

## Section 6.3. Ventilation Systems

### 6.3.1. Ventilation

#### 6.3.1.1. Required Ventilation

- 1) Except as provided in Sentence (3), all *buildings* shall be ventilated in accordance with this Part.
- 2) Except in *storage garages* covered by Article 6.3.1.4., the rates at which outdoor air is supplied in *buildings* by ventilation systems shall be not less than the rates required by ANSI/ASHRAE 62, “Ventilation for Acceptable Indoor Air Quality” (except Addendum n).
- 3) Self-contained heating-season mechanical ventilation systems serving only one *dwelling unit* shall comply with
  - a) this Part, or
  - b) Subsection 9.32.3.
- 4) For *suites* in *buildings* conforming to Subsection 10.2.2.5., the outdoor air required by Sentence (2) shall be supplied directly to each suite by mechanical ventilation through ducting.  
(See Note A-6.3.1.1.(4).)

#### 6.3.1.2. Crawl Spaces and Attic or Roof Spaces

- 1) Unconditioned and unoccupied crawl spaces and unconditioned and unoccupied *attic or roof spaces* shall be ventilated by natural or mechanical means as required by Part 5. (See Note A-6.3.1.2.(1).)

#### 6.3.1.3. Natural Ventilation

- 1) Except as permitted by Sentence (2) and except as required by Sentence 6.3.1.1.(4), the ventilation required by Article 6.3.1.1. shall be provided by mechanical ventilation, except that it can be provided by natural ventilation or a combination of natural and mechanical ventilation in
  - a) *buildings* of other than *residential occupancy* having an *occupant load* of not more than one person per 40m<sup>2</sup> during normal use,
  - b) *buildings* of *industrial occupancy* where the nature of the processes contained therein permits or requires the use of large openings in the *building* envelope even during the winter, and
  - c) seasonal *buildings* not intended to be occupied during the winter.
- 2) Where climatic conditions permit, *buildings* containing *occupancies* other than *residential occupancies* may be ventilated by natural ventilation methods in lieu of mechanical ventilation where engineering data demonstrates that such a method will provide the required ventilation for the type of *occupancy*.

#### 6.3.1.4. Ventilation of Storage Garages

- 1) Except as provided in Sentences (4) and (6), an enclosed *storage garage* for five or more motor vehicles shall have a mechanical ventilation system designed to
  - a) limit the concentration of carbon monoxide to not more than 100 parts per million parts of air,
  - b) limit the concentration of nitrogen dioxide to not more than 3 parts per million parts of air, where the majority of the vehicles stored are powered by diesel-fuelled engines, or
  - c) provide, during operating hours, a continuous supply of outdoor air at a rate of not less than 3.9L/s for each square metre of floor area (See Article 3.3.1.20.).  
(See also Sentence 3.3.5.4.(4).) (See Note A-6.3.1.4.(1).)
- 2) Mechanical ventilation systems provided in accordance with Clause (1)(a) shall be controlled by carbon monoxide monitoring devices, and systems provided in accordance with Clause (1)(b) shall be controlled by nitrogen dioxide or other acceptable monitoring devices. (See Note A-6.3.1.4.(2).)
- 3) Mechanical ventilation systems provided in accordance with Sentence (1) shall be designed such that the pressure in the *storage garage* is less than the pressure in adjoining *buildings* of other *occupancy*, or in adjacent portions of the same *building* having a different *occupancy*.

- 4) In *storage garages* subject to the requirements of Sentences (1) and (2), where motor vehicles are parked by mechanical means, the ventilation requirements may be reduced by one half.
- 5) Except as provided in Sentence (6), ticket and attendant booths of *storage garages* shall be pressurized with a supply of uncontaminated air.
- 6) The requirements of Sentences (1) to (5) shall not apply to *open-air storeys* in a *storage garage*.

#### 6.3.1.5. Heat Recovery Ventilators

- 1) Heat recovery ventilators with rated capacities of not less than 25L/s and not more than 200L/s shall be installed in accordance with Subsection 9.32.3.

#### 6.3.1.6. Indoor Air Contaminants

(See Note A-6.3.1.6.)

- 1) Air contaminants of concern that are released within *buildings* shall
  - a) be removed insofar as is possible at their points of origin, and
  - b) not be permitted to accumulate in concentrations greater than those permitted by applicable by-laws or regulatory enactments or, in the absence of such requirements, by good engineering practice such as that described in the publications listed in Sentence 6.2.1.1.(1), measured using the methodology described therein.
- 2) Systems serving spaces that contain sources of contamination and systems serving other occupied parts of the *building* but located in or running through spaces that contain sources of contamination shall be designed in such a manner as to prevent the spread of such contamination to other occupied parts of the *building*.
- 3) Heating, ventilating and air-conditioning systems shall be designed to minimize the growth and spread of bio-contaminants.

