CHAPTER 2
DEFINITIONS

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 chapter, the Merriam-Webster Collegiate Dictionary, available at www.m-w.com, shall be considered as providing ordinarily accepted meanings. The dictionary is incorporated by reference, is subject to frequent change, and is available through the Minitex interlibrary loan system.

CHAPTER 5
EXHAUST SYSTEMS

507.2.2.1 Type II hood exhaust flow rates. The net exhaust flow rate for Type II hoods shall comply with Table 507.2.2.1. The duty level for the hood shall be the duty level of the appliance that has the highest (heaviest) duty level of all of the appliances that are installed underneath the food hood according to Table 507.2.2.

CHAPTER 6
DUCT SYSTEMS

601.1 Scope. Duct systems used for the movement of air in air-conditioning, heating, ventilating, and exhaust systems shall conform to the provisions of this chapter except as otherwise specified in chapters 5 and 7.

Exception: Linen chutes, trash chutes, and ducts discharging combustible material directly into any combustion chamber, shall conform to the requirements of NFPA 82. Chutes shall not be required to be open to the atmosphere, as required by NFPA 82, section 5.2.2.4.3.

602.2.1.7 Piping in plenums. Piping carrying flammable or combustible gases or liquids in a plenum must have all connections made by welding or brazing. No flanges, valves, threaded fittings, unions, or connectors are permitted.

CHAPTER 8
CHIMNEYS AND VENTS

801.10 Connection to fireplace. Connection of appliances to chimney flues serving fireplaces shall be in accordance with Sections 801.10.1 through 801.10.3. Connection of appliances to chimney flues serving fireplaces is prohibited. Refer to IFGC Section 602 for Decorative Appliances for Installation in Fireplaces and IFGC Section 603 for Log Lights.

801.10.1 Closure and access. A noncombustible seal shall be provided below the point of connection to prevent entry of room air into the flue. Means shall be provided for access to the flue for inspection and cleaning.

801.10.2 Connection to factory-built fireplace flue. An appliance shall not be connected to a flue serving a factory-built fireplace unless the appliance is specifically listed for such installation. The connection shall be made in accordance with appliance manufacturer’s installation instructions.

801.10.3 Connection to masonry fireplace flue. A connector shall extend from the appliance to the flue serving a masonry fireplace such that the flue gases are exhausted directly into the flue. The connector shall be provided with access or shall be removable for inspection and cleaning of both the connector and the flue. Listed direct connection devices shall be installed in accordance with their listing.

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

901.5 Unvented heaters and appliances. Unvented room heaters, unvented infrared heaters, and unvented decorative appliances shall not be installed in any dwelling or occupancy.

Exception: Unvented infrared heaters may be installed when mechanical ventilation is provided to exhaust at least 4 cubic feet per minute (cfm) (0.0203 m³/s) per 1000 Btu/hr (0.292 kW) input and it is electrically interlocked with the heater. Makeup air shall be provided to the space to be heated.

CHAPTER 10
BOILERS, WATER HEATERS AND PRESSURE VESSELS

1001.2 Scope: boilers; labor and industry. Anyone who installs a boiler must ensure that the boiler is inspected by the Department of Labor and Industry after installation is complete and before the boiler is placed in operation if the individual or combined Btu input exceeds:

A. 100,000 Btu/hr for steam boilers;
B. 500,000 Btu/hr for hot water supply boilers; or
C. 750,000 Btu/hr for hot water heating boilers.

Boilers utilizing fuel gas systems with Btu/hr inputs that are rated at or below items A to C shall comply with Section 631 of the 2012 IFGC.

Exceptions: Boilers identified in Minnesota Statutes, Section 326B.988, including the following, are not subject to this section:

1. Boilers in buildings occupied solely for residential purposes with accommodations for not more than five families.
2. Boilers under the direct jurisdiction of the United States.
3. Boilers located on farms used solely for agricultural or horticultural purposes; for the purposes of this subpart, boilers used for mint oil extraction are considered used for agricultural or horticultural purposes, provided that the owner or lessee complies with the inspection requirements contained in Minnesota Statutes, Section 326B.958.

