This document provides all current Oregon Amendments contained in the 2014 Oregon Mechanical Specialty Code (OMSC), based on the 2012 International Mechanical Code (IMC). This list contains the Oregon Amendments in their entirety, both the new amendments from the 2014 OMSC and the existing amendments from the 2010 OMSC, and may be useful for those having access to the model IMC but not the OMSC.

CHAPTER 1
ADMINISTRATION

201.4 Terms not defined.
Where terms are not defined through the methods authorized by this section, such terms shall have ordinarily accepted meanings such as the context implies.

Words of common usage are given their plain, natural and ordinary meanings. Words that have well-defined legal meanings are given those meanings.

SECTION 202
GENERAL DEFINITIONS

BUILDING CODE. The Oregon Structural Specialty Code.

BUILDING OFFICIAL. The officer charged with the administration and enforcement of this code, or a duly authorized representative.

CODE OFFICIAL. See “Building Official.”

DESIGN FLOOD ELEVATION. The elevation of the “design flood,” including wave height, relative to the datum specified on the community’s legally designated flood hazard area map.

DESIGN FLOOD ELEVATION. The elevation of the design flood within the flood hazard area designated by the Flood Plain Administrator.
OAR 918-008-0000 is not part of this code but is provided here for the readers’ convenience:

918-008-0000 Purpose and Scope

(1) The Department of Consumer and Business Services, Building Codes Division, adopts model building codes, standards and other publications by reference, as necessary, through administrative rule to create the state building code. When a matter is included in a specialty code or referenced publication that is in conflict with Oregon Revised Statutes or Oregon Administrative Rules, the statute or rule applies and the code or standard provision does not. All remaining parts or application of the code or standard remain in effect.

(2) Unless required by law, matters generally not authorized for inclusion in a specialty code or referenced standard include, but are not limited to: licensing or certification requirements, or other qualifications and standards for businesses or workers; structures or equipment maintenance requirements; matters covered by federal or state law; and matters that conflict with other specialty codes or publications adopted by the department.

(3) OAR 918-008-0000 to OAR 918-008-0070 provides the process for adopting and amending the state building code that is consistent across all program areas.

(4) The state building code is derived from the most appropriate version of base model codes, which are updated periodically.

(5) The Oregon specialty code amendment process begins approximately midway into a code cycle.

(6) An appropriate advisory board approves or forwards the adoption of the Oregon specialty code and amendments to the Department for adoption.

(7) Notwithstanding sections (3) through (6) of this rule, the division may adopt supplemental code amendments as authorized by OAR 918-008-0028.

[Publications: Publications referenced are available from the agency.]

Stat. Auth.: ORS 447.020, 455.030 & 479.730
Stats. Implemented: ORS 447.020, 455.030 & 479.730
Hist.: BCD 26-1994, f. & cert. ef. 11-15-94; BCD 6-1997, f. & cert. ef. 4-1-97; BCD 3-2006(Temp), f. & cert. ef. 3-1-06 thru 8-27-06; BCD 9-2006, f. 6-30-06, cert. ef. 7-1-06

ELECTRICAL CODE. The Oregon Electrical Specialty Code.

ENERGY CODE. The Oregon Energy Efficiency Specialty Code.

EXCESS FLOW VALVE (EFV). A valve designed to activate when the fuel gas passing through it exceeds a prescribed flow rate.

FIRE CODE. As referenced in this code for construction, alteration and repair of buildings and structures is the Oregon Fire Code as adopted and amended by the State of Oregon Fire Marshal. For
the purpose of the Oregon Mechanical Specialty Code, fire code shall mean those portions of the Oregon Fire Code which include construction, reconstruction, alteration, repair or installation of materials and equipment that is covered by the State Building Code.

FLASHBACK ARRESTOR CHECK VALVE. A device that will prevent the backflow of one gas into the supply system of another gas and prevent the passage of flame into the gas supply system.

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FLOOD HAZARD AREA. The area designated as a flood hazard area by the Flood Plain Administrator. The greater of the following two areas:
1. The area within a flood plain subject to a 1 percent or greater chance of flooding in any year.
2. The area designated as a flood hazard area on a community’s flood hazard map, or otherwise legally designated.

MECHANICAL CODE. The Oregon Mechanical Specialty Code.

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PLUMBING CODE. The Oregon Plumbing Specialty Code.

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(\textit{Note: relocation from appendix C to cover all of mechanical code})

POINT OF DELIVERY. For natural gas systems, the \textit{point of delivery} is the outlet of the service meter assembly or the outlet of the service regulator or service shutoff valve where a meter is not provided. Where a valve is provided at the outlet of the service meter assembly, such valve shall be considered to be downstream of the \textit{point of delivery}. For undiluted liquefied petroleum gas systems, the point of delivery shall be considered to be the outlet of the first stage pressure regulator that provides utilization pressure, exclusive of line gas regulators, in the system.

RESIDENTIAL CODE. The Oregon Residential Specialty Code.

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STATE BUILDING CODE. The combined specialty codes adopted pursuant to ORS 455 and any code regulation or requirement in effect at the time of construction – regardless of when the building or structure was built.

\textit{[P]} THIRD-PARTY CERTIFICATION AGENCY. An approved agency operating a product or material certification system that incorporates initial product testing, assessment and surveillance of a manufacturer’s quality control system.

\textit{[P]} THIRD-PARTY CERTIFIED. Certification obtained by the manufacturer indicating that the function and performance characteristics of a product or material have been determined by testing and ongoing surveillance by an approved third-party certification agency. Assertion of certification is in the form of identification in accordance with the requirements of the third-party certification agency.

\textit{[P]} THIRD-PARTY TESTED. Procedure by which an approved testing laboratory provides documentation that a product material or system conforms to specified requirements.
VESTIBULE. A passage, hall or chamber between the outer door and the interior of a building.

WATER HEATER. Appliances which heat potable water, are equipped with approved safety devices and operate at or below all of the following:
1. Volume of 120 gallons (454 L);
2. Water temperature of 210°F (98.9°C);
3. 150 pounds (1031 kPa) per square inch operating pressure; and
4. 200,000 Btu (58,620 W) input.

ZONE. One occupiable space or several occupiable spaces with similar occupancy classification (see Table 403.3), occupant density, zone air distribution effectiveness and zone primary airflow rate per unit area.

CHAPTER 3
GENERAL

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.

301.4 Plastic pipe, fittings and components.
Plastic pipe, fittings and components shall be third-party certified as conforming to NSF 14.

301.5 Third-party testing and certification.
Piping, tubing and fittings shall comply with the applicable referenced standards, specifications and performance criteria of this code and shall be identified in accordance with Section 301.3. Piping, tubing and fittings shall either be tested by an approved third-party testing agency or certified by an approved third-party certification agency.

301.6 Fuel gas appliances and equipment.
The approval and installation of fuel gas distribution piping and equipment, fuel gas-fired appliances and fuel gas-fired appliance venting systems shall be in accordance with Appendix C the International Fuel Gas Code.

301.69 Label information.
A permanent factory-applied nameplate(s) shall be affixed to appliances on which shall appear in legible lettering, the manufacturer’s name or trademark, the model number, serial number and the seal or mark of the approved agency. A label shall also include the following:
Note: For reference only. Not adopted as part of this code.
Solid-fuel-burning devices, as defined by the Oregon Department of Environmental Quality OAR 340-262-0450 shall bear a DEQ certification label.

[B] 301.16 Flood hazard.
For structures located in flood hazard areas, mechanical systems, equipment and appliances shall be located at or above the elevation established by the Flood Plain Administrator local governing authorities required by Section 1612 of the International Building Code for utilities and attendant equipment.

**Exception:** Mechanical systems, equipment and appliances are permitted to be located below the elevation established by the Flood Plain Administrator local governing authorities required by Section 1612 of the International Building Code for utilities and attendant equipment provided that they are designed and installed to prevent water from entering or accumulating within the components and to resist hydrostatic and hydrodynamic loads and stresses, including the effects of buoyancy, during the occurrence of flooding up to such elevation.

[B] 301.16.1 High-velocity wave action.
In flood hazard areas subject to high-velocity wave action as established by the Flood Plain Administrator, mechanical systems and equipment shall not be mounted on or penetrate walls intended to break away under flood loads.
OAR 918-008-0000 is not part of this code but is provided here for the readers’ convenience:

**918-008-0000 Purpose and Scope**

(1) The Department of Consumer and Business Services, Building Codes Division, adopts model building codes, standards and other publications by reference, as necessary, through administrative rule to create the state building code. When a matter is included in a specialty code or referenced publication that is in conflict with Oregon Revised Statutes or Oregon Administrative Rules, the statute or rule applies and the code or standard provision does not. All remaining parts or application of the code or standard remain in effect.

(2) Unless required by law, matters generally not authorized for inclusion in a specialty code or referenced standard include, but are not limited to: licensing or certification requirements, or other qualifications and standards for businesses or workers; structures or equipment maintenance requirements; matters covered by federal or state law; and matters that conflict with other specialty codes or publications adopted by the department.

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**SECTION 303**

**EQUIPMENT AND APPLIANCE LOCATION**

**303.3 Prohibited locations.**

Fuel-fired appliances shall not be located in, or obtain combustion air from, any of the following rooms or spaces:

1. Sleeping rooms.
2. Bathrooms.
3. Toilet rooms.
4. Storage closets.
5. Surgical rooms.

**Exception:** This section shall not apply to the following appliances:

1. **Direct-vent appliances** that obtain all combustion air directly from the outdoors.
2. Solid fuel-fired appliances, provided that the room is not a confined space and the building is not of unusually tight construction.
3. Appliances installed in a dedicated enclosure in which all combustion air is taken directly from the outdoors, in accordance with Chapter 7. Access to such enclosure shall be through a solid door, weather-stripped in accordance with the exterior door air leakage requirements of the International Energy Conservation Code, and equipped with an approved self-closing
device.

304.3 Elevation of ignition source.
Equipment and appliances having an ignition source and located in hazardous locations and public garages, private garages, repair garages, automotive motor fuel-dispensing facilities and parking garages shall be elevated such that the source of ignition is not less than 18 inches (457 mm) above the floor surface on which the equipment or appliance rests. For the purpose of this section, rooms or spaces that are not part of the living space of a dwelling unit and that communicate directly with a private garage through openings shall be considered to be part of the private garage.

Exception: Elevation of the ignition source is not required for appliances that are listed as flammable vapor ignition resistant.

304.6 Public garages.
Appliances located in public garages, motor fueling-dispensing facilities, repair garages or other areas frequented by motor vehicles, shall be installed a minimum of 8 feet (2438 mm) above the floor. Where motor vehicles are capable of passing under an appliance, the appliance shall be installed at the clearances required by the appliance manufacturer and not less than 1 foot (305 mm) higher than the tallest vehicle garage door opening.

Exception: The requirements of this section shall not apply where the appliances are protected from motor vehicle impact and installed in accordance with Section 304.3 and NFPA 30A, Figure 304.1

304.7 Private garages.
Appliances located in private garages and carports shall be installed with a minimum clearance of 6 feet (1829 mm) above the floor.

Exception: The requirements of this section shall not apply where the appliances are protected from motor vehicle impact and installed in accordance with Section 304.3 and Figure 304.1

SECTION 306
ACCESS AND SERVICE SPACE

306.5 Equipment and appliances on roofs or elevated structures.
Where equipment requiring access or appliances are 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, an interior or exterior means of access shall be provided. Such access shall not require climbing over obstructions greater than 30 inches (762 mm) 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:
(Items 1 – 9 unchanged)
10. Access to ladders shall be provided at all times. Access paths to ladders and ladder landings shall remain unobstructed at all times.

Exceptions:
1. This section shall not apply to the replacement, repair or maintenance of an existing appliance or piece of equipment lawfully in existence at the time of the adoption of this code.
2. This section shall not apply to Group R-3 occupancies.

306.5.1 Sloped Roofs
Where appliances, equipment, fans or other components that require service are installed on a roof having a slope of three units vertical in 12 units horizontal (25-percent slope) or greater and having an edge more than 30 inches (762 mm) above grade at such edge, a level platform shall be provided on each side of the appliance or equipment to which access is required for service, repair or maintenance. The platform shall be not less than 30 inches (762 mm) in any dimension and shall be provided with guards. The guards shall extend not less than 42 inches (1067 mm) above the platform, shall be constructed so as to prevent the passage of a 21-inch diameter (533 mm) sphere and shall comply with the loading requirements for guards specified in the International Building Code. Access shall not require walking on roofs having a slope greater than four units vertical in 12 units horizontal (33-percent slope). Where access involves obstructions greater than 30 inches (762 mm) in height, such obstructions shall be provided with ladders installed in accordance with Section 306.5 or stairs installed in accordance with the requirements specified in the International Building Code in the path of travel to and from appliances, fans or equipment requiring service.

Exception: This section shall not apply to the replacement, repair or maintenance of an existing appliance or piece of equipment lawfully in existence at the time of the adoption of this code.

307.2.1 Condensate disposal.
Condensate from all cooling coils and evaporators shall be conveyed from the drain pan outlet to an approved place of disposal as listed in Items 1, 2, and 3 below. Such piping shall maintain a minimum horizontal slope in the direction of discharge of not less than one-eighth unit vertical in 12 units horizontal (1-percent slope). Condensate shall not discharge into a street, alley or other areas so as to cause a nuisance.

1. Units larger than 6 tons (21.1 kW) nominal capacity shall discharge to a sanitary sewer drain or storm sewer drain. Where discharging to a sanitary sewer, such drains shall be indirectly connected in accordance with the plumbing code.
2. Units 6 tons (21.1 kW) and smaller nominal capacity shall discharge in accordance with Item 1, or shall discharge to a gutter, roof drain or other approved location.
3. Condensate drains from rooftop units shall discharge in accordance with Item 1 or 2, or shall discharge onto rooftops where the condensate does not discharge into a street, alley or other areas so as to cause a nuisance.

307.2.2 Drain pipe materials and sizes.
Components of the condensate disposal system shall be cast iron, galvanized steel, copper, cross-linked polyethylene, polybutylene, polyethylene, ABS, CPVC or PVC pipe or tubing. All components shall be selected for the pressure and temperature rating of the installation. Joints and
Connections shall be made in accordance with the applicable provisions of Chapter 7 of the *International Plumbing Code* relative to the material type. Condensate waste and drain line size shall be not less than 3/4 inch (19 mm) internal diameter and shall not decrease in size from the drain pan connection to the place of connection to the place of condensate disposal. Where the drain pipes from more than one unit are manifolded together for condensate drainage, the pipe or tubing shall be sized in accordance with Table 307.2.2.

**TABLE 308.6**
CLEARANCE REDUCTION METHODS

<table>
<thead>
<tr>
<th>TYPE OF PROTECTIVE ASSEMBLY&lt;sup&gt;a&lt;/sup&gt;</th>
<th>REDUCED CLEARANCE WITH PROTECTION (inches)&lt;sup&gt;b&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Horizontal combustible assemblies located above the heat source</td>
</tr>
<tr>
<td></td>
<td>Horizontal combustible assemblies located beneath the heat source and all vertical combustible assemblies</td>
</tr>
<tr>
<td>Prefabricated brick 1 1/8-inch thick spaced out 1-inch and ventilated</td>
<td>Required clearance to combustibles without protection (inches)&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td></td>
<td>36</td>
</tr>
</tbody>
</table>

[F] SECTION 310
EXPLOSION CONTROL

[F] 310.1 Required.
Structures occupied for purposes involving explosion hazards shall be provided with explosion control where required by the *International Fire Code*. Explosion control systems shall be designed and installed in accordance with Section 911 of the *International Fire Code*.

[F] SECTION 311
SMOKE AND HEAT VENTS

[F] 311.1 Required.
Approved smoke and heat vents shall be installed in the roofs of one-story buildings where required by
the *International Fire Code*. Smoke and heat vents shall be designed and installed in accordance with the *International Fire Code*.

**SECTION 310**  
HEATING AND COOLING LOAD CALCULATIONS

310.1 Load calculations.  
Heating and cooling system design loads for the purpose of sizing systems, appliances and *equipment* shall be determined in accordance with the procedures described in the ASHRAE/ACCA Standard 183 or the *ASHRAE Handbook of Fundamentals*. Alternatively, design loads shall be determined by an *approved* equivalent computation procedure, using the design parameters specified in Chapter 3 of the *International Energy Conservation Code*.

