Section 9.32. Ventilation

9.32.1. General

9.32.1.1. Application

1) This Section applies to the ventilation of rooms and spaces in *residential occupancies* by natural ventilation and to self-contained mechanical ventilation systems serving only one *dwelling unit*.

2) Mechanical ventilation systems other than self-contained systems serving a single *dwelling unit* shall conform to Part 6.

3) A *storage garage* for more than 5 motor vehicles shall be ventilated in accordance with Part 6.

4) Systems used for ventilation shall conform to the energy efficiency requirements in Section 9.36.

9.32.1.2. Required Ventilation

1) Every *dwelling unit* shall incorporate

a) provisions for non-heating-season ventilation in accordance with Subsection 9.32.2., and

b) if supplied with electrical power, provisions for heating-season ventilation in accordance with Subsection 9.32.3.

2) Reserved.

3) Reserved.

4) Reserved.

9.32.1.3. Venting of Laundry-Drying Equipment

1) *Exhaust ducts* or vents connected to laundry-drying equipment shall discharge directly to the outdoors.

2) *Exhaust ducts* connected to laundry-drying equipment shall be

a) independent of other *exhaust ducts*,

b) accessible for cleaning, and

c) constructed of a smooth corrosion-resistant material.

(See Note A-9.32.1.3.(2).)

3) Where collective venting of multiple installations of laundry-drying equipment is used, the ventilation system shall

a) be connected to a common *exhaust duct* that is vented by one central exhaust fan and incorporates one central lint trap,

b) include an interlock to activate the central exhaust fan when laundry-drying equipment is in use, and

c) where required by Article 9.32.4.1., be provided with make-up air.

9.32.2. Non-Heating-Season Ventilation

9.32.2.1. Required Ventilation

1) Rooms or spaces in *dwelling units* shall be ventilated during the non-heating season by

a) natural ventilation in accordance with Article 9.32.2.2., or

b) a mechanical ventilation system conforming to Subsection 9.32.3.

2) Where a habitable room or space is not provided with natural ventilation as described in Clause (1)(a), mechanical ventilation shall be provided to exhaust inside air from, or to introduce outside air to, that room or space at the rate of

a) one-half air change per hour if the room or space is mechanically cooled during the non-heating season, or

b) one air change per hour if the room or space is not mechanically cooled during the non-heating season.

9.32.2.2. Non-Heating-Season Natural Ventilation

1) The unobstructed openable ventilation area to the outdoors for rooms and spaces in residential *buildings* ventilated by natural means shall conform to Table 9.32.2.2.

Table 9.32.2.2.
Natural Ventilation Area
Forming Part of Sentence 9.32.2.2.(1)

Location		Minimum Unobstructed Area
Within a *dwelling unit*	Bathrooms or water-closet rooms	0.09 m^2
	Unfinished *basement space*	0.2% of the *floor area*
	Dining rooms, living rooms, bedrooms, kitchens, combination rooms, dens, recreation rooms and all other finished rooms	0.28 m^2 per room or combination room
Other than within a *dwelling unit*	Bathrooms or water-closet rooms	0.09 m^2 per water closet
	Sleeping areas	0.14 m^2 per occupant
	Laundry rooms, kitchens, recreation rooms	4% of the *floor area*
	Corridors, storage rooms and other similar public rooms or spaces	2% of the *floor area*
	Unfinished *basement* space not used on a shared basis	0.2% of the *floor area*

2) Where a vestibule opens directly off a living or dining room within a *dwelling unit*, ventilation to the outdoors for such rooms may be through the vestibule.

3) Openings for natural ventilation other than windows shall provide protection from the weather and insects.

4) Screening shall be of corrosion-resistant material.

9.32.2.3. Reserved

9.32.3. Heating-Season Mechanical Ventilation

(See Note A-9.32.3.)

9.32.3.1. Required Ventilation

1) Every *dwelling unit* that is supplied with electrical power shall be provided with a mechanical ventilation system that conforms to

a) CAN/CSA-F326-M, "Residential Mechanical Ventilation Systems," or

b) this Subsection, or.

c) reserved.

9.32.3.2. Design and Installation

1) Aspects of mechanical ventilation systems not specifically addressed in this Subsection shall be designed, constructed and installed in accordance with good practice such as that described in the ASHRAE Handbooks and Standards, the HRAI Digest, the HRAI Residential Mechanical Ventilation Manual, the TECA Ventilation Guidelines, the Hydronics Institute Manuals and the SMACNA manuals.

2) Exhaust fans and supply fans shall be installed in accordance with this Subsection and the manufacturer's instructions.

3) The mechanical components of a mechanical ventilation system shall be installed so as to be accessible for inspection, maintenance, repair, and cleaning.