1001.3 Scope; pressure vessels; labor and industry. The owner of a pressure vessel not specifically exempted by Minnesota Statutes, Section 326B.988, must ensure that the pressure vessel is inspected by an insurance company authorized to do business in the state or the Department of Labor and Industry at least every two years.

Exceptions: Pressure vessels identified in Minnesota Statutes, Section 326B.988, including the following, are not subject to this subpart:

1. Pressure vessels in buildings occupied solely for residential purposes with accommodations for not more than five families.
2. Pressure vessels under the direct jurisdiction of the United States.
3. Pressure vessels located on farms used solely for agricultural or horticultural purposes; for the purposes of this section, boilers used for mint oil extraction are considered used for agricultural or horticultural purposes, provided that the owner or lessee complies with the inspection requirements contained in Minnesota Statutes, Section 326B.958.

1003.3 Welding. Welding on boilers and pressure vessels shall be performed by approved welders in compliance with nationally recognized standards the ASME Boiler and Pressure Vessel Code Section IX and the National Board Inspection Code.
1346.5060
REFERENCES TO OTHER INTERNATIONAL CODE COUNCIL (ICC) CODES

Subpart 1. General. References to other codes and standards promulgated by the International Code Council in the IMC and IFGC are modified in subparts 2 to 11.

CHAPTER 2
DEFINITIONS

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, chapter, the Merriam-Webster Collegiate Dictionary, available at www.m-w.com, shall be considered as providing ordinarily accepted meanings. The dictionary is incorporated by reference, is subject to frequent change, and is available through the Minitex interlibrary loan system.

CHAPTER 4
GAS PIPING INSTALLATIONS

401.5 Medium and high pressure identification. Exposed medium and high pressure gas piping systems shall include the operating pressure on the label required by Section 401.5.

407.3 Expansion and flexibility. Piping systems shall be designed to have sufficient flexibility to prevent thermal expansion or contraction from causing excessive stresses in the piping material, excessive bending or loads at joints, or undesirable forces at points of connections to equipment and at anchorage or guide points.

410.3 Venting of regulators. Pressure regulators that require a vent shall be vented directly to the outdoors. A vent to the outdoors shall have an independent vent to the outside of the building. The vent shall be designed to prevent the entry of insects, water, and foreign objects. Regulator vents shall terminate at least 3 feet (914 mm) from doors, operable windows, nonmechanical intake openings, and openings into direct-vent appliances. The vent termination shall be located at least 12 inches (305 mm) above grade and shall be suitably screened and hooded to prevent accidental closure of the vent pipe.

Exception: A vent to the outdoors outside of the building is not required for regulators equipped with and labeled for utilization with an approved vent-limiting device installed in accordance with the manufacturer’s instructions.

501.7 Connection to fireplace. Connection of any appliance to chimney flues serving fireplaces is prohibited. Refer to IFGC Section 602 for Decorative Appliances for installation in Fireplaces and IFGC Section 603 for Log Lighters.

501.7.1 Closure and access. A noncombustible seal shall be provided below the point of connection to prevent entry of room air into the flue. Means shall be provided for access to the flue for inspection and cleaning.

501.7.2 Connection to factory-built fireplace flue. An appliance shall not be connected to a flue serving a factory-built fireplace unless the appliance is specifically listed for such installation. The connection shall be made in accordance with the appliance manufacturer’s installation instructions.

501.7.3 Connection to masonry fireplace flue. A connector shall extend from the appliance to the flue serving a masonry fireplace such that the flue gases are exhausted directly into the flue. The connector shall be accessible or removable for inspection and cleaning of both the connector and the flue. Listed direct connection devices shall be installed in accordance with their listing.