**CHAPTER 4**  
VENTILATION  
**SECTION 401**  
GENERAL

401.1 Scope.  
This chapter shall govern the ventilation of spaces within a building intended to be occupied. Mechanical exhaust systems, including exhaust systems serving clothes dryers and cooking appliances; hazardous exhaust systems; dust, stock and refuse conveyor systems; subslab soil exhaust systems; smoke control systems; energy recovery ventilation systems and other systems specified in Section 502 shall comply with Chapter 5. The principles specified in ASHRAE Standard 62.1-2010 may be used as an alternative to this chapter to demonstrate compliance with required ventilation air for occupants.

401.2 Ventilation required.  
Every occupied space shall be ventilated by natural means in accordance with Chapter 12 of the *Building Code* Section 402 or by mechanical means in accordance with Section 403. Where the air infiltration rate in a dwelling unit is less than 5 air changes per hour when tested with a blower door at a pressure of 0.2-inch water column (50 Pa) in accordance with Section 402.4.1.2 of the *International Energy Conservation Code*, the dwelling unit shall be ventilated by mechanical means in accordance with Section 403.

**Exception:** Rooms within a private dwelling which contains a bathtub, shower or spa facility shall be provided with mechanical ventilation in accordance with the provisions of Table 403.3.

**Note:** Heating and air conditioning controls shall conform to Chapter 5 of the *Energy Code*.

401.4 Intake opening location.  
Air intake openings shall comply with all of the following:

1. Intake openings shall be located a minimum of 10 feet (3048 mm) from lot lines or buildings on the same lot.
2. Mechanical and gravity outdoor air intake openings shall be located not less than 10 feet (3048 mm) horizontally from any hazardous or noxious contaminant source, such as gas meters, vents, streets, alleys, parking lots and loading docks, except as specified in Item 3 or Section 501.2.1.
Outdoor air intake openings shall be permitted to be located less than 10 feet (3048 mm) horizontally from streets, alleys, parking lots and loading docks provided that the openings are located not less than 25 feet (7620 mm) vertically above such locations. Where openings front on a street or public way, the distance shall be measured from the closest edge of the street or public way.

3. Intake openings shall be located not less than 3 feet (914 mm) below contaminant sources where such sources are located within 10 feet (3048 mm) of the opening.

4. Intake openings on structures in flood hazard areas shall be at or above the elevation established by the Flood Plain Administrator local governing authority required by Section 1612 of the International Building Code for utilities and attendant equipment.

SECTION 402
NATURAL VENTILATION
Note: Section 402 is not adopted as part of this code, but is reproduced here for the readers convenience. Natural ventilation is regulated under the Building Code.

SECTION 403
MECHANICAL VENTILATION

403.2.2 Transfer air.
Except where recirculation from such spaces is prohibited by Table 403.3, air transferred from occupiable spaces is not prohibited from serving as makeup air for required exhaust systems in such spaces as kitchens, baths, toilet rooms, elevators and smoking lounges. The amount of transfer air and exhaust air shall be sufficient to provide the flow rates as specified in Section 403.3. The required outdoor airflow rates specified in Table 403.3 shall be introduced directly into such spaces or into the occupied spaces from which air is transferred or a combination of both.

Exceptions:
1. Where recirculation from such spaces is prohibited by Table 403.3.
2. Air transferred from spaces served by other fan systems shall not be used if those systems are required to meet either Section 401.6 of this code or Section 503.2.5.1 or 503.2.6 of the Energy Code.
3. Where ventilation schedule of HVAC system supplying transfer air is not similar to exhaust system operating schedule.

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. The anticipated ventilation occupancy load and occupancy ventilation design methods shall be documented on plans and specifications. 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.

**Exceptions:** The occupant load is not required to be determined based on the estimated maximum occupant load rate indicated in Table 403.3 where approved statistical data document the accuracy of an alternate anticipated occupant density. The occupant load shall not be less than one half the number determined from Table 403.3.

### TABLE 403.3
**MINIMUM VENTILATION RATES**

<table>
<thead>
<tr>
<th>OCCUPANCY CLASSIFICATION</th>
<th>PEOPLE OUTDOOR AIRFLOW RATE IN BREATHING ZONE CFM/PERSON</th>
<th>AREA OUTDOOR AIRFLOW RATE IN BREATHING ZONE R- CFM/FT²</th>
<th>DEFAULT OCCUPANT DENSITY #/1000 FT²</th>
<th>EXHAUST AIRFLOW RATE CFM/FT²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Private dwellings, single and multiple</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Garages, common for multiple units</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>0.75</td>
</tr>
<tr>
<td>Garages, separate for each dwelling</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>100 cfm per car</td>
</tr>
<tr>
<td>Kitchens</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>25/150f</td>
</tr>
<tr>
<td>Living areas</td>
<td>0.35 ACH but not less than 15 cfm/person</td>
<td>—</td>
<td>Based upon number of bedrooms, First bedroom, 2; each additional bedroom, 1</td>
<td>20/80f</td>
</tr>
</tbody>
</table>

**h.** For nail salons, the required exhaust shall include the use of ventilation tables or other systems that capture the contaminants and odors at their source and are capable of exhausting a minimum of 50 cfm per station.

**i.** All rooms containing bathing or residential spa facilities shall be provided with a mechanical ventilation system controlled by a de-humidistat, timer or similar means of automatic control.

**j.** Rooms containing bathing or residential spa facilities: Continuous ventilation fans shall be rated for sound at a maximum of 1.0 sone. Intermittent fans shall be rated for sound at a maximum of 3 sone, unless their maximum rated airflow exceeds 400 cfm (200 L/s). Remotely installed fans located at least 4 feet (1220 mm) away from the inlet grill are exempt from the sone rating requirements.

### SECTION 404
**ENCLOSED PARKING GARAGES**

404.1 Enclosed parking garages.
Mechanical ventilation systems for enclosed parking garages shall be permitted to operate intermittently **per the Energy Code**, in accordance with Item 1, Item 2 or both.

1. The system shall be arranged to operate automatically upon detection of vehicle operation or the presence of occupants by approved automatic detection devices.
2. The system shall be arranged to operate automatically by means of carbon monoxide detectors applied in conjunction with nitrogen dioxide detectors. Such detectors shall be installed in accordance with their manufacturers’ recommendations.
SECTION 405
SYSTEM CONTROL

405.1.1 Ventilation controls for high occupancy areas.
See Section 503.2.5 1317.2.2 of the Building Energy Code.

CHAPTER 5
EXHAUST SYSTEMS
SECTION 502
REQUIRED SYSTEMS

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:

(Note: 1- thru 3 unchanged)

4. Exhaust outlets serving structures in flood hazard areas shall be installed at or above the elevation established by the Flood Plain Administrator local governing authority required by Section 1612 of the International Building Code for utilities and attendant equipment.

[F] 502.4 Stationary storage battery systems.
Stationary storage battery systems, as regulated by Section 608 of the International Fire Code, shall be provided with ventilation in accordance with this chapter and Section 502.4.1 or 502.4.2. Flooding lead acid, flooded nickel cadmium and VRLA battery stationary storage systems of greater than 7 batteries or over 600 amp-hour total capacity shall meet the ventilation requirements of Section 502.4.2. Stationary storage battery systems shall not be located in a space with an open combustion source.

Exception: Lithium-ion batteries shall not require ventilation.

[F] 502.4.1 Hydrogen limit in rooms.
For flooded lead acid, flooded nickel cadmium and VRLA batteries, the ventilation system shall be designed to limit the maximum concentration of hydrogen to 1.0 percent of the total volume of the room.

[F] 502.4.2 Ventilation rate in rooms
Continuous ventilation shall be provided at a rate of not less than 1 cubic foot per minute per square foot (cfm/ft²) [0.00508 m³/(s • m²)] of floor area of the room.

502.4.3 Supervision.
Mechanical ventilation systems required by Section 502.4, as regulated by Section 608.6.3 of the Fire Code, shall be supervised by an approved central, proprietary or remote station service or shall initiate an audible and visual signal at a constantly attended on-site location.

[F] 502.5 Valve-regulated lead-acid batteries in cabinets.
Valve-regulated lead-acid (VRLA) batteries installed in cabinets, consisting of greater than 7 batteries, or over 600 amp-hour capacity total capacity, or systems as regulated by Section 608.6.2 of the International Fire Code, shall be provided with ventilation in accordance with Section 502.5.1 or
502.5.2.

[F] 502.5.1 Hydrogen limit in cabinets.
The cabinet ventilation system shall be designed to limit the maximum concentration of hydrogen to 1.0 percent of the total volume of the cabinet during the worst-case event of simultaneous boost charging of all batteries in the cabinet.

[F] 502.5.2 Ventilation rate in cabinets.
Continuous cabinet ventilation shall be provided at a rate of not less than 1 cubic foot per minute per square foot (cfm/ft²) [0.00508 m³/(s • m²)] of floor area covered by the cabinet. The room in which the cabinet is installed shall also be ventilated as required by Section 502.4.1 or 502.4.2.

502.5.3 Supervision.
Mechanical ventilation systems required by Section 502.5, for systems regulated by Section 608.6.3 of the Fire Code, shall be supervised by an approved central, proprietary or remote station service or shall initiate an audible and visual signal at a constantly attended on-site location.

[F] 502.6 Dry cleaning plants.
Ventilation in dry cleaning plants shall be adequate to protect employees and the public in accordance with this section and DOL 29 CFR Part 1910.1000, where applicable.

[F] 502.7 Application of flammable finishes.
Mechanical exhaust as required by this section shall be provided for operations involving the application of flammable finishes.

[F] 502.7.1 During construction.
Ventilation shall be provided for operations involving the application of materials containing flammable solvents in the course of construction, alteration or demolition of a structure.

[F] 502.7.7 Floor resurfacing operations.
To prevent the accumulation of flammable vapors during floor resurfacing operations, mechanical ventilation at a minimum rate of 1 cfm/ft² [0.00508 m³/(s • m²)] of area being finished shall be provided. Such exhaust shall be by approved temporary or portable means. Vapors shall be exhausted to the exterior of the building.

502.19 Indoor firing ranges.
Ventilation shall be provided in an approved manner in areas utilized as indoor firing ranges. Ventilation shall be designed to protect employees and the public in accordance with DOL 29 CFR 1910.1025 where applicable.

504.6.3 Transition ducts.
Transition ducts used to connect the dryer to the exhaust duct system shall be a single length that is listed and labeled in accordance with UL 2158A. Transition ducts shall be a maximum of 8 feet (2438 mm) in length and shall not be concealed within construction.
505.1 Domestic systems.

Where domestic range hoods and domestic appliances equipped with downdraft exhaust systems 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, shall be air tight, shall be equipped with a backdraft damper, and shall be independent of all other exhaust systems.

Exceptions:

1. Where installed in accordance with the manufacturer’s installation instructions and where mechanical or natural ventilation is otherwise provided in accordance with Chapter 4, listed and labeled ductless range hoods shall not be required to discharge to the outdoors.

Exception: 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.

SECTION 506
COMMERCIAL KITCHEN HOOD VENTILATION SYSTEM DUCTS AND EXHAUST EQUIPMENT

506.3.2.5 Grease duct test.
Prior to the use or concealment of any portion of a grease duct system, a leakage test shall be performed. Ducts shall be considered to be concealed where installed in shafts or covered by coatings or wraps that prevent the ductwork from being visually inspected on all sides. The permit holder shall be responsible to provide the necessary equipment and perform the grease duct leakage test. A light test or approved equivalent pressure test shall be performed to determine that all welded and brazed joints are liquid tight.

506.5.2 Exhaust fan discharge.
Exhaust fans shall be positioned so that the discharge will not impinge on the roof, other equipment or appliances or parts of the structure. A vertical discharge fan shall be manufactured with an approved drain outlet at the lowest point of the housing to permit drainage of grease to an approved grease reservoir.

506.5.2.1 Horizontal discharge. Where a centrifugal fan with horizontal discharge is located outside the building, such fan shall be provided with a duct or duct fitting connected to the fan outlet that diverts the discharge from the grease exhaust duct system in an upward direction.
Such diverter duct or fitting shall comply with the following:
1. The duct or duct fitting shall be constructed of metal as set forth in Chapter 6.
2. The maximum total developed length of the duct or duct fitting measured along the centerline shall not exceed three times the vertical dimension of the fan outlet.
3. The duct or duct fitting shall be provided with openings at the lowest point to permit drainage of grease to an approved collection device.

SECTION 507
COMMERCIAL KITCHEN HOODS

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

Exception: A single domestic cooking appliance installed where domestic cooking operations occur, such as in a church, day-care center, fire station, employee lunchroom, or similar types of commercial occupancies shall meet the requirements of Section 505.1.

507.9 Clearances for Type I hood.
A Type I hood shall be installed with a clearance to combustibles of not less than 18 inches (457 mm). This clearance may be reduced to 3 inches (76 mm), provided the combustible material is protected with materials as specified for 1-hour fire-resistant construction on the hood side. Hoods less than 12 inches (305 mm) from the ceiling or wall shall be flashed solidly with materials of the thickness specified in Section 507.4 or materials conforming to one-hour fire-resistant construction.

SECTION 509
FIRE SUPPRESSION SYSTEMS

509.1 Where required.
Commercial cooking appliances required by Section 507.2.1 to have a Type I hood shall be provided with an approved automatic fire suppression system complying with the International Building Code and the International Fire Code Sections 509.2 through 509.5.

509.2 Type of system. The automatic fire-extinguishing system for commercial cooking systems shall be of a type recognized for protection of commercial cooking equipment and exhaust systems of the type and arrangement protected. Pre-engineered automatic dry- and wet-chemical extinguishing system shall be tested in accordance with UL 300 and listed and labeled for the intended application. Other types of automatic fire-extinguishing shall be listed and labeled for specific use as protection for commercial cooking operations. The system shall be installed in accordance with this code, its listing and the manufacturer’s installation instructions. Automatic fire-extinguishing systems of the following types shall be installed in accordance with the referenced standard indicated as follows:
1. Carbon-dioxide extinguishing system, NFPA 12.
3. Foam-water sprinkler system or foam-water spray systems, NFPA 16.
4. **Dry-chemical extinguishing systems, NFPA 17.**
5. **Wet-chemical extinguishing systems, NFPA 17A.**

**Wet-chemical extinguishing systems, NFPA 17A.**

Exception: Factory-built commercial cooking recirculating systems that are tested in accordance with UL 710B and listed, labeled and installed in accordance with Section 304.1.

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509.3 Manual system operation. A manual actuation device shall be located at or near a means of egress from the cooking area, a minimum of 10 feet (3048 mm) and a maximum of 20 feet (6096 mm) from the kitchen exhaust system. The manual actuation device shall be installed not more than 48 inches (1200 mm) nor less than 42 inches (1067 mm) above the floor and shall clearly identify the hazard protected. The manual actuation shall require a maximum force of 40 pounds (178 N) and a maximum movement of 14 inches (356 mm) to actuate the fire suppression system.

Exception: Automatic sprinkler systems shall not be required to be equipped with manual actuation means.

509.4 System interconnection. The actuation of the fire extinguishing system shall automatically shut down the fuel or electrical power supply to the cooking equipment. The fuel and electrical power supply reset shall be manual.

509.5 System test and inspection. The automatic fire suppression system shall be acceptance-tested in accordance with the fire prevention code and installation standard listed in Section 509.2, and with the manufacturer’s instructions.

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**SECTION 510**

**HAZARDOUS EXHAUST SYSTEMS**

510.5.8 Motors and fans. Motors and fans used in conjunction with hazardous exhaust systems shall meet the requirements of Section 503.

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**SECTION 511**

**DUST, STOCK AND REFUSE CONVEYING SYSTEMS**

511.1.1 Collectors and separators. Collectors and separators involving such systems as centrifugal separators, bag filter systems and similar devices, and associated supports shall be constructed of noncombustible materials and shall be located on the exterior of the building or structure. A collector or separator shall not be located nearer than 10 feet (3048 mm) to combustible construction or to an unprotected wall or floor opening, unless the collector is provided with a metal vent pipe that extends above the highest part of any roof with a distance of 30 feet (9144 mm).

Exceptions:

1. Collectors such as “Point of Use” collectors, close extraction weld fume collectors, spray finishing booths, stationary grinding tables, sanding booths, and integrated or
machine-mounted collectors shall be permitted to be installed indoors provided the installation is in accordance with Table 2204.1 of the International Fire Code and NFPA 654 and 664, the Electric Code and approved by the code official, NFPA 70.

2. Collectors in independent exhaust systems handling combustible dusts in a facility shall be permitted to be installed indoors provided that there are not more than three independent collectors servicing not more than five dust producing appliances and, such collectors are installed in compliance with Table 2204.1 of the International Fire Code and NFPA 654 and 664, the Electric Code and approved by the code official, NFPA 70.

