

Gas Supply Design Guide

Innovation Water Heaters

With Edge [i] Controller



Applies to models:

- INN 600N
- INN 800N
- INN 1060N
- INN 1350N

Disclaimer

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1 General

AERCO's Innovation-Edge series gas fired water heaters are modulating input devices that require an adequate volume of natural gas at constant pressure for proper operation. The gas requirements specified in this document must be satisfied to ensure efficient combustion. Designers and installers must adhere to the AERCO specifications and those of the local authorities having jurisdiction. A thorough understanding and knowledge of these guidelines is required for the successful design and installation of **Innovation-Edge** water heaters.

2 Gas Train Components

Innovation-Edge gas-fired water heaters are equipped with a standard UL approved/FM compliant gas trains. These gas trains are factory tested and fired, with a minimum number of modular components. The gas train components have been designed to operate at high combustion efficiencies by closely controlling both the volume and air/fuel mixture to the burner. The major internal gas train components are:

- **SAFETY SHUT OFF VALVE (SSOV) With BUILT-IN SUPPLY GAS REGULATOR**
An electro-hydraulic gas valve, containing a proof of closure switch, is utilized to stop fuel from flowing into the gas train of the heater. This is a 100% tight shutoff device with a visible window indicator showing valve position. Reliable, and a standard industry component, this valve is factory piped with a low gas pressure switch on the inlet side of the valve which monitors the manifold pressure for minimum supply conditions. There is also a high gas pressure switch installed on the outlet side of the gas valve, which shuts down the heater if gas manifold pressures exceed maximum conditions. The actuator has a built-in regulator that replaces the need for an external supply regulator for installations that have supply pressure of up to 14.0" W.C. (3.48 kPa). For installations that have supply pressure greater than 14.0" W.C. (3.48 kPa), see the "**Gas Pressure Requirements**" section.
- **AIR/FUEL VALVE**
The air/fuel valve controls the volume and mixture of air and fuel in perfect proportion throughout the entire modulation range of the heater. The valve utilizes one common shaft to simultaneously vary the gas port area and air volume. The gas portion of the valve is a slide port type valve with linear proportion-to-position characteristics. The air side uses a butterfly type valve for adjusting the air volume. The driver of the valve shaft is a precision stepping motor which provides continuous positioning from full input to minimum fire. The air/fuel valve also contains two proof-of-position switches.
- **CAST ALUMINUM BLOWER ASSEMBLY**
A cast aluminum pre-mix blower ensures the precise mixing of air and fuel prior to entering the burner thereby providing controlled combustion.
- **LOW NO_x BURNER**
The burner provides the actual point of air/fuel contact and combustion into the cylindrical combustion/heat exchanger. Fabricated from metal fiber mesh covering a stainless steel body, the burner is stable throughout the entire input range of the heater. The spark igniter and flame detector for the combustion supervision system are part of this assembly. The burner is easily removable from the heater.

3 Gas Pressure Requirements

All **Innovation-Edge** series heaters require a stable natural gas input pressure. The minimum allowable natural gas inlet pressure range is **4.0” W.C. (1.0 kPa)** when firing at maximum input. However, the *nominal* inlet supply pressure is **7.0” W.C. (1.74 kPa)**. The maximum allowable natural gas inlet pressure is **14.0” W.C. (3.49 kPa)**.

A low supply gas pressure switch in each gas train prevents the heater from operating without sufficient pressure. Static gas pressure (when the unit is not firing) may vary, however actual gas pressure should be measured when the unit is in operation (firing). Measure the gas pressure with a manometer at the 1/8” (3.18 mm) NPT ball valve provided at the SSOV inlet. In a multiple heater installation, gas pressure should initially be set for single heater operation, and then the remaining heaters should be staged on at full fire, to insure gas pressures never fall below the minimum allowable pressure of **4.0” W.C. (1.0 kPa)** for natural gas.

External Isolation Valve

An external isolation valve must be installed at each **Innovation-Edge** heater, as shown in Figure 1. This isolation valve is supplied with the heater.

Gas Pressure Regulator

For installations that have greater than **14.0” W.C. (3.49 kPa)** supply pressure, an external lock-up type regulator must be installed downstream of the isolation valve. The lock-up type regulator(s) must be sized for at least 1,000 cu ft/hr (472 L/min.), but no more than 1,200 cu ft/hr (566 L/min.), per heater. External gas regulators are self-contained with tapped diaphragm vent ports allowing the diaphragm to change its position as required. These vents typically require piping to the outside. For details, see section 6 *Venting of Gas Supply Regulators* in this guide. The SSOV/Regulator in the gas train is factory piped and does not require any vent piping.

The following are AERCO’s recommendations for installation of a gas pressure regulator, unless superseded by state and local codes and the regulator manufacturer’s specifications:

- Horizontal installation of gas pressure regulators is recommended unless stated otherwise by the regulator manufacturer. Consult the manufacturer for additional recommendations and installation options.
- When installed horizontally the required distance between the gas pressure regulator and the nearest pipe fitting, elbow or valve is 20 inches (0.5 m) (see Figure 1).
- When pipe size reduction is required, use only bell reducers.

