

CHAPTER 17

COMBUSTION AIR

SECTION M1701 GENERAL

M1701.1 Air supply. Liquid and solid fuel-burning appliances shall be provided with a supply of air for fuel combustion, draft hood dilution and ventilation of the space in which the appliance is installed, in accordance with Section M1702 or Section M1703. The methods of providing combustion air in this chapter do not apply to fireplaces, fireplace stoves and direct-vent appliances.

M1701.1.1 Buildings of unusually tight construction. In buildings of unusually tight construction, combustion air shall be obtained from outside the sealed thermal envelope. In buildings of ordinary tightness, insofar as infiltration is concerned, all or a portion of the combustion air for fuel-burning appliances may be obtained from infiltration when the room or space has a volume of 50 cubic feet per 1,000 Btu/h (4.83 L/W) input.

M1701.2 Exhaust and ventilation system. Air requirements for the operation of exhaust fans, kitchen ventilation systems, clothes dryers and fireplaces shall be considered in determining the adequacy of a space to provide combustion air.

M1701.3 Volume dampers prohibited. Volume dampers shall not be installed in combustion air openings.

M1701.4 Prohibited sources. Combustion air ducts and openings shall not connect appliance enclosures with space in which the operation of a fan may adversely affect the flow of combustion air. Combustion air shall not be obtained from an area in which flammable vapors present a hazard. Fuel-fired appliances shall not obtain combustion air from any of the following rooms or spaces:

1. Sleeping rooms.
2. Bathrooms.
3. Toilet rooms.

Exception: The following appliances shall be permitted to obtain combustion air from sleeping rooms, bathrooms and toilet rooms:

1. Solid fuel-fired appliances provided that the room is not a confined space and the building is not of unusually tight construction.
2. Appliances installed in an enclosure in which all combustion air is taken from the outdoors and the enclosure is equipped with a solid weatherstripped door and self-closing device.

M1701.5 Opening area. The free area of each opening shall be used for determining combustion air. Unless otherwise specified by the manufacturer or determined by actual measurement, the free area shall be considered 75 percent of the gross area for metal louvers and 25 percent of the gross area for wood louvers.

SECTION M1702 ALL AIR FROM INSIDE THE BUILDING

M1702.1 Required volume. Where the volume of the space in which fuel-burning appliances are installed is greater than 50 cubic feet per 1,000 Btu/h (4.83 L/W) of aggregate input rating in buildings of ordinary tightness, insofar as infiltration is concerned, normal infiltration shall be regarded as adequate to provide combustion air. Rooms communicating directly with the space in which the appliances are installed through openings not furnished with doors shall be considered part of the required volume.

M1702.2 Confined space. Where the space in which the appliance is located does not meet the criterion specified in Section M1702.1, two permanent openings to adjacent spaces shall be provided so that the combined volume of all spaces meets the criterion. One opening shall be within 12 inches (305 mm) of the top and one within 12 inches (305 mm) of the bottom of the space, as illustrated in Figure M1702.2. Each opening shall have a free area equal to a minimum of 1 square inch per 1,000 Btu/h (2.20 mm²/W) input rating of all appliances installed within the space, but not less than 100 square inches (0.064 m²).

