# Chapter 51-52 WAC

# STATE BUILDING CODE ADOPTION AND AMENDMENT OF THE ((2009)) 2012 EDITION OF THE INTERNATIONAL MECHANICAL CODE

<u>AMENDATORY SECTION</u> (Amending WSR 10-03-099, filed 1/20/10, effective 7/1/10)

WAC 51-52-003 International Mechanical Code. The ((2009)) 2012 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).

<u>AMENDATORY SECTION</u> (Amending WSR 04-01-104, filed 12/17/03, effective 7/1/04)

WAC 51-52-004 Conflict between International Mechanical Code and State Energy Code chapter  $51-11\underline{C}$  WAC. In the case of conflict between the duct sealing or insulation requirements of Section 603 or Section 604 of this code and the duct sealing or insulation requirements of chapter  $51-11\underline{C}$  WAC, the Washington State Energy Code, or where applicable, a local jurisdiction's energy code, the provisions of such energy codes shall govern.

<u>AMENDATORY SECTION</u> (Amending WSR 10-03-099, filed 1/20/10, effective 7/1/10)

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, ((2010)) 2013.

<u>AMENDATORY SECTION</u> (Amending WSR 10-03-099, filed 1/20/10, effective 7/1/10)

### 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*.

#### **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 ((2008)) 2011 Edition of NFPA 58 (Liquefied Petroleum Gas Code) and the ((2009)) 2012 Edition of ANSI Z223.1/NFPA 54 (National Fuel Gas Code).

# NEW SECTION

# WAC 51-52-0102 Section 102--Applicability.

102.4 Additions, alterations or repairs. Additions, alterations, renovations or repairs to a mechanical system shall conform to that required for a new mechanical system without requiring the existing mechanical system to comply with all of the requirements of this code. Additions, alterations or repairs shall not cause an existing mechanical system to become unsafe, hazardous or overloaded.

Minor additions, alterations, renovations and repairs to existing mechanical systems shall meet the provisions for new construction, unless such work is done in the same manner and arrangement as was in the existing system, is not hazardous and is approved.

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.

<u>AMENDATORY SECTION</u> (Amending WSR 10-03-099, filed 1/20/10, effective 7/1/10)

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

((source specific ventilation. A mechanical ventilation system including all fans, controls, and ducting, which is dedicated to exhausting contaminant-laden air to the exterior of the building from the room or space in which the contaminant is generated.

unusually Tight construction. Construction meeting the following
requirements:

- 1. Walls exposed to the outdoor atmosphere having a continuous water vapor retarder with a rating of 1 perm (57 ng/s·m²·Pa) or less with openings gasketed or sealed; and
- 2. Operable windows and doors meeting the air leakage requirements of the *International Energy Conservation Code*, Section 502.1.4; and
- 3. Caulking or sealants are applied to areas such as joints around window and door frames, between sole plates and floors, between wall-ceiling joints, between wall panels, at penetrations for plumbing, electrical and gas lines, and at other openings; or
- 4. Buildings built in compliance with the 1986 or later editions of the Washington State Energy Code, chapter 51-11 WAC, Northwest Energy Code, or Super Good Cents weatherization standards or equivalent.)) LOCAL EXHAUST. An exhaust system that uses one or more fans to exhaust air from a specific room or rooms within a dwelling.

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.

### NEW SECTION

# WAC 51-52-0301 Section 301--General.

**301.3 Identification.** Each length of pipe and tubing and each pipe fitting utilized in a mechanical system shall bear the identification of the manufacturer.

EXCEPTION: The manufacturer identification for fittings and pipe nipples shall be on each piece or shall be printed on the fitting or nipple packaging or provided documentation.

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

306.5 Equipment and appliances on roofs or elevated structures. Where equipment requiring access ((and)) or appliances are ((installed on roofs or elevated structures at a height exceeding)) 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, ((such access shall be provided by a permanent approved means of access, the extent of which shall be from grade or floor level to the equipment and appliances' level service space)) an interior or exterior means of access shall be provided. Such access shall not require climbing over obstructions greater than 30 inches (762 mm) ((high)) 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.

- $\underline{9.}$  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.

## NEW SECTION

# WAC 51-52-0307 Section 307--Condensate disposal.

- **307.2.3 Auxiliary and secondary drain systems.** In addition to the requirements of Section 307.2.1, where damage to any building components could occur as a result of overflow from the *equipment* primary condensate removal system, one of the following auxiliary protection methods shall be provided for each cooling coil or fuelfired *appliance* that produces condensate:
- 1. An auxiliary drain pan with a separate drain shall be provided under the coils on which condensation will occur. The auxiliary pan drain shall discharge to a conspicuous point of disposal to alert occupants in the event of a stoppage of the primary drain. The pan shall have a minimum depth of 1 1/2 inches (38 mm), shall not be less than 3 inches (76 mm) larger than the unit or the coil dimensions in width and length and shall be constructed of corrosion-resistant material. Galvanized sheet steel pans shall have a minimum thickness of not less than 0.0236 inch (0.6010 mm) (No. 24 gage). Nonmetallic pans shall have a minimum thickness of not less than 0.0625 inch (1.6 mm).
- 2. A separate overflow drain line shall be connected to the drain pan provided with the equipment. Such overflow drain shall discharge to a conspicuous point of disposal to alert occupants in the event of a stoppage of the primary drain. The overflow drain line shall connect to the drain pan at a higher level than the primary drain connection.
- 3. An auxiliary drain pan without a separate drain line shall be provided under the coils on which condensate will occur. Such pan shall be equipped with a water-level detection device conforming to UL 508 that will shut off the equipment served prior to overflow of the pan. The auxiliary drain pan shall be constructed in accordance with Item 1 of this section.
- 4. A water-level detection device conforming to UL 508 shall be provided that will shut off the equipment served in the event that the primary drain is blocked. The device shall be installed in the primary drain line, the overflow drain line, or in the equipment-supplied drain pan, located at a point higher than the

primary drain line connection and below the overflow rim of such pan.