CAUTION!

THE AERCO HEATERS MUST BE ISOLATED FROM THE SYSTEM WHEN LEAK TESTING.

Drip Legs

Drip legs are typically required at the gas supply of each heater to prevent any dirt, weld slag, or debris from entering the heater gas train inlet pipe. When multiple heaters are installed, some utilities and local codes require a full size drip leg on the main gas supply line in addition to the drip leg at each unit. The bottom of the gas drip leg(s) should be removable without disassembling any gas piping. The weight of the gas pipe should not be supported from the bottom of the drip leg. The drip leg(s) should not be used to support any or part of the gas piping.

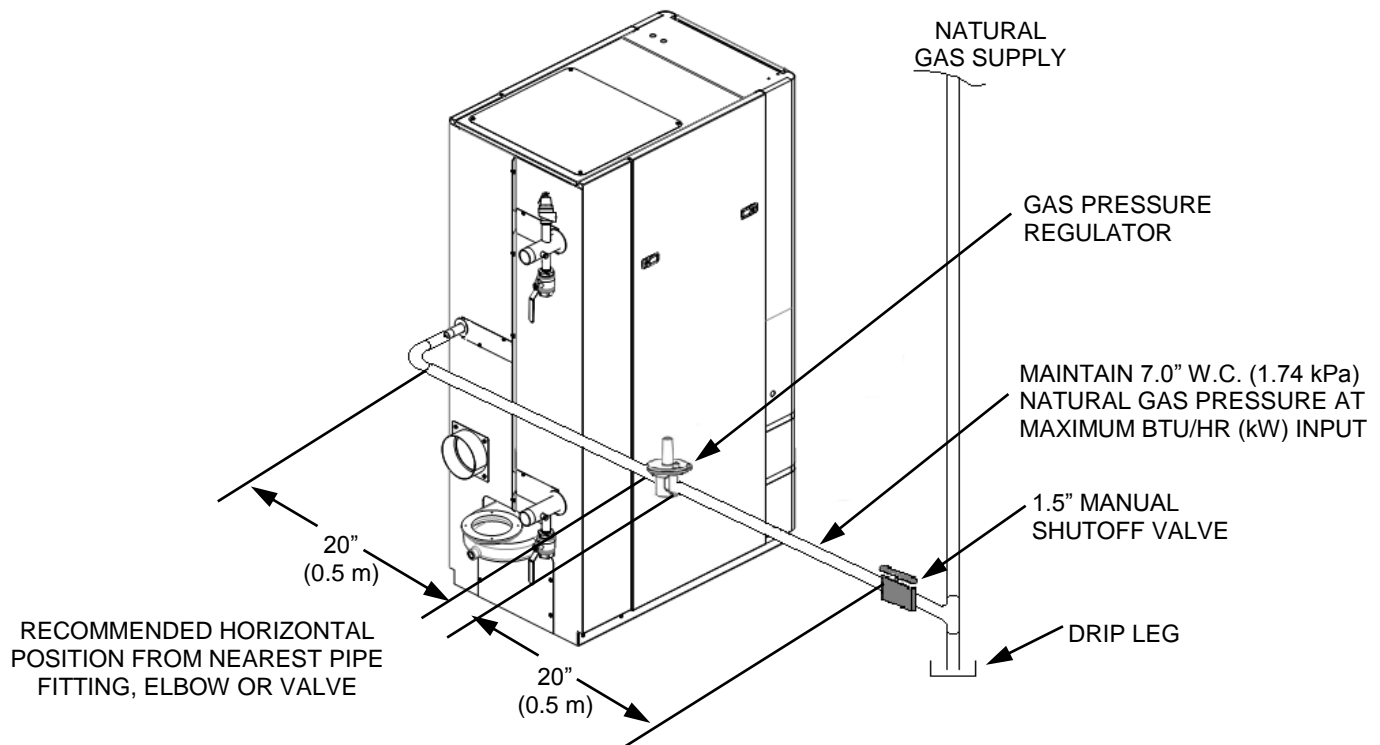


Figure 1: Single Heater Pipe Connections – Innovation Shown

4 Custom Gas Trains

Some utilities, insurance carriers, and industrial customers have special requirement gas components on high input devices beyond what’s normally supplied with AERCO heaters. Secondary shutoffs, high or low pressure operators, and external regulators are typical of the requirements of gas utilities. It is mandatory that a designer or installer comply with these requirements. AERCO assumes no liability when these requirements are not satisfied for any location or installation. Contact your local gas utility for their specific requirements before installing AERCO equipment. Special gas trains with a double block and bleed (DBB) configuration (formerly IRI) are available from AERCO. Gas inlet pressure requirements are as follows:

| FUEL | GAS TRAIN | NOMINAL | MINIMUM |
|-------------|-----------|----------------------|----------------------|
| Natural Gas | DBB | 7.0" W.C. (1.74 kPa) | 4.0" W.C. (1.00 kPa) |

5 Gas Piping

All gas piping and components must comply with NFPA local codes, and utility requirements minimum. Only gas approved fittings, valves, or pipe should be utilized.