9.32.3.3. Mechanical Ventilation System Components

1) A mechanical ventilation system shall include:

a) a principal ventilation fan system that

i) provides supply air in accordance with Article 9.32.3.4., and

ii) includes an exhaust fan that conforms with Article 9.32.3.5.,

b) the kitchen and bathroom exhaust fans that are required by Article 9.32.3.6., and

c) if the *building* includes a heated crawl space, the components that are required by Article 9.32.3.7.

9.32.3.4. Ventilation System Supply Air

(See Note A-9.32.3.4.)

1) Except as provided in Sentence (6), a principal ventilation system shall mechanically provide supply air in accordance with Sentence (2), (3), (4) or (5).

2) Where the principal ventilation system is a ducted forced-air heating system, the ducted forced-air heating system shall

a) provide supply air through the ducting to

i) each bedroom, and

ii) each floor level without a bedroom,

b) draw supply air from an outdoor inlet that is connected to the cabinet containing the furnace air circulating fan required by Clause (d) by ducting that measures, from that cabinet to the point at which the ducting intersects the return air plenum,

i) between 3 m and 4.5 m in length, or

ii) if a flow control device is used, not more than 4.5 m in length,

c) draw supply air through ducting that is

i) rigid ducting with an equivalent diameter of at least 100 mm, or

ii) flexible ducting with an equivalent diameter of at least 125 mm, and

d) have a furnace air circulating fan set to run continuously.

3) Where the principal ventilation system is a ducted forced-air heating system used in combination with a heat-recovery ventilator,

a) the ducted forced-air heating system shall conform to Clauses (2)(a),(c) and (d),

b) the heat-recovery ventilator shall draw supply air from an outdoor inlet into the return air plenum of the ducted forced-air heating system, and

c) the heat-recovery ventilator shall draw exhaust air, through dedicated ducting,

i) from one or more indoor inlets, at least one of which is located at least 2 m above the floor of the uppermost floor level, and

ii) at the capacity rating of the heat-recovery ventilator, which shall be no less than the air-flow rate specified in Table 9.32.3.5.

4) Where the principal ventilation system is a heat-recovery ventilator, the heat-recovery ventilator shall

a) provide supply air through dedicated ducting to

i) each bedroom, and

ii) each floor level without a bedroom, and

b) draw exhaust air, through dedicated ducting,

i) from one or more indoor inlets, at least one of which is located at least 2 m above the floor of the uppermost floor level, and

ii) at the capacity rating of the heat-recovery ventilator, which shall be no less than the air-flow rate specified in Table 9.32.3.5.

5) Where the principal ventilation system is a ducted central-recirculation ventilation system, the ducted central-recirculation ventilation system shall

a) draw supply air from an outdoor inlet connected upstream of the fan, and

b) draw air from

i) each bedroom and deliver it to a common area, or

ii) a common area and deliver it to each bedroom.

6) A principal ventilation system need not conform to Sentence (1) if the principal ventilation system

a) services a *dwelling unit* that

i) is located where the January design temperature, on a 2.5% basis determined in conformance with Article 1.1.3.1., is greater than –20°C,

ii) has only 1 *storey* and a *floor area* of less than 168 m2 within the *building* envelope (see Note A-9.32.3.4.(6)(a)(ii)),

iii) does not have a ducted forced-air heating system, and

iv) except for a *secondary suite*, is not located in a *building* conforming to Subsection 9.36.6. or 10.2.3., and

b) provides supply air passively from outdoors through dedicated inlets that

i) are located in each bedroom and at least one common area,

ii) are located at least 1 800 mm above the floor, and

iii) have an unobstructed vent area of not less than 25 cm^2.

9.32.3.5. Principal Ventilation System Exhaust Fan

1) A principal ventilation system exhaust fan shall

a) run continuously, and

b) provide at least the air-flow rate specified in Table 9.32.3.5.

Table 9.32.3.5.
Principal Ventilation System Exhaust Fan Minimum Air-flow Rate
Forming Part of Clause 9.32.3.5.(1)

Floor Area, m^2	Minimum Air-Flow Rate, L/s				
	Number of Bedrooms				
	0-1	2-3	4-5	6-7	> 7
< 140	14	21	28	35	42
140-280	21	28	35	42	49
281-420	28	35	42	49	56
421-560	35	42	49	56	64
561-700	42	49	56	64	71
> 700	49	56	64	71	78

2) For the purposes of Sentence (1), the capacity rating of the principal ventilation system exhaust fan shall be determined, based on air-flow performance at 50 pa of external static pressure, in accordance with

a) HVI Publication 916, "Airflow Test Procedure," or

b) CAN/CSA-C260-M, "Rating the Performance of Residential Mechanical Ventilating Equipment."

3) The principal ventilation system exhaust fan shall be

a) designed to run continuously, and

b) controlled by a dedicated switch that

i) has 2 settings, on and off,

ii) is located where it will be accessible for the purposes of servicing the exhaust fan but not likely to be turned off inadvertently, and

iii) is clearly marked "PRINCIPAL VENTILATION EXHAUST FAN."