EXCEPTIONS:

- 1. Fuel-fired appliances that automatically shut down operation in the event of a stoppage in the condensate drainage system.
- 2. Unducted fan coil units where there is no factory option available for water-level detection devices and which are installed directly within the occupied space.

AMENDATORY SECTION (Amending WSR 12-07-020, filed 3/12/12, effective 4/12/12)

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

**403.2 Outdoor air required.** The minimum ventilation rate of outdoor air 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, 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.

(Item 4 is not adopted.)

403.3 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. 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. Ventilation rates for occupancies not represented in Table 403.3 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 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 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 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 estimated maximum occupancy rates.

Table 403.3 REQUIRED OUTDOOR VENTILATION AIR

(( <del>Occupancy Classification</del>	People Outdoor Airflow Rate in Breathing Zone cfm/Person	Area Outdoor Airflow Rate in Breathing Zone R <sub>a</sub> cfm/ft <sup>2a</sup>	Default Occupant Density #/1000 ft <sup>2a</sup>	Exhaust Airflow Rate efm/ft²
Correctional facilities				
<del>Cells</del>				
without plumbing fixtures	<del>5</del>	<del>0.12</del>	<del>25</del>	<del>-</del>
with plumbing fixtures	<del>5</del>	<del>0.12</del>	<del>25</del>	<del>1.0</del>
Dining halls (see food and beverage service)	<del></del>	<del>-</del>	<del>-</del>	<del>-</del>
Guard stations	<del>5</del>	<del>0.06</del>	<del>15</del>	<del></del>
<del>Day room</del>	<del>5</del>	<del>0.06</del>	<del>30</del>	<del></del>
Booking/waiting	<del>7.5</del>	<del>0.06</del>	<del>50</del>	<del></del>
Dry cleaners, laundries				
Coin-operated dry eleaner	<del>15</del>	<del>-</del>	<del>20</del>	<del></del>
Coin-operated laundries	<del>7.5</del>	<del>0.06</del>	<del>20</del>	<del></del>
Commercial dry eleaner	<del>30</del>	-	<del>30</del>	<del></del>
Commercial laundry	<del>25</del>	<del>-</del>	<del>10</del>	
Storage, pick up	<del>7.5</del>	<del>0.12</del>	<del>30</del>	<del></del>
<b>Education</b>				
Art classroom	<del>10</del>	0.18	<del>20</del>	<del>0.7</del>
<del>Auditoriums</del>	<del>5</del>	<del>0.06</del>	<del>150</del>	<del></del>
Classrooms (ages 5-8)	<del>10</del>	<del>0.12</del>	<del>25</del>	<del></del>
Classrooms (ages 9 plus)	<del>10</del>	<del>0.12</del>	<del>35</del>	<del></del>
Computer lab	<del>10</del>	<del>0.12</del>	<del>25</del>	<del></del>
Corridors (see public spaces)	<del>-</del>	<del>-</del>	<del>-</del>	<del></del>
Day care (through age 4)	<del>10</del>	0.18	<del>25</del>	<del></del>
Lecture classroom	<del>7.5</del>	<del>0.06</del>	<del>65</del>	<del></del>
Lecture hall (fixed seats)	<del>7.5</del>	<del>0.06</del>	<del>150</del>	<del></del>
Locker/dressing room	=	=	=	<del>0.25</del>
Media center	<del>10</del>	<del>0.12</del>	<del>25</del>	<del></del>
Multiuse assembly	<del>7.5</del>	<del>0.06</del>	<del>100</del>	<del></del>
Music/theater/dance	<del>10</del>	<del>0.06</del>	<del>35</del>	<del></del>
Science laboratories	<del>10</del>	0.18	<del>25</del>	<del>1.0</del>
Smoking lounges <sup>b</sup>	<del>60</del>	<del>-</del>	<del>70</del>	<del></del>
Sports locker rooms	<del>-</del>	<del>-</del>	<del>-</del>	<del>0.5</del>
Wood/metal shops	<del>10</del>	0.18	<del>20</del>	<del>0.5</del>
Food and beverage service				
Bars, cocktail lounges	<del>7.5</del>	0.18	<del>100</del>	<del>-</del>
Cafeteria, fast food	<del>7.5</del>	0.18	<del>100</del>	<del></del>

