

# CHAPTER 3

## GENERAL REQUIREMENTS

### SECTION 301 RESERVED

### SECTION 302 DESIGN CONDITIONS

**302.1 Interior design conditions.** The interior design temperatures used for heating and cooling load calculations shall be a maximum of 72°F (22°C) for heating and a minimum of 75°F (24°C) for cooling.

**302.2 Exterior design conditions.** The following design parameters in Table 302.2 shall be used for calculations required under this code.

**TABLE 302.2  
THERMAL DESIGN PARAMETERS**

CONDITION	VALUE
Winter <sup>a</sup> , Design Dry-Bulb	-11°F
Summer <sup>a</sup> , Design Dry-Bulb	84°F
Summer, Design Wet Bulb	69°F
Degree Days Heating <sup>b</sup>	7,771
Degree Days Cooling <sup>b</sup>	2,228

For SI: °C = [(°F) - 32]/1.8.

- a. The outdoor design temperature is selected from the columns of 97<sup>1</sup>/<sub>2</sub>-percent values for winter and 2<sup>1</sup>/<sub>2</sub>-percent values for summer from tables in the ASHRAE *Handbook of Fundamentals*. Adjustments shall be permitted to reflect local climates which differ from the tabulated temperatures, or local weather experience determined by the code official or other authority having jurisdiction.
- b. The degree days heating (base 65°F) and cooling (base 65°F) shall be selected from NOAA "Annual Degree Days to Selected Bases Derived from the 1971-2000 Normals," the ASHRAE *Handbook of Fundamentals*, data available from adjacent military installations or other sources of local weather data acceptable to the code official or other authority having jurisdiction.

### SECTION 303 MATERIALS, SYSTEMS AND EQUIPMENT

**303.1 Identification.** Materials, systems and equipment shall be identified in a manner that will allow a determination of compliance with the applicable provisions of this code.

**303.1.1 Building thermal envelope insulation.** An *R*-value identification mark shall be applied by the manufacturer to each piece of *building thermal envelope* insulation 12 inches (305 mm) or greater in width. Alternately, the insulation installers shall provide a certification listing the type, manufacturer and *R*-value of insulation installed in each element of the *building thermal envelope*. For blown or sprayed insulation (fiberglass and cellulose), the initial installed thickness, settled thickness, settled *R*-value,

installed density, coverage area and number of bags installed shall be *listed* on the certification. For sprayed polyurethane foam (SPF) insulation, the installed thickness of the areas covered and *R*-value of installed thickness shall be *listed* on the certification. The insulation installer shall sign, date and post the certification in a conspicuous location on the job site.

**303.1.1.1 Blown or sprayed roof/ceiling insulation.**

The thickness of blown-in or sprayed roof/ceiling insulation (fiberglass or cellulose) shall be written in inches (mm) on markers that are installed at least one for every 300 square feet (28 m<sup>2</sup>) throughout the attic space. The markers shall be affixed to the trusses or joists and marked with the minimum initial installed thickness with numbers a minimum of 1 inch (25 mm) in height. Each marker shall face the attic access opening. Spray polyurethane foam thickness and installed *R*-value shall be *listed* on certification provided by the insulation installer.

**303.1.2 Insulation mark installation.** Insulating materials shall be installed such that the manufacturer's *R*-value mark is readily observable upon inspection.

**303.1.3 Fenestration product rating.** *U*-factors of fenestration products (windows, doors and skylights) shall be determined in accordance with NFRC 100 by an accredited, independent laboratory, and labeled and certified by the manufacturer. Products lacking such a labeled *U*-factor shall be assigned a default *U*-factor from Table 303.1.3(1) or 303.1.3(2).

**TABLE 303.1.3(1)  
DEFAULT GLAZED FENESTRATION U-FACTOR**

FRAME TYPE	SINGLE PANE	DOUBLE PANE	SKYLIGHT	
			Single	Double
Metal	1.20	0.80	2.00	1.30
Metal with Thermal Break	1.10	0.65	1.90	1.10
Nonmetal or Metal Clad	0.95	0.55	1.75	1.05
Glazed Block	0.60			

**TABLE 303.1.3(2)  
DEFAULT DOOR U-FACTORS**

DOOR TYPE	U-FACTOR
Uninsulated Metal	1.20
Insulated Metal	0.60
Wood	0.50
Insulated, nonmetal edge, max 45% glazing, any glazing double pane	0.35

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**303.1.4 Insulation product rating.** The thermal resistance (*R*-value) of insulation shall be determined in accordance with the U.S. Federal Trade Commission *R*-value rule (CFR Title 16, Part 460, May 31, 2005) in units of  $h \times ft^2 \times ^\circ F/Btu$  at a mean temperature of 75°F (24°C).