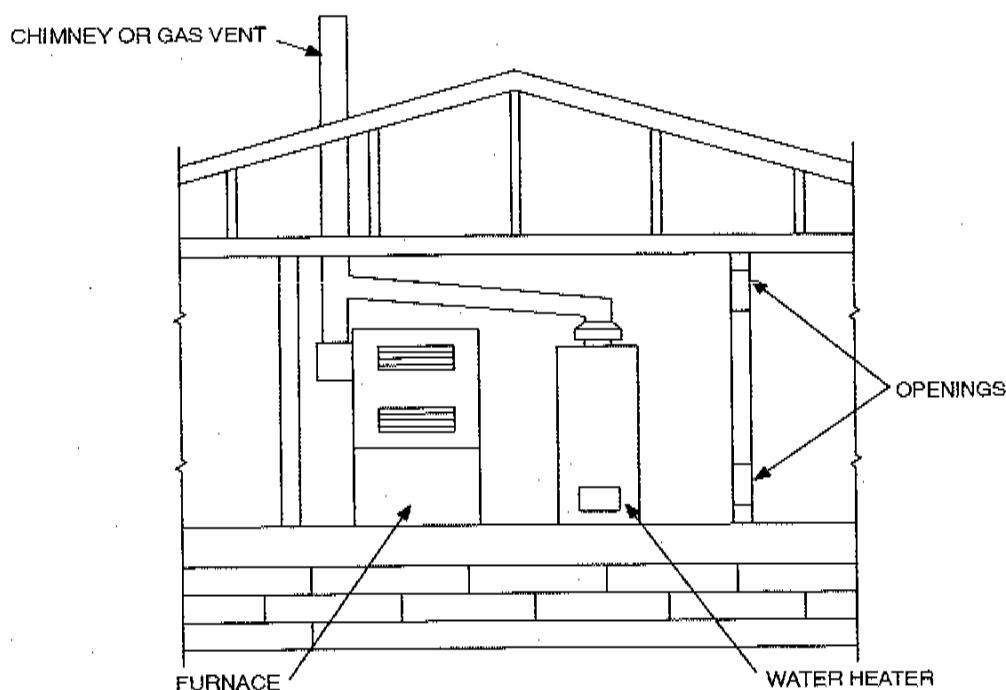
M1702.3 Unusually tight construction. Where the space is of adequate volume in accordance with Section M1702.1 or Section M1702.2, but is within a building sealed so tightly that infiltration air is not adequate for combustion, combustion air shall be obtained from outdoors or from spaces freely communicating with the outdoors in accordance with Section M1703.

SECTION M1703 ALL AIR FROM OUTDOORS

M1703.1 Outdoor air. Where the space in which fuel-burning appliances are located does not meet the criterion for indoor air specified in Section M1702, outside combustion air shall be supplied as specified in Section M1703.2 or Section M1703.3.

M1703.2 Two openings or ducts. Outside combustion air shall be supplied through openings or ducts, as illustrated in Figures M1703.2(1), M1703.2(2), M1703.2(3) and M1703.2(4). One opening shall be within 12 inches (305 mm) of the top of the enclosure, and one within 12 inches (305 mm) of the bottom of the enclosure. Openings are permitted to connect to spaces directly communicating with the outdoors, such as ventilated crawl spaces or ventilated attic spaces. The same duct or opening shall not serve both combustion air openings. The duct serving the upper opening shall be level or extend upward from the appliance space.

M1703.2.1 Size of openings. Where communicating with the outdoors by means of vertical ducts, each opening shall have a free area of at least 1 square inch per 4,000 Btu/h (0.550 mm²/W) of total input rating of all appliances in the space. Where horizontal ducts are used, each opening shall have a free area of at least 1 square inch per 2,000 Btu/h (0.275 mm²/W) of total input of all appliances in the space. Ducts shall be of the same minimum cross-sectional area as



For SI: 1 square inch = 645.16 mm², 1 British thermal unit per hour = 0.2931 W.

NOTE: Each opening shall have a free area of not less than 1 square inch per 1,000 Btu/h of the total input rating of all appliances in the enclosure, but not less than 100 square inches.

FIGURE M1702.2
APPLIANCES LOCATED IN CONFINED SPACES—ALL AIR TAKEN FROM ADJACENT SPACES WITHIN THE BUILDING

the required free area of the openings to which they connect. The minimum cross-sectional dimension of rectangular air ducts shall be 3 inches (76 mm).

M1703.3 Single opening or duct. For an appliance with a minimum clearance of 1 inch (25.4 mm) on the sides and back and 6 inches (152 mm) on the front, outside combustion air shall be supplied through one opening or duct, as illustrated in Figures M1703.3(1), M1703.3(2) and M1703.3(3). The opening or duct shall be within 12 inches (305 mm) of the top of the enclosure. The opening is permitted to connect to spaces directly communicating with the outdoors, such as ventilated attic spaces. A duct shall be level or extend upward from the appliance space.