((Occupancy Classification	People Outdoor Airflow Rate in Breathing Zone cfm/Person	Area Outdoor Airflow Rate in Breathing Zone R <sub>n</sub> cfm/ft <sup>2n</sup>	Default Occupant Density #/1000 ft <sup>2n</sup>	Exhaust Airflow Rate efm/ft <sup>2</sup>
Dining rooms	7.5	0.18	70	
	7.3			
Kitchens (cooking) <sup>b</sup>	-	<del></del>		<del>0.7</del>
Hospitals, nursing and convalescent homes				
				0.5
Autopsy rooms <sup>b</sup>	<del>-</del>	<del>-</del>	-	<del>0.5</del>
Medical procedure rooms	<del>15</del>	==	<del>20</del>	
Operating rooms	<del>30</del>	<del>-</del>	<del>20</del>	
Patient rooms	<del>25</del>		<del>10</del>	
Physical therapy	<del>15</del>	<del></del>	<del>20</del>	
Recovery and ICU	<del>15</del>	==	<del>20</del>	
Hotels, motels, resorts and				
<del>dormitories</del>				
Multipurpose assembly	<del>5</del>	<del>0.06</del>	<del>120</del>	<del></del>
Bathrooms/toilet private	-	-	<del></del>	<del>25/50</del> f
Bedroom/living room	<u>5</u>	<del>0.06</del>	10	
Conference/meeting	5	0.06	<del>50</del>	<u></u>
Dormitory sleeping areas	5 5	0.06	<del>20</del>	
	_			
Gambling casinos	<del>7.5</del>	0.18	<del>120</del>	
<del>Kitchens</del>	<del>-</del>	==	<del></del>	<del>25/100</del> f
Lobbies/prefunction	<del>7.5</del>	0.06	<del>30</del>	
<del>Offices</del>				
Conference rooms	<del>5</del>	<del>0.06</del>	<del>50</del>	
Office spaces	<del>5</del>	<del>0.06</del>	<del>5</del>	
Reception areas	<del>60</del>	<del>0.06</del>	<del>30</del>	
Telephone/data entry	<del>5</del>	<del>0.06</del>	<del>60</del>	
Main entry lobbies	5	0.06	<del>10</del>	<del></del>
Private dwellings, single and				
Garages, common for multiple units <sup>b</sup>	-	-	<del>-</del>	<del>0.75</del>
Garages, separate for each	-	-	<del>-</del>	100 efm per ca
Kitchens <sup>b</sup>	<del></del>			<del>25/100</del> f
Living areas <sup>e</sup>	See Tables 403.8.5.1 and	_	Based on the	23/100
	403.8.5.2		number of bedrooms. First bedrooms: 2; each additional bedroom, 1	
Toilet rooms, bathrooms and	<del>-</del>			<del>20/50</del> f
laundry areas <sup>t</sup>				
Public spaces				
Corridors	<del>-</del>	0.06	<del>-</del>	
Elevator car	<del></del>	<del></del>	<del></del>	<del>1.0</del>
Shower room (per shower head)	-	-	-	<del>50/20</del> f
Smoking lounges <sup>b</sup>	<del>60</del>	<del>-</del>	<del>70</del>	<del></del>
Toilet rooms - public	<del>-</del>	<del>-</del>	_	<del>50/70<sup>e</sup></del>
Places of religious worship	<del>5</del>	0.06	<del>120</del>	
Courtrooms	5	0.06 0.06	<del>70</del>	
				<del></del>
Legislative chambers	<del>5</del>	<del>0.06</del>	<del>50</del>	_
<del>Libraries</del>	<del>5</del>	0.12	10	<del></del>
Museums (children's)	<del>3</del> <del>7.5</del>	<del>0.12</del> <del>0.12</del>	40 40	

((Occupancy Classification	People Outdoor Airflow Rate in Breathing Zone cfm/Person	Area Outdoor Airflow Rate in Breathing Zone R <sub>n</sub> cfm/ft <sup>2n</sup>	Default Occupant Density #/1000 ft <sup>2n</sup>	Exhaust Airflow Rate efm/ft <sup>2</sup>
Museums/galleries	<del>7.5</del>	0.06	<del>40</del>	-
Retail stores, sales floors and showroom floors				
Sales (except as below)	<del>7.5</del>	<del>0.12</del>	<del>15</del>	
Dressing rooms	<del></del>	-		<del>0.25</del>
Mall common areas	<del>7.5</del>	<del>0.06</del>	<del>40</del>	
Shipping and receiving	=	<del>0.12</del>	<del></del>	==
Smoking lounges <sup>b</sup>	<del>60</del>	==	<del>70</del>	==
Storage rooms	=	<del>0.12</del>	<del></del>	==
Warehouses (see storage)	<del>-</del>	<del>-</del>	<del></del>	
Specialty shops				
Automotive motor-fuel- dispensing stations <sup>b</sup>	-	<del>-</del>	<del>-</del>	<del>1.5</del>
Barber	<del>7.5</del>	<del>0.06</del>	<del>25</del>	<del>0.5</del>
Beauty and nail salons b,h	<del>20</del>	<del>0.12</del>	<del>25</del>	<del>0.6</del>
Embalming room <sup>b</sup>		<del></del>		<del>2.0</del>
Pet shops (animal areas) <sup>b</sup>	<del>7.5</del>	0.18	<del>10</del>	0.9
Supermarkets	<del>7.5</del>	<del>0.06</del>	8	
Sports and amusement	,	0.00	Ü	
Disco/dance floors	<del>20</del>	<del>0.06</del>	<del>100</del>	
Bowling alleys (scating areas)	<del>10</del>	<del>0.12</del>	<del>40</del>	
Game areades	<del>7.5</del>	0.18	<del>20</del>	
Ice arenas, without	7.3	<del>0.30</del>		<del>0.5</del>
combustion engines				0.5
Gym, stadium arena (play area)	<del>-</del>	<del>0.30</del>	<del>-</del>	<del></del>
Spectator areas	7.5	<del>0.06</del>	<del>150</del>	=
Swimming pools (pool and deek area)	-	0.48	<del></del>	<del></del>
Health club/aerobies room	<del>20</del>	<del>0.06</del>	<del>40</del>	
Health club/weight room	<del>20</del>	<del>0.06</del>	<del>10</del>	
Storage				
Repair garages, enclosed parking garage b,d	<del>-</del>	<del>-</del>		<del>0.75</del>
Warehouses	-	<del>0.06</del>		
Theaters				
Auditoriums (see education)			<del>-</del>	
<del>Lobbies</del>	<del>5</del>	<del>0.06</del>	<del>150</del>	<del></del>
Stages, studios	<del>10</del>	0.06	<del>70</del>	-
Ticket booths	<del>5</del>	<del>0.06</del>	<del>60</del>	
<b>Transportation</b>				
<del>Platforms</del>	<del>7.5</del>	<del>0.06</del>	<del>100</del>	<del></del>
Transportation waiting	<del>7.5</del>	<del>0.06</del>	<del>100</del>	<del></del>
Workrooms				
Bank vaults/safe deposit	<del>5</del>	<del>0.06</del>	<del>5</del>	<del></del>
<del>Darkrooms</del>	<del></del>	<del>-</del>	-	1.0
Copy, printing rooms	<del>5</del>	<del>0.06</del>	4	<del>0.5</del>
Meat processing <sup>c</sup>	<del>15</del>	<del>-</del>	<del>10</del>	<del></del>
Pharmacy (prep area)	<del>5</del>	0.18	<del>10</del>	
Photo studios	<del>5</del>	<del>0.12</del>	<del>10</del>	
Computer (without printing)	<del>5</del>	<del>0.06</del>	4	<del></del> ))

