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### 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*. The occupant load utilized for design of the ventilation system shall be not 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 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:** The occupant load is not required to be determined based on the estimated maximum occupant load rate indicated in [Table 403.3.1.1](#) where *approved statistical data document the accuracy of an alternative anticipated occupant density*.

**TABLE 403.3.1.1 MINIMUM VENTILATION RATES**

OCCUPANCY CLASSIFICATION	OCCUPANT DENSITY #/1000 FT <sup>2</sup> <sup>a</sup>	PEOPLE OUTDOOR AIRFLOW RATE IN BREATHING ZONE, $R_p$ CFM/PERSON	AREA OUTDOOR AIRFLOW RATE IN BREATHING ZONE, $R_a$ CFM/FT <sup>2</sup> <sup>a</sup>	EXHAUST AIRFLOW RATE CFM/FT <sup>2</sup> <sup>a</sup>
<b>Correctional facilities</b>				
Booking/waiting	50	7.5	0.06	—
Cells without plumbing fixtures	25	5	0.12	—
with plumbing fixtures <sup>9</sup>	25	5	0.12	1.0
Day room	30	5	0.06	—
Dining halls (see "Food and beverage service")	—	—	—	—
Guard stations	15	5	0.06	—
<b>Dry cleaners, laundries</b>				
Coin-operated dry cleaner	20	15	—	—
Coin-operated laundries	20	7.5	0.12	—
Commercial dry cleaner	30	30	—	—
Commercial laundry	10	5	0.12	—
Storage, pick up	30	7.5	0.12	—

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Auditoriums	150	5	0.06	—
Classrooms (ages 5–8)	25	10	0.12	—
Classrooms (age 9 plus)	35	10	0.12	—
Computer lab	25	10	0.12	—
Corridors (see "Public spaces")	—	—	—	—
Day care (through age 4)	25	10	0.18	—
Lecture classroom	65	7.5	0.06	—
Lecture hall (fixed seats)	150	7.5	0.06	—
Locker/dressing rooms <sup>g</sup>	—	—	—	0.25
Media center	25	10	0.12	—
Multiuse assembly	100	7.5	0.06	—
Music/theater/dance	35	10	0.06	—
Science laboratories <sup>g</sup>	25	10	0.18	1.0
Smoking lounges <sup>b</sup>	70	60	—	—
Sports locker rooms <sup>g</sup>	—	—	—	0.5
Wood/metal shops <sup>g</sup>	20	10	0.18	0.5
<b>Food and beverage service</b>				
Bars, cocktail lounges	100	7.5	0.18	—
Cafeteria, fast food	100	7.5	0.18	—
Dining rooms	70	7.5	0.18	—
Kitchens (cooking) <sup>b</sup>	20	7.5	0.12	0.7
<b>Hotels, motels, resorts and dormitories</b>				
Bathrooms/toilet—private <sup>g</sup>	—	—	—	25/50 <sup>f</sup>
Bedroom/living room	10	5	0.06	—
Conference/meeting	50	5	0.06	—
Dormitory sleeping areas	20	5	0.06	—
Gambling casinos	120	7.5	0.18	—
Lobbies/prefunction	30	7.5	0.06	—
Multipurpose assembly	120	5	0.06	—
<b>Offices</b>				
Conference rooms	50	5	0.06	—
Main entry lobbies	10	5	0.06	—
Office spaces	5	5	0.06	—
Reception areas	30	5	0.06	—
Telephone/data entry	60	5	0.06	—
<b>Private dwellings, single and multiple</b>				

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KITCHENS				
Living areas <sup>c</sup>	Based on number of bedrooms. First bedroom, 2; each additional bedroom, 1	0.35 ACH but not less than 15 cfm/person	—	—
Toilet rooms and bathrooms <sup>g</sup>	—	—	—	25 /50 <sup>f</sup>
<b>Public spaces</b>				
Corridors	—	—	0.06	—
Courtrooms	70	5	0.06	—
Elevator car	—	—	—	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 shower head) <sup>g</sup>	—	—	—	50/20 <sup>f</sup>
Smoking lounges <sup>b</sup>	70	60	—	—
Toilet rooms — public <sup>g</sup>	—	—	—	50/70 <sup>e</sup>
<b>Retail stores, sales floors and showroom floors</b>				
Dressing rooms	—	—	—	0.25
Mall common areas	40	7.5	0.06	—
Sales	15	7.5	0.12	—
Shipping and receiving	2	10	0.12	—
Smoking lounges <sup>b</sup>	70	60	—	—
Storage rooms	—	—	0.12	—
Warehouses (see "Storage")	—	10	0.06	—
<b>Specialty shops</b>				
Automotive motor fuel-dispensing stations <sup>b</sup>	—	—	—	1.5
Barber	25	7.5	0.06	0.5
Beauty salons <sup>b</sup>	25	20	0.12	0.6
Embalming room <sup>b</sup>	—	—	—	2.0
Nail salons <sup>b, h</sup>	25	20	0.12	0.6
Pet shops (animal areas) <sup>b</sup>	10	7.5	0.18	0.9
Supermarkets	8	7.5	0.06	—
<b>Sports and amusement</b>				

