4.6.4. The whole house ventilation system shall operate continuously at the minimum ventilation rate determined in accordance with Section 403.4.2 unless configured with intermittent off controls in accordance with Section 403.4.6.5. The whole house supply fan shall provide ducted outdoor ventilation air to each habitable space within the residential unit.

403.4.6 Whole house ventilation system component requirements. Whole house ventilation supply and exhaust fans specified in this section shall have a minimum efficacy as prescribed in the *Washington State Energy Code*. The fans shall be rated for sound at a maximum of 1.0 sone at design airflow and static pressure conditions. Design and installation of the system or equipment shall be carried out in accordance with manufacturer's installation instructions.

EXCEPTIONS: 1. Central supply or exhaust fans serving multiple residential units do not need to comply with the maximum fan sone requirements.
2. Interior joining spaces provided with a 30 cfm transfer fan or a 25 square foot permanent opening do not require supply ventilation air directly to the space. Transfer fans shall meet the sone rating above and have whole house ventilation controls in accordance with Section 403.4.5.

403.4.6.1 Exhaust fans. Exhaust fans required shall be ducted directly to the outside in accordance with Section 501.3. Exhaust air outlets shall be designed to limit the pressure difference to the outside to limiting the outlet free area maximum velocity to 500 feet per minute and equipped with backdraft dampers or motorized dampers in accordance with *Washington State Energy Code*. Exhaust fans shall be tested and rated in accordance with HVI 915, HVI 916, and HVI 920. Exhaust fans required in this section may be used to provide local ventilation. Exhaust fans that are designed for intermittent exhaust airflow rates higher than the continuous exhaust airflow rates in Table 403.4.3 shall be provided with occupancy sensors or humidity sensors to automatically override the fan to the high speed airflow rate. The exhaust fans shall be tested and the testing results shall be submitted and posted in accordance with Section 403.4.6.7.

EXCEPTION: Central exhaust fans serving multiple residential units do not need to comply with the HVI testing requirements.

403.4.6.2 Supply fans. Supply fans used in meeting the requirements of this section shall supply outdoor air from intake openings in accordance with Sections 401.4 and 401.5. Intake air openings shall be designed to limit the pressure difference to the outside to limiting the inlet free area maximum velocity to 500 feet per minute and when designed for intermittent off operation shall be equipped with motorized dampers in accordance with the *Washington State Energy Code*. Supply fans shall be tested and rated in accordance with HVI 915, HVI 916, and HVI 920. Where outdoor air is provided to each habitable dwelling unit or sleeping unit by supply fan systems the outdoor air shall be filtered. The filter shall be provided with access for regular maintenance and replacement. The filter shall have a Minimum Efficiency Rating Value (MERV) of at least 8.

EXCEPTION: Central supply fans serving multiple residential units do not need to comply with the HVI testing requirements.

403.4.6.3 Balanced whole house ventilation system. A balanced whole house ventilation system shall include both supply and exhaust fans. The supply and exhaust fans shall have airflow that is within 10 percent of each other. The tested and balanced total mechanical exhaust airflow rate is within 10 percent or 5 cfm, whichever is greater, of the total mechanical supply airflow rate. The flow rate test results shall be submitted and posted in accordance with Section 403.4.6.6. The exhaust fan shall meet the requirements of Section 403.4.6.2. The supply fan shall meet the requirements of Section 403.4.6.3. For R-2 dwelling and sleeping units, the system is required to have balanced whole house ventilation but is not required to have distributed whole house ventilation where the not distributed system coefficient from Table 403.4.2 is utilized to correct the whole house mechanical ventilation rate. The system shall be design and balanced to meet the pressure equalization requirements of Section 501.4. Intermittent dryer exhaust, intermittent range hood exhaust, and intermittent toilet room exhaust airflow rates above the residential dwelling or sleeping unit minimum ventilation rate are exempt from the balanced airflow calculation.

403.4.6.4 Furnace integrated supply. Systems using space condition heating and/or cooling air handler fans for outdoor air supply air distribution are not permitted.