CHAPTER 6
DUCT SYSTEMS

[B] 602.4 Flood hazard.
For structures located in flood hazard areas, plenum spaces shall be located above the elevation established by the Flood Plain Administrator local governing authority required by Section 1612 of the International Building Code for utilities and attendant equipment or shall be designed and constructed to prevent water from entering or accumulating within the plenum spaces during floods up to such elevation. If the plenum spaces are located below the elevation established by the Flood Plain Administrator local governing authority required by Section 1612 of the International Building Code for utilities and attendant equipment, they shall be capable of resisting hydrostatic and hydrodynamic loads and stresses, including the effects of buoyancy, during the occurrence of flooding up to such elevation.

SECTION 603
DUCT CONSTRUCTION AND INSTALLATION

603.9.1 Joints, seams and connections.
All longitudinal and transverse joints, seams and connections in metallic and nonmetallic ducts shall be constructed as specified in SMACNA HVAC Duct Construction Standards—Metal and Flexible and NAIMA Fibrous Glass Duct Construction Standards. All joints, longitudinal and transverse seams and connections in ductwork shall be securely fastened and sealed with welds, gaskets, mastics (adhesives), mastic-plus-embedded-fabric systems, liquid sealants or tapes. Closure systems used to seal ductwork listed and labeled in accordance with UL 181A shall be marked “181A-P” for pressure-sensitive tape, “181 A-M” for mastic or “181 A-H” for heat-sensitive tape. Closure systems used to seal flexible air ducts and flexible air connectors shall comply with UL 181B and shall be marked “181B-FX” for pressure-sensitive tape or “181B-M” for mastic. Duct connections to flanges of air distribution system equipment shall be sealed and mechanically fastened. Mechanical fasteners for use with flexible nonmetallic air ducts shall comply with UL 181B and shall be marked “181B-C.” Closure systems used to seal metallic ductwork shall be installed in accordance with the manufacturer’s installation instructions. Unlisted duct tape is not permitted as a sealant on any duct.

Exceptions:
1. Continuously welded locking-type longitudinal joints and seams in ducts operating at static pressures of less than 2 inches of water column (500 Pa) pressure classification shall not require additional closure systems.
2. Adjustable metal elbow gore, longitudinal pipe joints, integral seams within a boot fitting or similar fitting and integral seams within a “Y” fitting.

603.9.2 Fastening. Duct connections to flanges of air distribution system equipment or sheet metal fittings
shall be mechanically fastened. Crimp joints for round ducts shall have a contact lap of at least 1.5 inches (38 mm). Connections of metal ducts and the inner core of flexible ducts shall be mechanically fastened per the manufacturer’s installation instructions. Mechanical fasteners for use with flexible nonmetallic air ducts shall comply with UL 181B and shall be marked 181B-C.

603.13 Flood hazard areas.
For structures in flood hazard areas, ducts shall be located above the elevation established by the Flood Plain Administrator local governing authority required by Section 1612 of the International Building Code for utilities and attendant equipment or shall be designed and constructed to prevent water from entering or accumulating within the ducts during floods up to such elevation. If the ducts are located below the elevation established by the Flood Plain Administrator local governing authority required by Section 1612 of the International Building Code for utilities and attendant equipment, the ducts shall be capable of resisting hydrostatic and hydrodynamic loads and stresses, including the effects of buoyancy, during the occurrence of flooding up to such elevation.

604.11 Vapor retarders.
Where ducts used for cooling are externally insulated, the insulation shall be covered with a vapor retarder having a maximum permeance of 0.05 perm [2.87 ng/(Pa • s • m²)] or aluminum foil having a minimum thickness of 2 mils (0.051 mm). Insulations having a permeance of 0.05 perm [2.87 ng/(Pa • s • m²)] or less shall not be required to be covered. All joints and seams shall be sealed to maintain the continuity of the vapor retarder.

CHAPTER 7
COMBUSTION AIR

SECTION 701
GENERAL

701.1 Scope.
Solid fuel-burning appliances shall be provided with combustion air in accordance with the appliance manufacturer’s installation instructions. Oil-fired appliances shall be provided with combustion air in accordance with NFPA 31. The methods of providing combustion air in this chapter do not apply to fireplaces, fireplace stoves and direct-vent appliances. The requirements for combustion and dilution air for gas-fired appliances shall be in accordance with Appendix C.

CHAPTER 8
CHIMNEYS AND VENTS

805.4 Factory-built fireplaces. Chimneys for use with factory-built fireplaces shall comply with the requirements of UL 127.

CHAPTER 9
SPECIFIC APPLIANCES, FIREPLACES AND SOLID FUEL-BURNING EQUIPMENT

SECTION 901
GENERAL

901.1 Scope.
This chapter shall govern the approval, design, installation, construction, maintenance, alteration and repair of the appliances and equipment specifically identified herein and factory-built fireplaces. The approval, design, installation, construction, maintenance, alteration and repair of gas-fired appliances shall be regulated by Appendix C the International Fuel Gas Code.
SECTION 906
FACTORY-BUILT BARBECUE APPLIANCES

906.1 General.
Factory-built barbecue appliances shall be of an approved type and shall be installed in accordance with the
manufacturer’s installation instructions, this chapter and Chapters 3, 5, 7, 8 and Appendix C, the International
Fuel Gas Code.

SECTION 918
FORCED-AIR WARM-AIR FURNACES

918.6 Prohibited sources.
Outdoor or return air for forced-air heating and cooling systems shall not be taken from the following locations:
1. Less than 10 feet (3048 mm) from an appliance vent outlet, a vent opening from a plumbing drainage
system or the discharge outlet of an exhaust fan, unless the outlet is 3 feet (914 mm) above the outdoor
air inlet.

Exception: Listed outdoor appliances which provide both circulating air inlet and vent
discharge.
(Note: Items 2. through 5. are not revised)
6. An unconditioned crawl space by means of direct connection to the return side of a forced air system.
Transfer openings in the crawl space enclosure shall not be prohibited.

SECTION 923
SMALL CERAMIC KILNS

923.1 General.
The provisions of this section shall apply to listed and unlisted kilns that are used for ceramics, have a
maximum interior volume of 20 cubic feet (0.566 m³) and are used for hobby and noncommercial purposes.
Electric kilns shall comply with UL 499.

923.1.1 Installation.
Kilns shall be installed in accordance with the manufacturer’s installation instructions and the provisions of
this code. Electric kilns shall comply with UL 499.

923.2 Unlisted outdoor kiln installation. Unlisted kilns shall be installed only outdoors and in accordance
with the manufacturer’s installation instructions and the provisions of Section 932.2 this code.

923.2.1 Installations under structures.
Kilns shall be installed with minimum clearances as specified in Section 923.2.1.1. Kilns located
under a roof and enclosed by two or more vertical wall surfaces shall have a hood and gravity
ventilation duct installed to comply with Sections 923.2.1.3 and 923.2.1.4.

923.2.1.1 Clearances for interior installation. The sides and tops of kilns shall be located a
minimum of 18 inches (457 mm) from any noncombustible surface and 3 feet (914 mm)
from any combustible wall surface. Kilns shall be installed on noncombustible flooring,
consisting of at least 2 inches (51 mm) of solid masonry or concrete extending at least 12
inches (305 mm) beyond the base or supporting members of the kiln.
Exception: These clearances may be reduced, provided independent testing is
provided to and approved by the building official.
923.2.1.2 Control side clearance. The clearance on the control side of a kiln shall not be reduced to less than 30 inches (762 mm).

923.2.1.3 Hoods. Where required, a canopy type hood shall be installed directly above each kiln. The face opening area of the hood shall be equal to or greater than the top horizontal surface area of the kiln. The hood shall be constructed of not less than 0.030-inch (0.76 mm) (No. 22 U.S. gage) galvanized steel or equivalent, and be supported at a height of between 12 inches and 30 inches (305 mm and 762 mm) above the kiln by noncombustible supports.

Exception: Electric kilns installed with listed exhaust blowers may be used when marked as being suitable for the kiln and installed in accordance with manufacturer’s instructions.

923.2.1.4 Gravity ventilation ducts. Each kiln hood shall be connected to a gravity ventilation duct extending in a vertical direction to outside the building. This duct shall be of the same construction as the hood and shall have a cross-sectional area of not less than one-fifteenth of the face opening of the hood. The duct shall terminate a minimum of 12 inches (305 mm) above any portion of a building within 4 feet (1219 mm) and terminate no less than 4 feet (1219 mm) from any openable windows or other opening into the building or adjacent property line. The duct to the outside shall be shielded, without reduction of duct area, to prevent entrance of rain into the duct. The duct shall be supported at each section by noncombustible supports.

923.2.1.5 Hood and duct clearances. Every hood and duct serving a fuel-burning kiln shall have a clearance from combustible construction of at least 18 inches (457 mm). This clearance may be reduced in accordance with Table 308.6.

923.2.1.5.1 Makeup air. Provisions shall be made for makeup air to enter the enclosure in which a kiln is installed at a rate at least equal to the air being removed through the kiln hood.

SECTION 927
RADIANT HEATING SYSTEMS

927.1 General. Electric radiant heating systems shall be installed in accordance with the manufacturer’s instructions and shall be listed for the application.

927.2 Clearances. Clearances for radiant heating panels or elements to any wiring, outlet boxes and junction boxes used for installing electrical devices or mounting luminaires shall be in accordance with the International Building Code and NFPA 70.

927.3 Installation on wood or steel framing. Radiant panels installed on wood or steel framing shall conform to the following requirements:

1. Heating panels shall be installed parallel to framing members and secured to the surface of framing members or shall be mounted between framing members.

2. Mechanical fasteners shall penetrate only the unheated portions provided for this purpose. Panels shall
not be fastened at any point closer than \(\frac{1}{4}\) inch (7 mm) to an element. Other methods of attachment of the panels shall be in accordance with the panel installation instructions.

3. Unless listed and labeled for field cutting, heating panels shall be installed as complete units.

927.4 Installation in concrete or masonry.
Radiant heating systems installed in concrete or masonry shall conform to the following requirements:

1. Radiant heating systems shall be identified as being suitable for the installation, and shall be secured in place as specified in the manufacturer’s instructions.

2. Radiant heating panels and radiant heating panel sets shall not be installed where they bridge expansion joints unless they are protected from expansion and contraction.

927.5 Finish surfaces.
Finish materials installed over radiant heating panels and systems shall be installed in accordance with the manufacturer’s instructions. Surfaces shall be secured so that fasteners do not pierce the radiant heating elements.

SECTION 928
SOLID FUEL-BURNING DEVICES

928.1 Used solid fuel-burning stoves.

Note: For reference only. Not adopted as part of this code.

The Oregon Department of Environmental Quality regulates the sale and use of residential and commercial solid fuel burning devices. See Oregon Administrative Rule (OAR) Chapter 340, Division 262. DEQ prohibits the installation of “used solid fuel burning devices.”

Exceptions:
1. Solid fuel-burning device certified as new on or after July 1, 1986, under rules adopted pursuant to OAR 340-262-0500.

2. Antique wood stoves pursuant to OAR 340-262-0700


928.2 Labeling for identification.

Note: For reference only. Not adopted as part of this code.

Solid fuel-burning device, as defined by the Oregon Department of Environmental Quality, OAR 340-262-0500 are required by DEQ to bear a certification label.
1001.1 Scope. The purpose of this chapter is to establish and provide minimum standards for the protection of the public welfare, health, safety, and property by regulating and controlling the installation of steam and hot-water boilers, water heaters, pressure vessels and their related piping that are not regulated by the Oregon Boiler and Pressure Vessel Specialty Code (OBPVSC) or the Oregon Plumbing Specialty Code (OPSC).

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 inspectors.
**Definitions for ORS 480.510 to 480.670.** As used in ORS 480.510 to 480.670, unless the context requires otherwise:

1. "Alteration" means a change or addition to equipment, other than the ordinary repair or replacement of an existing part of the equipment.

2. "Board" means the Board of Boiler Rules created under ORS 480.535.

3. "Boiler" or "boilers" means:
   a. A closed vessel or vessels intended for the heating or vaporizing of liquids to be used externally to such vessel or vessels by the application of heat from combustible fuels, electricity or nuclear energy;
   b. Related appurtenances including but not limited to pressure piping directly connected and related to the safe operation of a boiler; and
   c. Pressure piping consisting of boiler or nonboiler external piping connected to a boiler, but not potable water nonboiler external piping.

4. "Boiler external piping" has the meaning given the term in the 1986 Pressure Piping Code B 31.1, adopted by the American Society of Mechanical Engineers.

5. "Certificate of competency" means a certificate issued under the provisions of ORS 480.565 (3).

6. "Department" means the Department of Consumer and Business Services.

7. "Director" means the Director of the Department of Consumer and Business Services.

8. "Installation permit" means a permit issued by the department for the installation, alteration or repair of a boiler or pressure vessel.

9. "Minimum safety standards" means the rules, regulations, formulae, definitions and interpretations for the safe construction, installation, operation and repair of boilers and pressure vessels either adopted by ORS 480.510 to 480.670 or adopted by the board, under ORS 480.510 to 480.670.

10. "Nonboiler external piping" has the meaning given the term in the 1986 Pressure Piping Code B 31.1, adopted by the American Society of Mechanical Engineers.

11. "Operating permit" means a permit issued by the department authorizing the operation of a boiler or pressure vessel.

12. "Pressure vessel" means containers for the containment of pressure, either internal or external. This pressure may be obtained from an external source or by the application of heat from a direct or indirect source, or any combination thereof.

13. "Related appurtenances" means any equipment instrumental to the safe operation of a boiler or pressure vessel.

14. "Shop inspection" means an inspection at a boiler or pressure vessel manufacturing, construction or repair facility.

15. "Temporary operation authorization" means an authorization issued by the department to operate a boiler or pressure vessel for a specified period pending the issuance of an operating permit. [1961 c.485 §3; 1969 c.582 §2; 1971 c.753 §58; 1973 c.830 §1; 1983 c.676 §3; 1987 c.414 §35; 1991 c.518 §2; 1993 c.744 §142; 2007 c.487 §3; 2009 c.696 §11]
SECTION 1002
DEFINITIONS

1002.1 Definitions. Certain words and terms used in this chapter, unless clearly inconsistent with their context, shall mean as follows:

BOILER. As defined in ORS 480.515(3).

ORS 480.515(3) is not a part of this code but is reproduced here for the reader’s convenience:

480.515 Definitions for ORS 480.510 to 480.670.

(3) “Boiler” or “boilers” means:
(a) A closed vessel or vessels intended for the heating or vaporizing of liquids to be used externally to such vessel or vessels by the application of heat from combustible fuels, electricity or nuclear energy;
(b) Related appurtenances including but not limited to pressure piping directly connected and related to the safe operation of a boiler; and
(c) Pressure piping consisting of boiler or nonboiler external piping connected to a boiler, but not potable water nonboiler external piping.

DOMESTIC WATER HEATER. As defined in ORS 480.525(1)(b).

ORS 480.525(1)(b) is not a part of this code but is reproduced here for the reader’s convenience:

480.525 Exempt vessels.
(1)(b) Domestic water heaters designed for heating potable water, equipped with an approved pressure-relieving device, containing only water and that do not exceed a:
(A) Capacity of 120 gallons;
(B) Water temperature of 210 degrees Fahrenheit;
(C) Pressure of 150 pounds per square inch gauge pressure; or
(D) Heat input of 200,000 BTU per hour.

SECTION 1003
WATER HEATERS

1003.1 General.
Potable water heaters and hot water storage tanks shall be listed and labeled and installed in accordance with the manufacturer’s installation instructions, the International Plumbing Code and where applicable this code. All water heaters shall be capable of being removed without first removing a permanent portion of the building structure. The potable water connections and relief valves for all water heaters shall conform to the requirements of the International Plumbing Code. Domestic electric water heaters shall comply with UL 174 or UL 1453. Commercial electric water heaters shall comply with UL 1453. Oil-fired water heaters shall comply with UL 732. Solid-fuel-fired water heaters shall comply with UL 2523. Thermal solar water heaters shall comply with Chapter 14 and UL 174 or UL 1453.

SECTION 1004
BOILERS AND PRESSURE VESSELS

1004.1 General Scope. The requirements of this section shall apply to the boiler rooms, combustion air,
chimneys, and vents, and fuel piping related to the construction, installation, repair and alteration of rooms for the installation of boilers and pressure vessels.

All pressure vessels shall be in accordance with the ASME Boiler and Pressure Vessel Code, shall bear the label of an approved agency and shall be installed in accordance with the manufacturer’s installation instructions.

10034.2 Standards.
Boilers and pressure vessels that are not regulated under the Oregon Boiler and Pressure Vessel Specialty Code shall be designed and constructed in accordance with the requirements of their listing and labeling or the applicable standards for their use.

