

## 3. Technical Specifications

### 3.1 Specifications Chart

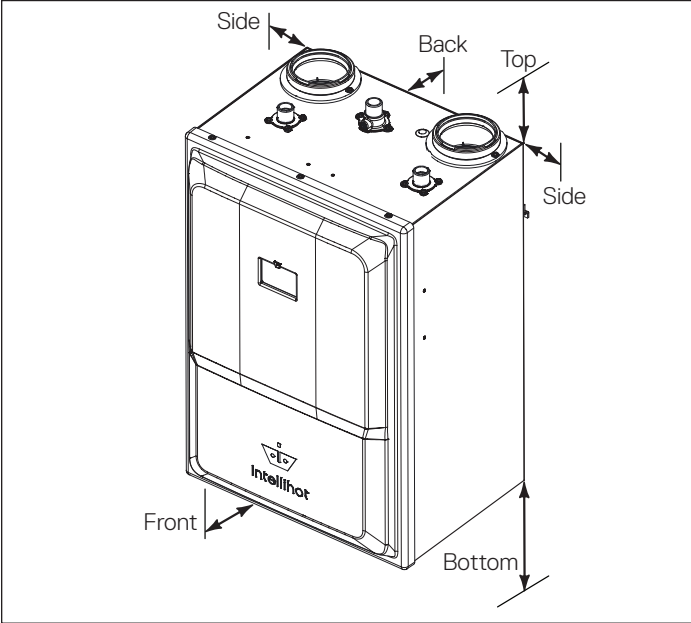
Technical Data	Specification
Type	Indoor/Outdoor, Wall Hung, Fully Condensing, On-demand Water Heater
Fuel	Preset for natural gas but convertible to propane
Minimum / Maximum Input (BTUs/hour)	30,000 / 251,000
Thermal Efficiency	96%
Dimensions H X W X D (inches)	26.4 X 17.8 X 15 (3.9 cu. ft)
Weight (lbs)	90
Water Inlet / Outlet Connection	3/4" NPT
Gas Inlet Connection	3/4" NPT
Minimum Flow Rate for Activation	0.6 GPM
Ignition	Electronic Spark Ignition
Installation Location Ambient Temperature	40°F – 130°F
Air intake temperature	40°F – 130°F
Venting Type	Direct Vent (2 pipe – air intake and exhaust gas outlet), Power Vent (1 pipe – exhaust gas only)
Venting Material Options	Sch. 40 PVC, Sch. 40 CPVC, Polypropylene, Stainless Steel (AL29-4C)
Max 3" Air Inlet and Exhaust Gas Outlet Pipe Length – Single Pipe / Power Vent	130 ft; deduct 5 ft per 90° elbow and 2 ft per 45° elbow
Max 3" Air Inlet and Exhaust Gas Outlet Pipe Length – Two Pipe / Direct Vent	65 ft; deduct 5 ft per 90° elbow and 2 ft per 45° elbow
Common Venting for Multiple Units	Yes
Safety Features	Flame Rod, Thermal Fuse, Overheat Prevention Device, Fan Speed Monitor, Flue Temperature Monitor, Blocked Vent Detector, Water Shut-Off Valve, two 10A Fuses, Dual Flame Sensing, Flue Damper
Water Pressure Min / Max (PSI)	30/160 <sup>T</sup>
Natural Gas and Propane – Minimum Static Gas Pressure 1/2" Pipe	NG=6" WC (non-corrugated, black iron); LP=8" WC
Natural Gas and Propane – Minimum Static Gas Pressure 3/4" Pipe	NG=2.5" WC (non-corrugated, black iron); LP=8" WC
Natural Gas and Propane – Maximum Static Gas Pressure	14" WC
Gas Pressure for Adjustments	8" WC for natural gas and 11" WC for propane
Electrical Requirements	120V AC, 60 Hz, 15 Amp Circuit Breaker
Power Consumption	500W (Max 4.2 Amps), 8W (Standby)
Features	Specification
Certification Organizations	ETL (Z21.10.3 / CSA 4.3), ASME HLW
Cascading	Masterless, up to 10 units
Heat Engine	Expandable, Stainless 316L
Performance	Specification
Hot Water Output (35°F Rise)	13.8 GPM (for installations above 2,000 feet see section 3.2)
Hot Water Output (45°F Rise)	10.7 GPM (for installations above 2,000 feet see section 3.2)
Hot Water Output (77°F Rise)	6.3 GPM (for installations above 2,000 feet see section 3.2)
Domestic Mode Water Temperature Settings	100 – 140°F <sup>T</sup>
Commercial Mode Water Temperature Settings	100 – 190°F <sup>T</sup>
Warranty (with recirculation, and unlimited thermal cycles)	Heat Engine Coil – 10 years, All Other Parts – 2 years
<sup>T</sup> = The unit does not include a temperature and pressure relief valve (T&P). The customer is responsible for supplying the T&P based on the application. Please refer to section 3.6	
<b>Note:</b> Due to continuous product improvements, the design and technical specifications are subject to change without notice.	