EXCEPTION: Air handler fans shall be permitted that have multi-speed or variable speed supply airflow control capability with a low speed operation not greater than 25 percent of the rated supply air flow capacity during ventilation only operation. Outdoor air intake openings must meet the provisions of Sections 401.4 and 401.5 and must include a motorized damper that is activated by the whole house ventilation system controller. Intake air openings shall be designed to limit the pressure difference to the outside to limiting the inlet free area maximum velocity to 500 ft per min. The motorized damper must be controlled to maintain the outdoor airflow intake airflow within 10 percent of the whole house mechanical exhaust airflow rate. The supply air handler shall provide supply air to each habitable space in the residential unit. The whole house ventilation system shall include exhaust fans in accordance with Section 403.4.6.2 to meet the pressure equalization requirements of Section 501.4. The flow rate for the outdoor air intake must be tested and verified at the minimum ventilation fan speed and the maximum heating or cooling fan speed. The results of the test shall be submitted and posted in accordance with Section 403.4.6.6.

403.4.6.5 Intermittent off operation. Whole house mechanical ventilation systems shall be provided with advanced controls that are configured to operate the system with intermittent off operation and shall operate for a least two hours in each four-hour segment. The whole house ventilation airflow rate determined in accordance with Section 403.4.2 as corrected by Section 403.4.3 shall be multiplied by the factor determined in accordance with Table 403.4.6.5.

Table 403.4.6.5
INTERMITTENT WHOLE HOUSE MECHANICAL VENTILATION RATE
FACTORS^{a, b}

Run-time Percentage in Each 4-hour Segment	50%	66%	75%	100%
Factor^a	<u>2</u>	<u>1.5</u>	<u>1.3</u>	<u>1.0</u>

^a For ventilation system run-time values between those given, the factors are permitted to be determined by interpolation.

^b Extrapolation beyond the table is prohibited.

403.4.6.6 Testing. Whole house mechanical ventilation systems shall be tested, balanced and verified to provide a flow rate not less than the minimum required by Sections 403.4.2 and 403.4.3. Testing shall be performed according to the ventilation equipment manufacturer's instructions, or by using a flow hood, flow grid, or other airflow measuring device at the mechanical ventilation fan's inlet terminals, outlet terminals or grilles or in the connected ventilation ducts. Where required by the building official, testing shall be conducted by an approved third party. A written report of the results of the test shall be signed by the party conducting the test and provided to the building official and shall be posted in the residential unit in accordance with Section 403.4.6.7.

403.4.6.7 Certificate. A permanent certificate shall be completed by the mechanical contractor, test and balance contractor or other approved party and posted on a wall in the space where the furnace is located, a utility room, or an approved location inside the building. When located on an electrical panel, the certificate shall not cover or obstruct the visibility of the circuit directory label, service disconnect label, or other required labels. The certificate shall list the flow rate determined from the delivered airflow of the whole house mechanical ventilation system as installed and the type of mechanical whole house ventilation system used to comply with Section 403.4.3.

403.4.7 Local exhaust. Bathrooms, toilet rooms and kitchens shall include a local exhaust system. Such local exhaust systems shall have the capacity to exhaust the minimum airflow rate in accordance with Table 403.4.7 and Table 403.3.1.1, including notes. Fans required by this section shall be provided with controls that enable manual over-

ride or automatic occupancy sensor, humidity sensor or pollutant sensor controls. An "on/off" switch shall meet this requirement for manual controls. Manual fan controls shall be provided with ready access in the room served by the fan.

Table 403.4.7
MINIMUM EXHAUST RATES

<u>Area to be exhausted</u>	<u>Exhaust Rate</u>	
	<u>Intermittent</u>	<u>Continuous</u>
<u>Kitchens</u>	<u>100 cfm</u>	<u>30 cfm</u>
<u>Bathrooms - Toilet rooms</u>	<u>50 cfm</u>	<u>20 cfm</u>

403.4.7.1 Whole house exhaust controls. If the local exhaust fan is included in a whole house ventilation system in accordance with Section 403.4.6, the exhaust fan shall be controlled to operate as specified in Section 403.4.5.