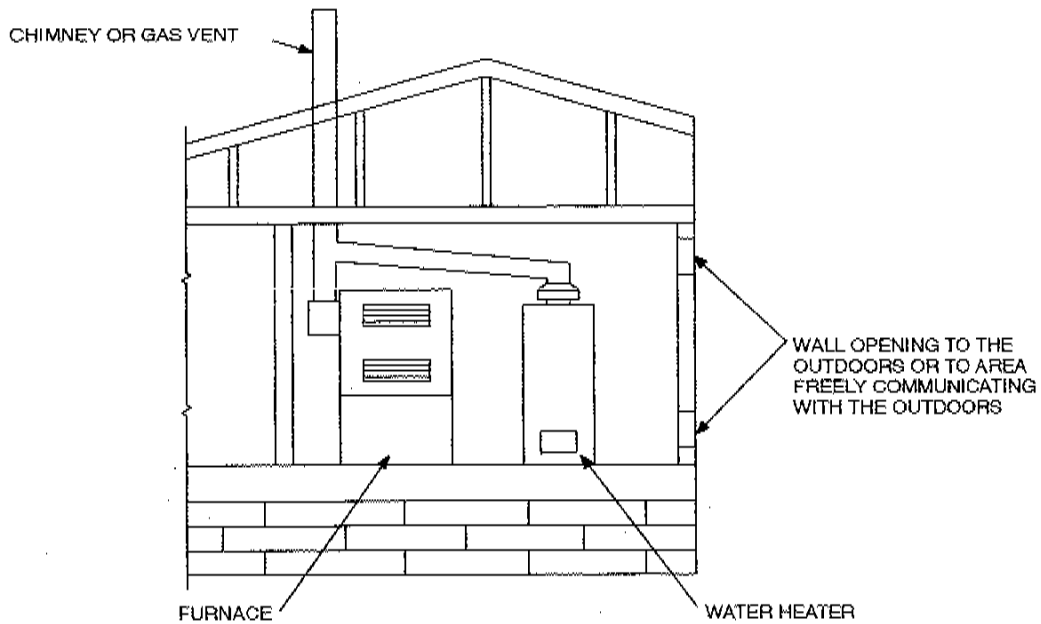
M1703.3.1 Size of opening. Where communicating with the outdoors by means of a single opening or duct, the opening or duct shall have a free area of at least 1 square inch per 3,000 Btu/h (0.413 mm²/W) of total input rating of all appliances in the space, but not smaller than the vent flow area. A duct shall be of the same minimum cross-sectional area as the required free area of the opening to which it connects. The minimum cross-sectional dimension of a rectangular air duct shall be 3 inches (76 mm).

M1703.4 Attic combustion air. Combustion air obtained from an attic area, as illustrated in Figure M1703.2(3), shall be in accordance with the following:

1. The attic ventilation shall be sufficient to provide the required volume of combustion air.
2. The combustion air opening shall be provided with a metal sleeve extending from the appliance enclosure to at least 6 inches (152 mm) above the top of the ceiling joists and ceiling insulation.
3. An inlet air duct within an outlet air duct shall be an acceptable means of supplying attic combustion air to an appliance room provided that the inlet duct extends at least 12 inches (305 mm) above the top of the outlet duct in the attic space, as illustrated in Figure M1703.4.
4. The end of ducts that terminate in an attic shall not be screened.

M1703.5 Under-floor combustion air. Combustion air obtained from under-floor areas, as illustrated in Figure M1703.2(4), shall have free opening areas to the outside equivalent to not less than twice the required combustion air opening.

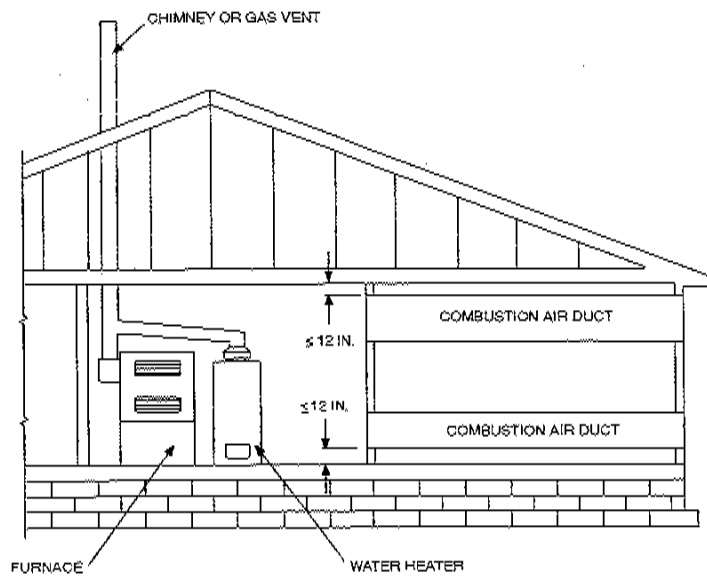
M1703.6 Opening requirements. Outside combustion air openings shall be covered with corrosion-resistant screen or equivalent protection having not less than 0.25-inch (6.4 mm) openings, and not greater than 0.5-inch (12.7 mm) openings.