Standard industry practice for gas piping is Schedule 40 iron pipe and fittings. All high and low gas pressure piping systems must comply with local utility and building codes.

Assembled piping should be clean of all debris, pipe chips, or foreign material to prevent any from entering the **Innovation-Edge** water heater gas train. Piping should be tested as prescribed in NFPA 54. Equipment should be isolated before testing any piping system over the allowable pressure. **DO NOT EXCEED 14.0" W.C. (3.49 kPa)** on the inlet side of the **Innovation-Edge** water heater at any time.

5.1 Gas Supply Main Sizing

Gas pipe sizing, for either a single or multiple heater installation, shall be sized for a maximum pressure drop of **0.3” W.C. (0.07 kPa)**, from the source to the final heater. The maximum gas flow rate required is the sum of the maximum inputs of each unit divided by the heat of combustion of the fuel supplied at the location, (approximately **1,030 BTU per cubic foot (38.4 MJ/m³)** for natural gas). The fuel supplier or utility should be consulted to confirm that sufficient volume and normal pressure is provided to the building at the discharge side of the gas meter or supply pipe. For existing installations with gas equipment, gas pressure should be measured with a manometer to be certain sufficient pressure is available. Before sizing gas piping, a survey of all connected gas devices should be made. Gas piping supplying more than one gas device must be able to handle the total connected input within the allowable gas pressure drop. The allowable minimum and maximum gas pressure for each device should be considered. Whenever the minimum and maximum gas pressures vary between devices, gas pressure regulators at each unit should be installed to allow regulation at any individual unit. Gas pressure must never exceed the maximum allowable rating of any connected device.

The total length of gas piping as well as fitting pressure drop must be considered when sizing the gas piping. Total equivalent length should be calculated from the meter or source location to the last heater connected on the header. Gas piping tables 1, 2 and 3 containing data extracted from NFPA 54 should be used as a *minimum guideline*. (See Tables on the following pages). Gas pipe size should be selected on the total *equivalent* length from the appropriate pressure table. The gas volume for cu ft/hr (L/min) flow will be the input divided by the calorific value of the fuel to be supplied.

5.2 Gas Header Sizing

Main supply gas pipe sizing should be developed for the total plant. Heater gas manifold piping should be sized based on the volume requirements and lengths between heaters and the fuel main. Multiple heater manifold sizing (Figure 2) indicates the proper sizing for units placed on the factory standard **52” (1.3 m)** centers with **2” (51 mm)** takeoffs for each unit. Header sizes can be either full size or stepped in size as units are connected. A typical gas piping header diagram for a 3-Module Innovation Heater Plant is illustrated in Diagram 3.

| INNOVATION-EDGE GAS HEADER SIZING | | | | | | | | |
|-----------------------------------|-----------------|---------------|---------------|----------------|----------------|----------------|----------------|----------------|
| No. of Heaters | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Sch 40 Iron Pipe* | 1.5” (38 mm) | 3” (76 mm) | 3” (76 mm) | 4” (101 mm) | 4” (101 mm) | 5” (127 mm) | 5” (127 mm) | 5” (127 mm) |

Figure 2: Multiple Heater Manifold Chart

* Based on Table 1 on the following page for natural gas, 0.6 specific gravity, **1,000 cu ft/hr (472 L/min)** per unit, actual header sizes will vary with length of pipe run and fittings employed.

If supply gas pressure exceeds **14.0” W.C. (3.49 kPa)**, a single header gas manifold lock-up type regulator, -or- individual lock-up regulators can be used to bring the gas pressure down to **14.0” W.C. (3.49 kPa)**. Header should be located above or behind heater. Gas piping should not be installed directly over top or front of any part of heater. Sufficient clearances for maintenance are required.