403.4.7.2 Local exhaust fans. Exhaust fans shall meet the following criteria.

1. Exhaust fans shall be tested and rated in accordance with HVI 915, HVI 916, and HVI 920.

EXCEPTION: Where a range hood or down draft exhaust fan is used for local exhaust for a kitchen, the device is not required to be rated per these standards.

2. Fan airflow rating and duct system shall be designed and installed to deliver at least the exhaust airflow required by Table 403.4.4. The airflows required refer to the delivered airflow of the system as installed and tested using a flow hood, flow grid, or other airflow measurement device. Local exhaust systems shall be tested, balanced and verified to provide a flow rate not less than the minimum required by this section.

3. Design and installation of the system or equipment shall be carried out in accordance with manufacturers' installation instructions.

4. Fan airflow rating and duct system shall be designed and installed to deliver at least the exhaust airflow required by Table 403.4.3.

EXCEPTIONS: 1. An exhaust airflow rating at a pressure of 0.25 in. w.g. may be used, provided the duct sizing meets the prescriptive requirements of Table 403.4.7.2.

2. Where a range hood or down draft exhaust fan is used to satisfy the local ventilation requirements for kitchens, the range hood or down draft exhaust shall not be less than 100 cfm at 0.10 in. w.g.

Table 403.4.7.2
PRESCRIPTIVE EXHAUST DUCT SIZING

<u>Fan Tested cfm at 0.25 inches w.g.</u>	<u>Minimum Flex Diameter</u>	<u>Maximum Length in Feet</u>	<u>Minimum Smooth Diameter</u>	<u>Maximum Length in Feet</u>	<u>Maximum Elbows^a</u>
<u>50</u>	<u>4 inches</u>	<u>25</u>	<u>4 inches</u>	<u>70</u>	<u>3</u>
<u>50</u>	<u>5 inches</u>	<u>90</u>	<u>5 inches</u>	<u>100</u>	<u>3</u>
<u>50</u>	<u>6 inches</u>	<u>No Limit</u>	<u>6 inches</u>	<u>No Limit</u>	<u>3</u>
<u>80</u>	<u>4 inches^b</u>	<u>NA</u>	<u>4 inches</u>	<u>20</u>	<u>3</u>
<u>80</u>	<u>5 inches</u>	<u>15</u>	<u>5 inches</u>	<u>100</u>	<u>3</u>
<u>80</u>	<u>6 inches</u>	<u>90</u>	<u>6 inches</u>	<u>No Limit</u>	<u>3</u>
<u>100</u>	<u>5 inches^b</u>	<u>NA</u>	<u>5 inches</u>	<u>50</u>	<u>3</u>
<u>100</u>	<u>6 inches</u>	<u>45</u>	<u>6 inches</u>	<u>No Limit</u>	<u>3</u>
<u>125</u>	<u>6 inches</u>	<u>15</u>	<u>6 inches</u>	<u>No Limit</u>	<u>3</u>
<u>125</u>	<u>7 inches</u>	<u>70</u>	<u>7 inches</u>	<u>No Limit</u>	<u>3</u>

a. For each additional elbow, subtract 10 feet from length.

b. Flex ducts of this diameter are not permitted with fans of this size.

AMENDATORY SECTION (Amending WSR 13-04-053, filed 2/1/13, effective 7/1/13)

WAC 51-52-0501 Section 501—General.

501.3.1 Location of exhaust outlets. The termination point of exhaust outlets and ducts discharging to the outdoors shall be located with the following minimum distances:

1. **For ducts conveying explosive or flammable vapors, fumes or dusts:** 30 feet (9144 mm) from the property line; 10 feet (3048 mm) from operable openings into the building; 6 feet (1829 mm) from exterior walls and roofs; 30 feet (9144 mm) from combustible walls and operable openings into the building which are in the direction of the exhaust discharge; 10 feet (3048 mm) above adjoining grade.

2. **For other product-conveying outlets:** 10 feet (3048 mm) from property lines; 3 feet (914 mm) from exterior walls and roofs; 10 feet (3048 mm) from operable openings into the building; 10 feet (3048 mm) above adjoining grade.