### 3.2 High Elevation Installations

For operation at elevations above 2,000 feet, the hot water delivery output should be reduced by 4% for each 1,000 feet above sea level.

3.3 Clearance Requirements

In order for the water heater to operate properly and efficiently, the clearances specified in the table are required.



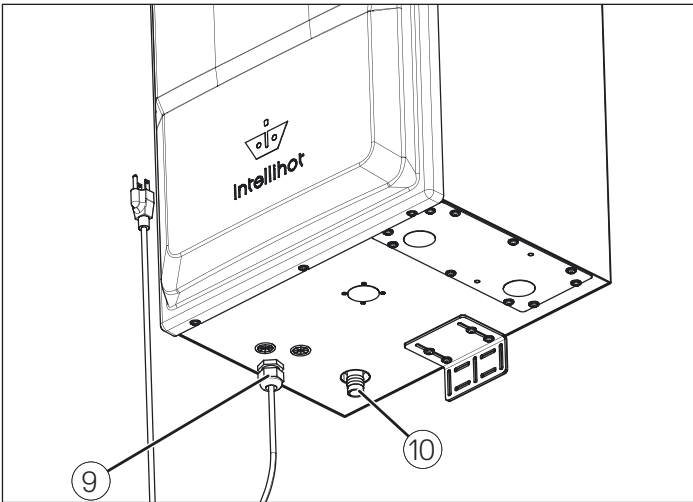
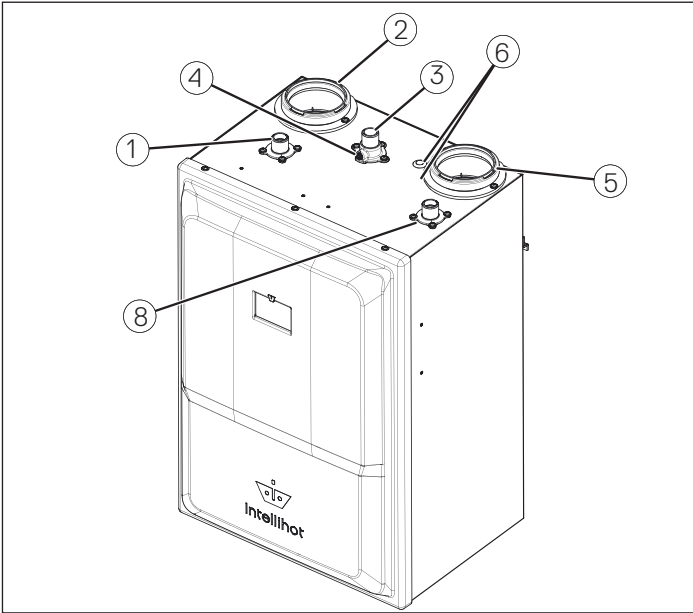
Location	Required		Recommended Service Clearance <sup>1</sup>
	From Combustibles	From Non-Combustibles	
Top	6" (15.2 cm)	2" (50.8 cm)	12" (30.4 cm)
Back <sup>2</sup>	5/8" (15.8 mm)	5/8" (15.8 mm)	5/8" (15.8 mm)
Sides	1" (25.4 mm)	1/2" (12.7 mm)	1" (25.4 mm)
Front	2" (5.1 cm)	2" (5.1 cm)	30" (76.2 cm)
Bottom	12" (30.4 cm)	12" (30.4 cm)	12" (30.4 cm)

<sup>1</sup> Service clearances are suggested to allow for normal service.  
<sup>2</sup> Mounting bracket automatically sets this distance.

