

# CHAPTER 7

## COMBUSTION AIR

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**User note:**

**About this chapter:** Chapter 7 defers to the International Fuel Gas Code® for combustion air provisions for gas-fired appliances. This code addresses oil-fired and solid-fuel-fired appliances; therefore, Chapter 7 is brief, referring to the manufacturer for solid-fuel appliances and NFPA 31 for oil-fired appliances. Combustion air must be provided to appliances to prevent poor combustion that can create multiple health and safety hazards.

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### SECTION 701 GENERAL

**[S] 701.1 Scope.** This chapter shall apply to oil-burning appliances and equipment to ensure that adequate air for safe combustion is provided. Solid fuel-burning appliances, fireplaces and fireplace stoves shall be provided with combustion air in accordance with the appliance manufacturer's installation instructions and International Building Code Section 2111. ((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)) Direct-vent appliances shall be provided with combustion air in accordance with the appliance manufacturer's installation instructions. The requirements for combustion and dilution air for gas-fired appliances shall be in accordance with the International Fuel Gas Code.

**701.2 Dampered openings.** Where combustion air openings are provided with volume, smoke or fire dampers, the dampers shall be interlocked with the firing cycle of the appliances served, so as to prevent operation of any appliance that draws combustion air from the room or space when any of the dampers are closed. Manual dampers shall not be installed in combustion air ducts. Ducts not provided with dampers and that pass through rated construction shall be enclosed in a shaft in accordance with the International Building Code.

**[S] 701.3 Oil-burning appliance and equipment installation location.** Oil-burning appliances and equipment shall be installed in locations where available ventilation permits satisfactory combustion of oil, proper venting of combustion gases, and maintenance of safe ambient temperatures under normal conditions of use. Appliances shall be located so that they do not interfere with the supply of air within the space.

**Note:** The provisions of Chapter 7 are based on NFPA 31-2016.

**[S] 701.4 Tight construction.** Where buildings are so tight that normal infiltration does not provide sufficient air for combustion, outside air shall be introduced.

**[S] 701.5 Combustion air ducts.** Combustion air ducts shall:

1. Be of galvanized steel complying with Chapter 6 or of equivalent corrosion-resistant material approved for this application.  
**Exception:** Within dwelling units, unobstructed stud and joist spaces shall not be prohibited from conveying combustion air, provided that not more than one required fireblock is removed.
2. Have a minimum cross-sectional dimension of 3 inches (76 mm).
3. Terminate in an unobstructed space allowing free movement of combustion air to the appliances.
4. Have the same cross-sectional areas as the free area of the openings to which they connect.
5. Serve a single appliance enclosure.
6. Not serve both upper and lower combustion air openings where both such openings are used. The separation between ducts serving upper and lower combustion air openings shall be maintained to the source of combustion air.
7. Not be screened where terminating in an attic space.
8. Not slope downward toward the source of combustion air, where serving the upper required combustion air opening.

**[S] 701.6 Prohibited sources.** Openings and ducts shall not connect appliance enclosures with a space in which the operation of a fan will adversely affect the flow of the combustion air. Combustion air shall not be obtained from a hazardous location, except where the fuel-fired appliances are located within the hazardous location and are installed in accordance with this code. Combustion air shall not be taken from a refrigeration machinery room, except where a refrigerant vapor detector system is installed to automatically shut off the combustion process in the event of refrigerant leakage. Combustion air shall not be obtained from any location below the design flood elevation.

[S] 701.7 Opening location and protection. *Combustion* air openings to the outdoors shall comply with the location and protection provisions of Sections 401.4 and 401.5 applicable to outdoor air intake openings.

**[S] SECTION 702**  
**APPLIANCES LOCATED IN UNCONFINED SPACES**

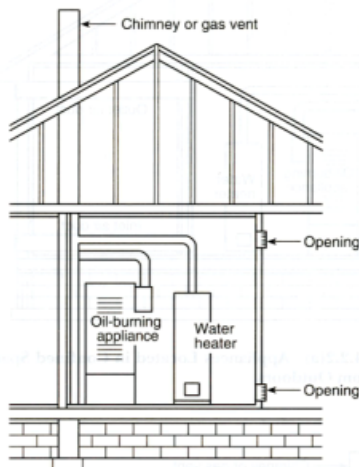
[S] 702.1 Unconfined spaces. In *unconfined spaces* air for *combustion* and ventilation shall be obtained directly from outdoors or from spaces that freely communicate with outdoors by means of a permanent opening or openings having a total free area of not less than 1 in.<sup>2</sup> per 5000 Btu/hr (28 in.<sup>2</sup> per gal/hr) (4.4 cm<sup>2</sup> kW), based on the total input rating of all appliances in the space.