4) If the principal ventilation system exhaust fan is designed to run at multiple air-flow rates,

a) the air-flow rate of the fan shall be controlled by a switch other than the switch described in Clause (3)(b), and

b) the lowest air-flow rate shall not be less than the air-flow rate specified in Table 9.32.3.5.

5) The sound rating of the principal ventilation system exhaust fan shall not exceed 1.0 sone when running continuously at the air-flow rate specified in Table 9.32.3.5. as determined in accordance with

a) HVI Publication 915, "Loudness Testing and Rating Procedure," or

b) CAN/CSA-C260-M, "Rating the Performance of Residential Mechanical Ventilating Equipment."

9.32.3.6. Kitchen and Bathroom Exhaust Fans

1) An exhaust fan that provides at least the air-flow rate specified in Table 9.32.3.6. shall be installed in

a) every kitchen, and

b) every bathroom or water-closet room, unless the bathroom or water-closet room is served by the principal ventilation system exhaust fan that complies with Article 9.32.3.5.

2) For the purposes of Sentence (1), the capacity rating of the exhaust fan shall be determined, based on air-flow performance at 50 pa of external static pressure, in accordance with

a) HVI Publication 916, "Airflow Test Procedure," or

b) CAN/CSA-C260-M, "Rating the Performance of Residential Mechanical Ventilating Equipment."

Table 9.32.3.6.
Kitchen/Bathroom Exhaust Fan Minimum Air-Flow Rate
Forming Part of Sentence 9.32.3.6.(1)

Room	Minimum Exhaust Fan Air-Flow Rate, L/s	
	Intermittent	Continuous
Kitchen	47	N/A
Bathroom	23	9

9.32.3.7. Heated Crawl Space Ventilation

1) Where a crawl space is heated by a ducted forced-air heating system that does not draw air from the crawl space to the furnace through the return air plenum, the crawl space shall be connected to the floor space above the crawl space by at least one air-transfer grille.

2) Where a crawl space is heated other than by a ducted forced-air heating system, the crawl space shall

a) be connected to

i) the floor space above the crawl space by at least one air-transfer grille, and

ii) the principal ventilation system by a supply air outlet or an exhaust air inlet,

b) be connected to the floor space above the crawl space by at least 2 air-transfer grilles for every 30 m^2 of crawl space area, or

c) be connected to

i) the floor space above the crawl space by at least one air-transfer grille, and

ii) the outdoors by a dedicated exhaust fan that complies with Sentence (4).

3) An air-transfer grille required by Sentence (1) or (2) shall have an unobstructed vent area of the greater of

a) 25 cm^2, and

b) 0.83 cm^2 for every m^2 of crawl space area.

4) Where a dedicated exhaust fan is installed in accordance with Subclause (2)(c)(ii), the dedicated exhaust fan shall

a) provide an air-flow rate of at least 23 L/s, and

b) be controlled by

i) a humidity control device, or

ii) an adjustable time control device that is capable of providing not less than 8 total hours of ventilation per 24 hour period.

5) Where a crawl space is divided into 2 or more compartments, each heated compartment shall conform to Sentence (1) or (2).

9.32.3.8. Air Ducts

1) Except as required by Sentence (3), this Article applies to air ducts other than those described in Article 9.32.1.3.

2) *Exhaust ducts* shall discharge to the outdoors.

3) *Exhaust ducts* that are downstream of an exhaust fan shall have no connections to other fans or ducts.

4) *Exhaust ducts*, and *supply ducts* that conduct heated or cooled air, shall

a) be sized in accordance with the requirements of the manufacturer of the fans to which they are connected, and

b) have an equivalent diameter not less than that specified by Table 9.32.3.8.(3).

Table 9.32.3.8.(3)
Maximum Equivalent Duct Length[1], m
Forming Part of Sentence 9.32.3.8.(3)

Flexible Duct						
Equivalent Diameter, mm (Cross Section Area for Rectangular Ducts, cm^2)	Fan Capacity, L/s					
	25	40	50	60	70	80
125 (123)	32	15	--	--	--	--
150 (177)	46	40	28	18	13	--
175 (240)	46	46	46	46	46	24
200 (314)	46	46	46	46	46	46
Rigid Duct						
Equivalent Diameter, mm (Cross Section Area for Rectangular Ducts, cm^2)	Fan Capacity, L/s					
	25	40	50	60	70	80
100 (79)	32	15	--	--	--	--
125 (123)	46	40	28	18	13	--
150 (177)	46	46	46	42	34	24
175 (240)	46	46	46	46	46	46

Notes to Table 9.32.3.8.(3):

(1) The equivalent length of a duct is the length of the duct plus 10 m for the exterior hood and 3 m for each 90° elbow.