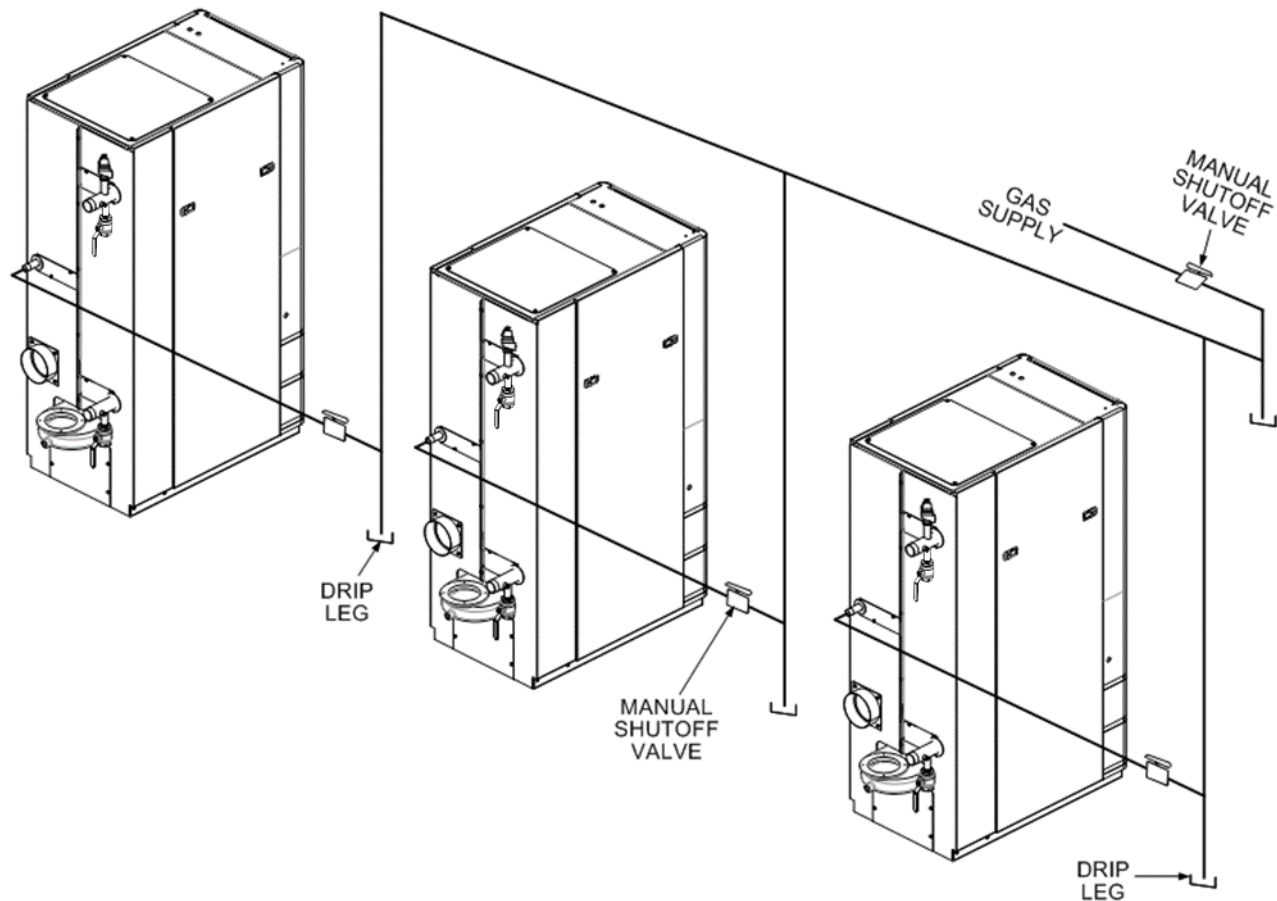


Figure 3: Typical Multiple Heater Manifold Construction

5.3 Gas Piping Tables

The data in the following pipe and vent sizing tables have been extracted from the National Fire Protection Association Article 54 (NFPA 54)

TABLE 1: Maximum Capacity of Pipe
In Cubic Feet/Hour (L/min) of Gas of Pressures of 0.5 psi (3.45 kPa) or Less and a Pressure Drop of 0.3 inch Water Column (0.07 kPa)

| Nominal Iron Pipe Size in Inches (mm) | Internal Diameter in Inches (mm) | Total Equivalent Length of Pipe (Feet) | | | | | | | | | | | | |
|---------------------------------------|----------------------------------|--|------------------|-----------------|-----------------|-----------------|-------------------|-----------------|-----------------|-----------------|------------------|-----------------|-----------------|-----------------|
| | | 10 | 20 | 30 | 40 | 50 | 60 | 70 | 80 | 90 | 125 | 150 | 175 | 200 |
| 2.00 (50.8) | 2.067 (52.5) | 3,050 (1433) | 2,100 (987) | 1,650 (775) | 1,450 (681) | 1,270 (596) | 1,150 (540) | 1,050 (493) | 990 (465) | 930 (437) | 780 (366) | 710 (333) | 650 (305) | 610 (286) |
| 2.50 (63.5) | 2.469 (62.7) | 4,800 (2256) | 3,300 (1551) | 2,700 (1269) | 2,300 (1081) | 2,000 (940) | 1,850 (869.5) | 1,700 (799) | 1,600 (752) | 1,500 (705) | 1,250 (587.5) | 1,130 (531) | 1,050 (493) | 980 (460) |
| 3.00 (76.2) | 3.068 (77.9) | 8,500 (3995) | 5,900 (2773) | 4,700 (2209) | 4,100 (1927) | 3,600 (1692) | 3,250 (1527.5) | 3,000 (1410) | 2,800 (1316) | 2,600 (1222) | 2,200 (1034) | 2,000 (940) | 1,850 (869) | 1,700 (799) |
| 4.00 (102.6) | 4.026 (102.3) | 17,500 (8225) | 12,000 (5640) | 9,700 (4559) | 8,300 (3901) | 7,400 (3478) | 6,800 (3196) | 6,200 (2914) | 5,800 (2726) | 5,400 (2538) | 4,500 (2115) | 4,100 (1927) | 3,800 (1786) | 3,500 (1645) |