**303.2 Installation.** All materials, systems and equipment shall be installed in accordance with the manufacturer's installation instructions and the *International Building Code*.

**303.2.1 Protection of exposed foundation insulation.** Insulation applied to the exterior of basement walls, crawl-space walls and the perimeter of slab-on-grade floors shall have a rigid, opaque and weather-resistant protective covering to prevent the degradation of the insulation's thermal performance. The protective covering shall cover the exposed exterior insulation and extend a minimum of 6 inches (153 mm) below grade.

**303.3 Maintenance information.** Maintenance instructions shall be furnished for equipment and systems that require preventive maintenance. Required regular maintenance actions shall be clearly stated and incorporated on a readily accessible label. The label shall include the title or publication number for the operation and maintenance manual for that particular model and type of product.

### SECTION 304 DESIGN CRITERIA FOR RESIDENTIAL VENTILATION SYSTEMS

**304.1 Scope.** This section shall govern ventilation of the dwelling unit(s) within Type A-1 residential buildings, Type A-2 residential buildings and multiple single-family attached dwellings (townhouses) not more than three stories in height.

**304.1.1 Compliance.** Compliance with Section 304 shall be achieved by meeting Section 304.2 and 304.3.

**304.2 Local ventilation.** Bathrooms containing a bathtub, shower, spa or similar bathing fixture and not included in the whole house ventilation system shall be sized to meet the net capacity rates as required in Table 304.2. Whole house ventilation fans serving both localized and whole house ventilation functions shall be sized to meet the net capacity rates as required by Section 304.6 and must meet all other requirements listed in Section 304.3, as applicable.

TABLE 304.2  
MINIMUM REQUIRED LOCAL EXHAUST

OCCUPANCY CLASSIFICATION	MECHANICAL EXHAUST CAPACITY (CFM)
Bathrooms	50 cfm intermittent or 20 cfm continuous

**304.3 Whole house ventilation (MANDATORY).** Every home built to RBES shall be mechanically ventilated by a whole house ventilation system as defined in Chapter 2. The whole house ventilation system shall be one of two types: "exhaust only" or "balanced."

**304.4 Whole house air circulation.** Provisions shall be made to allow air flow to all finished living spaces by installation of

distribution ducts, undercutting doors, installation of grilles, transoms or equivalent means. Door undercuts shall be at least 1/2 inch (12.7 mm) above the surface of the finished floor covering.

**304.5 Fan motor requirements.** Fans installed for the purpose of providing whole house ventilation must meet the minimum requirements as specified in this section.

**Exception:** Fans installed exclusively for local ventilation purposes are exempted from meeting the fan motor requirements listed in section 304.5.

**304.5.1 Fan durability.** Whole house ventilation fan motors shall be rated for "continuous duty" and have manufacturer flow ratings as listed in HVI 911.

**304.5.2 Fan power consumption.** Single-port whole house ventilation equipment shall not exceed 50 watts as listed by the manufacturer on the fan motor or as listed in accordance with HVI 911. Power used for lights, sensors, heaters, timers or night lights shall not be included in the determination of power consumption.

**304.5.3 Fan noise.** Whole house ventilation equipment located less than 4 feet (1219 mm) from louvers, grilles or openings shall have a sound rating no greater than 1.5 sones as determined in accordance with HVI 911.

**304.5.4 Performance verification.** In-field measurements of exhaust fan flows shall be conducted using a manufactured flow-measuring device in accordance with the manufacturer's instructions. Acceptable devices include a calibrated orifice combined with a digital manometer or a flow hood. All measuring devices shall be accurate to within 10 percent of measured flow.

**304.6 Net capacity requirements.** Whole house ventilation system fans shall be installed according to the manufacturer's installation instructions and shall have the manufacturer's fan flow ratings as listed in accordance with HVI 911. Unless the whole house system is tested according to procedures in Section 304.6.1, the minimum continuous flow rate that the ventilation system must be capable of supplying during its operation shall be based on the rate per bedroom as specified in Table 304.6.

**304.6.1 Testing option.** Testing may be done to verify that the whole house ventilation system satisfies the ventilation requirements of this section in accordance with Sections 304.6.1.1 and 304.6.1.2.

**304.6.1.1 Minimum Outdoor Air.** Automatic operation of the ventilation system shall not reduce the minimum continuous ventilation rate below 15 cfm of outdoor air per bedroom plus 15 cfm during occupancy.