#### 6.3.1.7. Commercial Cooking Equipment

- 1) Except as provided in Sentences (2) and (3), Article 3.6.3.1. and Article 3.6.3.5., systems for the ventilation of commercial cooking equipment shall be designed, constructed and installed to conform to NFPA96, "Ventilation Control and Fire Protection of Commercial Cooking Operations."

2) The exhaust from a commercial cooking unit shall discharge through an ecology unit or *acceptable* equipment complying with Sentence (4), where the exterior wall termination of the exhaust is within 3 m of a *lane*, property line or street property line. (See Note A-6.3.1.7.(2).)

- 3) The exhaust from a commercial cooking unit which is discharged from an exterior wall termination shall not
  - a) be discharged in a location or manner which causes a concentrated stream of air to fall directly onto pedestrians,
  - b) be discharged in a location or manner which causes exhaust to accumulate in an area with outdoor seating, and
  - c) generate a sound pressure level which exceeds noise levels permitted by the Noise Control By-law.

(See Note A-6.3.1.7.(3).)

- 4) Equipment provided in compliance with Sentence (3) shall
  - a) remove 99.97% of the grease entering the equipment,
  - b) be of continuously welded 1.5 mm thick carbon steel or 1.1 mm stainless steel,
  - c) prevent the leakage of flame, smoke, or grease from the equipment at normal or abnormal temperatures,
  - d) limit the temperature rise of adjacent combustible materials to no more than 97°C above room temperature, and
  - e) limit the temperature of exhaust air at the exhaust outlet to no more than 138°C.

(See Note A-6.3.1.7.(4).)

## 6.3.2. Air Duct Systems

### 6.3.2.1. Application

1) This Subsection applies to the design, construction and installation of air duct distribution systems serving heating, ventilating and air-conditioning systems other than those in *dwelling units* covered by Part 9.

### 6.3.2.2. Drain Pans

- 1) Dehumidifying cooling coil assemblies and condensate-producing heat exchangers shall be equipped with drain pans beneath them that are
  - a) designed in accordance with Section 5.11, Drain Pans, of ANSI/ASHRAE 62.1, “Ventilation for Acceptable Indoor Air Quality,”
  - b) provided with an outlet that is piped to the outside of the airstream in a location where condensate can be eliminated, and
  - c) installed so that water drains freely from the pan.

### 6.3.2.3. Materials in Air Duct Systems

- 1) All ducts, duct connectors, associated fittings and *plenums* used in air duct systems shall be constructed of materials as described in Article 3.6.5.1.
- 2) Ducts that are used in a location where they may be subjected to excessive moisture shall have no appreciable loss of strength when wet and shall be resistant to moisture-induced corrosion.
- 3) All ductwork and fittings shall be constructed and installed as recommended in SMACNA Manuals and ASHRAE Standards.
- 4) All duct materials shall be suitable for exposure to the temperature and humidity of the air being carried and shall be resistant to corrosion caused by contaminants in the air being conveyed in the duct.

### 6.3.2.4. Connections in Air Duct Systems

- 1) Air duct systems shall have tight-fitting connections throughout.

### 6.3.2.5. Duct Coverings and Linings

(See Note A-6.3.2.5.)

- 1) Coverings, linings and associated adhesives and insulation used in air ducts, *plenums* and other parts of air duct systems shall comply with Article 3.6.5.4.
- 2) Duct linings shall be installed so that they will not interfere with the operation of volume or balancing dampers or of *fire dampers*, *fire stop flaps* and other *closures*.

### 6.3.2.6. Clearance of Ducts and Plenums

- 1) The clearance of ducts and *plenums* from *combustible* materials shall comply with Article 3.6.5.6.

### 6.3.2.7. Interconnection of Systems

- 1) In a *care* or *residential occupancy*, air from one *suite* shall not be circulated to any other *suite* or to a *public corridor*.
- 2) Except as permitted by Sentences (3) and 6.3.2.10.(6), air duct systems serving *storage garages* shall not be directly interconnected with other parts of the *building*.
- 3) *Exhaust ducts* referred to in Sentence 6.3.2.10.(10) are permitted to exhaust through an enclosed *storage garage* prior to exhausting to the outdoors, provided
  - a) the *storage garage's* exhaust system runs continuously,
  - b) the capacity of the *storage garage's* exhaust system is equal to or exceeds the volume of the exhaust entering the garage, and

- c) a leakage rate 1 smoke/*fire damper* rated in accordance with CAN/ULC-S112.1, “Leakage Rated Dampers for Use in Smoke Control Systems,” is provided near the duct outlet location in the *storage garage* to prevent air from the *storage garage* from entering the exhaust ductwork system in the event the *building’s* exhaust fan is shut down.