TABLE 2: Pipe Sizing Table For 1 Pound Pressure Capacity
of Pipes of Different Diameters and Lengths In Cubic Feet per Hour (L/min) for an Initial Pressure of 1.0 psi (6.9 kPa) with a 10% Pressure Drop and a Gas of 0.6 Specific Gravity

| Pipe Size of Schedule 40 Standard Pipe in Inches (mm) | Internal Diameter in Inches (mm) | Total Equivalent Length of Pipe (Feet) | | | | | | | |
|---|----------------------------------|--|-------------------|------------------|------------------|------------------|------------------|------------------|------------------|
| | | 50 | 100 | 150 | 200 | 250 | 300 | 400 | 500 |
| 2.00 (50.8) | 2.067 (52.5) | 4245 (2003) | 2918 (1377.0) | 2343 (1105) | 2005 (946) | 1777 (838) | 1610 (759) | 1378 (650) | 1222 (576) |
| 2.50 (63.5) | 2.469 (62.7) | 6766 (3192.9) | 4651 (2194) | 3735 (1762) | 3196 (1508) | 2833 (1336) | 2567 (1211) | 2197 (1036) | 1947 (918) |
| 3.00 (76.2) | 3.068 (77.9) | 11962 (5644) | 8221 (3879) | 6602 (3115) | 5650 (2666) | 5008 (2363) | 4538 (2141) | 3884 (1832.9) | 3442 (1624) |
| 3.50 (88.9) | 3.548 (90.1) | 17514 (8264) | 12037 (5680) | 9666 (4561) | 8273 (3904) | 7332 (3460) | 6644 (3135) | 5686 (2683) | 5039 (2377) |
| 4.00 (101.6) | 4.026 (102.3) | 24398 (11513) | 16769 (7913) | 13466 (6354) | 11525 (5438) | 10214 (4820) | 9255 (4367) | 7921 (3737) | 7020 (3312) |
| 5.00 (127) | 5.047 (128.2) | 44140 (20829) | 30337 (14316) | 24362 (11496) | 20851 (9839) | 18479 (8720) | 16744 (7901) | 14330 (6762) | 12701 (5993) |
| 6.00 (152.4) | 6.065 (154.1) | 71473 (33728) | 49123 (23181) | 39447 (18615) | 33762 (15932) | 29923 (14120) | 27112 (12794) | 23204 (10950) | 20566 (9705) |
| 8.00 (203.2) | 7.981 (202.7) | 146849 (69298) | 100929 (47628) | 81049 (38247) | 69368 (32734) | 61479 (29011) | 55705 (26287) | 47676 (22498) | 42254 (19939) |

TABLE 3: Pipe Sizing Table for 2 Pounds Pressure Capacity
of Pipes of Different Diameters and Lengths in Cubic Feet per Hour (L/min) for an Initial Pressure of 2.0 psi (13.8 kPa) with a 10% Pressure Drop and a Gas of 0.6 Specific Gravity

| Pipe Size of Schedule 40 Standard Pipe in Inches (mm) | Internal Diameter in Inches (mm) | Total Equivalent Length of Pipe (Feet) | | | | | | | |
|---|----------------------------------|--|------------------|------------------|------------------|------------------|------------------|------------------|------------------|
| | | 50 | 100 | 150 | 200 | 250 | 300 | 400 | 500 |
| 2.00 (50.8) | 2.067 (52.5) | 6589 (3109) | 4528 (2136) | 3636 (1715) | 3112 (1468) | 2758 (1301) | 2499 (1179) | 2139 (1009) | 1896 (894) |
| 2.50 (63.5) | 2.469 (62.7) | 10501 (4955) | 7217 (3405) | 5796 (2735) | 4961 (2341) | 4396 (2074) | 3983 (1879) | 3409 (1608) | 3022 (1426) |
| 3.00 (76.2) | 3.068 (77.9) | 18564 (8760) | 12759 (6021) | 10246 (4835) | 8769 (4138) | 7772 (3667) | 7042 (3323) | 6027 (2844) | 5342 (2520) |
| 3.50 (88.9) | 3.548 (90.1) | 27181 (12826) | 18681 (8815) | 15002 (7079) | 12840 (6059) | 11379 (5369) | 10311 (4865) | 8825 (4164) | 7821 (3690) |
| 4.00 (101.6) | 4.026 (102.3) | 37865 (17868) | 26025 (12281) | 20899 (9862) | 17887 (8440) | 15853 (7481) | 14364 (6778) | 12293 (5801) | 10895 (5141) |
| 5.00 (127) | 5.047 (128.2) | 68504 (32327) | 47082 (22218) | 37809 (17842) | 32359 (15270) | 28680 (13534) | 25986 (12262) | 22240 (10495) | 19711 (9301) |
| 6.00 (152.4) | 6.065 (154.1) | 110924 (52345) | 76237 (35976) | 61221 (28890) | 52397 (24726) | 46439 (21914) | 42077 (19856) | 36012 (16994) | 31917 (15061) |