3. **For environmental air exhaust other than enclosed parking garage and transformer vault exhaust:** 3 feet (914 mm) from property lines, 3 feet (914 mm) from operable openings into buildings for all occupancies other than Group U, and 10 feet (3048 mm) from mechanical air intakes. Such exhaust shall not be considered hazardous or noxious.

EXCEPTIONS:

1. The separation between an air intake and exhaust outlet on a single listed package HVAC unit.
2. Exhaust from environmental air systems other than garages may be discharged into an open parking garage.
3. Except for Group I occupancies, where ventilation system design circumstances require building HVAC air to be relieved, such as during economizer operation, such air may be relieved into an open or enclosed parking garage within the same building.

4. Exhaust outlets serving structures in flood hazard areas shall be installed at or above the elevation required by Section 1613 of the *International Building Code* for utilities and attendant equipment.

5. For enclosed parking garage exhaust system outlets and transformer vault exhaust system outlets: 10 feet (3048 mm) from property lines which separate one lot from another; 10 feet (3048 mm) from operable openings into buildings; (~~10 feet (3048 mm) above~~) 3 feet (914 mm) horizontally from, 10 feet above, or 10 feet below adjoining finished sidewalk.

6. For elevator machinery rooms in enclosed or open parking garages: Exhaust outlets may discharge air directly into the parking garage.

7. For specific systems see the following sections:

- 7.1. Clothes dryer exhaust, Section 504.4.
- 7.2. Kitchen hoods and other kitchen exhaust equipment, Sections 506.3.13, 506.4 and 506.5.
- 7.3. Dust stock and refuse conveying systems, Section 511.2.
- 7.4. Subslab soil exhaust systems, Section 512.4.
- 7.5. Smoke control systems, Section 513.10.3.
- 7.6. Refrigerant discharge, Section 1105.7.
- 7.7. Machinery room discharge, Section 1105.6.1.

501.4 Pressure equalization. Mechanical exhaust systems shall be sized to remove the quantity of air required by this chapter to be exhausted. The system shall operate when air is required to be exhausted.

Where mechanical exhaust is required in a room or space, such space shall be maintained with a neutral or negative pressure. If a greater quantity of air is supplied by a mechanical ventilating supply system than is removed by a mechanical exhaust for a room, adequate means shall be provided for the natural or mechanical exhaust of the excess air supplied. If only a mechanical exhaust system is installed for a room or if a greater quantity of air is removed by a mechanical exhaust system than is supplied by a mechanical ventilating supply system for a room, adequate makeup air consisting of supply air, transfer air or outdoor air shall be provided to satisfy the deficiency. The calculated building infiltration rate shall not be used to satisfy the requirements of this section.

EXCEPTION: Intermittent domestic range exhaust, intermittent domestic dryer exhaust, and intermittent local exhaust systems in R-3 occupancies and dwelling units in R-2 occupancies are excluded from the pressure equalization requirement unless required by Section ((504.5)) 504 or Section ((505.2)) 505.

AMENDATORY SECTION (Amending WSR 16-01-148, filed 12/21/15, effective 7/1/16)

WAC 51-52-0506 Section 506—Commercial kitchen hood ventilation system ducts and exhaust equipment.

506.3.2.4 Vibration isolation. A vibration isolation connector for connecting a duct to a fan shall consist of noncombustible packing in a metal sleeve joint of approved design or shall be a coated-fabric flexible duct connector rated for continuous duty at temperature of not less than 1500°F (816°C). Vibration isolation connectors shall be installed only at the connection of a duct to a fan inlet or outlet.

506.3.9 Grease duct cleanout location, spacing and installation.

506.3.9.1 Grease duct horizontal cleanout. Cleanouts located on horizontal sections of ducts shall:

1. Be spaced not more than 20 feet (6096 mm) apart.
2. Be located not more than 10 feet (3048 mm) from changes in direction that are greater than 45 degrees (0.79 rad).
3. Be located on the bottom only where other locations are not available and shall be provided with internal damming of the opening such that grease will flow past the opening without pooling. Bottom cleanouts and openings shall be approved for the application and installed liquid-tight.
4. Not be closer than 1 inch (25.4 mm) from the edges of the duct.
5. Have dimensions of not less than 12 inches by 12 inches (305 mm by 305 mm). Where such dimensions preclude installation, the openings shall be not less than 12 inches (305 mm) on one side and shall be large enough to provide access for cleaning and maintenance.
6. Shall be located at grease reservoirs.