For SI: 1 square inch = 645.16 mm², 1 British thermal unit per hour = 0.2931 W.

NOTE: Each opening shall have a free area of not less than 1 square inch per 4,000 Btu/h of the total input rating of all appliances in the enclosure.

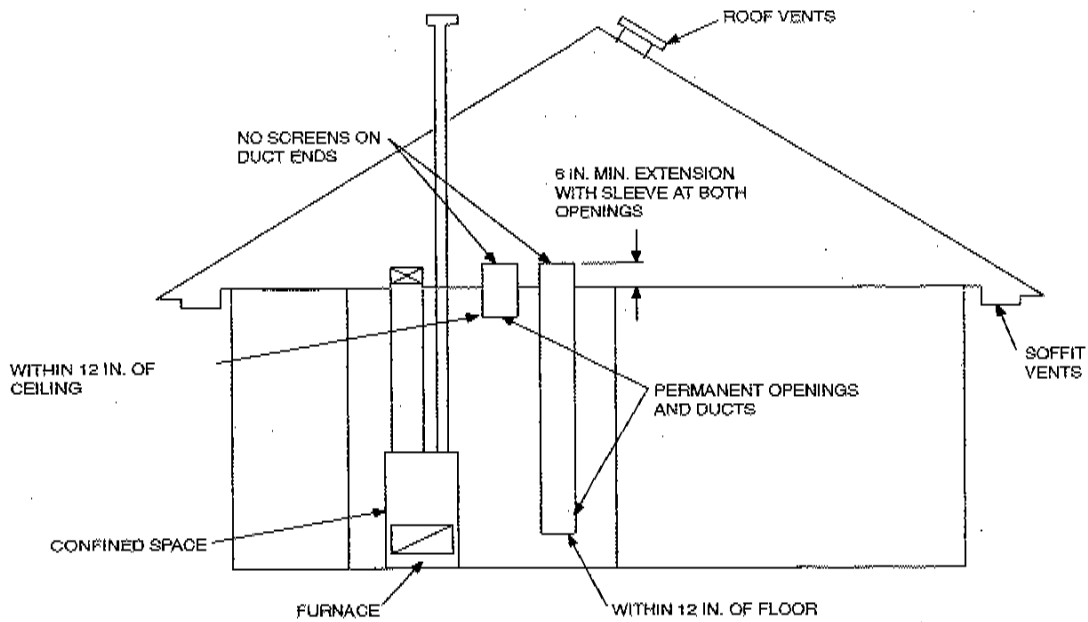
FIGURE M1703.2(1)
APPLIANCES LOCATED IN CONFINED SPACES—ALL AIR TAKEN
FROM OUTDOORS THROUGH TWO OPENINGS



For SI: 1 inch = 25.4 mm, 1 square inch = 645.16 mm², 1 British thermal unit per hour = 0.2931 W.