TABLE 4: Pipe Sizing Table for 5 Pounds Pressure Capacity
of Pipes of Different Diameters and Lengths in Cubic Feet per Hour (L/min) for an Initial Pressure of 5.0 psi (34.5 kPa) with a 10% Pressure Drop and a Gas of 0.6 Specific Gravity

| Pipe Size of Schedule 40 Standard Pipe in Inches (mm) | Internal Diameter in Inches (mm) | Total Equivalent Length of Pipe (Feet) | | | | | | | |
|---|----------------------------------|--|--------|--------|-------|-------|-------|-------|-------|
| | | 50 | 100 | 150 | 200 | 250 | 300 | 400 | 500 |
| 2.00 (50.8) | 2.067 (52.5) | 11786 | 8101 | 6505 | 5567 | 4934 | 4471 | 3827 | 3391 |
| | | 5562 | 3823 | 3070 | 2627 | 2328 | 2110 | 1806 | 1600 |
| 2.50 (63.5) | 2.469 (62.7) | 18785 | 12911 | 10368 | 8874 | 7865 | 7126 | 6099 | 5405 |
| | | 8865 | 6093 | 4893 | 4188 | 3711 | 3363 | 2878 | 2551 |
| 3.00 (76.2) | 3.068 (77.9) | 33209 | 22824 | 18329 | 15687 | 13903 | 12597 | 10782 | 9556 |
| | | 15671 | 10771 | 8649 | 7403 | 6561 | 5945 | 5088 | 4509 |
| 3.50 (88.9) | 3.548 (90.1) | 48623 | 33418 | 26836 | 22968 | 20365 | 18444 | 15786 | 13991 |
| | | 22945 | 15770 | 12664 | 10839 | 9610 | 8704 | 7449 | 6602 |
| 4.00 (101.6) | 4.026 (102.3) | 67736 | 46555 | 37385 | 31997 | 28358 | 25694 | 21991 | 19490 |
| | | 31965 | 21969 | 17642 | 15099 | 13382 | 12125 | 10378 | 9197 |
| 5.00 (127) | 5.047 (128.2) | 122544 | 84224 | 67635 | 57887 | 51304 | 46485 | 39785 | 35261 |
| | | 57829 | 39745 | 31917 | 27317 | 24210 | 21936 | 18775 | 16640 |
| 6.00 (152.4) | 6.065 (154.1) | 198427 | 136378 | 109516 | 93732 | 83073 | 75270 | 64421 | 57095 |
| | | 93638 | 64357 | 51681 | 44232 | 39202 | 35520 | 30400 | 26943 |

6 Venting of Gas Supply Regulators

AERCO's general guidelines for venting of gas regulators are listed below. AERCO recommends that these guidelines be followed to ensure the most reliable and proper operation of AERCO gas fired equipment. It is also recommended that you consult local codes and the gas regulator manufacturer for additional details. Always follow the most stringent guidelines available, including those listed below.

- When venting a gas supply regulator, the vent pipe must be no smaller than the regulator vent size.
- In a multiple unit installation, each regulator must have a separate vent line.
- Vent lines must not be manifolded together or with any other equipment at the site that also requires atmospheric vents.
- When sizing the vent, pipe diameters must be increased by one pipe diameter every 20 equivalent feet (6.1 equivalent meters) of pipe.

Each 90° elbow is equivalent to approximately:

⇒ 2.5 feet (0.76 m) for nominal pipe sizes of up to 3/4" (19.01 mm)

⇒ 4.5 feet (1.37 m) for nominal pipe sizes of up to 1-1/2" (38.1 mm)

⇒ 10.5 feet (3.20 m) for nominal pipe sizes of up to 4" (101.6 mm)

Each 45° elbow is equivalent to approximately:

⇒ 1 foot (0.30 m) for nominal pipe sizes of up to 3/4" (19.1 mm)

⇒ 2 feet (0.61 m) for nominal pipe sizes of up to 1-1/2" (38.1 mm)

⇒ 5 feet (1.52 m) for nominal pipe sizes of up to 4" (101.6 mm)

CALCULATION WORKSHEET: PIPE SIZING, BRANCH LENGTH METHOD

North American Standard Units of Measure

Step 1:

- Draw a sketch of the piping system in the space to the right.



Length of runs:

- A=
- B=
- C=
- D=
- E=

Step 2:

- Enter the system information. Note that demand is the amount of gas flowing through a section of pipe.
- Use total Btu/hr rating/1000 (ft³/hr) for natural gas.