506.3.9.2 Grease duct vertical cleanouts. Where ducts pass vertically through floors, cleanouts shall be provided. A minimum of one cleanout shall be provided on each floor. Cleanout openings shall be not less than 1 1/2 inches (38 mm) from all outside edges of the duct or welded seams.

506.3.11 Grease duct enclosures. A commercial kitchen grease duct serving a Type I hood that penetrates a ceiling, wall, floor or any

concealed spaces shall be enclosed from the point of penetration to the outlet terminal. In-line exhaust fans not located outdoors shall be enclosed as required for grease ducts. A duct shall penetrate exterior walls only at locations where unprotected openings are permitted by the *International Building Code*. The duct enclosure shall serve a single grease duct and shall not contain other ducts, piping or wiring systems. Duct enclosures shall be a shaft enclosure in accordance with Section 506.3.11.1, a field-applied enclosure assembly in accordance with Section 506.3.11.2 or a factory-built enclosure assembly in accordance with Section 506.3.11.3. Duct enclosures shall have a fire-resistance rating of not less than that of the assembly penetrated. The duct enclosure need not exceed 2 hours but shall not be less than 1 hour. Fire dampers and smoke dampers shall not be installed in grease ducts.

EXCEPTION: A duct enclosure shall not be required for a grease duct that penetrates only a nonfire-resistance-rated roof/ceiling assembly.

AMENDATORY SECTION (Amending WSR 16-01-148, filed 12/21/15, effective 7/1/16)

WAC 51-52-0515 Section 515—Waste or linen chute venting.

515.1 General. Waste or linen chutes shall be gravity vented per NFPA 82.

EXCEPTION: Waste or linen chutes may be mechanically ventilated by an exhaust fan. The exhaust fan (~~shall be located outside the building at the top of the chute~~) in accordance with *International Building Code* Section 713.13.7.

AMENDATORY SECTION (Amending WSR 16-01-148, filed 12/21/15, effective 7/1/16)

WAC 51-52-0601 Section 601—General.

601.2 Air movement in egress elements. Corridors shall not serve as supply, return, exhaust, relief or ventilation air ducts.

EXCEPTIONS:

1. Use of a corridor as a source of makeup air for exhaust systems in rooms that open directly onto such corridors, including toilet rooms, bathrooms, dressing rooms, smoking lounges and janitor closets, shall be permitted provided that each such corridor is directly supplied with *outdoor air* at a rate greater than the rate of makeup air taken from the corridor.
2. Where located within a dwelling unit, the use of corridors for conveying return air shall not be prohibited.
3. Where located within tenant spaces of one thousand square feet (93 m²) or less in area, utilization of corridors for conveying return air is permitted.
4. Incidental air movement from pressurized rooms within health care facilities, provided that the corridor is not the primary source of supply or return to the room.
5. Where such air is part of an engineered smoke control system.
6. Air supplied to corridors serving residential occupancies shall not be considered as providing ventilation air to the dwelling units and sleeping units subject to the following:
 - 6.1 The air supplied to the corridor is one hundred percent outside air; and
 - 6.2 The units served by the corridor have conforming ventilation air independent of the air supplied to the corridor; and
 - 6.3 For other than high-rise buildings, the supply fan will automatically shut off upon activation of corridor smoke detectors (~~which shall be spaced at no more than thirty feet (9,144 mm) on-center along the corridor~~) installed in accordance with Section 606.2.4; or
 - 6.4 For high-rise buildings, (~~corridor smoke detector activation will close required smoke/fire dampers at the supply inlet to the corridor at the floor receiving the alarm.~~) the supply fan will automatically shut off upon activation of the smoke detectors required by *International Fire Code* Section 907.2.12.1 or upon receipt of another approved fire alarm signal. The supply fan is not required to be automatically shut off when used as part of an approved building stairwell or elevator hoistway pressurization system. Corridor smoke detectors shall be installed in accordance with Section 606.2.5.