OTS-4920.4

	Occupant Density #/1000	People Outdoor Airflow Rate in Breathing Zone R <sub>p</sub>	Area Outdoor Airflow Rate in Breathing Zone R <sub>a</sub>	Exhaust Airflow Rate
Occupancy Classification	<u>ft²a</u>	cfm/Person	$\frac{R_a}{cfm/ft^{2a}}$	cfm/ft <sup>2</sup>
Offices				
Conference rooms	<u>50</u>	<u>5</u>	<u>0.06</u>	<u></u>
Kitchenettes	=	=	<u>=</u>	0.30
Office spaces	<u>5</u>	<u>5</u>	<u>0.06</u>	=
Reception areas	<u>30</u>	<u>5</u>	0.06	=
Telephone/data entry	<u>60</u>	<u>5</u>	0.06	=
Main entry lobbies	<u>10</u>	<u>5</u>	0.06	<u></u>
Private dwellings, single and				
multiple				
Garages, common for multiple units <sup>b</sup>	=	=	=	<u>0.75</u>
Garages, separate for each dwelling <sup>b</sup>	=	==	=	100 cfm per car
Kitchens <sup>b</sup>	<u>=</u>	<u>=</u>	<u>=</u>	25/100 <sup>f</sup>
Living areas <sup>c</sup>	Based on the number of bedrooms. First bedroom, 2; each additional bedroom,	See Tables 403.8.1 and 403.8.5.1	=	=
Toilet rooms, bathrooms and laundry areas <sup>g, 1</sup>	<u>1</u> ==	11	11	<u>20/50<sup>f</sup></u>
Sports and amusement				
Disco/dance floors	<u>100</u>	<u>20</u>	0.06	=
Bowling alleys (seating areas)	<u>40</u>	<u>10</u>	<u>0.12</u>	=
Game arcades	<u>20</u>	<u>7.5</u>	0.18	==
Ice arenas, without combustion engines	=	三	0.30	<u>0.5</u>
Gym, stadium, arena (play area) <sup>j</sup>	==	=	0.30	==
Spectator areas	<u>150</u>	<u>7.5</u>	0.06	==
Swimming pools (pool and deck area)	=	二	0.48	=
Health club/aerobics room	<u>40</u>	<u>20</u>	<u>0.06</u>	==
Health club/weight room	<u>10</u>	<u>20</u>	0.06	<u>-</u>
Storage	<del></del>	<del></del>	<del></del>	
Janitor closets, trash rooms, recycling rooms	=	=	=	<u>1.0</u>
Repair garages, enclosed parking garage <sup>b, d</sup>	=	=	=	<u>0.75</u>
Storage rooms, chemical	<u>=</u>	=	<u>=</u>	<u>1.5</u>
Warehouses	<u>=</u>	<u>=</u>	0.06	=

- For SI: 1 cubic foot per minute =  $0.0004719 \text{ m}^3/\text{s}$ , 1 ton = 908 kg, 1 cubic foot per minutes per square foot =  $0.00508 \text{ m}^3/(\text{s} \bullet \text{m}^2)$ ,  $^{\circ}\text{C} = [(^{\circ}\text{F}) 32]/1.8$ , 1 square foot  $0.0929 \text{ m}^2$ .
  - a. Based upon  $net\ occupiable\ floor\ area.$
  - b. Mechanical exhaust required and the recirculation of air from such spaces is prohibited (see Section 403.2.1, Item 3).
  - c. Spaces unheated or maintained below  $50^{\circ}$ 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 ((periods of heavy use are expected to occur, such as toilets in theaters, schools and sports facilities)) the exhaust system is designed to operate intermittently. The lower rate shall be permitted ((where periods of heavy use are not expected.)) 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 <u>only</u> where the exhaust system is designed to operate continuously ((during normal hours of use)) while occupied.
  - g. ((Reserved.)) Mechanical exhaust is required and recirculation is prohibited.
  - h. For nail salons, ((the required exhaust shall include ventilation tables or other systems that capture the contaminants and odors at their source and are capable of exhausting a minimum of)) each nail station shall be provided with a source capture