Exception: In buildings built prior to the 1986 edition of the *Washington State Energy Code with Seattle Amendments*, air for *combustion* shall be permitted to be supplied by normal infiltration.

**[S] SECTION 703**  
**APPLIANCES LOCATED IN CONFINED SPACES**

[S] 703.1 Confined spaces. For appliances installed in confined spaces, air for *combustion* and ventilation shall be provided using one of the methods set forth in this section.

[S] 703.2 All air taken from inside the building. Where all *combustion* air will be taken from inside the building, the confined space shall be provided with two permanent openings as shown in Figure 703.2.1, one near the top of the space and one near the bottom.



**FIGURE 703.2.1 – APPLIANCES LOCATED IN CONFINED SPACES – ALL AIR TAKEN FROM INSIDE THE BUILDING**

[S] 703.2.1 Size of openings. Each opening shall have a free area of not less than 1 in.<sup>2</sup> per 1000 Btu/hr (140 in.<sup>2</sup> per gal/hr) (22 cm<sup>2</sup>/kW), based on the total input rating of all appliances in the space.

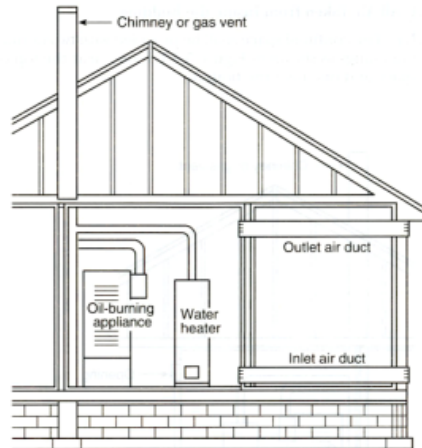
[S] 703.2.2 Source of air. Each opening shall freely communicate with interior areas of the building that, in turn, have adequate infiltration from the outside.

[S] 703.3 All air taken from outdoors. Where all air will be taken from outdoors, the confined space shall be provided with two permanent openings, one near the top of the space and one in or near the bottom.

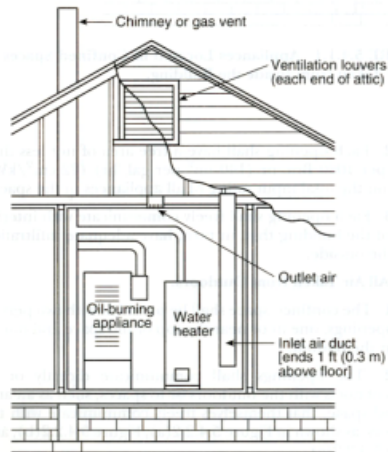
[S] 703.3.1 Source of air. The openings shall communicate directly or by means of ducts with the outdoors or to spaces such as an attic or crawl space, that themselves freely communicate with the outdoors, as shown in Figure 703.3.2.1, Figure 703.3.2.2, and Figure 703.3.2.3.

[S] 703.3.2 Vertical ducts. Where communicating with the outdoors directly or by means of vertical ducts, each opening shall have a free area of not less than 1 inch<sup>2</sup> per 4000 Btu/hr (35 inch<sup>2</sup> per gal/hr) (5.5 cm<sup>2</sup>/kW), based on the total input rating of all appliances in the space.

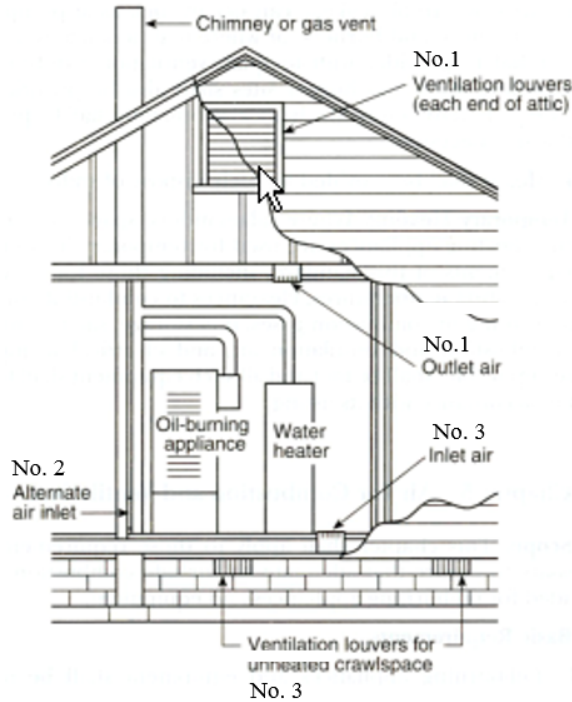
[S] 703.3.3 Horizontal ducts. Where communicating with the outdoors by means of horizontal ducts, each opening shall have a free area of not less than 1 inch<sup>2</sup> per 2000 Btu/hr (70 inch<sup>2</sup> per gal/hr) (11 cm<sup>2</sup>/kW), based on the total input rating of all appliances in the space.