10034.3 Installation.
In addition to the requirements of this code, the installation of boilers and pressure vessels that are not regulated under the Oregon Boiler and Pressure Vessel Specialty Code shall conform to the manufacturer’s instructions. Operating instructions of a permanent type shall be attached to the boiler. Boilers shall have all controls set, adjusted and tested by the installer. The manufacturer’s rating data and the nameplate shall be attached to the boiler.

1004 Workmanship. All equipment, appurtenances, devices and piping shall be installed in a workmanlike manner conforming to provisions and intent of this chapter.

1004.2 Piping.
All piping materials, fittings, joints, connections and devices associated with systems utilized in conjunction with pressure vessels shall be designed for the specific application and shall be approved.

1004.3 Welding.
Welding on pressure vessels shall be performed by approved welders in compliance with nationally recognized standards.

SECTION 1004
BOILERS

1004.1 Standards.
Oil-fired boilers and their control systems shall be listed and labeled in accordance with UL 726. Electric boilers and their control systems shall be listed and labeled in accordance with UL 834. Solid-fuel-fired boilers shall be listed and labeled in accordance with UL 2523. Boilers shall be designed and constructed in accordance with the requirements of ASME CSD-1 and as applicable, the ASME Boiler and Pressure Vessel Code, Section I or IV; NFPA 8501; NFPA 8502 or NFPA 8504.

1004.2 Installation.
In addition to the requirements of this code, the installation of boilers shall conform to the manufacturer’s instructions. Operating instructions of a permanent type shall be attached to the boiler. Boilers shall have all controls set, adjusted and tested by the installer. The manufacturer’s rating data and the nameplate shall be attached to the boiler.

1004.3 Working clearance.
Clearances shall be maintained around boilers, generators, heaters, tanks and related equipment and appliances so as to permit inspection, servicing, repair, replacement and visibility of all gauges. When boilers are installed or replaced, clearance shall be provided to allow access for inspection, maintenance and repair. Passageways around all sides of boilers shall have an unobstructed width of not less than 18 inches (457 mm), unless otherwise approved.

1004.3.1 Top clearance.
Clearances from the tops of boilers to the ceiling or other overhead obstruction shall be in accordance with
Table 1004.3.1.

<table>
<thead>
<tr>
<th>BOILER TYPE</th>
<th>MINIMUM CLEARANCES FROM TOP OF BOILER TO CEILING OR OTHER OVERHEAD OBSTRUCTION (feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>All boilers with manholes on top of the boiler except where a greater clearance is required in this table.</td>
<td>3</td>
</tr>
<tr>
<td>All boilers without manholes on top of the boiler except high-pressure steam boilers and where a greater clearance is required in this table.</td>
<td>2</td>
</tr>
<tr>
<td>High-pressure steam boilers with steam generating capacity not exceeding 5,000 pounds per hour.</td>
<td>3</td>
</tr>
<tr>
<td>High-pressure steam boilers with steam generating capacity exceeding 5,000 pounds per hour.</td>
<td>7</td>
</tr>
<tr>
<td>High-pressure steam boilers having heating surface not exceeding 1,000 square feet (93 m²).</td>
<td>3</td>
</tr>
<tr>
<td>High-pressure steam boilers having heating surface in excess of 1,000 square feet (93 m²).</td>
<td>7</td>
</tr>
<tr>
<td>High-pressure steam boilers with input not exceeding 5,000,000 Btu/h (1465 kW).</td>
<td>3</td>
</tr>
<tr>
<td>High-pressure steam boilers with input in excess of 5,000,000 Btu/h (1465 kW).</td>
<td>7</td>
</tr>
<tr>
<td>Steam-heating boilers and hot water-heating boilers with input exceeding 5,000,000 Btu/h (1465 kW).</td>
<td>3</td>
</tr>
<tr>
<td>Steam-heating boilers exceeding 5,000 pounds of steam per hour (2268 kg/h).</td>
<td>3</td>
</tr>
<tr>
<td>Steam-heating boilers and hot water-heating boilers having heating surface exceeding 1,000 square feet (93 m²).</td>
<td>3</td>
</tr>
</tbody>
</table>

For SI: 1 foot = 304.8 mm, 1 square foot = 0.0929 m², 1 pound per hour = 0.4536 Kg/h.

1004.4 Mounting:

*Equipment* shall be set or mounted on a level base capable of supporting and distributing the weight contained thereon. Boilers, tanks and *equipment* shall be secured in accordance with the manufacturer's installation instructions.

1004.5 Floors.
Boilers shall be mounted on floors of noncombustible construction, unless listed for mounting on combustible flooring.

1004.6 Boiler rooms and enclosures.
Boiler rooms and enclosures and access thereto shall comply with the International Building Code and Chapter 3 of this code. Boiler rooms shall be equipped with a floor drain or other approved means for disposing of liquid waste.

1004.7 Operating adjustments and instructions.
Hot water and steam boilers shall have all operating and safety controls set and operationally tested by the installing contractor. A complete control diagram and boiler operating instructions shall be furnished by the installer for each installation.

SECTION 1005
BOILER CONNECTIONS

1005.1 Valves.
Every boiler or modular boiler shall have a shutoff valve in the supply and return piping. For multiple boiler or multiple modular boiler installations, each boiler or modular boiler shall have individual shutoff valves in the supply and return piping.

Exception: Shutoff valves are not required in a system having a single low-pressure steam boiler.

1005.2 Potable water supply.
The water supply to all boilers shall be connected in accordance with the International Plumbing Code.

SECTION 1005
PERMITS REQUIRED

1005.1 Permits. It shall be unlawful to install any boiler or pressure vessel regulated by this code or the Oregon Boiler and Pressure Vessel Specialty Code without first obtaining a permit from the local building jurisdiction and an installation permit from the Oregon Building Codes Division, Boiler and Pressure Vessel Program. Permits obtained from the local jurisdiction shall apply to the boiler rooms, combustion air, chimneys, vents, and fuel and hydronic piping related to the construction, repair and alteration of rooms for the installation of boilers and pressure vessels and the installation of any boiler or pressure vessel regulated by this code.

SECTION 1006
SAFETY AND PRESSURE RELIEF VALVES AND CONTROLS

1006.1 Safety valves for steam boilers.
All steam boilers shall be protected with a safety valve.

1006.2 Safety-relief valves for hot water boilers.
Hot water boilers shall be protected with a safety-relief valve.

1006.3 Pressure relief for pressure vessels.
All pressure vessels shall be protected with a pressure relief valve or pressure-limiting device as required by the manufacturer’s installation instructions for the pressure vessel.

1006.4 Approval of safety and safety relief valves.
Safety and safety relief valves shall be listed and labeled, and shall have a minimum rated capacity for the equipment or appliances served. Safety and safety relief valves shall be set at a maximum of the nameplate pressure rating of the boiler or pressure vessel.

1006.5 Installation.
Safety or relief valves shall be installed directly into the safety or relief valve opening on the boiler or pressure vessel. Valves shall not be located on either side of a safety or relief valve connection. The relief valve shall discharge by gravity.

1006.6 Safety and relief valve discharge.
Safety and relief valve discharge pipes shall be of rigid pipe that is approved for the temperature of the system. The discharge pipe shall be the same diameter as the safety or relief valve outlet. Safety and relief valves shall not discharge so as to be a hazard, a potential cause of damage or otherwise a nuisance. High-pressure steam safety valves shall be vented to the outside of the structure. Where a low-pressure safety valve or a relief valve discharges to the drainage system, the installation shall conform to the International Plumbing Code.

1006.7 Boiler safety devices.
Boilers shall be equipped with controls and limit devices as required by the manufacturer’s installation instructions and the conditions of the listing.

1006.8 Electrical requirements.
The power supply to the electrical control system shall be from a two-wire branch circuit that has a grounded conductor, or from an isolation transformer with a two-wire secondary. Where an isolation transformer is provided, one conductor of the secondary winding shall be grounded. Control voltage shall not exceed 150 volts nominal, line to line. Control and limit devices shall interrupt the ungrounded side of the circuit. A means of manually disconnecting the control circuit shall be provided and controls shall be arranged so that when deenergized, the burner shall be inoperative. Such disconnecting means shall be capable of being locked in the off position and shall be provided with ready access.

SECTION 1006
DETAILED REQUIREMENTS

1006.1 Safety requirements. The installation of all boilers and pressure vessels not regulated under the Oregon Boiler and Pressure Vessel Specialty Code shall conform to the minimum requirements for safety established by this code.

1006.1.1 Safety relief valves for hot water boilers.
Hot water boilers shall be protected with a safety relief valve.

1006.1.2 Pressure relief for pressure vessels.
All pressure vessels shall be protected with a pressure relief valve or pressure-limiting device as required by the manufacturer’s installation instructions for the pressure vessel.
1006.2 Stack dampers. Stack dampers on boilers not regulated under the Oregon Boiler and Pressure Vessel Specialty Code fired with oil or solid fuel shall not close more than 80 percent of the stack area when closed, except on automatic boilers with prepurge, automatic draft control and interlock. Operative dampers shall not be placed within any stack, flue or vent of a gas-fired boiler, except on an automatic boiler with prepurge, automatic draft control and interlock.

SECTION 1007
BOILER LOW-WATER CUTOFF

1007.1 General.
All steam and hot water boilers shall be protected with a low-water cutoff control.

1007.2 Operation.
The low-water cutoff shall automatically stop the combustion operation of the appliance when the water level drops below the lowest safe water level as established by the manufacturer.

SECTION 1007
EXPANSION TANKS

1007.1 Expansion tanks. Expansion tanks shall be securely fastened to the structure; supports shall be adequate to carry twice the weight of the tank filled with water without placing any strain on connecting piping.

All water heating systems incorporating hot water tanks or fluid relief columns shall be installed to prevent freezing under normal operating conditions.

An expansion tank shall be installed in every hot water system. For multiple boiler installations, a minimum of one expansion tank is required. Expansion tanks shall be of the closed or open type. Tanks shall be rated for the pressure of the hot water system.

SECTION 1008
STEAM BLOWOFF VALVE

1008.1 General.
Every steam boiler shall be equipped with a quick-opening blowoff valve. The valve shall be installed in the opening provided on the boiler. The minimum size of the valve shall be the size specified by the boiler manufacturer or the size of the boiler blowoff-valve opening.

1008.2 Discharge.
Blowoff valves shall discharge to a safe place of disposal. Where discharging to the drainage system, the installation shall conform to the International Plumbing Code.
SECTION 1008
SAFETY OR RELIEF VALVE DISCHARGE

1008.1 General. The discharge from relief valves for water heaters and boilers not regulated under the Oregon Boiler and Pressure Vessel Specialty Code shall be piped to within 18 inches (457 mm) of the floor or to an open receptacle, and when the operating temperature is in excess of 212°F (100°C), shall be equipped with a splash shield or centrifugal separator. When the discharge from safety valves would result in a hazardous discharge of steam inside the boiler room, such discharge shall be extended outside the boiler room. Valves are prohibited between the safety valve and the atmosphere.

SECTION 1009
HOT WATER BOILER EXPANSION TANK

1009.1 Where required. An expansion tank shall be installed in every hot water system. For multiple boiler installations, a minimum of one expansion tank is required. Expansion tanks shall be of the closed or open type. Tanks shall be rated for the pressure of the hot water system.

1009.2 Closed-type expansion tanks. Closed-type expansion tanks shall be installed in accordance with the manufacturer’s instructions. The size of the tank shall be based on the capacity of the hot water heating system. The minimum size of the tank shall be determined in accordance with the following equation:

\[
V_t = \frac{(0.00041T - 0.0466)V_s}{\left(\frac{P_a}{P_f} - \frac{P_a}{P_o}\right)}
\]

For SI:

\[
V_t = \frac{(0.000738T - 0.03348)V_s}{\left(\frac{P_a}{P_f} - \frac{P_a}{P_o}\right)}
\]

where:

- \(V_t\) = Minimum volume of tanks (gallons) (L).
- \(V_s\) = Volume of system, not including expansion tanks (gallons) (L).
- \(T\) = Average operating temperature (°F) (°C).
- \(P_f\) = Atmospheric pressure (psi) (kPa).
- \(P_a\) = Fill pressure (psi) (kPa).
- \(P_o\) = Maximum operating pressure (psi) (kPa).

1009.3 Open-type expansion tanks. Open-type expansion tanks shall be located a minimum of 4 feet (1219 mm) above the highest heating element. The tank shall be adequately sized for the hot water system. An overflow with a minimum diameter of 1 inch (25 mm) shall be installed at the top of the tank. The overflow shall discharge to the drainage system in accordance with the International Plumbing Code.
SECTION 1009
HOT WATER BOILER EXPANSION TANK - GAS PRESSURE REGULATORS

1009.1 General. An approved gas pressure regulator shall be installed on gas-fired boilers not regulated under the Oregon Boiler and Pressure Vessel Specialty Code where the gas supply pressure is higher than that at which the main burner is designed to operate. A separate approved gas pressure regulator shall be installed to regulate the gas pressure to the pilot or pilots. A separate regulator shall not be required for the pilot or pilots on manufacturer-assembled boiler-burner units which have been approved by the building official and on gas-fired boilers in Group R occupancies of less than six units and in Group U occupancies.

SECTION 1010
GAUGES

1010.1 Hot water boiler gauges. Every hot water boiler shall have a pressure gauge and a temperature gauge, or a combination pressure and temperature gauge. The gauges shall indicate the temperature and pressure within the normal range of the system’s operation.

1010.2 Steam boiler gauges. Every steam boiler shall have a water-gauge glass and a pressure gauge. The pressure gauge shall indicate the pressure within the normal range of the system’s operation.

1010.2.1 Water-gauge glass. The gauge glass shall be installed so that the midpoint is at the normal boiler water level.

SECTION 1010
CLEARANCE FOR ACCESS

1009.1 Access. When boilers not regulated under the Oregon Boiler and Pressure Vessel Specialty Code are installed or replaced, clearance shall be provided to allow access for inspection, maintenance and repair, and passageways shall have an unobstructed width of not less than 18 inches (457 mm). Clearance for repair and cleaning may be provided through a door or access panel into another area, provided the opening is of sufficient size. Package boilers, miniature boilers, low-pressure boilers and hot water supply boilers with no manhole on top of shell shall have a minimum clearance of 2 feet (610 mm) from the ceiling.

SECTION 1011
TESTS

1011.1 Tests. Upon completion of the assembly and installation of boilers and pressure vessels, acceptance tests shall be conducted in accordance with the requirements of the ASME Boiler and Pressure Vessel Code. Where field assembly of pressure vessels or boilers is required, a copy of the completed U-1 Manufacturer’s Data Report required by the ASME Boiler and Pressure Vessel Code shall be submitted to the code official.

1011.2 Test gauges. An indicating test gauge shall be connected directly to the boiler or pressure vessel where it is visible to the operator throughout the duration of the test. The pressure gauge scale shall be graduated over a range of not less
than one and one-half times and not greater than four times the maximum test pressure. All gauges utilized for testing shall be calibrated and certified by the test operator.

**SECTION 1011**  
**BOILER ROOM ENCLOSURES**

1011.1 Boiler rooms. Boiler rooms and enclosures and access thereto shall comply with Chapter 3 of this code and the *Building Code*.

**SECTION 1012**  
**FLOORS**

1012.1 General. Boilers shall be mounted on floors of noncombustible construction unless listed for mounting on combustible floors. The floor and related structural supports shall be designed as required in the *Building Code* to carry the loads imposed by the boiler and appurtenances.

**SECTION 1013**  
**CHIMNEYS OR VENTS**

1013.1 General. When required, boilers shall be connected to a chimney or vent in accordance with Chapter 8 for oil or wood and Appendix C for fuel gas installations.

**SECTION 1014**  
**DRAINAGE**

1014.1 Drains. The boiler room shall have an approved floor drain or equivalent means for disposing of accumulation of liquid wastes incidental to cleaning or recharging.

**SECTION 1015**  
**FUEL SUPPLY PIPING**

1015.1 Piping. Fuel supply piping shall conform to Chapter 13, Appendix C or the standards cited in Chapter 15, Referenced Standards.

**SECTION 1016**  
**AIR FOR COMBUSTION AND VENTILATION**

1016.1 General. Air for combustion and ventilation shall be installed in accordance with Chapter 7 or Appendix C of this code.

**SECTION 1017**  
**STEAM AND HOT WATER PIPING**

**Note:** Boilers and pressure vessels and related piping are regulated by the state of Oregon *Boiler and Pressure Vessel Law* (ORS 480.510 to 480.670).

1017.1 General. Steam piping is regulated under the jurisdiction of the *Oregon Boiler and Pressure Vessel Law* and related administrative rules and is under the jurisdiction of the Building Codes Division, Boiler and Pressure Vessel Program.