### 6.3.2.8. Makeup Air

(See Note A-6.2.1.1.)

1) In ventilating systems that exhaust air to the outdoors, provision shall be made for the admission of a supply of makeup air in sufficient quantity so that the operation of the exhaust system and other exhaust equipment or combustion equipment is not adversely affected.

2) Makeup air facilities required by Sentence (1) shall be interlocked with the exhaust devices they serve so that both operate together.

3) Where makeup air facilities are intended to introduce air directly from the outdoors to occupied parts of the *building* in winter, they shall incorporate means of tempering that air to maintain the indoor design temperature.

### 6.3.2.9. Supply, Return, Intake and Exhaust Air Openings

1) Supply, return and exhaust air openings located less than 2m above the floor in rooms or spaces in *buildings* shall be protected by grilles having openings of a size that will not allow the passage of a 15mm diameter sphere.

2) Outdoor air intakes shall be located so that

- the quality of the air entering the *building* complies with Sentences 6.2.1.2.(2) and (3), and
- they are separated a minimum distance from sources of contaminants in accordance with Table 6.3.2.9.

**Table 6.3.2.9.**  
**Minimum Distances of Air Intakes from Sources of Contaminants**  
Forming Part of Sentence 6.3.2.9.(2)

Source of Contaminants	Minimum Distance of Outdoor Air Intake, m
Garage entry of a garage for 5 or more motor vehicles, automobile loading area and drive-in queue	4.5
Truck loading area or dock, and bus parking	7.6
Driveway, street, and parking space	1.5
Thoroughfare, arterial road, freeway, and highway	7.6
Garbage storage/pick-up area and dumpsters	4.5
Discharge from evaporative cooling tower, evaporative fluid cooler and evaporative condenser	7.6
Sanitary vent	3.5
Kitchen cooking exhaust	3.0
Vent for combustion products	3.0

3) Outdoor air intakes shall be installed not less than 0.3m above roofs, landscape grades or other surfaces, taking into account anticipated snow accumulation levels.

4) Exterior openings for outdoor air intakes and exhaust outlets shall be shielded from the entry of snow and rain and shall be fitted with corrosion-resistant screens of mesh having openings not larger than 15mm, except where experience has shown that climatic conditions require larger openings to prevent the screen openings from icing over.

5) Screens required in Sentence (4) shall be accessible for maintenance.

6) *Combustible* grilles, diffusers and other devices covering supply, return, intake and exhaust openings shall comply with Article 3.6.5.7.

### 6.3.2.10. Exhaust Ducts and Outlets

1) Except as provided in Sentence (2), exhaust ducts of non-mechanical ventilating systems serving separate rooms or spaces shall not be combined.

2) *Exhaust ducts* of non-mechanical ventilating systems serving similar *occupancies* may be combined immediately below the point of final delivery to the outdoors, such as at the base of a roof ventilator.

3) *Exhaust ducts* of ventilating systems shall have provision for the removal of condensation where this may be a problem.

4) Exhaust outlets shall be designed to prevent backdraft under wind conditions.

5) Except as permitted in Sentence (6), exhaust systems shall discharge directly to the outdoors.  
(See Note A-6.3.2.10.(5) and (6).)

6) Exhaust systems are permitted to exhaust into a *storage garage*, provided

- a) they serve rooms that are accessible only from that *storage garage*,
- b) the exhaust contains no contaminants that would adversely affect the air quality in the *storage garage*  
(See Note A-6.3.2.10.(6)(b).), and
- c) they are designed in accordance with Sentence 6.3.2.7.(3).

(See Note A-6.3.2.10.(5) and (6).)

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

- a) independent of other *exhaust ducts*,
- b) accessible for inspection and cleaning, and
- c) constructed of a smooth corrosion-resistant material.

(See Note A-6.3.2.10.(7) and (8).)

8) 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) be provided with make-up air.

(See Note A-6.3.2.10.(7) and (8).)

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

10) Except as provided in Sentence (12) and except for self-contained systems serving individual *dwelling units*, *exhaust ducts* serving rooms containing water closets, urinals, basins, showers or slop sinks shall be independent of other *exhaust ducts*.

11) Except as provided in Sentence (12) and except for self-contained systems serving individual *dwelling units*, *exhaust ducts* serving rooms containing residential cooking equipment shall be independent of other *exhaust ducts*.