606.2.4 Corridors serving Group R occupancies in other than high-rise buildings. Corridors that serve Group R occupancies in other than high-rise buildings and that are mechanically ventilated with supply air shall be equipped with smoke detectors spaced in accordance with

NFPA 72. The supply fan shall automatically shut off upon activation of the corridor smoke detectors.

EXCEPTION: Corridor smoke detection is not required when air is returned back to the supply fan from the corridor and return air smoke detectors are installed in the return air duct or plenum upstream of any filters, exhaust air connections, outdoor air connections, or decontamination equipment and appliances designed to automatically shut off the supply fan.

606.2.5 Corridors serving Group R occupancies in high-rise buildings.
Corridors that serve Group R occupancies in high-rise buildings and that are mechanically ventilated with supply air shall be equipped with smoke detectors that are spaced in accordance with NFPA 72 and air supply inlets to the corridor shall be provided with smoke/fire dampers. The supply inlet smoke/fire dampers shall automatically close upon activation of the corridor smoke detectors.

EXCEPTIONS: 1. Corridor smoke detection is not required to close the supply inlet smoke/fire dampers when the smoke/fire dampers are used as part of an approved building stairwell or elevator hoistway pressurization smoke control system.
2. Corridor smoke detection is not required when air is returned back to the supply fan from the corridor and return air smoke detectors are installed in the return air duct or plenum upstream of any filters, exhaust air connections, outdoor air connections, or decontamination equipment and appliances designed to automatically shut off the supply fan.

AMENDATORY SECTION (Amending WSR 16-01-148, filed 12/21/15, effective 7/1/16)

WAC 51-52-0605 Section 605—Air filters.

605.1 General. Heating and air-conditioning systems shall be provided with approved air filters. Filters shall be installed such that all return air, outdoor air and makeup air is filtered upstream from any heat exchanger or coil. Filters shall be installed in an approved convenient location. Liquid adhesive coatings used on filters shall have a flash point not lower than 325°F (163°C).

EXCEPTION: ((Chilled beams that are designed to operate above the space dew point temperature)) Cooling coils that are designed, controlled and operated to provide sensible cooling only do not require filtration at the terminal device.

605.4 Particulate matter removal. Particulate matter filters or air cleaners having a minimum efficiency reporting value (MERV) of not less than 6 for ducted air handlers and not less than 4 for ductless mini-split systems shall be provided upstream of all cooling coils or other devices with wetted surfaces through which air is supplied to an occupiable space.

AMENDATORY SECTION (Amending WSR 16-01-148, filed 12/21/15, effective 7/1/16)

WAC 51-52-0928 ((Section 928—Evaporative cooling equipment.))
Reserved.

NEW SECTION

WAC 51-52-1105 Section 1105—Machinery room, general requirements.

1105.6.3 Ventilation rate. For other than ammonia systems, the mechanical ventilation systems shall be capable of exhausting the minimum quantity of air both at normal operating and emergency conditions, as required by Sections 1105.6.3.1 and 1105.6.3.2. The minimum required emergency ventilation rate for ammonia shall be 30 air changes per hour and the room conditions shall be in accordance with IIAR2. Multiple fans or multispeed fans shall be allowed to produce the emergency ventilation rate and to obtain a reduced airflow for normal ventilation.

NEW SECTION

WAC 51-52-1106 Section 1106—Machinery room, special requirements.

1106.5.2 Emergency ventilation system. An emergency ventilation system shall be provided at the minimum exhaust rate specified in ASHRAE 15 or Table 1106.5.2. Shutdown of the emergency ventilation system shall be by manual means.

Table 1106.5.2
MINIMUM EXHAUST RATES

Refrigerant	Q(m/sec)	Q(cfm)
R32	15.4	32,600
R143A	13.6	28,700
R444A	6.46	13,700
R444B	10.6	22,400
R445A	7.83	16,600
R446A	23.9	50,700
R447A	23.8	50,400
R451A	7.04	15,000
R451B	7.05	15,000
R1234yf	7.80	16,600
R1234ze(E)	5.92	12,600

AMENDATORY SECTION (Amending WSR 16-01-148, filed 12/21/15, effective 7/1/16)

WAC 51-52-1107 Section 1107—(~~Refrigerant piping~~) Reserved.