1017.1.1 Hot water piping systems. Water piping used for hot-water heating systems and hydronics shall be installed in accordance with the Chapter 12 of this code.
CHAPTER 11
REFRIGERATION

Note: Brazing certifications required. A person qualified for inspection of brazing or welding of refrigeration piping shall have a valid certification meeting the requirements in OAR 918-098-1020. A person engaged in the brazing or welding of refrigeration piping shall have a valid certification meeting the requirements in OAR 918-040-0015. For refrigeration piping regulated by the State of Oregon Boiler and Pressure Vessel Program, see requirements listed in OAR 918-225-0310. All three of these administrative rules were effective July 1, 2001.

918-098-1020 Expanded Scope of Work for Oregon A- or B-Level or Commercial Mechanical Inspectors

Unless stated otherwise within this rule, this rule is applied retroactively from July 1, 2010.

(1) Persons may conduct inspections of brazing or welding work related to the installation, alteration, or repair of refrigeration piping systems, except as regulated by the Oregon Boiler and Pressure Vessel Program under OAR chapter 918, division 225.

(2) To perform work under section (1) of this rule, these persons must successfully complete a training program in accordance with either Section IX, “Welding and Brazing Qualification” of the ASME Boiler and Pressure Vessel Code, or AWS B2.2, “Standard for Brazing Procedure and Performance Qualification” administered by a division-approved organization.

(3) Inspector certification for refrigeration piping in residential structures is not required.

Hist.: BCD 2-2001, f. 2-2-01, cert. ef. 7-1-01; BCD 16-2005(Temp), f. & cert. ef. 7-7-05 thru 12-31-05, Renumbered from 918-098-0900; BCD 24-2005, f. 9-30-05, cert. ef. 10-1-05, Renumbered from 918-098-0900; Renumbered from 918-098-1080, BCD 19-2006, f. 12-29-06, cert. ef. 1-1-07; BCD 6-2010, f. 5-14-10, cert. ef. 7-1-10; BCD 7-2011, f. & cert. ef. 3-11-11; BCD 24-2011, f. 7-26-11, cert. ef. 10-1-11

918-440-0015 Refrigeration Installer Certification

All persons engaged in brazing or welding related to the installation, alteration or repair of refrigeration piping systems not regulated by the Oregon Boiler and Pressure Vessel Program under OAR chapter 918, division 225, shall be certified in accordance with the requirements of this rule.

(1) The minimum requirement for persons engaged in brazing or welding of refrigeration piping systems is a current and valid certification issued upon completion of a class by a division-approved certifying organization in brazing or welding in accordance with either:
   (a) Section IX, Welding and Brazing Qualifications of the American Society of Mechanical Engineers publication, 2001 ASME Boiler and Pressure Vessel Code; or
   (b) American Welding Society publication AWS B2.2-91, Standard for Brazing Procedure and Performance Qualification.

(2) Refrigeration systems installed in dwelling units regulated under the Oregon Residential Specialty Code are exempt from this rule.

(3) All refrigeration piping system requirements not regulated by OAR 918-225-0310, are subject to the Oregon Mechanical Specialty Code.

Hist.: BCD 34-2000, f. 12-27-00, cert. ef. 7-1-01; BCD 19-2003, f. 12-15-03, cert. ef. 1-1-04; BCD 3-2010, f. 5-14-10, cert. ef. 7-1-10; BCD 5-2011, f. & cert. ef. 3-11-11; BCD 22-2011, f. 7-26-11, cert. ef. 10-1-11

918-225-0310 Refrigerant Piping Systems; Components

(1) The requirements of OAR 918-225-0430(5) shall be enforced under this rule for all refrigerant piping systems consisting of welded, brazed or mechanically assembled piping and piping fittings exceeding 2 inches NPS, and containing any refrigerant chemical rated as other than A-1 or B-1 by the American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE 34) as adopted by the Oregon Mechanical Specialty Code.

(2) One and two-family dwelling units and air conditioning refrigeration systems used solely for human comfort are exempt from this rule.

(3) All refrigeration piping system requirements other than those regulated by this rule are subject to the Oregon Mechanical Specialty Code.

Hist.: BCD 35-2000, f. 12-29-00, cert. ef. 7-1-01
1101.7 Maintenance
Mechanical refrigeration systems shall be maintained in proper operating condition, free from accumulations of oil, dirt, waste, excessive corrosion, other debris and leaks.

1101.8 Change in refrigerant type.
The type of refrigerant in refrigeration systems having a refrigerant circuit containing more than 220 pounds (99.8 kg) of Group A1 or 30 pounds (13.6 kg) of any other group refrigerant shall not be changed without prior notification to the code official and compliance with the applicable code provisions for the new refrigerant type.

[F] 1101.9 Refrigerant discharge.
Notification of refrigerant discharge shall be provided in accordance with the International Fire Code.

SECTION 1105
MACHINERY ROOM, GENERAL REQUIREMENTS

[B] 1105.1 Design and construction. (NOTE: 2010 OMSC and earlier deleted this section)
Machinery rooms shall be designed and constructed in accordance with the International Building Code and this section. A machinery room shall be dimensioned so as to provide clearances required by Chapter 3. Passageways shall maintain a clear head room of not less than 87 inches (2210 mm) below equipment and appliances located over passageways.

1105.1 Access. Access to machinery rooms shall be restricted to authorized personnel. A sign shall be posted on the machinery room door prohibiting access by others.

1105.2 Openings.
Ducts and air handlers in the machinery room that operate at a lower pressure than the room shall be sealed to prevent any refrigerant leakage from entering the airstream. Openings to other parts of the building that permit passage of escaping refrigerant to other parts of the building are prohibited.

Exceptions:
1. Egress doors serving the machinery room.
2. Access doors and panels in air ducts and air-handling units, provided that such openings are gasketed and tight fitting.

1105.3 Refrigerant detector.
Refrigerant detectors in machinery rooms shall be provided as required by Section 606.8 of the International Fire Code. Machinery rooms shall contain a refrigerant detector with an audible and visual alarm. The detector, or a sampling tube that draws air to the detector, shall be located in an area where refrigerant from a leak will concentrate. The alarm shall be actuated at a value not greater than the corresponding TLV-TWA values shown in Table 1103.1. Detectors and alarms shall be placed in approved locations.

Exception: Detectors are not required for ammonia systems complying with Section 1106.3.

SECTION 1106
MACHINERY ROOM, SPECIAL REQUIREMENTS

1106.5.1 Refrigeration system emergency shutoff.
A clearly identified switch of the break-glass type or with an approved tamper-resistant cover shall provide off-only control of refrigerant compressors, refrigerant pumps, and normally closed, automatic refrigerant valves located in the machinery room at an approved location immediately outside the machinery room and adjacent to its primary entrance. Additionally, this equipment shall be automatically shut off whenever the refrigerant vapor concentration in the machinery room exceeds the vapor detector’s upper detection limit or 25 percent of the LEL, whichever is lower.

[F] SECTION 1109
PERIODIC TESTING

1109.1 Testing required.
The following emergency devices and systems shall be periodically tested in accordance with the manufacturer’s instructions and as required by the code official:

1. Treatment and flaring systems.
2. Valves and appurtenances necessary to the operation of emergency refrigeration control boxes.
3. Fans and associated equipment intended to operate emergency pure ventilation systems.
4. Detection and alarm systems.

CHAPTER 12
HYDRONIC PIPING
SECTION 1205
VALVES

1205.1 Where required.
Shutoff valves shall be installed in hydronic piping systems in the locations indicated in Sections 1205.1.1 through 1205.1.6.

1205.1.1 Heat exchangers.
Shutoff valves shall be installed on the supply and return side of a heat exchanger.

Exception: Shutoff valves shall not be required when heat exchangers are integral with a boiler; or are a component of a manufacturer’s boiler and heat exchanger packaged unit and are capable of being isolated from the hydronic system by the supply and return valves, required by Section 1005.1.

SECTION 1206
PIPING INSTALLATION

1206.9.1 Flood hazard. Piping located in a flood hazard area shall be capable of resisting hydrostatic and hydrodynamic loads and stresses, including the effects of buoyancy, during the occurrence of flooding to the design flood elevation as established by the Flood Plain Administrator local governing authority.

SECTION 1208
TESTS

1208.1 General.
Hydronic piping systems other than ground-source heat pump loop systems shall be tested hydrostatically at one and one half times the maximum system design pressure, but not less than 100 psi (689 kPa). The duration of each test shall be not less than 15 minutes. Ground-source heat pump loop systems and cross-linked polyethylene (PEX) tubing systems shall be tested in accordance with Sections 1208.1.1 and 1208.1.2.

1208.1.1 Ground source heat pump loop systems.
Before connection (header) trenches are backfilled, the assembled loop system shall be pressure tested with
water at 100 psi (689 kPa) for 30 minutes with no observed leaks. Flow and pressure loss testing shall be performed and the actual flow rates and pressure drops shall be compared to the calculated design values. If actual flow rate or pressure drop values differ from calculated design values by more than 10 percent, the problem shall be identified and corrected.

1208.1.2 Cross-linked polyethylene (PEX) tubing systems.
Before a continuous looped systems using PEX tubing is embedded or concealed the assembled system shall be pressure tested at 100 psi (689 kPa) for 30 minutes with no observed leaks.

SECTION 1209
EMBDEDDED PIPING

1209.1 Materials.
Piping for heating panels shall be standard-weight steel pipe, Type L copper tubing, cross-linked polyethylene (PEX) tubing, cross-linked polyethylene/aluminum/cross-linked polyethylene (PEX-AL-PEX) pressure pipe or polybutylene rated at 100 psi (689 kPa) at 180°F (82°C).

1209.3.4 Cross-linked polyethylene joints.
PEX pipe shall be joined using cold expansion, insert or compression fittings.

1209.3.5 Cross-linked polyethylene/aluminum/crosslinked polyethylene.
PEX-AL-PEX pipe shall be joined by mechanical, crimp/insert fittings.

CHAPTER 13
FUEL OIL PIPING AND STORAGE
SECTION 1301
GENERAL

1301.1 Scope.
This chapter shall govern the design, installation, construction and repair of fuel-oil storage and piping systems. The storage of fuel oil and flammable and combustible liquids shall be in accordance with Chapters 6 and 57 of the International Fire Code.

1301.2 Storage and piping systems.
Fuel-oil storage systems shall comply with Section 603.3 of the International Fire Code. Fuel-oil piping systems shall comply with the requirements of this code and the Oregon Department of Environmental Quality.

SECTION 1305
FUEL OIL SYSTEM INSTALLATION

1305.2.1 Flood hazard. All fuel oil pipe, equipment and appliances located in flood hazard areas shall be located above the elevation established by the Flood Plain Administrator local governing authority required by Section 1612 of the International Building Code for utilities and attendant equipment or shall be capable of resisting hydrostatic and hydrodynamic loads and stresses, including the effects of buoyancy, during the occurrence of flooding up to such elevation.
CHAPTER 14
SOLAR SYSTEMS
SECTION 1401
GENERAL

1401.1 Scope.
This chapter shall govern the design, construction, installation, alteration and repair of systems, equipment and appliances intended to utilize solar energy for nonpotable space heating or cooling, domestic hot water heating, swimming pool heating or process heating.

1401.2 Potable water supply.
Potable water supplies to solar systems shall be protected against contamination in accordance with the International Plumbing Code.

Exception: Where all solar system piping is a part of the potable water distribution system, in accordance with the requirements of the International Plumbing Code, and all components of the piping system are listed for potable water use, cross-connection protection measures shall not be required.

1402.5.1 Pressure and temperature.
Solar energy system components containing pressurized fluids shall be protected against pressures and temperatures exceeding design limitations with a pressure and temperature relief valve. Each section of the system in which excessive pressures are capable of developing shall have a relief device located so that a section cannot be valved off or otherwise isolated from a relief device. Listed and labeled Relief valves shall have a minimum rated capacity for the equipment or appliances served comply with the requirements of Section 1006.4 and discharge in accordance with Section 1006.6.

1402.5.4 Expansion tanks.
Liquid single-phase solar energy systems shall be equipped with expansion tanks sized in accordance with Section 1009.

CHAPTER 15
REFERENCED STANDARDS

This chapter lists the standards that are referenced in various sections of this document. The standards are listed herein by the promulgating agency of the standard, the standard identification, the effective date and title, and the section or sections of this document that reference the standard. The application of the referenced standards shall be as specified in Section 102.8.

<table>
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APPENDIX C

FUEL GAS

SECTION C101 (IFGC)

GENERAL

(NOTE: All Appendix C is IFGC with Oregon amendments, renumbered as Appendix C)

[A] 101.1 Title.
These regulations shall be known as the Fuel Gas Code of [NAME OF JURISDICTION], hereinafter referred to as “this code.”

[A] C101.2 Scope.
This code appendix shall apply to the installation of fuel-gas piping systems, fuel gas appliances, gaseous hydrogen systems and related accessories in accordance with Sections C101.2.1 through C101.2.5.

Exception: 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 Oregon Residential Specialty Code.

[A] C101.2.4 Systems, appliances and equipment outside the scope.
This code shall not apply to the following:
1. Portable LP-fuel gas appliances and **equipment** of all types that is not connected to a fixed fuel **piping** system.

2. Installation of farm appliances and **equipment** such as brooders, dehydrators, dryers and irrigation **equipment**.

3. Raw material (feedstock) applications except for **piping** to special atmosphere generators.

4. Oxygen-fuel gas cutting and welding systems.

5. Industrial gas applications using gases such as acetylene and acetylenic compounds, hydrogen, ammonia, carbon monoxide, oxygen and nitrogen.

6. Petroleum refineries, pipeline compressor or pumping stations, loading terminals, compounding plants, refinery tank farms and natural gas processing plants.

7. Integrated chemical plants or portions of such plants where flammable or combustible liquids or gases are produced by, or used in, chemical reactions.

8. LP-gas installations at utility gas plants.


10. Fuel gas **piping** in power and atomic energy plants.

11. Proprietary items of **equipment**, apparatus or instruments such as gas-generating sets, compressors and calorimeters.

12. LP-gas **equipment** for vaporization, gas mixing and gas manufacturing.

13. Temporary LP-fuel **piping** for buildings under construction or renovation that is not to become part of the permanent **piping** system.


15. Installation of hydrogen gas, LP-gas and compressed natural gas (CNG) systems on vehicles.

16. Except as provided in Section C401.1.1, gas **piping**, meters, gas pressure regulators and other appurtenances used by the serving gas supplier in the distribution of gas, other than undiluted LP-gas.

17. Building design and construction, except as specified herein.

18. **Piping** systems for mixtures of gas and air within the flammable range with an operating pressure greater than 10 psig (69 kPa gauge).

19. Portable fuel cell appliances that are neither connected to a fixed **piping** system nor interconnected to a power grid.

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[A] 101.2.5 Other fuels.

The requirements for the design, installation, maintenance, **alteration** and inspection of mechanical systems operating with fuels other than fuel gas shall be regulated by the **International Mechanical Code**.

[A] 101.3 Appendices.

Provisions in the appendices shall not apply unless specifically adopted.


The purpose of this code is to provide minimum standards to safeguard life or limb, health, property and public welfare by regulating and controlling the design, construction, installation, quality of materials, **and** location, operation and maintenance or use of fuel gas systems.
SECTION 102 (IFGC)
APPLICABILITY
(Note: This section deleted in its entirety)

PART 2—ADMINISTRATION AND ENFORCEMENT

SECTION 103 (IFGC)
DEPARTMENT OF INSPECTION
(Note: This section deleted in its entirety)

SECTION 104 (IFGC)
DUTIES AND POWERS OF THE CODE OFFICIAL
(Note: This section deleted in its entirety)

SECTION 105 (IFGC)
APPROVAL
(Note: This section deleted in its entirety)

SECTION 106 (IFGC)
PERMITS
(Note: This section deleted in its entirety)

SECTION C1027 (IFGC)
INSPECTIONS AND TESTING

[A] 107.2.1 Other inspections.
In addition to the inspections specified above, the code official is authorized to make or require other inspections of any construction work to ascertain compliance with the provisions of this code and other laws that are enforced.

[A] 107.2.2 Inspection requests.
It shall be the duty of the holder of the permit or his or her duly authorized agent to notify the code official when work is ready for inspection. It shall be the duty of the permit holder to provide access to and means for inspections of such work that are required by this code.

[A] 107.2.3 Approval required.
Work shall not be done beyond the point indicated in each successive inspection without first obtaining the approval of the code official. The code official, upon notification, shall make the requested inspections and shall either indicate the portion of the construction that is satisfactory as completed, or notify the permit holder or his or her agent wherein the same fails to comply with this code. Any portions that do not comply shall be corrected and such portion shall not be covered or concealed until authorized by the code official.