Pipe system sketch

Step 3:

- Determine the gas used and the system pressure, and enter it on the right.
- Determine the piping material and enter it on the right.
- Select the appropriate pipe sizing table, above, and enter it on the right.

Gas: _____

Pressure: _____

Piping Material: _____

Step 4:

- On the sketch above, label the section of pipe from the point of delivery (meter or regulator) to the manifold as Section A.

Table used: _____

Pressure Drop: _____

Table 1: Piping System

Step 5:

- Determine the length of the branch serving each appliance. Enter this length in Table 1.

| Section | Demand (chf) | Section Length (ft.) | Size (in.) |
|---------|--------------|----------------------|------------|
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

CALCULATION WORKSHEET: PIPE SIZING, BRANCH LENGTH METHOD – *Continued*
North American Standard Units of Measure

Step 6:

- Enter the input rating for each appliance in Table 2. For natural gas appliances, enter the input rating in ft³/hr.

Table 2: Appliances Table

| Section | Demand (chf) | Section Length (ft.) | Size (in.) |
|--------------|--------------|----------------------|------------|
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| TOTAL | | | |

Step 7:

- From the table, determine the length of each pipe section using the appropriate table, using only the row with the longest length. Round up to the lengths in the table. Read across until a capacity equal to or greater than the required demand for the section is found. Read up to find the size. Repeat for each section of piping. Enter this size in Table 2.

JOB: _____ **PREPARED BY:** _____ **DATE:** _____

The following is an example of a completed worksheet:

CALCULATION WORKSHEET: PIPE SIZING, BRANCH LENGTH METHOD

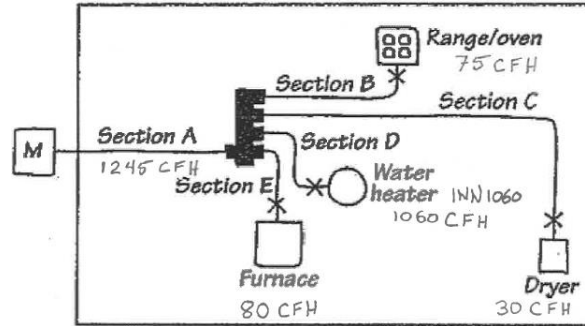
North American Standard Units of Measure

Step 1:

- Draw a sketch of the piping system in the space to the right.

Step 2:

- Enter the system information. Note that demand is the amount of gas flowing through a section of pipe.
- Use total Btu/hr rating/1000 (ft³/hr) for natural gas.



Length of runs:

- A= 20ft
- B= 10ft
- C= 30ft
- D= 10ft
- E= 10ft

Pipe system sketch

Step 3:

- Determine the gas used and the system pressure, and enter it on the right.
- Determine the piping material and enter it on the right.
- Select the appropriate pipe sizing table, above, and enter it on the right.

Gas: NATURAL

Pressure: 7 in. W.C.

Piping Material: Copper

Table used: Table 1

Pressure Drop: 0.3 in. W.C.

Step 4:

- On the sketch above, label the section of pipe from the point of delivery (meter or regulator) to the manifold as Section A.

Table 1: Piping System

Step 5:

- Determine the length of the branch serving each appliance. Enter this length in Table 1.

| Section | Demand (chf) | Section Length (ft.) | Size (in.) |
|---------|--------------|----------------------|------------|
| A | 1245 | 50 ft. | 2 in. |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

CALCULATION WORKSHEET: PIPE SIZING, BRANCH LENGTH METHOD – *Continued*

North American Standard Units of Measure

Step 6:

- Enter the input rating for each appliance in Table 2. For natural gas appliances, enter the input rating in ft³/hr.

Table 2: Appliances Table

| Section | Demand (chf) | Section Length (ft.) | Size (in.) |
|--------------|--------------|----------------------|------------|
| Furnace | 80 | 30 | 1/2 |
| Furnace | | | |
| Water Heater | 1060N | 30 | 1.25 |
| Water Heater | | | |
| Range | 75 | 30 | 1/2 |
| Oven | | | |
| Dryer | 30 | 30 | 3/8 |
| Other | | | |
| Other | | | |
| Other | | | |
| TOTAL | 1245 | -- | -- |

Step 7:

- From the table, determine the length of each pipe section using the appropriate table, using only the row with the longest length. Round up to the lengths in the table. Read across until a capacity equal to or greater than the required demand for the section is found. Read up to find the size. Repeat for each section of piping. Enter this size in Table 2.

JOB: 25 Main St. **PREPARED BY:** TL **DATE:** 6/10/13

CALCULATION WORKSHEET: PIPE SIZING, BRANCH LENGTH METHOD

Metric Units of Measure

Step 1:

- Draw a sketch of the piping system in the space to the right.

Step 2:

- Enter the system information. Note that demand is the amount of gas flowing through a section of pipe.
- Use total kw rating per 1000 (L/min) for natural gas.