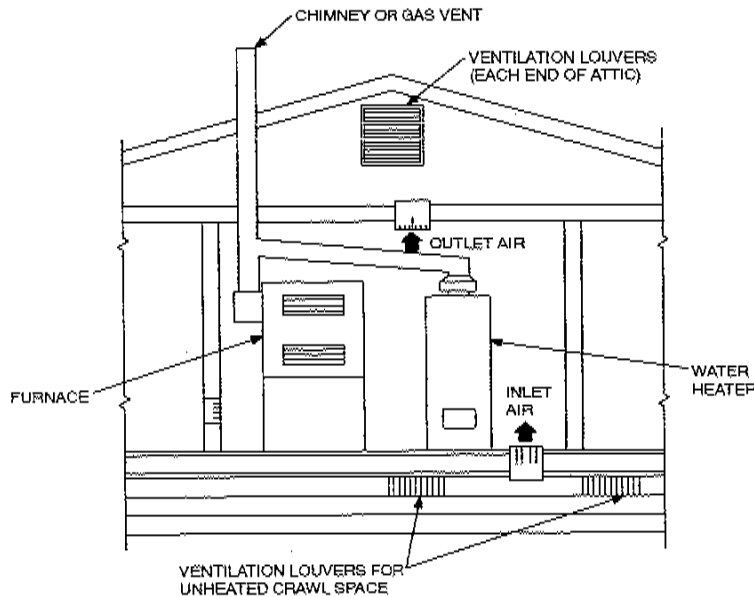
NOTE: Each opening shall have a free area of at least 1 square inch per 2,000 Btu/h of the total input of all appliances in the space.

FIGURE M1703.2(2)
APPLIANCES LOCATED IN CONFINED SPACES—ALL AIR TAKEN
FROM OUTDOORS THROUGH HORIZONTAL DUCTS



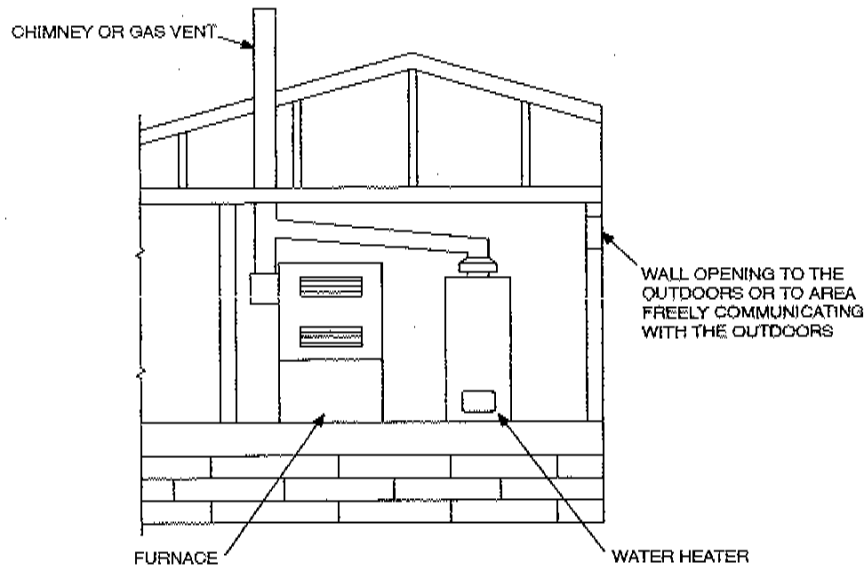
For SI: 1 inch = 25.4 mm, 1 British thermal unit per hour = 0.2931 W, 1 square inch = 645.16 mm².
 NOTE: Each opening shall have a free area of at least 1 square inch per 4,000 Btu/h of the total input of all appliances in the space. The attic must be sufficiently vented for combustion air to be taken from the attic.

FIGURE M1703.2(3)
APPLIANCES LOCATED IN CONFINED SPACES—ALL AIR TAKEN FROM OUTDOORS THROUGH VENTILATED ATTIC



For SI: 1 square inch = 645.16 mm², 1 British thermal unit per hour = 0.2931 W.
 NOTE: The inlet and outlet air openings shall have a free area of not less than 1 square inch per 4,000 Btu/h of the total input rating of all appliances in the enclosure.

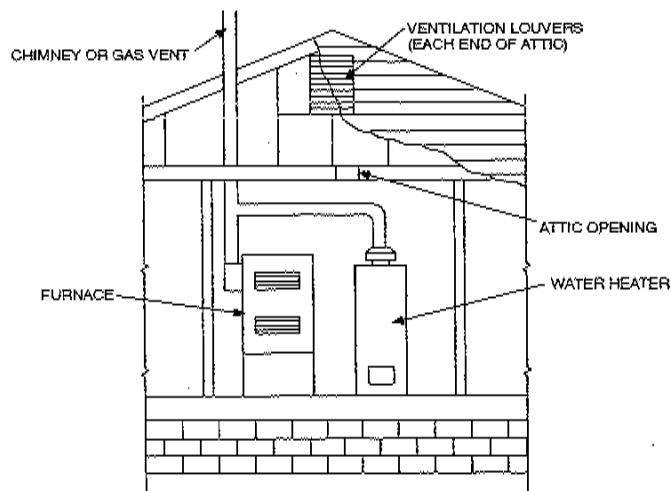
FIGURE M1703.2(4)
APPLIANCES LOCATED IN CONFINED SPACES—INLET AIR TAKEN FROM VENTILATED CRAWL SPACE AND OUTLET AIR TO VENTILATED ATTIC



For SI: 1 square inch = 645.16 mm², 1 British thermal unit per hour = 0.2931 W.