501.8 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 IFGC Sections 613 and 614).
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. Direct-fired make-up air heaters.
9. Specialized equipment of limited input such as laboratory burners and gas lights.
Automatically operated equipment vented with a hood or exhaust system shall comply with IFGC Section 503.3.4. Where the appliances and equipment listed in Items 5 to 9 are installed so that the aggregate input rating exceeds 20 Btu/hr per cubic foot (207 watts per m²) of volume of the room or space in which such appliances and equipment are installed, one or more shall be provided with venting systems or other approved means for conveying the vent gases to the outdoor atmosphere so that the aggregate input rating of the remaining unvented appliances and equipment does not exceed the 20 Btu/hr per cubic foot (207 watts per m²) figure. Where the room or space in which the equipment or appliance is installed is directly connected to another room or space by a doorway, archway, or other opening of comparable size that cannot be closed, the volume of such adjacent room or space shall be permitted to be included in the calculations.

501.12.1 Terminations. Metallic liners shall terminate in accordance with the requirements for gas vents in IFGC Section 503.6.6.

503.5.5 Size of chimneys. The effective area of a chimney venting system serving listed appliances with draft hoods, Category I appliances, and other appliances listed for use with Type B vents shall be in accordance with IFGC Section 504 or other approved engineering methods.

Exceptions:

1. As an alternate method of sizing an individual chimney venting system for a single appliance with a draft hood, the effective areas of the vent connector and chimney flue shall be not less than the area of the appliance flue collar or draft hood outlet, nor greater than four times the draft hood outlet area.

2. As an alternate method for sizing a chimney venting system connected to two appliances with draft hoods, the effective area of the chimney flue shall be not less than the area of the larger draft hood outlet plus 50 percent of the area of the smaller draft hood outlet, nor greater than four times the smallest draft hood outlet area.

Where an incinerator is vented by a chimney serving other gas utilization appliance, the gas input to the incinerator shall not be included in calculating chimney size, provided the chimney flue diameter is not less than 1 inch (25.4 mm) larger in equivalent diameter than the diameter of the incinerator flue outlet.

CHAPTER 6

SPECIFIC APPLIANCES

602.3 Prohibited installations. Decorative appliances for installation in fireplaces shall not be installed where prohibited by IFGC Section 303.3. Unvented decorative appliances shall not be installed in any dwelling or occupancy.

SECTION 621 (IFGC)

UNVENTED ROOM HEATERS

Unvented room heaters and unvented decorative appliances shall not be installed in any dwelling or occupancy.

621.1 General. Unvented room heaters shall be tested in accordance with ANSI Z21.11.2 and shall be installed in accordance with the conditions of the listing and the manufacturer's installation instructions. Unvented room heaters utilizing fuel other than fuel gas shall be regulated by the International Mechanical Code.

621.2 Prohibited use. One or more unvented room heaters shall not be used as the sole source of comfort heating in a dwelling unit.

621.3 Input rating. Unvented room heaters shall not have an input rating in excess of 40,000 Btu/h (11.7 kW).

621.4 Prohibited locations. Unvented room heaters shall not be installed within occupancies in Groups A, E and I. The location of unvented room heaters shall also comply with Section 303.3.

621.5 Room or space volume. The aggregate input rating of all unvented appliances installed in a room or space shall not exceed 20 Btu/hr per cubic foot (207 W/m²) of volume of such room or space. Where the room or space in which the appliances are installed is directly connected to another room or space by a doorway, archway or other opening of comparable size that cannot be closed, the volume of such adjacent room or space shall be permitted to be included in the calculations.

621.6 Oxygen-depletion safety system. Unvented room heaters shall be equipped with an oxygen-depletion-sensitive safety shutoff system. The system shall shut off the gas supply to the main and pilot burners when the oxygen in the surrounding atmosphere is depleted to the percent concentration specified by the manufacturer, but not lower than 18 percent. The system shall not incorporate field adjustment means capable of changing the set point at which the system acts to shut off the gas supply to the room heater.

621.7 Unvented decorative room heaters. An unvented decorative room heater shall not be installed in a factory-built fireplace unless the fireplace system has been specifically tested, listed and labeled for such use in accordance with UL 127.