Length of runs:

- A=
- B=
- C=
- D=
- E=

Pipe system sketch

Step 3:

- Determine the gas used and the system pressure, and enter it on the right.
- Determine the piping material and enter it on the right.
- Select the appropriate pipe sizing table, above, and enter it on the right.

Gas: _____

Pressure: _____

Piping Material: _____

Table used: _____

Step 4:

- On the sketch above, label the section of pipe from the point of delivery (meter or regulator) to the manifold as Section A.

Pressure Drop: _____

Table 1: Piping System

Step 5:

- Determine the length of the branch serving each appliance. Enter this length in Table 1.

| Section | Demand (L/min) | Section Length (m) | Size (mm) |
|---------|----------------|--------------------|-----------|
| | | | |
| | | | |
| | | | |
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CALCULATION WORKSHEET: PIPE SIZING, BRANCH LENGTH METHOD – *Continued*
Metric Units of Measure

Step 6:

- Enter the input rating for each appliance in Table 2. For natural gas appliances, enter the input rating in L/min.

Table 2: Appliances Table

| Section | Demand (L/min) | Section Length (m) | Size (mm) |
|--------------|----------------|--------------------|-----------|
| | | | |
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| | | | |
| TOTAL | | | |

Step 7:

- From the table, determine the length of each pipe section using the appropriate table, using only the row with the longest length. Round up to the lengths in the table. Read across until a capacity equal to or greater than the required demand for the section is found. Read up to find the size. Repeat for each section of piping. Enter this size in Table 2.

JOB: _____ **PREPARED BY:** _____ **DATE:** _____

The following is an example of a completed worksheet using Metric units of measure:

CALCULATION WORKSHEET: PIPE SIZING, BRANCH LENGTH METHOD

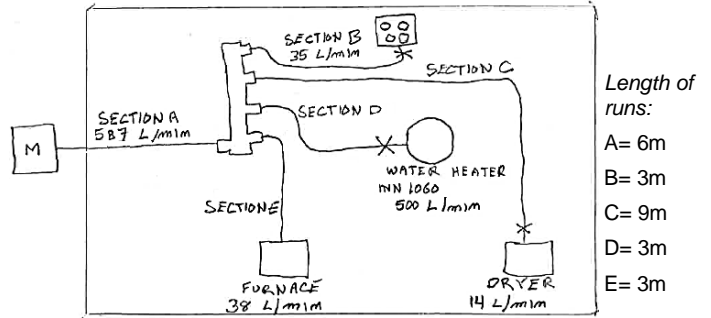
Metric Units of Measure

Step 1:

- Draw a sketch of the piping system in the space to the right.

Step 2:

- Enter the system information. Note that demand is the amount of gas flowing through a section of pipe.
- Use total kW rating per 1000 (L/min) for natural gas.



Length of runs:
 A= 6m
 B= 3m
 C= 9m
 D= 3m
 E= 3m

Pipe system sketch

Step 3:

- Determine the gas used and the system pressure, and enter it on the right.
- Determine the piping material and enter it on the right.
- Select the appropriate pipe sizing table, above, and enter it on the right.

Gas: NATURAL

Pressure: 3 kPa

Piping Material: Sch 40 Iron Pipe

Table used: 1

Step 4:

- On the sketch above, label the section of pipe from the point of delivery (meter or regulator) to the manifold as Section A.

Pressure Drop: 0.07 kPa.

Table 1: Piping System

Step 5:

- Determine the length of the branch serving each appliance. Enter this length in Table 1.

| Section | Demand (L/min) | Section Length (m) | Size (mm) |
|---------|----------------|--------------------|-----------|
| A | 587 | 15 m. | 50.8 mm |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

CALCULATION WORKSHEET: PIPE SIZING, BRANCH LENGTH METHOD – *Continued*
Metric Units of Measure

Step 6:

- Enter the input rating for each appliance in Table 2. For natural gas appliances, enter the input rating in L/min.

Table 2: Appliances Table

| Section | Demand (L/min) | Section Length | Size |
|------------------------|----------------|----------------|----------|
| Furnace | 38 | 3 m | 12.7 mm |
| Furnace | | | |
| Water Heater INN 1060N | 500 | 3 m | 31.8 mm |
| Water Heater | | | |
| Range | 35 | 3 m | 12.7 mm. |
| Oven | | | |
| Dryer | 14 | 9 m | 9.5 mm. |
| Other | | | |
| Other | | | |
| Other | | | |
| TOTAL | 587 | -- | -- |

Step 7:

- From the table, determine the length of each pipe section using the appropriate table, using only the row with the longest length. Round up to the lengths in the table. Read across until a capacity equal to or greater than the required demand for the section is found. Read up to find the size. Repeat for each section of piping. Enter this size in Table 2.

JOB: 25 Main St. **PREPARED BY:** TL **DATE:** 6/10/15

| Change Log: | | |
|-------------|------------------------|------------|
| Date | Description | Changed by |
| 9/6/2019 | Rev A: Initial release | |
| | | |