NOTE: The air opening shall have a free area of not less than 1 square inch per 3,000 Btu/h of the total input rating of all appliances in the enclosure but not smaller than the vent flow area.

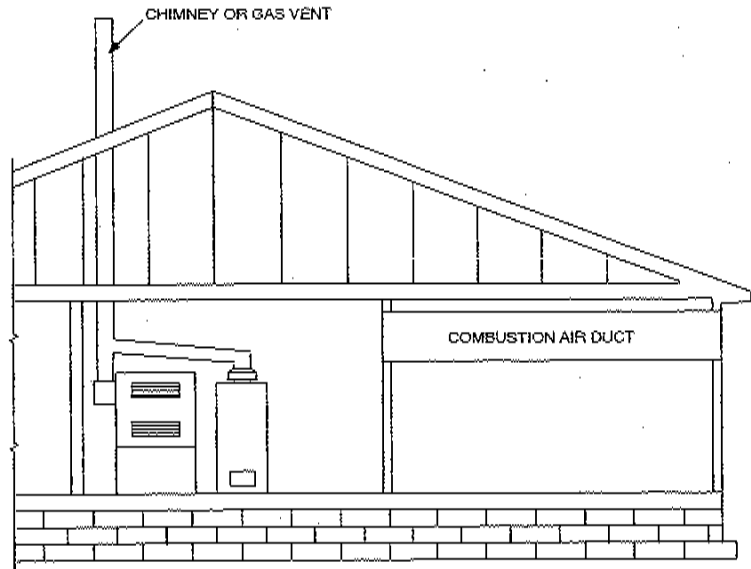
FIGURE M1703.3(1)
APPLIANCES LOCATED IN CONFINED SPACES—ALL AIR TAKEN FROM OUTDOORS THROUGH SINGLE OPENING



For SI: 1 square inch = 645.16 mm², 1 British thermal unit per hour = 0.2931 W.

NOTE: The air opening and duct shall have a free area of not less than 1 square inch per 3,000 Btu/h of the total input rating of all appliances in the enclosure but not smaller than the vent flow area.

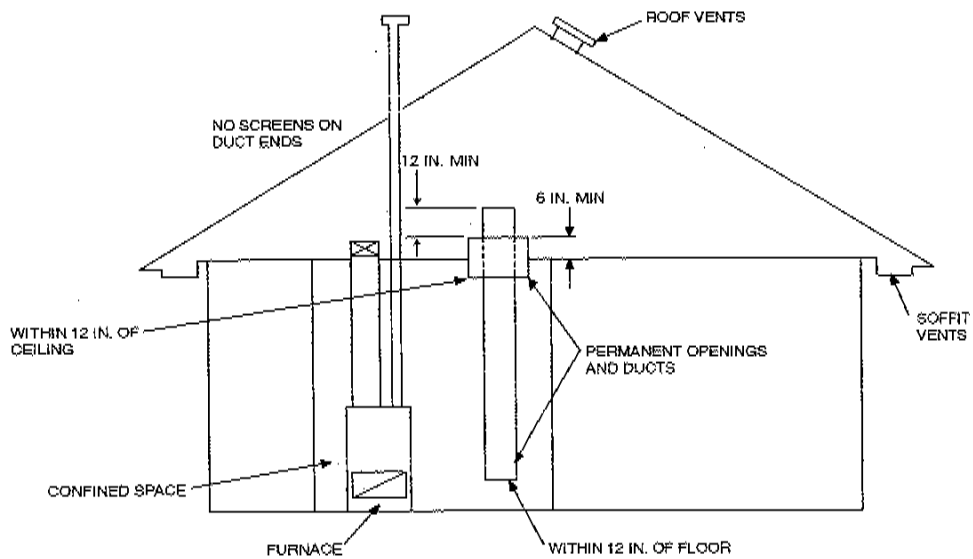
FIGURE M1703.3(2)
APPLIANCES LOCATED IN CONFINED SPACES—ALL AIR TAKEN FROM OUTDOORS THROUGH SINGLE OPENING OR DUCT



For SI: 1 square inch = 645.16 mm², 1 British thermal unit per hour = 0.2931 W.