621.7.1 Ventless firebox enclosures. Ventless firebox enclosures used with unvented decorative room heaters shall be listed as complying with ANSI Z21.9.1.
### TABLE 402.4(2)A

**SCHEDULE 40 METALLIC PIPE**

**Gas**

<table>
<thead>
<tr>
<th>Inlet Pressure</th>
<th>Natural</th>
<th>7 in. w.c.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pressure Drop</td>
<td>Natural</td>
<td>1 in. w.c.</td>
</tr>
<tr>
<td></td>
<td>Specific Gravity Natural Gas</td>
<td>0.60</td>
</tr>
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</table>

**PIPE SIZING FOR NATURAL GAS**

<table>
<thead>
<tr>
<th>Nominal</th>
<th>(\frac{D}{2})</th>
<th>(\frac{h}{D})</th>
<th>(\frac{D}{4})</th>
<th>(\frac{D}{8})</th>
<th>(\frac{D}{16})</th>
<th>(\frac{D}{32})</th>
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<tr>
<td>Actual ID</td>
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<td>0.493</td>
<td>0.622</td>
<td>0.824</td>
<td>1.049</td>
<td>1.380</td>
</tr>
<tr>
<td>Length (ft)</td>
<td>Maximum Capacity in Cubic Feet of Gas Per Hour</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>61</td>
<td>135</td>
<td>248</td>
<td>318</td>
<td>276</td>
<td>2,004</td>
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<tr>
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<td>42</td>
<td>93</td>
<td>170</td>
<td>236</td>
<td>205</td>
<td>1,378</td>
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<td>137</td>
<td>200</td>
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<td>16</td>
<td>30</td>
<td>62</td>
<td>118</td>
<td>241</td>
</tr>
</tbody>
</table>

| Nominal | 2 21/2 3 4 5 6 8 |
|---------|----------------|----------------|----------------|----------------|----------------|
| Actual ID | 2.067 | 2.469 | 3.068 | 4.026 | 5.047 | 6.065 | 7.891 |
| Length (ft) | Maximum Capacity in Cubic Feet of Gas Per Hour |
| 10 | 5,784 | 9,218 | 16,296 | 33,239 | 60,134 | 97,370 | 194,195 |
| 20 | 3,975 | 6,336 | 11,200 | 22,845 | 41,330 | 66,922 | 133,469 |
| 30 | 3,192 | 5,088 | 8,994 | 18,345 | 33,189 | 53,741 | 107,181 |
| 40 | 2,732 | 4,354 | 7,698 | 15,701 | 28,406 | 45,995 | 91,333 |
| 50 | 2,421 | 3,859 | 6,822 | 13,916 | 25,175 | 40,765 | 81,301 |
| 60 | 2,194 | 3,497 | 6,612 | 12,609 | 22,811 | 36,936 | 73,665 |
| 80 | 1,878 | 2,993 | 5,291 | 10,791 | 19,523 | 31,612 | 63,047 |
| 100 | 1,664 | 2,652 | 4,689 | 9,564 | 17,303 | 28,017 | 55,878 |
| 125 | 1,475 | 2,351 | 4,156 | 8,477 | 15,335 | 24,831 | 49,523 |
| 150 | 1,336 | 2,130 | 3,765 | 7,680 | 13,895 | 22,499 | 44,872 |
| 175 | 1,279 | 1,960 | 3,464 | 7,066 | 12,783 | 20,699 | 41,281 |
| 200 | 1,144 | 1,823 | 3,223 | 6,573 | 11,892 | 19,256 | 38,404 |
| 250 | 1,014 | 1,616 | 2,856 | 5,826 | 10,540 | 17,066 | 34,037 |
| 300 | 918 | 1,464 | 2,588 | 5,379 | 9,550 | 15,463 | 30,840 |
| 350 | 845 | 1,347 | 2,381 | 4,856 | 8,786 | 14,226 | 28,373 |
| 400 | 786 | 1,253 | 2,215 | 4,518 | 8,173 | 13,235 | 26,395 |
| 450 | 738 | 1,176 | 2,078 | 4,239 | 7,669 | 12,418 | 24,766 |
| 500 | 697 | 1,110 | 1,963 | 4,004 | 7,244 | 11,730 | 23,394 |

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square inch = 6.895 kPa, 1-inch water column = 0.2488 kPa, 1 British thermal unit per hour = 0.2931 W, 1 cubic foot per hour = 0.0283 m³/h, 1 degree = 0.01745 rad.