- system capable of exhausting not less than 50 cfm per station.
- i. A laundry area within a kitchen or bathroom is not required to have ((source specific)) 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.
- 403.8 Ventilation systems for Group R occupancies. Each dwelling unit or ((guest room)) sleeping unit shall be equipped with ((source specific)) local exhaust and whole house ventilation systems and shall comply with Sections 403.8.1 through 403.8.11. All public corridors and other than Group R occupied spaces that support the Group R occupancy shall meet the ventilation requirements of Section 402 or Sections 403.1 to 403.7.
- **403.8.1 Minimum ventilation performance.** Ventilation systems shall be designed and installed to satisfy the ventilation requirements of Table 403.3 or Table 403.8.1. <u>Breathing zone ventilation rates from Table 403.3 shall be calculated per Section 403.3.1.1 and corrected per zone air distribution effectiveness requirements per Section 403.3.1.2.</u>

Table 403.8.1

VENTILATION RATES FOR ALL GROUP R PRIVATE DWELLINGS, SINGLE AND MULTIPLE

(CONTINUOUSLY OPERATING SYSTEMS)

Floor Area	Bedrooms <sup>1</sup>				
(ft <sup>2</sup> )	0-1	2-3	4-5	6-7	>7
<1500	30	45	60	75	90
1501 - 3000	45	60	75	90	105
3001 - 4500	60	75	90	105	120
4501 - 6000	75	90	105	120	135
6001 - 7500	90	105	120	135	150
>7500	105	120	135	150	165

<sup>1</sup>Ventilation 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. (( $\frac{\text{Source specific}}{\text{Source specific}}$ )) <u>Local exhaust</u> ventilation systems. (( $\frac{\text{Source specific}}{\text{Source specific}}$ )) <u>Local exhaust</u> 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. Exhaust fans, forced-air system fans, or supply fans shall be equipped with "fan on" as override controls. Controls shall be capable of operating the ventilation system without energizing other energy-consuming appliances. A 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 ((twelve)) 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.
- 403.8.4 ((Source specific)) Local exhaust ventilation requirements. ((Source specific)) Local exhaust ventilation systems shall exhaust at least the volume of air required for exhaust in Table 403.3. 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 ((Source specific))** <u>Local</u> **exhaust systems.** Exhaust systems shall be designed and installed to meet all of the criteria below:
- 1. ((Source specific)) <u>Local</u> exhaust shall be discharged outdoors.
  - 2. Exhaust outlets shall comply with Section ((501.2)) 501.3.
- 3. Pressure equalization shall comply with Section ((501.3)) 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 ((501.2.2)) 501.3.2.
- 8. Exhaust fans in separate dwelling units or ((guest rooms)) sleeping units shall not share common exhaust ducts unless the system is engineered for this operation.
- 9. Where permitted by Chapter 5, multiple ((source specific)) local exhaust ducts may be combined. If more than one of the exhaust fans in a dwelling unit or ((guest room)) 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 ((Source specific))** <u>Local</u> **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 ((source specifie)) <u>local</u> 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. 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 ((source specific ventilation)) 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 <sup>1</sup>
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 <sup>2</sup>	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 <sup>2</sup>	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

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

403.8.5 Whole house ventilation requirements. Each dwelling unit or ((guest room)) 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.

**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 or Table 403.8.1.

EXCEPTION:

Intermittently operating ventilation systems: ((The mechanical system shall have controls for intermittent operation per Section 403.8.2 and shall supply at least the volume of outdoor air required for intermittent operation based on the combination of its delivered capacity (from Table 403.8.1), its ventilation effectiveness (from Table 403.8.5.1) and its daily fractional operation time (from Table 403.8.5.1) using the formula:

	Qf = Qr/(sf)	
Where:		
<del>Qf</del>	=	outdoor air flow rate
<del>Qr</del>	=	ventilation air requirement (from Table 403.3 or 403.8.1)
ŧ	=	ventilation effectiveness (from Table 403.8.5.1)
f	=	fractional operation time (from Table 403.8.5.1)))

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 403.8 or Table 403.8.1 is multiplied by the factor determined in accordance with Table 403.8.5.1.

### TABLE 403.8.5.1

# ((VENTILATION EFFECTIVENESS FOR)) INTERMITTENT ((FANS)) WHOLE HOUSE MECHANICAL VENTILATION RATE FACTORS<sup>a, b</sup>

((Daily Fractional Operation	<b>Ventilation</b>
Time, f	<del>Effectiveness, ε</del>
<del>f ≤ 35%</del>	<del>0.33</del>
35% ≤ f < 60%	<del>0.50</del>
60% ≤ f < 80%	<del>0.75</del>
<del>80% ≤ f</del>	<del>1.0</del> )))

RUN-TIME PERCENTAGE IN						
EACH 4-HOUR SEGMENT	<u>25%</u>	<u>33%</u>	<u>50%</u>	<u>66%</u>	<u>75%</u>	<u>100%</u>
<u>Factor</u> <sup>a</sup>	<u>4</u>	<u>3</u>	<u>2</u>	<u>1.5</u>	<u>1.3</u>	<u>1.0</u>

<sup>&</sup>lt;sup>a</sup> For ventilation system run-time values between those given, the factors are permitted to be determined by interpolation.

- **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 ((7)) 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. <u>Outdoor air ducts</u> 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 ((continuous and)) intermittent operation shall ((be provided at both)) allow

Extrapolation beyond the table is prohibited.