5) Where an *exhaust duct* passes through or is located adjacent to a space that is not *conditioned space*, the duct shall conform to Article 9.36.3.2., except that in no case shall such a duct be insulated to less than RSI 0.75.

6) Where a principal ventilation system *supply duct* passes through or is located adjacent to a *conditioned space*, the duct shall be

a) insulated to not less than RSI 0.75, and

b) provided with an effective vapour barrier.

7) Where a kitchen exhaust fan grille is installed within 1.2 m horizontally of a *cooktop*, the exhaust fan duct shall

a) be constructed of a material that is noncombustible, corrosion-resistant, and cleanable, and

b) be equipped with a grease filter at the intake end.

8) Except for a supply air system described in Sentence 9.32.3.4.(2) or (3), all joints in *exhaust ducts*, and in *supply ducts* that conduct conditioned air, shall be sealed against air leakage with

a) sealants or gaskets made from liquids, mastics or heat-applied materials,

b) mastic with embedded fabric,

c) foil-faced butyl tape, or

d) aluminum foil tape.

9) *Supply ducts* for a mechanical ventilation system shall not be used to provide combustion or dilution air to fuel-burning appliances.

9.32.3.9. Outdoor Inlets and Outlets

1) Outdoor air inlets and exhaust outlets shall be shielded from the weather, birds and rodents by using hoods incorporating a screen of corrosion-resistant material with openings of 6 to 12 mm.

9.32.3.10. Interior Distribution

1) Interior doors shall be undercut by a minimum of 12 mm above the finished floor or the rooms shall be provided with an air-transfer grille with an unobstructed vent area that is not less than 100 cm^2.

9.32.4. Additional Protection Against Depressurization

9.32.4.1. Protection Requirements

1) Additional make-up air for the actual *appliance* exhaust rate shall be provided for any *appliance* that discharges air to the exterior at an installed rate exceeding 0.5 air changes per hour when it is located within a *dwelling unit* that contains a vented *appliance* that is subject to back drafting (Naturally Aspirating Fuel Fired Vented Appliance). (see Note A-9.32.4.1.)

2) Where additional make-up air is required for *appliances* described in Sentence (1), it shall be provided by a supply fan rated to deliver outdoor air at the rate of the installed exhaust *appliance*.

3) The supply fan as required in Sentence (2) shall be interconnected with the exhaust fan for which make-up air is required.

4) The outdoor air required by Sentence (3) shall be

a) tempered to at least 1°C before being introduced to a normally unoccupied area of the *dwelling unit*, or

b) tempered to at least 12°C before being introduced to occupied areas either by passive transfer grille or directly from outside.

9.32.4.2. Carbon Monoxide Alarms

(See Note A-9.32.4.2.)

1) This Article applies to every *building* that contains a *residential occupancy* and that also contains

a) a fuel-burning *appliance*, or

b) a *storage garage*.

2) Carbon monoxide (CO) alarms required by this Article shall

a) conform to CAN/CSA-6.19, "Residential Carbon Monoxide Alarming Devices,"

b) be equipped with an integral alarm that satisfies the audibility requirements of CAN/CSA-6.19, "Residential Carbon Monoxide Alarming Devices,"

c) have no disconnect switch between the overcurrent device and the CO alarm, where the CO alarm is powered by the *dwelling unit*'s electrical system, and

d) be mechanically fixed at a height recommended by the manufacturer.

3) Where a room contains a solid-fuel-burning *appliance*, a CO alarm conforming to CAN/CSA-6.19, "Residential Carbon Monoxide Alarming Devices," shall be mechanically fixed

a) at the manufacturer's recommended height where these instructions specifically mention solid-fuel-burning *appliances*, or

b) in the absence of specific instructions related to solid-fuel-burning *appliances*, on or near the ceiling.

4) Where a fuel-burning *appliance* is installed in a *suite* of *residential occupancy*, a CO alarm shall be installed

a) inside each bedroom, or

b) outside each bedroom, within 5 m of each bedroom door, measured following corridors and doorways.

5) Where a fuel-burning *appliance* is installed in a *service room* that is not in a *suite* of *residential occupancy*, a CO alarm shall be installed

a) either inside each bedroom, or if outside, within 5 m of each bedroom door, measured following corridors and doorways, in every *suite* of *residential occupancy* that shares a wall or floor/ceiling assembly with the *service room*, and

b) in the *service room*.

6) For each *suite* of *residential occupancy* that shares a wall or floor/ceiling assembly with a *storage garage* or that is adjacent to an attic or crawl space to which the *storage garage* is also adjacent, a CO alarm shall be installed

a) inside each bedroom, or

b) outside each bedroom, within 5 m of each bedroom door, measured following corridors and doorways.

7) Reserved.