**Note:** All table entries have been rounded to three significant digits.
APPENDIX E (IFGC)

WORKSHEET E-1

Residential Combustion Air Calculation Method
(for Furnace, Boiler, and/or Water Heater in the Same Space)

Step 1: Complete vented combustion appliance information.

Furnace/Boiler:

Draft Hood __________ Fan Assisted __________ Direct Vent __________
(Not fan assisted) & Power Vent 

Input: ________ Btu/hr

Water Heater:

Draft Hood __________ Fan Assisted __________ Direct Vent __________
(Not fan assisted) & Power Vent

Input: ________ Btu/hr

Step 2: Calculate the volume of the Combustion Appliance Space (CAS) containing combustion appliances.
The CAS includes all spaces connected to one another by code compliant openings. CAS volume: ________ ft³

Step 3: Determine Air Changes per Hour (ACH)¹
Default ACH values have been incorporated into Table E-1 for use with Method 4b (KAIR Method). If the year of construction or ACH is not known, use Method 4a (Standard Method).

Step 4: Determine Required Volume for Combustion Air.


Total Btu/hr input of all combustion appliances
(DO NOT COUNT DIRECT VENT APPLIANCES) Input: ________ Btu/hr

Use Standard Method column in Table E-1 to find Total Required Volume (TRV)
TRV: ________ ft³

If CAS Volume (from Step 2) is greater than TRV then no outdoor openings are needed.

If CAS Volume (from Step 2) is less than TRV then go to STEP 5.

4b. Known Air Infiltration Rate (KAIR) Method.

Total Btu/hr input of all fan-assisted and power vent appliances
(DO NOT COUNT DIRECT VENT APPLIANCES) Input: ________ Btu/hr

Use Fan-Assisted Appliances column in Table E-1 to find
Required Volume Fan Assisted (RVFA) RVFA: ________ ft³

Total Btu/hr of all Non-Fan-Assisted Appliances Input: ________ Btu/hr

Use Non-Fan-Assisted Appliances column in Table E-1 to find
Required Volume Non-Fan-Assisted (RVNFA) RVNFA: ________ ft³

Total Required Volume (TRV) = RVFA + RVNFA RV = ________ + ________ = ________ ft³

If CAS Volume (from Step 2) is greater than TRV then no outdoor openings are needed.

If CAS Volume (from Step 2) is less than TRV then go to STEP 5.

(continued)
FUEL GAS

WORKSHEET E-1—(continued)

Residential Combustion Air Calculation Method
(for Furnace, Boiler, and/or Water Heater in the Same Space)

Step 5: Calculate the ratio of available interior volume to the total required volume.

Ratio = CAS Volume (from Step 2) divided by TRV (from Step 4a or Step 4b)

Ratio = __________ / __________ = __________

Step 6: Calculate Reduction Factor (RF).

RF = 1 minus Ratio

RF = 1 - __________ = __________

Step 7: Calculate single outdoor opening as if all combustion air is from outside.

Total Btu/hr input of all Combustion Appliances in the same CAS (EXCEPT DIRECT VENT)

Input: __________ Btu/hr

Combustion Air Opening Area (CAOA):

Total Btu/hr divided by 3000 Btu/hr per in²

CAOA = __________ / 3000 Btu/hr per in² = __________ in²

Step 8: Calculate Minimum CAOA.

Minimum CAOA = CAOA multiplied by RF

Minimum CAOA = __________ × __________ = __________ in²

Step 9: Calculate Combustion Air Opening Diameter (CAOD).

CAOD = 1.13 multiplied by the square root of Minimum CAOA

CAOD = 1.13 Minimum CAOA = __________ in

1If desired, ACH can be determined using ASHRAE calculation or blower door test. Follow procedures in Section G304.