**FIGURE 703.3.2.1 – APPLIANCES LOCATED IN CONFINED SPACES – ALL AIR FROM OUTDOORS**



**FIGURE 703.3.2.2 – APPLIANCES LOCATED IN CONFINED SPACES – ALL AIR FROM OUTDOORS THROUGH VENTILATED ATTIC**



**Notes:**

- Ducts used for make-up air can be connected to the cold air return of the heating system only if they connect directly to outdoor air.
- Nos. 1, 2, and 3 mark alternate locations for air from outdoors.
- Provide attic ventilation louvers at each end of attic with alternate air inlet No. 1.
- Provide crawl space ventilation louvers for unheated crawl space with alternate air inlet No. 3.

**FIGURE 703.3.2.3  
APPLIANCES LOCATED IN CONFINED SPACES, WITH VENTILATION AIR FROM INSIDE BUILDING AND COMBUSTION AIR FROM OUTSIDE, VENTILATED ATTIC, OR VENTILATED CRAWL SPACE**

**[S] 703.4 Ventilation air taken from inside the building—Combustion air taken from outdoors.** Where *ventilation air* will be taken from inside the building and *combustion air* will be taken from outdoors, the confined space shall be provided with two openings for ventilation, located and sized as specified in Section 703.2 and as shown in Figure 703.3.2.3. In addition, there shall be one opening communicating directly with the outdoors or to spaces, such as an attic or crawl space, that freely communicates with the outdoors and has a free area of not less than 1 in.<sup>2</sup> per 5000 Btu/hr (28 in.<sup>2</sup> per gal/hr) (4.4 cm<sup>2</sup>/kW), based on the total input of all appliances in the space.

**[S] SECTION 704  
COMBUSTION AIR FOR COMMERCIAL AND INDUSTRIAL INSTALLATIONS**

**[S] 704.1 General.** For commercial and industrial oil-burning *equipment*, permanent means for supplying an ample amount of outside air shall be provided in accordance with this section.

**[S] 704.2 Size of openings.** For furnace or boiler rooms adjacent to outside walls and where *combustion air* is provided by *natural ventilation* from the outside, there shall be a permanent air supply inlet having a total free area of not less than 1 in.<sup>2</sup> per 4000 Btu/hr (35 in.<sup>2</sup> per gal/hr) (5.5 cm<sup>2</sup>/kW), based on the total input rating of the burner or burners, but in no case less than 35 in.<sup>2</sup> (0.425 m<sup>2</sup>). For furnace or boiler rooms that are not adjacent to outside walls, the *combustion air* shall be supplied in a manner acceptable to the building official.

**[S] SECTION 705  
LOUVERS AND GRILLES**

**[S] 705.1 Louvers and grilles.** In calculating the free area required by Sections 701, 702, 703 and 704, the blocking effect of louvers, grilles, or screens protecting openings shall be taken into consideration.

[S] 705.2 Screens. Screens used in louvers or grilles shall not be smaller than 1/4 in (6.3 mm) mesh and shall be accessible for cleaning.

[S] 705.3 Size of openings. If the free area through a particular design of louver or grille is known, it shall be used in calculating the size of the opening needed to provide the free area required. If the free area of the design is not known, it shall be assumed that wood louvers will have 20 percent to 25 percent free area and metal louvers and grilles will have 60 percent to 75 percent free area.

#### **[S] SECTION 706 SPECIAL CONDITIONS**

[S] 706.1 Special conditions. Where an appliance is installed in a location where the operation of exhaust fans, kitchen ventilation systems, clothes dryers or fireplaces can create conditions of unsatisfactory *combustion* or venting, special provisions shall be made subject to the approval of the building official.