[A] 107.2.4 Approved inspection agencies.
The code official is authorized to accept reports of approved agencies, provided that such agencies satisfy the requirements as to qualifications and reliability.

[A] 107.2.5 Evaluation and follow-up inspection services.
Prior to the approval of a prefabricated construction assembly having concealed work and the issuance of a permit, the code official shall require the submittal of an evaluation report on each prefabricated construction assembly, indicating the complete details of the installation, including a description of the system and its...
components, the basis upon which the system is being evaluated, test results and similar information and other data as necessary for the code official to determine conformance to this code.

[A] 107.2.5.1 Evaluation service.
The code official shall designate the evaluation service of an approved agency as the evaluation agency, and review such agency’s evaluation report for adequacy and conformance to this code.

[A] 107.2.5.2 Follow-up inspection.
Except where ready access is provided to installations, appliances, service equipment and accessories for complete inspection at the site without disassembly or dismantling, the code official shall conduct the in-plant inspections as frequently as necessary to ensure conformance to the approved evaluation report or shall designate an independent, approved inspection agency to conduct such inspections. The inspection agency shall furnish the code official with the follow-up inspection manual and a report of inspections upon request, and the installation shall have an identifying label permanently affixed to the system indicating that factory inspections have been performed.

[A] 107.2.5.3 Test and inspection records.
Required test and inspection records shall be available to the code official at all times during the fabrication of the installation and the erection of the building; or such records as the code official designates shall be filed.

SECTION 108 (IFGC)
VIOLATIONS
(Note: This section deleted in its entirety)

SECTION 109 (IFGC)
MEANS OF APPEAL
(Note: This section deleted in its entirety)

SECTION C201 (IFGC)
GENERAL

C201.4 Terms not defined.
Where terms are not defined through the methods authorized by this section, such terms shall have ordinarily accepted meanings such as the context implies.

Words of common usage are given their plain, natural and ordinary meanings. Words that have well-defined legal meanings are given those meanings.

SECTION C202 (IFGC)
GENERAL DEFINITIONS

[M] AIR, EXHAUST. Air being removed from any space or piece of equipment or appliance and conveyed directly to the atmosphere by means of openings or ducts.

[A] ALTERATION. A change in a system that involves an extension, addition or change to the arrangement, type or purpose of the original installation.
[M] APPLIANCE. Any apparatus or device that utilizes a fuel or raw material to produce light, heat, power, refrigeration or air conditioning.

[A] APPROVED. Acceptable to the code official or other authority having jurisdiction.

[A] APPROVED AGENCY. An established and recognized agency that is approved by the code official and regularly engaged in conducting tests or furnishing inspection services.

BOILER, LOW-PRESSURE. A self-contained appliance for supplying steam or hot water.

Hot water heating boiler. A boiler in which no steam is generated, from which hot water is circulated for heating purposes and then returned to the boiler, and that operates at water pressures not exceeding 160 pounds per square inch gauge (psig) (1100 kPa gauge) and at water temperatures not exceeding 250°F (121°C) at or near the boiler outlet.

Hot water supply boiler. A boiler, completely filled with water, which furnishes hot water to be used externally to itself, and that operates at water pressures not exceeding 160 psig (1100 kPa gauge) and at water temperatures not exceeding 250°F (121°C) at or near the boiler outlet.

Steam heating boiler. A boiler in which steam is generated and that operates at a steam pressure not exceeding 15 psig (100 kPa-gauge).

CLOTHES DRYER. An appliance used to dry wet laundry by means of heated air. Dryer classifications are as follows:

Type 1. Factory-built package, multiple production. Primarily used in family living environment. Usually the smallest unit physically and in function output.

Type 2. Factory-built package, multiple production. Used in business with direct intercourse of the function with the public. Not designed for use in individual family living environment.

[A] CODE. These regulations, subsequent amendments thereto or any emergency rule or regulation that the administrative authority having jurisdiction has lawfully adopted.

[A] CODE OFFICIAL. The officer or other designated authority charged with the administration and enforcement of this code, or a duly authorized representative.

[M] COMBUSTIBLE ASSEMBLY. Wall, floor, ceiling or other assembly constructed of one or more component materials that are not defined as noncombustible.

COMBUSTIBLE MATERIAL. Any material not defined as noncombustible.

[A] CONSTRUCTION DOCUMENTS. All of the written, graphic and pictorial documents prepared or assembled for describing the design, location and physical characteristics of the elements of the project necessary for obtaining a mechanical permit.

[B] DESIGN FLOOD ELEVATION. The elevation of the “design flood,” including wave height, relative to the datum specified on the community’s legally designated flood hazard map.
[A] DWELLING UNIT. A single unit providing complete, independent living facilities for one or more persons, including permanent provisions for living, sleeping, eating, cooking and sanitation.

EXCESS FLOW VALVE (EFV). A valve designed to activate when the fuel gas passing through it exceeds a prescribed flow rate.

FIREPLACE. A fire chamber and hearth constructed of noncombustible material for use with solid fuels and provided with a chimney.

- **Factory-built fireplace.** A fireplace composed of listed factory-built components assembled in accordance with the terms of listing to form the completed fireplace.

- **Masonry fireplace.** A hearth and fire chamber of solid masonry units such as bricks, stones, listed masonry units or reinforced concrete, provided with a suitable chimney.

FLASHBACK ARRESTOR CHECK VALVE. A device that will prevent the backflow of one gas into the supply system of another gas and prevent the passage of flame into the gas supply system.

[B] FLOOD HAZARD AREA. The greater of the following two areas:

1. The area within a floodplain subject to a 1 percent or greater chance of flooding in any given year.

2. This area designated as a flood hazard area on a community’s flood hazard map, or otherwise legally designated.

LIVING SPACE. Space within a dwelling unit utilized for living, sleeping, eating, cooking, bathing, washing and sanitation purposes.

[A] OCCUPANCY. The purpose for which a building, or portion thereof, is utilized or occupied.

POINT OF DELIVERY. For natural gas systems, the point of delivery is the outlet of the service meter assembly or the outlet of the service regulator or service shutoff valve where a meter is not provided. Where a valve is provided at the outlet of the service meter assembly, such valve shall be considered to be downstream of the point of delivery. For undiluted liquefied petroleum gas systems, the point of delivery shall be considered to be the outlet of the service first stage pressure regulator that provides utilization pressure, exclusive of line gas regulators, in the system.

RELIEF VALVE (DEVICE). A safety valve designed to forestall the development of a dangerous condition by relieving either pressure, temperature or vacuum in the hot water supply system.

RELIEF VALVE, PRESSURE. An automatic valve that opens and closes a relief vent, depending on whether the pressure is above or below a predetermined value.

RELIEF VALVE, TEMPERATURE.

- **Manual reset type.** A valve that automatically opens a relief vent at a predetermined temperature and that must be manually returned to the closed position.

- **Reseating or self-closing type.** An automatic valve that opens and closes a relief vent, depending on whether the temperature is above or below a predetermined value.
RELIEF VALVE, VACUUM. A valve that automatically opens and closes a vent for relieving a vacuum within the hot water supply system, depending on whether the vacuum is above or below a predetermined value.

[B] SLEEPING UNIT. A room or space in which people sleep, which can also include permanent provisions for living, eating and either sanitation or kitchen facilities, but not both. Such rooms and spaces that are also part of a dwelling unit are not sleeping units.

[P] THIRD-PARTY CERTIFICATION AGENCY. An approved agency operating a product or material certification system that incorporates initial product testing, assessment and surveillance of a manufacturer’s quality control system.

[P] THIRD-PARTY CERTIFIED. Certification obtained by the manufacturer indicating that the function and performance characteristics of a product or material have been determined by testing and ongoing surveillance by an approved third-party certification agency. Assertion of certification is in the form of identification in accordance with the requirements of the third-party certification agency.

[P] THIRD-PARTY TESTED. Procedure by which an approved testing laboratory provides documentation that a product, material or system conforms to specified requirements.

UNLISTED BOILER. A boiler not listed by a nationally recognized testing agency.

WATER HEATER. Any heating appliance or equipment that heats potable water and supplies such water to the potable hot water distribution system.

CHAPTER 3
GENERAL REGULATIONS
SECTION C301 (IFGC)
GENERAL

C301.1 Scope.
This chapter shall govern the approval and installation of all equipment and appliances that comprise parts of the installations regulated by this code in accordance with Section 101.2.

C301.1.1 Other fuels.
The requirements for combustion and dilution air for gas-fired appliances shall be governed by Section C304. The requirements for combustion and dilution air for appliances operating with fuels other than fuel gas shall be regulated by Chapter 7 the International Mechanical Code.

301.4 Labeling.
Labeling shall be in accordance with the procedures set forth in Sections 301.4.1 through 301.4.2.3.

301.4.1 Testing.
An approved agency shall test a representative sample of the appliances being labeled to the relevant standard or standards. The approved agency shall maintain a record of all of the tests performed. The record shall provide sufficient detail to verify compliance with the test standard.

301.4.2 Inspection and identification.
The approved agency shall periodically perform an inspection, which shall be in-plant if necessary, of the appliances to be labeled. The inspection shall verify that the labeled appliances are representative of the appliances tested.

301.4.2.1 Independent.
The agency to be approved shall be objective and competent. To confirm its objectivity, the agency shall disclose all possible conflicts of interest.
301.4.2.2 Equipment.
An approved agency shall have adequate equipment to perform all required tests. The equipment shall be periodically calibrated.

301.4.2.3 Personnel.
An approved agency shall employ experienced personnel educated in conducting, supervising and evaluating tests.

301.5 Label information.
A permanent factory-applied nameplate(s) shall be affixed to appliances on which shall appear in legible lettering, the manufacturer’s name or trademark, the model number, serial number and, for listed appliances, the seal or mark of the testing agency. A label shall also include the hourly rating in British thermal units per hour (Btu/h) (W); the type of fuel approved for use with the appliance; and the minimum clearance requirements.

301.6 Plumbing connections.
Potable water supply and building drainage system connections to appliances regulated by this code shall be in accordance with the International Plumbing Code.

301.8 Vibration isolation.
Where means for isolation of vibration of an appliance is installed, an approved means for support and restraint of that appliance shall be provided.

301.9 Repair.
Defective material or parts shall be replaced or repaired in such a manner so as to preserve the original approval or listing.

301.10 Wind resistance.
Appliances and supports that are exposed to wind shall be designed and installed to resist the wind pressures determined in accordance with the International Building Code.

[B] 301.11 Flood hazard.
For structures located in flood hazard areas, the appliance, equipment and system installations regulated by this code shall be located at or above the elevation established by the Flood Plain Administrator required by Section 1612 of the International Building Code for utilities and attendant equipment.

   Exception: The appliance, equipment and system installations regulated by this code are permitted to be located below the elevation established by the Flood Plain Administrator required by Section 1612 of the International Building Code for utilities and attendant equipment provided that they are designed and installed to prevent water from entering or accumulating within the components and to resist hydrostatic and hydrodynamic loads and stresses, including the effects of buoyancy, during the occurrence of flooding to such elevation.

301.12 Seismic resistance.
When earthquake loads are applicable in accordance with the International Building Code, the supports shall be designed and installed for the seismic forces in accordance with that code.

301.13 Ducts.
All ducts required for the installation of systems regulated by this code shall be designed and installed in accordance with the International Mechanical Code.
301.14 Rodentproofing.
Buildings or structures and the walls enclosing habitable or occupiable rooms and spaces in which persons live, sleep or work, or in which feed, food or foodstuffs are stored, prepared, processed, served or sold, shall be constructed to protect against rodents in accordance with the *International Building Code*.

301.15 Prohibited location.
The appliances, equipment and systems regulated by this code shall not be located in an elevator shaft.

**SECTION C302 (IFGC)**
STRUCTURAL SAFETY

[B] C302.1 Structural safety. See Chapter 3, Section 302.
The building shall not be weakened by the installation of any gas piping. In the process of installing or repairing any gas piping, the finished floors, walls, ceilings, tile work or any other part of the building or premises which is required to be changed or replaced shall be left in a safe structural condition in accordance with the requirements of the *International Building Code*.
*Note: remainder of Section deleted in its entirety.*

**SECTION C303 (IFGC)**
APPLIANCE LOCATION

C303.1 General.
Appliances shall be located as required by this section, specific requirements elsewhere in this *appendix* code and the conditions of the *equipment* and *appliance* listing.

C303.4 Protection from vehicle impact damage.
Appliances shall not be installed in a location subject to vehicle impact damage except where protected by an approved means. *See Figure C303.1.*

C303.6 Outdoor locations.
Appliances installed in outdoor locations shall be either listed for outdoor installation or provided with protection from outdoor environmental factors that influence the operability, durability and safety of the appliances.

**SECTION C304 (IFGS)**
COMBUSTION, VENTILATION AND DILUTION AIR

C304.1 General.
Air for combustion, ventilation and dilution of flue gases for appliances installed in buildings shall be provided by application of one of the methods prescribed in Sections C304.5 through C304.9. Where the requirements of Section C304.5 are not met, outdoor air shall be introduced in accordance with one of the methods prescribed in Sections C304.6 through C304.9. *Direct-vent appliances*, gas appliances of other than natural draft design and vented gas appliances other than Category I shall be provided with combustion, ventilation and dilution air in accordance with the *appliance* manufacturer’s instructions.

*Exception:* Type 1 clothes dryers that are provided with makeup air in accordance with Section 504.5 614.5.

C304.4 Makeup air provisions.
Where exhaust fans, clothes dryers and kitchen ventilation systems interfere with the operation of appliances, makeup air shall be provided.
C304.4.1 Special Conditions. In buildings containing combustion appliances, equipment or fireplaces not equipped with forced or induced draft or separated from the habitable area where an individual exhaust appliance exceeds 350 cfm (165.2 L/s), makeup air of sufficient quantity to equal that being exhausted shall be supplied to the area being ventilated. In such cases, the minimum size makeup air duct shall be 6 inches (152 mm) in diameter or equivalent in area.

SECTION C305 (IFGC)
INSTALLATION

C305.3 Elevation of ignition source.
*Equipment* and appliances having an *ignition source* shall be elevated such that the source of ignition is not less than 18 inches (457 mm) above the floor in hazardous locations, and public garages, private garages, repair garages, motor fuel-dispensing facilities and parking garages. For the purpose of this section, rooms or spaces that are not part of the living space of a dwelling unit and that communicate directly with a private garage through openings shall be considered to be part of the private garage.

**Exception:** Elevation of the *ignition source* is not required for appliances that are listed as flammable vapor ignition resistant.

C305.4 Public garages.
Appliances located in public garages, motor fuel-dispensing facilities, repair garages or other areas frequented by motor vehicles shall be installed a minimum of 8 feet (2438 mm) above the floor. Where motor vehicles are capable of passing under an appliance, the appliance shall be installed at the clearances required by the appliance manufacturer and not less than 1 foot (305 mm) higher than the tallest vehicle garage door opening.

**Exception:** The requirements of this section shall not apply where the appliances are protected from motor vehicle impact and installed in accordance with Section C305.3 and NFPA 30A.

C305.5 Private garages.
Appliances located in private garages shall be installed with a minimum clearance of 6 feet (1829 mm) above the floor.

**Exception:** The requirements of this section shall not apply where the appliances are protected from motor vehicle impact and installed in accordance with Section C305.3  *(See Figure C304.1).*

[M] C306.5 Equipment and appliances on roofs or elevated structures.
*Install per Section 306.5 of Chapter 3.* Where equipment requiring access or appliances are 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, an interior or exterior means of access shall be provided. Such access shall not require climbing over obstructions greater than 30 inches (762 mm) 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.

**Exception:** This section shall not apply to the replacement, repair or maintenance of an existing appliance or piece of *equipment* lawfully in existence at the time of the adoption of this code.

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 30 inches (762 mm).
2. Ladders shall have rung spacing not to exceed 14 inches (356 mm) on center. The uppermost rung shall be a maximum of 24 inches (610 mm) below the upper edge of the roof hatch, roof or parapet, as applicable.

3. Ladders shall have a toe spacing not less than 6 inches (152 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 per square foot (488.2 kg/m²). Landing dimensions shall be not less than 18 inches (457 mm) and not less than the width of the ladder served. A guard rail shall be provided on all open sides of the landing.

7. Climbing clearance. 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 (762 mm) 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 (381 mm) 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 (762 mm) by 30 inches (762 mm) centered in front of the ladder.

9. Ladders shall be protected against corrosion by approved means.

10. Access to ladders shall be provided at all times. Access path to ladder and ladder landing shall remain unobstructed.