3.4 Connections

Connections		
Item	Description	Specification <sup>1</sup>
1	Hot Water Outlet Connection	3/4" Female NPT
2	Exhaust Gas Vent	3" O.D.
3	Gas Supply Inlet Connection	3/4" Female NPT
4	Gas Pressure Analyzer Port	1/8" Female NPT
5	Fresh Air Intake	3" O.D.
6	Access Ports for Blower Mounting Screws	—
7	—	—
8	Cold Water Inlet Connection	3/4" Male NPT
9	Power Supply Cord and Plug	120V AC Power
10	Condensate Drain Connection	3/4" Nipple (3/4" flex hose)

<sup>1</sup> Using sizes other than specified can cause damage to the water heater and will void the warranty.



### 3.5 Exhaust Gas Standards

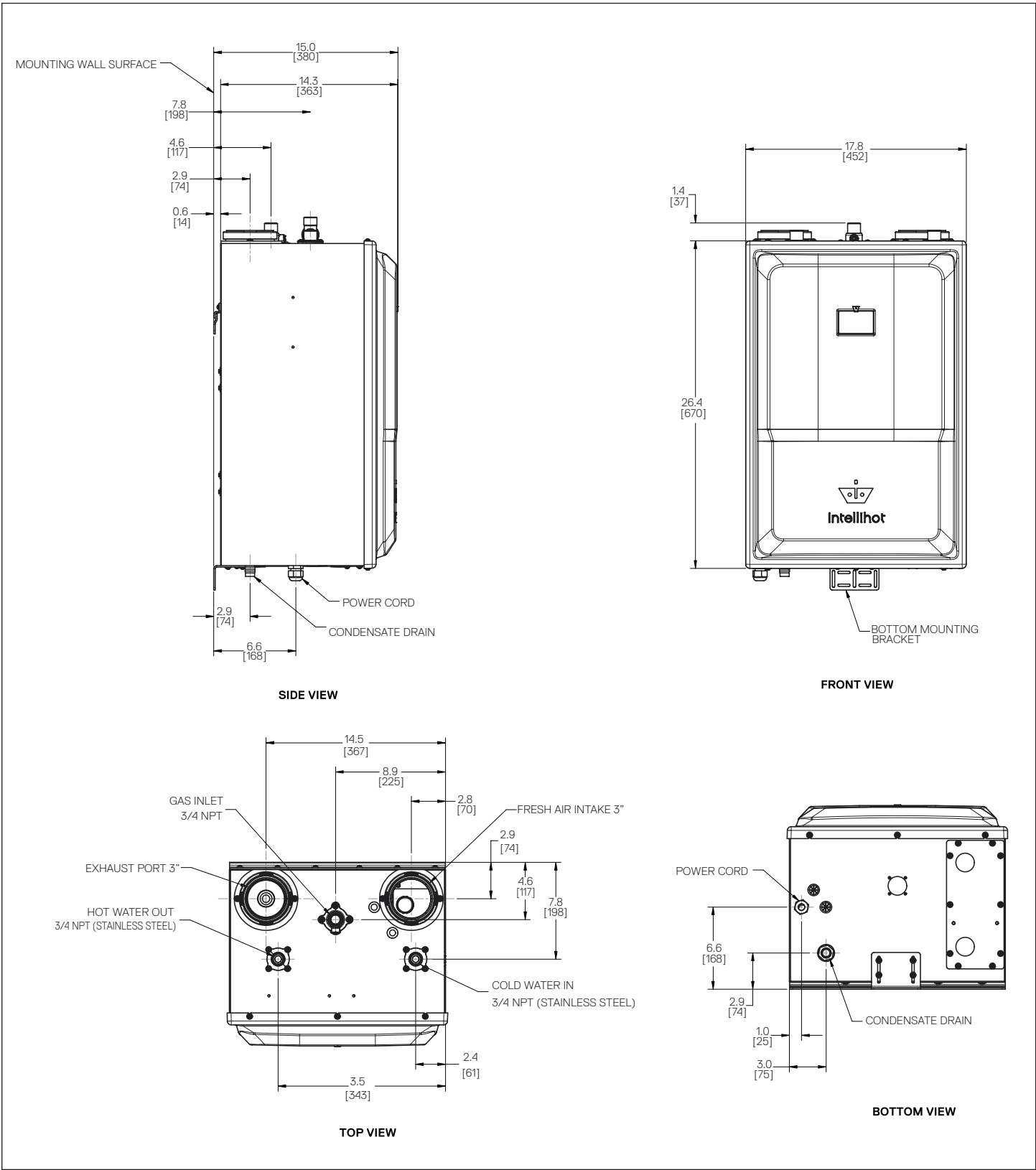
CO <sub>2</sub> and CO Standards		
Description	CO <sub>2</sub> Range (%)	Max. CO Level (ppm)
Natural Gas		
High Fire	9.1% to 9.3%	< 200 ppm
Low Fire	9.1% to 9.3%	< 60 ppm
Propane Gas		
High Fire	10.1% to 10.5%	< 200 ppm
Low Fire	10.1% to 10.5%	< 60 ppm