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Discourse rooms	100	20	0.00	
Game arcades	20	7.5	0.18	—
Gym, stadium, arena (play area)	7	20	0.18	—
Health club/aerobics room	40	20	0.06	—
Health club/weight room	10	20	0.06	—
Ice arenas without combustion engines	—	—	0.30	0.5
Spectator areas	150	7.5	0.06	—
Swimming pools (pool and deck area)	—	—	0.48	—
<b>Storage</b>				
Refrigerated warehouses/freezers	—	10	—	0.75
Repair garages, enclosed parking garages <sup>b, d</sup>	—	—	—	0.75
Warehouses	—	10	0.06	—
<b>Theaters</b>				
Auditoriums (see "Education")	—	—	—	—
Lobbies	150	5	0.06	—
Stages, studios	70	10	0.06	—
Ticket booths	60	5	0.06	—
<b>Transportation</b>				
Platforms	100	7.5	0.06	—
Transportation waiting	100	7.5	0.06	—
<b>Workrooms</b>				
Bank vaults/safe deposit	5	5	0.06	—
Computer (without printing)	4	5	0.06	—
Copy, printing rooms	4	5	0.06	0.5
Darkrooms	—	—	—	1.0
Meat processing <sup>c</sup>	10	15	—	—
Pharmacy (prep. area)	10	5	0.18	—
Photo studios	10	5	0.12	—

For SI: 1 cubic foot per minute = 0.0004719 m<sup>3</sup>/s, 1 ton = 908 kg, 1 cubic foot per minute per square foot = 0.00508 m<sup>3</sup>/(s · m<sup>2</sup>), °C = [(°F) – 32]/1.8, 1 square foot = 0.0929 m<sup>2</sup>.

- a. Based on *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.

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If there is a mixed-type energy recovery ventilation (ERV) unit in the exhaust system design, the volume of air leaked from the exhaust airstream into the outdoor airstream within the ERV shall be less than 10 percent of the outdoor air volume. 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.

### **403.3.1.1.1 Zone outdoor airflow.**

The minimum outdoor airflow required to be supplied to each zone shall be determined as a function of *occupancy classification* and space air distribution effectiveness in accordance with [Sections 403.3.1.1.1.1](#) through [403.3.1.1.3](#).

#### **403.3.1.1.1.1 Breathing zone outdoor airflow.**

The outdoor airflow rate required in the *breathing zone* ( $V_{bz}$ ) of the *occupiable space* or spaces in a zone shall be determined in accordance with [Equation 4-1](#).

$$V_{bz} = R_p P_z + R_a A_z \quad (\text{Equation 4-1})$$

where:

$A_z$  = Zone floor area: the net *occupiable floor area* of the space or spaces in the zone.

$P_z$  = Zone population: the number of people in the space or spaces in the zone.

$R_p$  = People outdoor air rate: the outdoor airflow rate required per person from [Table 403.3.1.1](#).

$R_a$  = Area outdoor air rate: the outdoor airflow rate required per unit area from [Table 403.3.1.1](#).

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Fire and smoke dampers must be provided with approved access for inspection and maintenance.

Refrigerant tables updated to include new refrigerants.

Addition of condensate termination identification markings and discharge restrictions.

Approved factory-built combination intake/exhaust terminations permitted, relaxing separation requirement.

30% reduction in minimum mechanical ventilation for whole-house balanced ventilation systems.

Continuous operation requirement for manicure and pedicure station exhaust systems.

Grease duct horizontal cleanout required within 3 feet of a horizontal discharge fan.

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