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.

[M] 306.5.1 Sloped roofs.
Where appliances, equipment, fans or other components that require service are installed on a roof having a slope of 3 units vertical in 12 units horizontal (25-percent slope) or greater and having an edge more than 30 inches (762 mm) above grade at such edge, a level platform shall be provided on each side of the appliance or equipment to which access is required for service, repair or maintenance. The platform shall be not less than 30 inches (762 mm) in any dimension and shall be provided with guards. The guards shall extend not less than 42 inches (1067 mm) above the platform, shall be constructed so as to prevent the passage of a 21-inch-diameter (533 mm) sphere and shall comply with the loading requirements for guards specified in the International Building Code. Access shall not require walking on roofs having a slope greater than 4 units vertical in 12 units horizontal (33-percent slope). Where access involves obstructions greater than 30 inches (762 mm) in height, such obstructions shall be provided with ladders installed in accordance with Section 306.5 or stairs installed in accordance with the requirements specified in the International Building Code in the path of travel to and from appliances, fans or equipment requiring service.

[M] 306.5.2 Electrical requirements.
A receptacle outlet shall be provided at or near the appliance location in accordance with the Electrical Code NFPA 70.

Install per Section 306.6 of Chapter 3. Guards shall be provided where appliances or other components that require service and roof hatch openings are located within 10 feet (3048 mm) of a roof edge or open side of a walking surface and such edge or open side is located more than 30 inches (762 mm) above the floor, roof or grade below. The guard shall extend not less than 30 inches (762 mm) beyond each end of such appliances, or components and roof hatch openings and the top of the guard shall be located not less than 42 inches (1067 mm)
above the elevated surface adjacent to the guard. The guard shall be constructed so as to prevent the passage of a 21-inch-diameter (533 mm) sphere and shall comply with the loading requirements for guards specified in the International Building Code.

Exception: This section shall not apply to the replacement, repair or maintenance of an existing appliance or piece of equipment lawfully in existence at the time of the adoption of this code.

SECTION C307 (IFGC)
CONDENSATE DISPOSAL

Note: For additional information on condensate disposal see Chapter 3, Section 307.

C307.1 Evaporators and cooling coils.
Condensate drainage systems shall be provided for equipment and appliances containing evaporators and cooling coils in accordance with this section and Section 307 of Chapter 3 the International Mechanical Code.

[M] C307.3 Drain pipe materials and sizes.
Components of the condensate disposal system shall be cast iron, galvanized steel, copper, cross-linked polyethylene, polybutylene, polyethylene, ABS, CPVC or PVC pipe or tubing. All components shall be selected for the pressure and temperature rating of the installation. Joints and connections shall be made in accordance with the applicable provisions of Chapter 7 of the International Plumbing Code relative to the material type. Condensate waste and drain line size shall be not less than ¾-inch (19 mm) internal diameter and shall not decrease in size from the drain pan connection to the place of condensate disposal. Where the drain pipes from more than one unit are manifolded together for condensate drainage, the pipe or tubing shall be sized in accordance with an approved method.

SECTION C308 (IFGS)
CLEARANCE REDUCTION

C308.1 Scope.
This section shall govern the reduction in required clearances to combustible materials, including gypsum board, and combustible assemblies for chimneys, vents, appliances, devices and equipment. Clearance requirements for gas-fired air-conditioning equipment and gas-fired central heating boilers and furnaces shall comply with Sections C308.3 and C308.4.

SECTION C310 (IFGS)
ELECTRICAL BONDING

C310.1 Pipe and tubing other than CSST.
Each above-ground portion of a gas piping system other than corrugated stainless steel tubing (CSST) that is likely to become energized shall be electrically continuous and bonded to an effective ground-fault current path. Gas piping other than CSST shall be considered to be bonded where it is connected to appliances that are connected to the equipment grounding conductor of the circuit supplying that appliance.

310.1.1 CSST.
Corrugated stainless steel tubing (CSST) gas piping systems shall be bonded to the electrical service grounding electrode system. The bonding jumper shall connect to a metallic pipe or fitting between the point of delivery and the first downstream CSST fitting. The bonding jumper shall be not smaller than 6 AWG copper wire or equivalent. Gas piping systems that contain one or more segments of CSST shall be bonded in accordance with this section.
SECTION C401 (IFGC)
GENERAL

C401.1 Scope.
This chapter shall govern the design, installation and modification and maintenance of piping systems. The applicability of this code to piping systems extends from the point of delivery to the connections with the appliances and includes the design, materials, components, fabrication, assembly, installation, testing, inspection and operation and maintenance of such piping systems.

C401.1.1 Utility piping systems located within buildings.
Utility service piping located within buildings shall be installed in accordance with the structural safety and fire protection provisions of the International Building Code.

Notice of installation. A “Notice of Installation” is required by the State Fire Marshal for all LP-gas tank installations. For installation requirements of LP-gas tanks and tubing or piping up to the first stage regulator, see Article 82 of the Fire Code.

SECTION C402 (IFGS)
PIPE SIZING

C402.3 Sizing.
Gas piping shall be sized in accordance with one of the following:
1. Pipe sizing tables or sizing equations in accordance with Section C402.4.
2. The sizing tables included in a listed piping system’s manufacturer’s installation instructions.
3. Other approved engineering methods.

C406 (IFGS)
INSPECTION, TESTING AND PURGING

C406.1.1 Inspections.
Inspection shall consist of visual examination, during or after manufacture, fabrication, assembly or pressure tests.

C406.1.1.1 Rough piping inspection. This inspection shall be made after piping authorized by the permit has been installed and before such piping has been covered or concealed or a fixture or appliance has been attached thereto. This inspection shall include a determination that the gas piping size, material and installation meet the requirements of this appendix.

C406.1.1.2 Final piping inspection. This inspection shall be made after piping authorized by the permit has been installed and after all portions thereof which are to be covered or concealed are so concealed and after fixtures, appliances or shutoff valves have been attached thereto.

C406.3 Test preparation.
Pipe joints, including welds, shall be left exposed for examination during the test.

Exception: Covered or concealed pipe end joints that have been previously tested in accordance with this code appendix.
C406.4 Test pressure measurement.
Test pressure shall be measured with a manometer or with a pressure-measuring device designed and calibrated to read, record or indicate a pressure loss caused by leakage during the pressure test period. The source of pressure shall be isolated before the pressure tests are made. Mechanical gauges used to measure test pressures shall have a range such that the highest end of the scale is not greater than five times the test pressure.

C406.4.1 Test pressure. Gas-piping systems under 14 inches (3.5 kPa) water column pressure shall be tested at a pressure of not less than 10 pounds per square inch (69 kPa) gauge. Test pressures shall be held for not less than 15 minutes with no perceptible drop in pressure. For welded piping and piping carrying gas at pressures exceeding 14 inches water column (3484 Pa) pressure, the test pressure shall be at least 60 pounds per square inch (0.0422 kg/mm²) for not less than 30 minutes.

Exception: Testing, inspection and purging of gas-piping systems performed by using NFPA 54 shall be permitted.

406.4.1 Test-pressure.
The test pressure to be used shall be no less than \( \frac{1}{2} \) times the proposed maximum working pressure, but not less than 3 psig (20 kPa gauge), irrespective of design pressure. Where the test pressure exceeds 125 psig (862 kPa gauge), the test pressure shall not exceed a value that produces a hoop stress in the piping greater than 50 percent of the specified minimum yield strength of the pipe.

406.4.2 Test duration.
Test duration shall be not less than \( \frac{1}{2} \) hour for each 500 cubic feet (14 m³) of pipe volume or fraction thereof. When testing a system having a volume less than 10 cubic feet (0.28 m³) or a system in a single-family dwelling, the test duration shall be not less than 10 minutes. The duration of the test shall not be required to exceed 24 hours.

406.5 Detection of leaks and defects.
The piping system shall withstand the test pressure specified without showing any evidence of leakage or other defects.

Any reduction of test pressures as indicated by pressure gauges shall be deemed to indicate the presence of a leak unless such reduction can be readily attributed to some other cause.

406.5.1 Detection methods.
The leakage shall be located by means of an approved gas detector, a noncorrosive leak detection fluid or other approved leak detection methods. Matches, candles, open flames or other methods that could provide a source of ignition shall not be used.

406.5.2 Corrections.
Where leakage or other defects are located, the affected portion of the piping system shall be repaired or replaced and retested.

406.6 Piping system and equipment leakage check.
Leakage checking of systems and equipment shall be in accordance with Sections 406.6.1 through 406.6.4.

406.6.1 Test gases.
Leak checks using fuel gas shall be permitted in piping systems that have been pressure tested in accordance with Section 406.
406.6.2 Before turning gas on.
During the process of turning gas on into a system of new gas piping, the entire system shall be inspected to determine that there are no open fittings or ends and that all valves at unused outlets are closed and plugged or capped.

406.6.3 Leak check.
Immediately after the gas is turned on into a new system or into a system that has been initially restored after an interruption of service, the piping system shall be checked for leakage. Where leakage is indicated, the gas supply shall be shut off until the necessary repairs have been made.

406.6.4 Placing appliances and equipment in operation.
Appliances and equipment shall not be placed in operation until after the piping system has been checked for leakage in accordance with Section 406.6.3, the piping system has been purged in accordance with Section 406.7 and the connections to the appliances have been checked for leakage.

406.7 Purging.
The purging of piping shall be in accordance with Sections 406.7.1 through 406.7.3.

406.7.1 Piping systems required to be purged outdoors.
The purging of piping systems shall be in accordance with the provisions of Sections 406.7.1.1 through 406.7.1.4 where the piping system meets either of the following:

1. The design operating gas pressure is greater than 2 psig (13.79 kPa).
2. The piping being purged contains one or more sections of pipe or tubing meeting the size and length criteria of Table 406.7.1.1.

406.7.1.1 Removal from service.
Where existing gas piping is opened, the section that is opened shall be isolated from the gas supply and the line pressure vented in accordance with Section 406.7.1.3. Where gas piping meeting the criteria of Table 406.7.1.1 is removed from service, the residual fuel gas in the piping shall be displaced with an inert gas.

<table>
<thead>
<tr>
<th>NOMINAL PIPE SIZE (inches)</th>
<th>LENGTH OF PIPING (feet)</th>
</tr>
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<tbody>
<tr>
<td>3/4</td>
<td>&gt; 50</td>
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<tr>
<td>3/4</td>
<td>&gt; 40</td>
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<td>&gt; 15</td>
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<td>5/4</td>
<td>&gt; 10</td>
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For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm.
a. CSST EHD size of 62 is equivalent to nominal 2 inch pipe or tubing size.
406.7.1.2 Placing in operation.
Where gas piping containing air and meeting the criteria of Table 406.7.1.1 is placed in
operation, the air in the piping shall first be displaced with an inert gas. The inert gas shall then
be displaced with fuel gas in accordance with Section 406.7.1.3.

406.7.1.3 Outdoor discharge of purged gases.
The open end of a piping system being pressure vented or purged shall discharge directly to an
outdoor location. Purging operations shall comply with all of the following requirements:

1. The point of discharge shall be controlled with a shutoff valve.
2. The point of discharge shall be located at least 10 feet (3048 mm) from sources of
   ignition, at least 10 feet (3048 mm) from building openings and at least 25 feet (7620
   mm) from mechanical air intake openings.
3. During discharge, the open point of discharge shall be continuously attended and
   monitored with a combustible gas indicator that complies with Section 406.7.1.4.
4. Purging operations introducing fuel gas shall be stopped when 90 percent fuel gas by
   volume is detected within the pipe.
5. Persons not involved in the purging operations shall be evacuated from all areas within
   10 feet (3048 mm) of the point of discharge.

406.7.1.4 Combustible-gas indicator.
Combustible-gas indicators shall be listed and shall be calibrated in accordance with the
manufacturer’s instructions. Combustible-gas indicators shall numerically display a volume
scale from zero percent to 100 percent in 1 percent or smaller increments.

406.7.2 Piping systems allowed to be purged indoors or outdoors.
The purging of piping systems shall be in accordance with the provisions of Section 406.7.2.1
where the piping system meets both of the following:

1. The design operating gas pressure is 2 psig (13.79 kPa) or less.
2. The piping being purged is constructed entirely from pipe or tubing not meeting the size and
   length criteria of Table 406.7.1.1.

406.7.2.1 Purging procedure.
The piping system shall be purged in accordance with one or more of the following:

1. The piping shall be purged with fuel gas and shall discharge to the outdoors.
2. The piping shall be purged with fuel gas and shall discharge to the indoors or outdoors
   through an appliance burner not located in a combustion chamber. Such burner shall be
   provided with a continuous source of ignition.
3. The piping shall be purged with fuel gas and shall discharge to the indoors or outdoors
   through a burner that has a continuous source of ignition and that is designed for such
   purpose.
4. The piping shall be purged with fuel gas that is discharged to the indoors or outdoors, and the point of discharge shall be monitored with a listed combustible gas detector in accordance with Section 406.7.2.2. Purging shall be stopped when fuel gas is detected.

5. The piping shall be purged by the gas supplier in accordance with written procedures.

406.7.2.2 Combustible gas detector.
Combustible gas detectors shall be listed and shall be calibrated or tested in accordance with the manufacturer’s instructions. Combustible gas detectors shall be capable of indicating the presence of fuel gas.

406.7.3 Purging appliances and equipment.
After the piping system has been placed in operation, appliances and equipment shall be purged before being placed into operation.

SECTION C407 (IFGC)
PIPING SUPPORT

C407.2 Design and installation.
Piping shall be supported with metal pipe hooks, metal pipe straps, metal bands, metal brackets, metal hangers or building structural components, suitable for the size of piping, of adequate strength and quality, and located at intervals so as to prevent or damp out excessive vibration. Piping shall be anchored to prevent undue strains on connected appliances and shall not be supported by other piping. Pipe hangers and supports shall conform to the requirements of MSS SP-58 and shall be spaced in accordance with Section C415. Supports, hangers and anchors shall be installed so as not to interfere with the free expansion and contraction of the piping between anchors. All parts of the supporting equipment shall be designed and installed so they will not be disengaged by movement of the supported piping.

SECTION C410 (IFGC)
FLOW CONTROLS

C410.3 Liquefied petroleum gas regulators. LP-gas second stage and 2 psi regulators, as defined by NFPA 58, shall be installed in accordance with the following:
1. Regulators installed outdoors shall be protected from motor vehicle impact. For examples of approved types of protection, see Figure C304.1.
2. Regulator vent discharge shall be located not less than 3 feet (915 mm) horizontally from openings below the point of discharge and not less than 5 feet (1525 mm) in any direction from exterior sources of ignition, openings into direct-vent appliances or mechanical ventilation air intakes.
3. Venting of regulators shall comply with Sections C410.4 and C410.4.1.

C410.43.1 Vent piping.
Vent piping for relief vents and breather vents shall be constructed of materials allowed for gas piping in accordance with Section 403. Vent piping shall be not smaller than the vent connection on
the pressure regulating device. Vent piping serving relief vents and combination relief and breather vents shall be run independently to the outdoors and shall serve only a single device vent. Vent piping serving only breather vents is permitted to be connected in a manifold arrangement where sized in accordance with an approved design that minimizes back-pressure in the event of diaphragm rupture. Regulator vent piping shall not exceed the length specified in the regulator manufacturer’s instructions.

SECTION C411 (IFGC)
APPLIANCE AND MANUFACTURED HOME CONNECTIONS

411.2 Manufactured home connections.
Manufactured homes shall be connected to the distribution piping system by one of the following materials:

1. Metallic pipe in accordance with Section 403.4.
2. Metallic tubing in accordance with Section 403.5.
3. Listed and labeled connectors in compliance with ANSI Z21.75/CSA 6.27 and installed in accordance with the manufacturer’s installation instructions.

SECTION C412 (IFGC)
LIQUEFIED PETROLEUM GAS MOTOR VEHICLE FUEL-DISPENSING FACILITIES

[C] C412.1 General.
Motor fuel-dispensing facilities for LP-gas fuel shall be in accordance with this section and the International Fire Code. The operation of LP-gas motor fuel-dispensing facilities shall be regulated by the International Fire Code.

Note: remainder of Section deleted in its entirety.

SECTION C413 (IFGC)
COMPRESSED NATURAL GAS MOTOR VEHICLE FUEL-DISPENSING FACILITIES

[C] C413.1 General.
Motor fuel-dispensing facilities for CNG fuel shall be in accordance with this section and the International Fire Code. The operation of CNG motor fuel-dispensing facilities shall be regulated by the International Fire Code.

Note: remainder of Section deleted in its entirety.