**304.6.1.2 Performance Verification.** In-field measurements of exhaust fan flows shall be conducted using a manufactured flow-measuring device in accordance with the manufacturer's instructions. Acceptable devices include a calibrated orifice combined with a digital manometer or a flow hood. All measuring devices shall be accurate to within 10 percent of measured flow.

**TABLE 304.6  
PRESCRIPTIVE FAN CAPACITY REQUIREMENTS**

NUMBER OF BEDROOMS	MINIMUM NOMINAL RATED TOTAL FAN CAPACITY <sup>a</sup> (at 0.1 inches w.g.)	MINIMUM NUMBER OF FANS TO MEET WHOLE HOUSE AIRFLOW RATES
1	50 cfm	1
2	75 cfm	1
3	100 cfm	1
4	125 cfm	Centrally ducted systems—1 All other systems—2 or more
5	150 cfm	Centrally ducted systems—1 All other systems—2 or more
Homes > 3,000 ft <sup>2</sup>	cfm = 0.05 · ft <sup>2</sup>	Centrally ducted systems—1 All other systems—2 or more

For SI: 1 cubic foot per minute = 0.0004719 m<sup>3</sup>/s, 1 cubic foot per minute per square foot = 0.00508 m<sup>3</sup>/(s · m<sup>2</sup>).

a. Represents the total installed rated capacity of all fans designed for whole house ventilation.

**304.7 Ventilation required during periods of occupancy.**

Ventilation shall be provided continuously or intermittently during the period that the building is occupied.

**304.8 Controls.** Whole house ventilation systems shall be capable of being set remotely for continuous operation or shall be provided with an automatic control for intermittent operation. All whole house ventilation controls shall be readily accessible.

**Exception:** Fans installed expressly for local ventilation purposes.

**304.8.1 Intermittent operation.** Intermittently operated whole house ventilation systems shall be capable of being set remotely for continuous operation; or shall be provided with an automatic control capable of operating without the need for occupant intervention, such as a time switch or some other control device. Twist or crank-style timers are prohibited as control devices for whole house ventilation systems. Operation controlled solely by a humidity sensor (humidistat or dehumidistat) does not qualify.

**304.8.2 Continuous operation.** Continuously operated whole house ventilation systems shall not be provided with local controls unless that control only operates the whole house ventilation system both intermittently at high speed and continuously at low speed.

**304.8.2.1 On/off switch for continuous operation.** An on/off switch for continuously operated whole-house ventilation systems shall be remotely installed and appropriately labeled.

**304.9 Installation requirements.** Ventilation equipment shall be installed according to the manufacturer’s instructions and in accordance with Sections 304.9.1 through 304.9.8.

**304.9.1 Fan housings.** Fan housings for single-port exhaust only systems must be sealed to the ceiling or wall.

**304.9.2 Inlet grills.** Inlet grills for multiport exhaust ventilation systems or balanced whole house ventilation systems must be sealed to the ceiling or wall.

**304.9.3 Ducts.** Smooth wall ducts (PVC or metal) must be used for all duct runs longer than 8 feet (2438 mm). Ducts shall be insulated when installed in an unheated location.

**304.9.4 Fasteners.** Mechanical fasteners must be used to connect all ducts to the fan(s) without impeding the operation of the fan or any internal backdraft damper.

**304.9.5 Joints and connections.** All joints, seams and connections shall be securely fastened and sealed with welds, gaskets, mastics (adhesives), mastic embedded fabric systems or approved tapes.

**304.9.6 Noise abatement.** Remote whole house ventilation fans shall be acoustically isolated from the structural elements of the building and from attached ducts using at least 1 foot (305 mm), but not more than 2 feet (610 mm) of insulated flexible duct.

**304.9.7 Intake openings.** Mechanical and gravity outside air intake openings for balanced whole house systems, integrated supply systems or heat recovery ventilating systems that are installed in accordance with Section 304 shall be located a minimum of 10 feet (3048 mm) from any hazardous or noxious contaminant, such as vents, chimneys, plumbing vents, fuel fills and vents, streets, alleys, parking lots and loading docks, except as otherwise specified in this code.

The bottom of the intake termination shall be located at least 12 inches (305 mm) above the normally expected snow accumulation level.

**304.9.8 Outside opening protection.** Air exhaust and intake openings located in exterior walls shall be protected with corrosion-resistant screens, louvers or grilles having a minimum opening size of 1/4 inch (6.4 mm) and a maximum opening size of 1/2 inch (12.7 mm), in any dimension. Openings shall be protected against local weather conditions.

**304.10 Clothes dryer exhaust.** Clothes dryers shall be exhausted in accordance with the manufacturer’s instructions. Dryer exhaust systems shall be independent of all other systems and shall convey the moisture and any products of combustion to the outside of the building.