<u>concurrent operation of</u> the forced-air fan and the <u>associated</u> <u>outdoor air</u> 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. ((For interior spaces without openings to the outdoor, air inlets cannot be used unless a transfer fan is provided in compliance with Section 403.8.6.1 Item 3.)) The air inlets shall comply with all of the following:
- $((\frac{\pi}{2}))$  <u>1.1</u>. Inlets shall have controllable, secure openings and shall be designed to not compromise the thermal properties of the building envelope.
- ((b)) 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.
- ((e)) <u>1.3</u>. Inlets shall be screened or otherwise protected from entry by insects, leaves, or other material.
- ((d)) <u>1.4</u>. 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 or Table 403.8.1.
- $((\frac{e}{}))$  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.
- ((f)) <u>1.6</u>. Each occupiable space shall have a minimum of one air inlet that has a minimum of 4 square inches of net free area.
- 2. In high-rise buildings, outdoor air may be drawn in through operable windows, doors, louvers or other operable openings to the outdoors. Exterior spaces shall have a minimum openable area of 4 percent of the total floor area being ventilated. Doors exiting to a corridor, court or public way shall not be used to provide outdoor air. ((For interior spaces without openings to the outdoors, the opening to the adjoining room shall be unobstructed

and shall have an area of not less than 8 percent of the floor area of the interior room or space, but not less than 25 square feet.)) The operable openings shall comply with the following:

- $((\frac{1}{2}))$  2.1. Openings shall be controllable, securable, and shall be designed to not compromise the thermal properties of the building envelope.
- $((\frac{b}{}))$  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.
- 3. For interior <u>adjoining</u> spaces((, in <u>buildings</u> with air inlets in accordance with <u>Section 403.8.6.1 Item 1 or in high-rise building</u> without operable openings in accordance with <u>Section 403.8.6.1 Item 2 shall have a whole house transfer fan sized to provide a minimum of the ventilation rate required per <u>Section 403.8.5.1</u>. 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 <u>Section 403.8.2</u>)) without <u>outdoor air</u> openings, one of the following two options shall be used to ventilate the interior adjoining space:</u>
- 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 (( $source\ specific$ )) <u>local</u> 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 ((guest rooms)) 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 ((source specific)) <u>local</u> exhaust ducts. If more than one of the exhaust fans in a dwelling unit or ((guest room)) <u>sleeping unit</u> 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 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 ((guest room)) <u>sleeping unit</u> 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 ((guest rooms)) sleeping units shall supply *outdoor air* to the return side of the forced air system fan.
- **403.8.7.2 Whole house forced-air system.** Where *outdoor air* is provided to each habitable dwelling unit or ((guest room)) 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.

- **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  $((guest\ room))$  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 ((guest rooms)) sleeping units.
- **403.8.8.2 Whole house supply system.** Where *outdoor air* is provided to each habitable dwelling unit or  $((guest\ room))$  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 ((<del>guest room</del>)) <u>sleeping unit</u> 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  $((guest\ rooms))$  sleeping units.
- 403.8.9.2 Whole house heat recovery ventilator system. Where outdoor air is provided to each habitable dwelling unit or ((guest room)) 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.
- 403.8.10 ((Source specific)) 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(( $\frac{-2007}{}$ )) shall be permitted.

<u>AMENDATORY SECTION</u> (Amending WSR 10-03-099, filed 1/20/10, effective 7/1/10)

WAC 51-52-0404 Section 404--Enclosed parking garages and automobile repair facilities.

((404.5)) <u>404.4</u> Automobile repair facilities. In buildings used for the repair of automobiles, each repair stall shall be equipped with an exhaust extension duct, extending to the outside of the building. Exhaust extension duct over 10 feet in length shall mechanically exhaust at least 300 cfm. Connecting offices and waiting rooms shall be supplied with conditioned air under positive pressure.

<u>AMENDATORY SECTION</u> (Amending WSR 10-03-099, filed 1/20/10, effective 7/1/10)

WAC 51-52-0501 Section 501--General.

((501.2 Exhaust discharge. The air removed by every mechanical exhaust system shall be discharged outdoors at a point where it will not cause a nuisance and not less than the distances specified in Section 501.2.1. The air shall be discharged to a location from which it cannot again be readily drawn in by a ventilating system. Air shall not be exhausted into an attic or crawlspace.

**EXCEPTIONS:** 

1. Whole-house cooling fans shall be permitted to discharge into the attic space of dwelling units having private attics:

2. Commercial cooking recirculating systems.

- 501.2.1)) 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 that 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 ((design flood level)) 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 adjoining ((grade)) 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)) 506.3.13, 506.4 and 506.5.
- 7.3. Dust stock and refuse conveying systems, Section ((511)) 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:

R-3 occupancies and dwelling units in R-2 occupancies are excluded from the pressure equalization requirement unless required by Section 504.5 or Section 505.2.

AMENDATORY SECTION (Amending WSR 10-03-099, filed 1/20/10, effective 7/1/10)

# WAC 51-52-0504 Section 504--Clothes dryer exhaust.

504.6.4.1 Specified length. The maximum length of the exhaust duct shall be 35 feet (10668 mm) from the connection to the transition duct from the dryer to the outlet terminal. Where fittings are used, the maximum length of the exhaust duct shall be reduced in accordance with Table 504.6.4.1.

The maximum length of the duct may be increased in an engineered exhaust system when a listed and labeled exhaust booster fan is installed in accordance with the manufacturer's installation instructions.