~~(1107.2 Piping location.~~ Refrigerant piping that crosses an open space that affords passageway in any building shall be not less than 7 feet 3 inches (2210 mm) above the floor unless the piping is located against the ceiling of such space. Refrigerant piping shall not be placed in any of the following:

- ~~1. A fire-resistance-rated exit access corridor.~~
- ~~2. An interior exit stairway.~~
- ~~3. An interior exit ramp.~~
- ~~4. An exit passageway.~~

- ~~5. An elevator, dumbwaiter, or other shaft containing a moving object.~~
- ~~6. A shaft that has one or more openings into a fire-resistance-rated exit access corridor, interior exit stairway or ramp, or exit passageway.)~~

AMENDATORY SECTION (Amending WSR 16-01-148, filed 12/21/15, effective 7/1/16)

WAC 51-52-1200 Chapter 12—Hydronic piping.

1209.5 Thermal barrier required. Radiant floor heating and snow melt systems shall be provided with a thermal barrier in accordance with Sections 1209.5.1 through 1209.5.4. Concrete slab-on-grade, asphalt and paver-system type pavements shall have a minimum of R-10 insulation installed under the area to be snow melted, or R-5 insulation shall be installed under and at the slab edges of the area to be snow melted. The insulation shall be located underneath the snow and ice melt hydronic piping or cable and along all edges of the pavement where the snow and ice melt system is installed in accordance with the snow and ice melt manufacturer's instructions.

1209.5.1 Slab-on-grade installation. Radiant piping utilized in slab-on-grade applications shall be provided with insulating materials installed beneath the piping as required by the *Washington State Energy Code*.

1210.7.6 Expansion tanks. Shutoff valves shall be installed at connections to expansion tanks. A method of draining the expansion tank downstream of the shutoff valve shall be provided.

NEW SECTION

WAC 51-52-1400 Chapter 14—Solar thermal systems.

1402.8.1.2 Rooftop-mounted solar thermal collectors and systems. The roof shall be constructed to support the loads imposed by roof-mounted solar collectors. Where mounted on or above the roof covering, the collector array, mounting systems and their attachments to the roof shall be constructed of noncombustible materials or fire-retardant-treated wood conforming to the *International Building Code* to the extent required for the type of roof construction of the building to which the collectors are accessory.

AMENDATORY SECTION (Amending WSR 16-01-148, filed 12/21/15, effective 7/1/16)

WAC 51-52-1500 Chapter 15—Referenced standards. The following referenced standards are added to Chapter 15.

ASHRAE

((62.2-2013)) 15-2019 Safety standards for refrigeration systems and designation and classification of refrigerants.

62.2-2016 Ventilation and Acceptable Indoor Air Quality in Low-Rise Residential Buildings. 403.4.11

HVI address:

Home Ventilating Institute
1740 Dell Range Blvd., Suite H, PMB 450
Cheyenne, WY 82009

HVI 915-2015 Procedure for Loudness Testing of Residential Fan Products. 403.4.6.1, 403.4.6.2, 403.4.7.2

HVI 916-2015 Air Flow Test Procedure. 403.4.6.1, 403.4.6.2, 403.4.7.2

HVI 920-2015 Product Performance Certification Procedure Including Verification and Challenge. 403.4.6.1, 403.4.6.2, 403.4.7.2

AMENDATORY SECTION (Amending WSR 16-01-148, filed 12/21/15, effective 7/1/16)

WAC 51-52-21401 ((Chapter 4 Gas piping installations.)) Reserved.

AMENDATORY SECTION (Amending WSR 16-01-148, filed 12/21/15, effective 7/1/16)

WAC 51-52-21601 ((Chapter 6 Specific appliances.)) Reserved.

AMENDATORY SECTION (Amending WSR 07-01-092, filed 12/19/06, effective 7/1/07)

WAC 51-52-22006 ((Chapter 6 Gas piping installation.)) Reserved.