NOTE: The air opening and duct shall have a free area of not less than 1 square inch per 3,000 Btu/h of the total input rating of all appliances in the enclosure but not smaller than the vent flow area.

FIGURE M1703.3(3)
APPLIANCES LOCATED IN CONFINED SPACES—ALL AIR TAKEN FROM OUTDOORS THROUGH SINGLE DUCT



For SI: 1 inch = 25.4 mm, 1 British thermal unit per hour = 0.2931 W, 1 square inch = 645.16 mm².

NOTE: Each duct shall have a free area of at least 1 square inch per 4,000 Btu/h of the total input of all appliances in the space. The attic must be sufficiently ventilated to provide the required combustion air.

FIGURE M1703.4
APPLIANCES LOCATED IN CONFINED SPACES—ALL AIR TAKEN FROM OUTDOORS THROUGH VENTILATED ATTIC, INLET DUCT WITHIN OUTLET DUCT

COMBUSTION AIR

CONDITION ONE: Indoor Air

BTUH INPUT	FREE AREA, each opening
Any	None required

NOTE: Room must be greater than 50 cu. ft. per 1,000 BTUH of all appliances. Adjoining rooms without doors can be included.

WHEN ABOVE CONDITION CANNOT BE MET, PROCEED TO:

CONDITION TWO: Indoor Air

BTUH INPUT	FREE AREA, each opening
32,000 through 100,000	100 sq. in.
105,000	105 "
120,000	120 "

NOTES: One opening within 12" from top, and one opening within 12" from bottom of room containing appliances. Grille **MUST BE** of same free area! Rule of thumb: subtract 25% for metal, 75% for wood, if grille free area is unknown.

WHEN ABOVE CONDITION CANNOT BE MET, PROCEED TO:

CONDITION THREE: Outside Air

BTUH INPUT	FREE AREA, each opening		ROUND PIPE SIZE	
	Vertical	Horizontal	Vertical	Horizontal
32,000	8.0 sq. in.	16.0 sq. in.	4"	5"
40,000	10.0 "	20.0 "	4"	5"
45,000	11.25 "	22.5 "	4"	6"
60,000	15.0 "	30.0 "	5"	7"
75,000	18.75 "	37.5 "	5"	7"
80,000	20.0 "	40.0 "	5"	8"
90,000	22.5 "	45.0 "	6"	8"
100,000	25.0 "	50.0 "	6"	8"
105,000	26.25 "	52.5 "	6"	9"
120,000	30.0 "	60.0 "	7"	9"

Calculations furnished by an Ohio County Building Department's Mechanical Inspector; are believed to be accurate and are offered here as a guideline for your calculations.

NOTES: Same as Condition Two, plus: Outdoor grilles must have corrosion-resistant screen between ¼ and ½ inch openings. Outdoor air can be a ventilated attic or crawl, provided attic has enough volume to provide its own ventilation plus combustion air, and crawl has twice the free area needed by the appliances. Attic duct must be 6" above joist and/or insulation. Do not screen attic ducts. FOR DIRECT OPENINGS, USE VERTICAL FREE AREA.

CONDITION THREE, ALTERNATE: Inside and Outside Air

See Condition Two for Inside Air portion requirement, plus:

BTUH INPUT	FREE AREA, One opening	ROUND PIPE SIZE
32,000	6.4 sq. in.	3"
40,000	8.0 "	4"
45,000	9.0 "	4"
60,000	12.0 "	4"
75,000	15.0 "	5"
80,000	16.0 "	5"
90,000	18.0 "	5"
100,000	20.0 "	5"
105,000	21.0 "	6"
120,000	24.0 "	6"

NOTES: May use attic, provided conditions are met for attic ducts as in Condition Three.