- 504.7.1 Protection required. Protective shield plates shall be provided in accordance with Section 504.6.7.
- 504.8 Common exhaust systems for clothes dryers located in multistory structures. Where a common multistory duct system is designed and installed to convey exhaust from multiple clothes dryers, the construction of the system shall be in accordance with all of the following:
- 1. The shaft in which the duct is installed shall be constructed and fire-resistance rated as required by the International Building Code.
- 2. Dampers shall be prohibited in the exhaust duct. Penetrations of the shaft and ductwork shall be protected in accordance with Section 607.5.5, Exception 2.
- 3. Rigid metal ductwork shall be installed within the shaft to convey the exhaust. The ductwork shall be constructed of sheet steel having a minimum thickness of 0.0187 inch (0.4712 mm) (No. 26 gage) and in accordance with SMACNA Duct Construction Standards.
- 4. The ductwork within the shaft shall be designed and installed without offsets.
- 5. The exhaust fan motor design shall be in accordance with Section 503.2.
- 6. The exhaust fan motor shall be located outside of the airstream.
  - 7. The exhaust fan shall run continuously, and shall be

connected to a standby power source.

- 8. Exhaust fan operation shall be monitored in an approved location and shall initiate an audible or visual signal when the fan is not in operation.
- 9. Makeup air shall be provided for the exhaust system to maintain the minimum flow for the exhaust fan when the dryers are not operating. Additionally, makeup air shall be provided when required by Section 504.5.
- 10. A cleanout opening shall be located at the base of the shaft to provide access to the duct to allow for cleaning and inspection. The finished opening shall be not less than 12 inches by 12 inches (305 mm by 305 mm).
  - 11. Screens shall not be installed at the termination.
- 12. The common multistory duct system shall serve only clothes dryers and shall be independent of other exhaust systems.

<u>AMENDATORY SECTION</u> (Amending WSR 10-03-099, filed 1/20/10, effective 7/1/10)

# WAC 51-52-0505 Section 505--Domestic kitchen exhaust equipment.

**505.1 Domestic systems.** Where domestic range hoods and domestic appliances equipped with downdraft exhaust are located within dwelling units, such hoods and appliances shall discharge to the outdoors through sheet metal ducts constructed of galvanized steel, stainless steel, aluminum or copper. Such ducts shall have smooth inner walls ((and)), shall be air tight ((and)), shall be equipped with a backdraft damper((. Domestic range hood duct systems shall not be combined with other environmental air exhaust systems)) and shall be independent of all other exhaust systems.

Listed and labeled exhaust booster fans shall be permitted when installed in accordance with the manufacturer's installation instructions.

### EXCEPTIONS:

- 1. Where installed in accordance with the manufacturer's installation instructions and where mechanical ventilation is otherwise provided in accordance with Chapter 4, listed and labeled ductless range hoods shall not be required to discharge to the outdoors.
- 2. Ducts for domestic kitchen cooking appliances equipped with downdraft exhaust systems shall be permitted to be constructed of Schedule 40 PVC pipe and fittings provided that the installation complies with all of the following:
- 2.1. The duct shall be installed under a concrete slab poured on grade.
- 2.2. The underfloor trench in which the duct is installed shall be completely backfilled with sand or gravel.
- 2.3. The PVC duct shall extend not more than 1 inch (25 mm) above the indoor concrete floor surface.
- 2.4. The PVC duct shall extend not more than 1 inch (25 mm) above grade outside of the building.
- 2.5. The PVC ducts shall be solvent cemented.

- WAC 51-52-0506 Section 506--Commercial kitchen hood ventilation system ducts and exhaust equipment.
- 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.
- ((The cleanouts shall))  $\underline{2.~B}$ e located ((on the side of the duct with the opening not less than 1 1/2 inches (38 mm) above the bottom of the duct, and not less)) 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.
- $\underline{4. \text{ Not be closer}}$  than 1 inch (((25))  $\underline{25.4}$  mm) (( $\underline{\text{below the top}}$  of the duct. The opening minimum)) from the edges of the duct.
- 5. Have dimensions ((shall be)) of not less than 12 inches by 12 inches (305 mm by 305 mm) ((on each side)). Where ((the)) such dimensions ((of the side of the duct prohibit the cleanout)) preclude installation ((prescribed herein)), the openings shall ((be on the top of the duct or the bottom of the duct. Where located on the top of the duct, the opening edges shall be a minimum of 1 inch (25 mm) from the edges of the duct. Where located in the bottom of the duct, cleanout openings shall be designed to provide internal damming around the opening, shall be provided with gasketing to preclude grease leakage, shall provide for drainage of grease down the duct around the dam and shall be approved for the application. Where the dimensions of the sides, top or bottom of the duct preclude the installation of the prescribed minimum-size cleanout opening, the cleanout shall be located on the duct face that affords the largest opening dimension and shall be installed with the opening edges at the prescribed distances from the duct edges as previously set forth in this section)) 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 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. 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 either field-applied or factory-built. 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. Duct enclosures shall be as prescribed by Section 506.3.11.1, 506.3.11.2 or 506.3.11.3.

<u>AMENDATORY SECTION</u> (Amending WSR 10-03-099, filed 1/20/10, effective 7/1/10)

# WAC 51-52-0507 Section 507--Commercial kitchen hoods.

**507.2.1 Type I hoods.** Type I hoods shall be installed where cooking appliances produce grease or smoke. Type I hoods shall be installed over medium-duty, heavy-duty and extra-heavy-duty cooking appliances. Type I hoods shall be installed over light-duty cooking appliances that produce grease or smoke.

EXCEPTIONS:

1. A Type I hood shall not be required for an electric cooking appliance where an approved testing agency provides documentation that the appliance effluent contains 5 mg/m<sup>3</sup> or less of grease when tested at an exhaust flow rate of 500 cfm in accordance with Section 17 of UL 710B.