### 3.6 T&P requirements

The unit does not ship with a T&P (temperature and pressure relief valve). The customer selects and supplies a suitable T&P based on their specific application. Please consider the following while choosing an appropriate T&P..

1. T&P should be made of a suitable grade of stainless steel according to the specific application.
2. A Brass T&P is not recommended as it may contaminate and/or degrade when it interacts with deionized or pool water..
3. Follow the manufacturer's guidelines and inspect the T&P regularly to ensure proper operation (please refer to section 14.3)

3.7 Dimensional Specifications



## 4. Preparation Before Installation

### 4.1 Selecting an Indoor Installation Site

**Note:** When installing the water heater, follow all local building codes and the current edition of the National Fuel Gas Code (ANSI Z223.1/NFPA 54) in the USA, or National Gas and Propane Installation Code (CAN/CGA B149.1) in Canada when installing this product.

**Note:** For water heater installations in Massachusetts, refer to section “17. Requirements for State of Massachusetts” on page 64.

1. Select an interior location for the installation. Each installation is unique; therefore, take the time to find the best location for the water heater.
  - a. Install the water heater near locations that use hot water, such as bathroom, kitchen, or laundry room faucets.
  - b. Select a location that minimizes the length of the water pipe.
  - c. If the distances are long or if the faucet or appliance requires “instant” hot water, we recommend running a recirculation pipe back to the water heater from the farthest fixture.
  - d. Insulate the hot water supply and recirculation pipes.
  - e. Select a location away from foot traffic and away from areas where dust, debris, chemical agents, or other combustible materials could accumulate.
  - f. Allow sufficient space for service and maintenance access to all gas, water, and drain connections. Refer to “3.3 Clearance Requirements” on page 9.
  - g. Make sure the location meets all building code requirements.
2. Minimize the distance that the exhaust gas outlet and air intake inlet must travel to an exterior wall.
  - a. The exhaust gas outlet must not be located next to a walkway, near soffit vents, crawl space vents, or other areas where condensate (water vapor) could cause damage or create a hazard. Refer to “7.7 Venting Clearance Specifications” on page 26 for additional information.
  - b. The air intake inlet vent must be separated from the exhaust gas outlet per guidelines in section “7. Air Intake Inlet and Exhaust Gas Outlet Pipe Connections” on page 19.
  - c. Contaminated or dirty air drawn into the intake pipe can damage the water heater. The warranty does not cover damage caused by airborne contaminants.