SECTION C414 (IFGC)
SUPPLEMENTAL AND STANDBY GAS SUPPLY

C414.1 Use of air or oxygen under pressure. Special supplementary gas
Where air, or oxygen or other special supplementary gas is introduced into the gas piping system, an approved backflow preventer shall be installed. The backflow preventer shall be on the gas line to the equipment or appliance supplied by the special gas and located between the source of...
the gas and the gas meter, under pressure is used in connection with the gas supply, effective means such as a backpressure regulator and relief valve shall be provided to prevent air or oxygen from passing back into the gas piping. Where oxygen is used, installation shall be in accordance with NFPA 51.

SECTION C416
FUEL-GAS EQUIPMENT AND INSTALLATIONS IN MANUFACTURED STRUCTURE (MOBILE HOME OR RECREATIONAL VEHICLE) PARKS

C416.1 Required gas supply. The minimum hourly volume of gas required at each manufactured structure (mobile home or recreational vehicle) lot outlet or any section of the manufactured structures park gas piping system shall be calculated as shown in Table C416.1. Required gas supply for buildings or other fuel-gas-consuming appliances connected to the manufactured structure park gas piping system shall be calculated as provided in this code.

TABLE C416.1
MINIMUM DEMAND FACTORS FOR CALCULATING GAS PIPING SYSTEMS IN MANUFACTURED STRUCTURE PARKS

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<thead>
<tr>
<th>NUMBER OF MANUFACTURE</th>
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<tr>
<td>1</td>
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<td>Over 60</td>
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</tbody>
</table>

C416.2 Mechanical protection. Customer-owned gas outlet risers, regulators, meters, valves or other exposed equipment shall be protected from mechanical damage. Such protection may consist of posts, fencing or other permanent barriers. Atmospherically controlled regulators shall be installed in such a manner that moisture cannot enter the regulator vent and accumulate above the diaphragm. When the regulator vent may be obstructed by snow or ice, shields, hoods or other suitable devices shall be provided to guard against obstruction of the vent opening.
C416.3 Gas meters. Customer-owned meters shall be installed in ventilated and accessible locations, not closer than 3 feet (914 mm) to sources of ignition. When meters are installed, they shall not depend on the gas outlet riser for support, but shall be adequately supported by a post or bracket placed on a firm footing, or other approved means providing equivalent support.

C416.4 Gas piping size. The size of each section of natural gas or LP-gas piping systems shall be determined as specified in this appendix.

SECTION C4176 (IFGS)
OVERPRESSURE PROTECTION DEVICES

416.3 Device maintenance.
The pressure regulating, limiting and relieving devices shall be maintained; and inspection procedures shall be devised or instrumentation installed to detect failures or malfunctions of such devices; and replacements or repairs shall be made.

C4176.5.4 Unauthorized operation.
Where unauthorized operation of any shutoff valve can make a pressure relieving valve or pressure limiting device inoperative, one of the following shall apply:

1. The valve shall be locked in the open position. Authorized personnel shall be instructed in the importance of leaving the shutoff valve open and of being present while the shutoff valve is closed so that it can be locked in the open position before leaving the premises.
2. Duplicate relief valves shall be installed, each having adequate capacity to protect the system, and the isolating valves and three-way valves shall be arranged so that only one safety device can be rendered inoperative at a time.

SECTION C501 (IFGC)
GENERAL

C501.1 Scope.
This chapter shall govern the installation, maintenance, repair and approval of factory-built chimneys, chimney liners, vents and connectors and the utilization of masonry chimneys serving gas-fired appliances. The requirements for the installation, maintenance, repair and approval of factory-built chimneys, chimney liners, vents and connectors serving appliances burning fuels other than fuel gas shall be regulated by the International Mechanical Code. The construction, repair, maintenance and approval of masonry chimneys shall be regulated by the International Building Code.

C501.8 Appliances not required to be vented.
The following appliances shall not be required to be vented.

1. Ranges.
2. Built-in domestic cooking units listed and marked for optional venting.
3. Hot plates and laundry stoves.
4. Type 1 clothes dryers (Type 1 clothes dryers shall be exhausted in accordance with the requirements of Section 513 of Chapter 5).

5. A single booster-type automatic instantaneous water heater, where designed and used solely for the sanitizing rinse requirements of a dishwashing machine, provided that the heater is installed in a commercial kitchen having a mechanical exhaust system. Where installed in this manner, the draft hood, if required, shall be in place and unaltered and the draft hood outlet shall be not less than 36 inches (914 mm) vertically and 6 inches (152 mm) horizontally from any surface other than the heater.

6. Refrigerators.

7. Counter appliances.

8. Room heaters listed for unvented use.


10. Other appliances listed for unvented use and not provided with flue collars.

11. Specialized appliances of limited input such as laboratory burners and gas lights.

C501.11 Masonry chimneys.
Masonry chimneys utilized to vent appliances shall be located, constructed and sized as specified in the manufacturer’s installation instructions for the appliances being vented and Section 503.

SECTION C502 (IFGC)
VENTS

C502.7 Protection against physical damage.
In concealed locations, where a vent is installed through holes or notches in studs, joists, rafters or similar members less that 1 ½ inches (38 mm) from the nearest edge of the member, the vent shall be protected by shield plates in accordance with Section C614.6.3 or 504.6.7 of Chapter 5. Protective steel shield plates having a minimum thickness of 0.0575 inch (1.463 mm) (No. 16 gage) shall cover the area of the vent where the member is notched or bored and shall extend a minimum of 4 inches (102 mm) above sole plates, below top plates and to each side of a stud, joist or rafter.

SECTION C503 (IFGS)
VENTING OF APPLIANCES

C503.5.3 Masonry chimneys.
Masonry chimneys shall be built and installed in accordance with the Building Code NFPA 211 and shall be lined with approved clay flue lining, a listed chimney lining system or other approved material that will resist corrosion, erosion, softening or cracking from vent gases at temperatures up to 1,800°F (982°C).

C503.5.6 Inspection of chimneys.
Before replacing an existing appliance or connecting a vent connector to a chimney, the chimney
passageway shall be examined to ascertain that it is clear and free of obstructions and it shall be
cleaned if previously used for venting solid or liquid fuel-burning appliances or fireplaces.

**C503.5.6.1 Chimney lining.**
Chimneys shall be lined in accordance with the Building Code NFPA 211.

**Exception:** Where an existing chimney complies with Sections C503.5.6 through
C503.5.6.3 and its sizing is in accordance with Section C503.5.5, its continued use shall be
allowed where the appliance vented by such chimney is replaced by an appliance of similar
type, input rating and efficiency.

**503.5.6.2 Cleanouts.**
Cleanouts shall be examined to determine if they will remain tightly closed when not in use.

**C503.5.6.23 Unsafe chimneys.**
Where inspection reveals that an existing chimney is not safe for the intended application, it
shall be repaired, rebuilt, lined, relined or replaced with a vent or chimney to conform to the
Building Code or this code NFPA 211 and it shall be suitable for the appliances to be vented.

**C503.10.2.2 Vent connectors located in unconditioned areas.**
Where the vent connector used for an appliance having a draft hood or a Category I appliance
is located in or passes through attics, crawl spaces or other unconditioned spaces, that portion of
the vent connector shall be listed Type B, Type L or listed vent material having equivalent
insulation properties.

**Exception:** Single-wall metal pipe located within the exterior walls of the building in areas
having a local 99-percent winter design temperature of 5°F (-15°C) or higher shall be
permitted to be used in unconditioned spaces other than attics, garages and crawl spaces.

**SECTION C505 (IFGC)**
DIRECT-VENT, INTEGRAL VENT,
MECHANICAL VENT AND
VENTILATION/EXHAUST HOOD VENTING

**C505.1 General.**
The installation of direct-vent and integral vent appliances shall be in accordance with Section C503.
Mechanical venting systems and exhaust hood venting systems shall be designed and installed in
accordance with Section C503. Exhaust hood venting used in conjunction with commercial cooking
operations shall be designed and installed in accordance with Section 507 of Chapter 5.

**505.1.1 Commercial cooking appliances vented by exhaust hoods.**
Where commercial cooking appliances are vented by means of the Type I or II kitchen exhaust
hood system that serves such appliances, the exhaust system shall be fan powered and the
appliances shall be interlocked with the exhaust hood system to prevent appliance operation when
the exhaust hood system is not operating. The method of interlock between the exhaust hood system and the appliances equipped with standing pilot burner ignition systems shall not cause such pilots to be extinguished. Where a solenoid valve is installed in the gas piping as part of an interlock system, gas piping shall not be installed to bypass such valve. Dampers shall not be installed in the exhaust system.

Exception: An interlock between the cooking appliance(s) and the exhaust hood system shall not be required where heat sensors or other approved methods automatically activate the exhaust hood system when cooking operations occur.

SECTION C601 (IFGC)  
GENERAL

C601.1 Scope.
This chapter shall govern the approval, design, installation, construction, maintenance, alteration and repair of the appliances and equipment specifically identified herein.

SECTION C603 (IFGC)  
LOG LIGHTERS

C603.1 General.
Log lighters shall be tested in accordance with CSA 8 and installed in accordance with the manufacturer’s installation instructions.

SECTION C613 (IFGC)  
CLOTHES DRYERS

C613.1 General.
Clothes dryers shall be tested in accordance with ANSI Z21.5.1 or ANSI Z21.5.2 and shall be installed in accordance with the manufacturer’s installation instructions and Chapter 5.

SECTION C614 (IFGC)  
CLOTHES DRYER EXHAUST

[M] C614.1 Installation.
Clothes dryers shall be exhausted in accordance with the manufacturer’s instructions. Dryer exhaust systems shall be independent of all other systems, shall convey the moisture and any products of combustion to the outside of the building. See Chapter 5, Section 504.

Note: Remainder of Section C614 deleted.

SECTION C615 (IFGC)  
SAUNA HEATERS

C615.1 General.
Sauna heaters shall be installed in accordance with the manufacturer’s installation instructions and Section 914 of Chapter 9.

615.2 Location and protection.
Sauna heaters shall be located so as to minimize the possibility of accidental contact by a person in the room.
615.2.1 Guards.
Sauna heaters shall be protected from accidental contact by an approved guard or barrier of material having a low coefficient of thermal conductivity. The guard shall not substantially affect the transfer of heat from the heater to the room.

615.3 Access.
Panels, grilles and access doors that are required to be removed for normal servicing operations shall not be attached to the building.

C615.24 Combustion and dilution air intakes.
Sauna heaters of other than the direct-vent type shall be installed with the draft hood and combustion air intake located outside the sauna room. Where the combustion air inlet and the draft hood are in a dressing room adjacent to the sauna room, there shall be provisions to prevent physically blocking the combustion air inlet and the draft hood inlet, and to prevent physical contact with the draft hood and vent assembly, or warning notices shall be posted to avoid such contact. Any warning notice shall be easily readable, shall contrast with its background and the wording shall be in letters not less than ¼ inch (6.4 mm) high.

C615.35 Combustion and ventilation air.
Combustion air shall not be taken from inside the sauna room. Combustion and ventilation air for a sauna heater not of the direct-vent type shall be provided to the area in which the combustion air inlet and draft hood are located in accordance with Section 304.

615.6 Heat and time controls.
Sauna heaters shall be equipped with a thermostat which will limit room temperature to 194°F (90°C). If the thermostat is not an integral part of the sauna heater, the heat-sensing element shall be located within 6 inches (152 mm) of the ceiling. If the heat-sensing element is a capillary tube and bulb, the assembly shall be attached to the wall or other support, and shall be protected against physical damage.

615.6.1 Timers.
A timer, if provided to control main burner operation, shall have a maximum operating time of 1 hour. The control for the timer shall be located outside the sauna room.

615.7 Sauna room.
A ventilation opening into the sauna room shall be provided. The opening shall be not less than 4 inches by 8 inches (102 mm by 203 mm) located near the top of the door into the sauna room.

615.7.1 Warning notice.
The following permanent notice, constructed of approved material, shall be mechanically attached to the sauna room on the outside:

WARNING: DO NOT EXCEED 30 MINUTES IN SAUNA. EXCESSIVE EXPOSURE CAN BE HARMFUL TO HEALTH. ANY PERSON WITH POOR HEALTH SHOULD CONSULT A PHYSICIAN BEFORE USING SAUNA.

The words shall contrast with the background and the wording shall be in letters not less than ¼ inch (6.4 mm) high.
Exception: This section shall not apply to one- and two-family dwellings.

SECTION C618 (IFGC)
FORCED-AIR WARM-AIR FURNACES

C618.4 Prohibited sources.
Outdoor or return air for forced-air heating and cooling systems shall not be taken from the following locations:

1. Closer than 10 feet (3048 mm) from an appliance vent outlet, a vent opening from a plumbing drainage system or the discharge outlet of an exhaust fan, unless the outlet is 3 feet (914 mm) above the outside air inlet.
   Exception: Listed outdoor appliances which provide both circulating air and vent discharge.
2. A closet, bathroom, toilet room, kitchen, garage, mechanical room, boiler room, furnace room or unconditioned attic.

Exceptions:
1. Where return air intakes are located not less than 10 feet (3048 mm) from cooking appliances and serve only the kitchen area, taking return air from a kitchen area shall not be prohibited.
2. Dedicated forced air systems serving only a garage shall not be prohibited from obtaining return air from the garage.
3. A crawl space by means of direct connection to the return side of a forced-air system. Transfer openings in the crawl space enclosure shall not be prohibited.

SECTION C623 (IFGC)
COOKING APPLIANCES

623.6 Commercial cooking appliance venting.
Commercial cooking appliances, other than those exempted by Section 501.8, shall be vented by connecting the appliance to a vent or chimney in accordance with this code and the appliance manufacturer’s instructions or the appliance shall be vented in accordance with Section 505.1.1.

C623.67 (IFGS) Vertical clearance above cooking top.
Household cooking appliances shall have a vertical clearance above the cooking top of not less than 30 inches (760mm) to combustible material and metal cabinets. A minimum clearance of 24 inches (610 mm) is permitted where one of the following is installed:

1. The underside of the combustible material or metal cabinet above the cooking top is protected with not less than ¼ inch (6 mm) insulating millboard covered with sheet metal not less than 0.0122 inch (0.3 mm) thick.
2. A metal ventilating hood constructed of sheet metal not less than 0.0122 inch (0.3 mm) thick is installed above the cooking top with a clearance of not less than ¼ inch (6.4 mm) between the hood and the underside of the combustible material or metal cabinet. The hood shall have a width not less than the width of the appliance and shall be centered over the appliance.
3. A listed cooking appliance or microwave oven is installed over a listed cooking appliance and in compliance with the terms of the manufacturer’s installation instructions for the upper appliance.
SECTION C624 (IFGC)
WATER HEATERS

C624.1 General.
Water heaters shall be tested in accordance with ANSI Z21.10.1 and ANSI Z21.10.3 and shall be installed in accordance with the manufacturer’s installation instructions. Water heaters utilizing fuels other than fuel gas shall be regulated by Chapter 10 the International Mechanical Code.

SECTION C629 (IFGC)
SMALL CERAMIC KILNS

C629.2 Unlisted fuel-gas kiln installation: See Section 923.2 of Chapter 9.

SECTION C631 (IFGC)
BOILERS

C631.1 Standards.
Boilers shall be listed in accordance with Chapter 10, the requirements of ANSI Z21.13 or UL 795. If applicable, the boiler shall be designed and constructed in accordance with the requirements of ASME CSD-1 and as applicable, the ASME Boiler and Pressure Vessel Code, Sections I, II, IV, V and IX and NFPA 85.

C631.2 Installation.
In addition to the requirements of this code, the installation of boilers shall be in accordance with the manufacturer’s instructions and the International Mechanical Code. Operating instructions of a permanent type shall be attached to the boiler. Boilers shall have all controls set, adjusted and tested by the installer. A complete control diagram together with complete boiler operating instructions shall be furnished by the installer. The manufacturer’s rating data and the nameplate shall be attached to the boiler.

C631.23 Clearance to combustible materials.
Clearances to combustible materials shall be in accordance with Section C308.4.

SECTION 632 (IFGC)
EQUIPMENT INSTALLED IN EXISTING UNLISTED BOILERS

632.1 General.
Gas equipment installed in existing unlisted boilers shall comply with Section 631.1 and shall be installed in accordance with the manufacturer’s instructions and the International Mechanical Code.

SECTION C-8 IFGC/IFGS CHAPTER 8
REFERENCED STANDARDS

This section chapter lists the standards that are referenced in various sections of Appendix C this document. The standards are listed herein by the promulgating agency of the standard, the standard identification, the effective date and title, and the section or sections of Appendix C this document that reference the standard. The application of the referenced standards shall be as specified in Section 102.8.
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