2. A Type I hood shall not be required in an R-2 type occupancy with not more than 16 residents.

507.2.3 Domestic cooking appliances used for commercial purposes.

Domestic cooking appliances utilized for commercial purposes shall be provided with Type I, Type II or residential hoods as required for the type of appliances and processes in accordance with Table 507.2.2 and Sections 507.2, 507.2.1 and 507.2.2.

# TABLE 507.2.2 TYPE OF HOOD REQUIRED FOR DOMESTIC COOKING APPLIANCES IN THE FOLLOWING SPACES<sup>a, b</sup>

Type of Space	Type of Cooking	Type of Hood
Church	1. Boiling, steaming and warming	Type II hood
	precooked food	
	2. Roasting, pan frying and deep frying	Type I hood
Community or party room in	1. Boiling, steaming and warming	Residential hood <sup>c</sup> or Type II
apartment and condominium	precooked food	<u>hood</u> <sup>d</sup>
	2. Roasting, pan frying and deep frying	Type I hood
Day care	1. Boiling, steaming and warming	Residential hood <sup>c</sup> or Type II
	precooked food	<u>hood<sup>d</sup></u>
	2. Roasting, pan frying and deep frying	Type I hood
Dormitory, boarding home,	1. Boiling, steaming and warming	Type II hood
nursing home	precooked food	
	2. Roasting, pan frying and deep frying	Type I hood
Office lunch room	1. Boiling, steaming and warming	Residential hood <sup>c</sup> or Type II
	precooked food	<u>hood</u> <sup>d</sup>

Type of Space	Type of Cooking	Type of Hood	
	2. Roasting, pan frying and deep frying	Type I hood	

<sup>&</sup>lt;sup>a</sup> Commercial cooking appliances shall comply with Section 507.2.

<u>AMENDATORY SECTION</u> (Amending WSR 10-03-099, filed 1/20/10, effective 7/1/10)

### 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)) 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 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; 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.

### NEW SECTION

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

**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 unducted air handlers shall be provided upstream of all cooling coils or other devices with wetted surfaces through which air is supplied to an occupiable space.

b Requirements in this table apply to electric or gas fuel appliances only. Solid fuel appliances or charbroilers require Type I hoods.

<sup>&</sup>lt;sup>c</sup> Residential hood shall ventilate to the outside.

d Type II hood required when more than one appliance is used.

## NEW SECTION

# WAC 51-52-0928 Section 928--Evaporative cooling equipment.

- 928.1 General. Evaporative cooling equipment shall:
- 1. Be installed in accordance with the manufacturer's instructions.
- 2. Be installed on level platforms in accordance with Section 304.10.
- 3. Have openings in exterior walls or roofs flashed in accordance with the *International Building Code*.
- 4. Be provided with potable water backflow protection in accordance with backflow requirements in the plumbing code.
- 5. Have air intake opening locations in accordance with Section 401.4.

<u>AMENDATORY SECTION</u> (Amending WSR 10-03-099, filed 1/20/10, effective 7/1/10)

# WAC 51-52-1000 Chapter 10--Boilers, water heaters and pressure vessels.

((SECTIONS 1003 THROUGH 1011, are not adopted.

Boilers and Unfired Pressure Vessels are regulated by chapter 70.79 RCW.))

**Informational Note:** 

Boilers and pressure vessels are regulated by chapter 70.79 RCW and chapter 296-104 WAC in addition to the requirements of this code.

1001.1 Scope. This chapter shall govern the installation, alteration and repair of boilers, water heaters and pressure vessels.

### EXCEPTIONS:

- 1. Pressure vessels used for unheated water supply.
- 2. Portable unfired pressure vessels and Interstate Commerce Commission containers.
- 3. Containers for bulk oxygen and medical gas.
- 4. Unfired pressure vessels having a volume of 5 cubic feet (0.14 m³) or less operating at pressures not exceeding
- 250 pounds per square inch (psi) (1724 kPa) and located within occupancies of Groups B, F, H, M, R, S and U.
- 5. Pressure vessels used in refrigeration systems that are regulated by Chapter 11 of this code.
- 6. Pressure tanks used in conjunction with coaxial cables, telephone cables, power cables and other similar humidity control systems.
- 7. Any boiler or pressure vessel subject to inspection by federal or state inspection programs.

<u>AMENDATORY SECTION</u> (Amending WSR 10-03-099, filed 1/20/10, effective 7/1/10)

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

### **ASHRAE**

62.2-((2007)) <u>2010</u> Ventilation and Acceptable Indoor Air Quality in Low-Rise Residential Buildings

<u>AMENDATORY SECTION</u> (Amending WSR 10-03-099, filed 1/20/10, effective 7/1/10)

### WAC 51-52-21101 Section 101--General.

101.2 Scope. This code shall apply to the installation of fuel gas piping systems, fuel gas utilization equipment, gaseous hydrogen systems and regulated accessories in accordance with Section 101.2.1 through 101.2.5.

#### 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  $((\frac{2008}{}))$  2011 Edition of NFPA 58 (Liquefied Petroleum Gas Code) and the  $((\frac{2009}{}))$  2012 Edition of ANSI Z223.1/NFPA 54 (National Fuel Gas Code).

### NEW SECTION

## WAC 51-52-21401 Chapter 4--Gas piping installations.

**401.9 Identification.** Each length of pipe and tubing and each pipe fitting utilized in a mechanical system shall bear the identification of the manufacturer.

EXCEPTION:

The manufacturer identification for fittings and pipe nipples shall be on each piece or shall be printed on the fitting or nipple packaging or provided documentation.

### NEW SECTION

# WAC 51-52-21601 Chapter 6--Specific appliances.

**614.7.1 Protection required.** Protective shield plates shall be provided in accordance with Section 614.6.3.