12) Two or more exhaust systems described in Sentences (10) and (11) may be interconnected or connected with *exhaust ducts* serving other areas of the *building*, provided

- a) the connections are made at the inlet of an exhaust fan, and all interconnected systems are equipped with suitable back pressure devices to prevent the passage of odours from one system to another when the fan is not in operation, or
- b) the *exhaust ducts* discharge to a shaft that is served by an exhaust fan having a capacity that is equal to or greater than the combined capacity of the exhaust fans discharging to the *plenum* multiplied by the operation diversity factor, provided that the exhaust fan serving the shaft operates continuously  
(See Note A-6.3.2.10.(12)(b).).

13) Where *exhaust ducts* containing air from *conditioned spaces* pass through or are adjacent to unconditioned spaces, the ducts shall be constructed to prevent condensation from forming on the inside or outside of the ducts.

#### 6.3.2.11. Return-Air System

- 1) Return-air systems shall comply with Article 3.6.5.8.
- 2) Where a ceiling space is used as a return-air *plenum*, the requirements of Article 3.6.4.3. shall apply.
- 3) A *public corridor* or *exit* shall not be used as a return-air *plenum*.

**6.3.2.12. Underground Ducts**

- 1) Underground ducts shall
  - a) be constructed and installed to provide interior drainage from and access to all low points,
  - b) not be connected directly to a sewer, and
  - c) be installed and constructed of materials recommended by ASHRAE and SMACNA Standards and HRAI Manuals.
- 2) A clean-out or pump-out connection shall be provided in an underground duct system at every low point of the duct system.

**6.3.2.13. Filters**

- 1) Air filters for air duct systems shall conform to the requirements for Class 2 air filter units as described in CAN/ULC-S111, "Fire Tests for Air Filter Units."
- 2) When electrostatic-type filters are used, they shall be installed so as to ensure that the electric circuit is automatically de-energized when filter access doors are opened or, in *dwelling units*, when the *furnace* circulation fan is not operating.

**6.3.2.14. Reserved****6.3.2.15. Evaporative Cooling Towers, Evaporative Fluid Coolers and Evaporative Condensers**

- 1) Discharge from evaporative cooling towers to ventilation air intakes shall comply with
  - a) Sentence 6.3.2.9.(2), and
  - b) CAN/CSA-Z317.2, "Special Requirements for Heating, Ventilation, and Air-Conditioning (HVAC) Systems in Health Care Facilities."
- 2) The distance between the air intakes of evaporative cooling towers, evaporative fluid coolers and evaporative condensers in relation to kitchen exhaust outlets, vegetation or other sources of organic matter shall be not less than 4.6 m.
- 3) Deleted.
- 4) Water treatment equipment for biological growth control shall be provided in accordance with Sub-Section 7.6.2. of ASHRAE Guideline 12, "Minimizing the Risk of Legionellosis Associated with Building Water Systems."
- 5) Deleted.
- 6) Evaporative cooling towers, evaporative fluid coolers and evaporative condensers shall be provided with access ports, service platforms, fixed ladders and restraint connections to allow visual inspection, maintenance and testing.

**6.3.2.16. Evaporative Air Coolers, Misters, Atomizers, Air Washers and Humidifiers**

- 1) The filter and water evaporation medium of every air washer and evaporative air cooler enclosed within a *building* shall be made of *noncombustible* material.
- 2) Sumps for air washers and evaporative air coolers shall be constructed and installed so that they can be flushed and drained.
- 3) Evaporative air coolers, misters, atomizers, air washers and humidifiers shall be designed in accordance with Sections 8 and 9 of ASHRAE Guideline 12, "Minimizing the Risk of Legionellosis Associated with Building Water Systems."

**6.3.2.17. Fans and Associated Air-Handling Equipment**

- 1) Fans for heating, ventilating and air-conditioning systems shall be located and installed so that their operation
  - a) does not adversely affect the draft required for proper operation of fuel-fired *appliances*, and
  - b) does not allow the air in the duct system to be contaminated by air or gases from the *boiler* room or *furnace* room.
- 2) Fans and associated air-handling equipment, such as air washers, filters and heating and cooling units, when installed on the roof or elsewhere outside the *building*, shall be of a type designed for outdoor use.

**6.3.2.18. Vibration Isolation Connectors**

- 1) Vibration isolation connectors in air duct systems shall comply with Article 3.6.5.2.

**6.3.2.19. Tape**

- 1) Tape used for sealing joints in air ducts, *plenums* and other parts of air duct systems shall comply with Article 3.6.5.3.