**Exception:** This section shall not apply to listed and labeled condensing (ductless) clothes dryers

## SECTION 305 COMBUSTION SAFETY (MANDATORY)

**305.1 General.** The provisions of this section shall govern the requirements for combustion and dilution air for fuel-burning appliances in every new home built to RBES, whenever a new heating system is installed, or whenever alteration, renovation or repair work creates *unusually tight construction* as defined in NFPA 54 and NFPA 31.

**305.2 Unusually tight construction.** For the purpose of applying the provisions of Section 305 to fuel gas, kerosene and oil-burning equipment, buildings constructed in compliance with the RBES shall be considered so tight that normal infiltration does not meet combustion air requirements, and therefore, of unusually tight construction as defined in NFPA 54 and NFPA 31.

**305.3 Fuel gas, kerosene and oil-burning equipment.** Every new home built to the RBES that contains Category I or II natural draft venting fuel-burning appliances shall be provided with combustion and dilution air as required by NFPA 54 for fuel-gas utilization equipment or NFPA 31 for oil-burning equipment. Direct vent appliances that do not draw combustion air from inside of the building are not required to be considered in the determination of the combustion and dilution air requirements.

**Exception:** Where all combustion devices in the home have a sealed combustion venting system, a mechanical draft venting system or are direct-vent appliances, then the combustion and dilution air requirements of this section do not apply.

**305.3.1 Crawl space and attic space.** For the purposes of applying the provisions of Section 305, an opening to a naturally ventilated crawl space or attic space is not considered equivalent to an opening outdoors and is therefore prohibited for the purposes of supplying combustion and dilution air.

**305.3.2 Unvented Room Heaters.** Unvented fuel-fired heaters, including room heaters and unvented fireplaces are prohibited.

**305.4 Solid fuel-burning appliances and fireplaces.** All solid fuel-burning appliances and fireplaces shall meet the provisions of this section.

**305.4.1 Gasketed Doors.** All solid fuel-burning appliances and fireplaces shall have tight-fitting (defined as gasketed doors with compression closure or compression latch system) metal glass or ceramic doors.

**Exception:** Any home certified to have passed the Canadian General Standards Board 51.71 "Spillage Test" is not required to have tight-fitting doors. The CGSB Spillage Test creates a "worst-case" condition to determine whether the appliances can vent properly even with the house closed tight and all the exhaust equipment running.

**305.4.2 Spillage Testing.** All chimney-vented equipment shall establish complete draft without spillage under "worst-case" conditions within two minutes. If any chimney-vented equipment fails this requirement, mechanically

induced pressure relief shall be provided such that the requirement is met.

**305.4.2 Exterior air supply requirements.** Solid fuel-burning appliances and fireplaces shall be equipped with an exterior air supply according to the provisions of sections 305.4.2.1 through 305.4.2.7.

**Exception:** Factory-built fireplaces, masonry fireplaces and solid fuel-burning appliances that list exterior air supply ducts as optional or required for proper installation are permitted to be installed with those exterior air supply ducts according to the manufacturer's installation instructions.

**305.4.2.1** Combustion air shall not be taken from within the garage, attic, or basement.

**305.4.2.2** The exterior air inlet shall not terminate to the exterior higher than the firebox and shall not rise vertically within 18 inches of the firebox.

**Exception:** Where woodstove or fireplace is installed below grade (in a basement), air intake is permitted to terminate above the firebox if the combustion air supply point is below the firebox and the combustion air intake point is greater than 15 inches below the top of the wood stove or fireplace chimney.

**305.4.2.3** The exterior air intake must deliver combustion air to the firebox.

**Exception:** For older woodstoves and cookstoves where direct connection of combustion air is not possible, combustion air may be delivered within 24 inches of the stove's air intake opening.

**305.4.2.4** The air inlet shall be screened with  $\frac{1}{4}$  inch mesh.

**305.4.2.5** The air inlet shall be closable and designed to prevent debris from dropping into the air intake.

**305.4.2.6** The exterior air inlet shall be installed so as to remain free of obstruction from snow.

**305.4.2.7 Passageway.** The combustion air passageway for unlisted exterior air supply ducts shall be a minimum of 6 square inches (3870 mm<sup>2</sup>) and not more than 55 square inches (0.035 m<sup>2</sup>). The passageway shall be non-combustible, masonry or 30 gauge (or thicker) metal, have 1 inch clearance to combustibles for the length of the combustion air intake. Combustion air systems for listed fireplaces shall be constructed according to the fireplace manufacturer's instructions.