**6.3.3. Chimneys and Venting Equipment****6.3.3.1. Requirement for Venting**

- 1) Except as provided in Articles 6.3.3.2. and 6.3.3.3., the products of combustion from oil-, gas- and solid-fuel-burning *appliances* shall be vented in conformance with the requirements in the applicable *appliance* installation standard listed in Article 6.2.1.5.

- 2) Except as provided in Article 6.2.1.5., vented products of combustion, other than those referred to in Sentence (1), shall be discharged away from the *building*, so as not to re-enter it, to a distance not less than

- a) 2.15m above sidewalks and driveways,
- b) 3m from outdoor air intakes,
- c) 3m horizontally or vertically from doors and operable windows, and
- d) 3m horizontally or vertically from occupiable outdoor spaces, excluding maintenance spaces.

(See Note A-6.3.3.1.(2).)

**6.3.3.2. Masonry or Concrete Chimneys**

- 1) Rectangular *masonry or concrete chimneys* not more than 12m in height shall conform to Part 9 if they serve

- a) appliances with a combined total rated heat output of 120kW or less, or
- b) fireplaces.

- 2) *Masonry or concrete chimneys* other than those described in Sentence (1) shall be designed and installed in conformance with the appropriate requirements in NFPA211, "Chimneys, Fireplaces, Vents, and Solid Fuel-Burning Appliances."

**6.3.3.3. Metal Smoke Stacks**

- 1) Single wall metal smoke stacks shall be designed and installed in conformance with NFPA211, "Chimneys, Fireplaces, Vents, and Solid Fuel-Burning Appliances."

**6.3.3.4. Access Ladders**

- 1) Access ladders for *chimneys*, when provided, shall consist of steel or bronze rungs, built into the walls of the *chimneys*.

- 2) Rungs for external ladders shall begin at not less than 2.5m from ground level.

**6.3.4. Ventilation for Laboratories****6.3.4.1. Application**

- 1) This Subsection applies to laboratories where *dangerous goods*, including *flammable liquids* and *combustible liquids*, are used in normal laboratory operations in quantities or in a manner that creates a fire or explosion hazard.

**6.3.4.2. General Ventilation**

- 1) A laboratory shall be provided with continuous mechanical ventilation designed to ensure that *dangerous goods* vapours and particles

- a) do not accumulate in the laboratory,
- b) are prevented from migrating to other parts of the *building*,
- c) do not accumulate in the ventilation system,



- d) are exhausted to the outdoors, and
- e) are not returned to the *building*.
- 2) A ventilation system required by this Subsection shall be provided with monitoring devices to
  - a) indicate that the ventilation system is in operation, and
  - b) sound an alarm if the ventilation system is malfunctioning.
- 3) A ventilation system required by this Subsection shall be maintained in conformance with Article 5.5.4.1. of DivisionB of the Fire By-law.

#### 6.3.4.3. Enclosure Exhaust Ventilation

- 1) The ventilation system for a power-ventilated enclosure required by Sentence 5.5.4.2.(1) of Division B of the Fire By-law shall
  - a) conform to NFPA91, “Exhaust Systems for Air Conveying of Vapors, Gases, Mists, and Noncombustible Particulate Solids,”
  - b) provide continuous exhaust ventilation at an air velocity sufficient to prevent the accumulation of *combustible* or reactive deposits in the power-ventilated enclosure and its *exhaust duct* system,
  - c) confine *dangerous goods* vapours and particles to the area where they are generated and exhaust them to the outdoors,
  - d) not return the exhausted air to the *building*, and
  - e) be provided with well identified control switches that are
    - i) located outside of the power-ventilated enclosure, and
    - ii) readily accessible in case of an emergency.

#### 6.3.4.4. Enclosure Construction

- 1) The power-ventilated enclosure required by Sentence 5.5.4.2.(1) of DivisionB of the Fire By-law and its *exhaust duct* system shall
  - a) except as provided in Sentences (2) and(3), be constructed of *noncombustible* materials compatible with and chemically resistant to the *dangerous goods* vapours and particles being exhausted, and
  - b) be provided with access doors to permit inspection and maintenance of the fan assembly and *exhaust ducts*.
- 2) *Combustible* materials are permitted in systems described in Clause (1)(a) if
  - a) such materials are required by the corrosive or reactive properties of the *dangerous goods* being used, and
  - b) their *flame-spread rating* is not more than 25.
- 3) The *flame-spread rating* required by Sentence (2) is permitted to be greater than 25 if an automatic fire suppression system is provided inside the power-ventilated enclosure and its *exhaust duct* system.