3. Locate the unit close to a drain and near gas and water connections.

The water heater produces a significant amount of condensate during normal operation and should be located near a suitable drain where damage from a possible leak will be minimal. Installing the water heater in a location, without a drain, will void the warranty and the manufacturer will not be responsible for any resulting water damages that may occur. For additional information, refer to “8.4 Condensate Drain Line” on page 30.

4. Locate the water heater and all the water pipes in an area where the ambient temperature always remains above freezing.
  - a. When the water heater is connected to an electrical power supply, it will automatically prevent the water from freezing inside the unit.
  - b. The unit’s freeze protection system will not prevent the water in the surrounding pipes from freezing.

### NOTICE

*In cold climates, if there is a power failure, the unit’s freeze protection system will not operate and can result in water freezing inside the heat engine. To prevent damage to the water heater, turn OFF the gas supply and inlet water valve. Drain the unit completely as per “14.1 Draining the Water Heater” on page 50. Damage caused by freezing water is not covered by the warranty.*

5. Select an appropriate location for the intake air inlet and exhaust gas outlet pipes to exit the building, as shown in “7.7 Venting Clearance Specifications” on page 26.
6. Check the water quality.
  - a. Proper operation of the water heater requires that the water meets EPA quality standards. The table in section “18. Warranty” on page 65 shows the maximum contaminant levels allowed, based on the EPA National Secondary Drinking Water Regulations (40 CFR Part 143.3).
  - b. If contaminated water is suspected, discontinue use of the water heater and contact an authorized technician or licensed professional.
  - c. If the incoming water is known to have a high mineral content or “hardness” (see “18. Warranty” on page 65), treatment is recommended upstream from the water heater.

## 4.2 Selecting an Outdoor Installation Site

**Note:** When installing the water heater, follow all local building codes and the current edition of the National Fuel Gas Code (ANSI Z223.1/NFPA 54) in the USA, or National Gas and Propane Installation Code (CAN/CGA B149.1) in Canada when installing this product.

**Note:** For water heater installations in Massachusetts, refer to section “17. Requirements for State of Massachusetts” on page 64.

1. Select a location for the installation. Each installation is unique; therefore, take the time to find the best location for the water heater.
  - a. Install the water heater near locations that use hot water, such as bathroom, kitchen, or laundry room faucets.
  - b. Select a location that minimizes the length of the water pipe.
  - c. If the distances are long or if the faucet or appliance requires “instant” hot water, we recommend running a recirculation pipe back to the water heater from the farthest fixture.
  - d. Insulate the hot and cold water supply and recirculation pipes to prevent freezing or burns due to hot surfaces.
  - e. Select a location away from foot traffic and away from areas where dust, debris, chemical agents, or other combustible materials could accumulate.
  - f. Allow sufficient space for service and maintenance access to all gas, water, and drain connections. Refer to “3.3 Clearance Requirements” on page 9.
  - g. Make sure the location meets all building code requirements.
  - h. Contaminated or dirty air drawn into the intake pipe can damage the water heater. The warranty does not cover damage caused by airborne contaminants.
  - i. Ensure that the air intake is free (and remains free) from grass clippings, wood chips, landscaping, and other debris. The exhaust gas outlet must be above the minimum code height of the defined snow line for the surrounding area.
  - j. Install Intellihot outdoor kit IGT-SPR0063. For installation instructions and details, see manual IGT-MNL0019

2. Locate the unit close to a drain and near gas and water connections.

The water heater produces a significant amount of condensate during normal operation and should be located near a suitable drain where damage from a possible leak will be minimal. If installing on a roof, installing the water heater in a location, without a drain, will void the warranty and the manufacturer will not be responsible for any resulting water damages that may occur. For additional information, refer to “8.4 Condensate Drain Line” on page 30.

3. Locate the water heater and all the water pipes in an area where they can be properly insulated.
  - a. When the water heater is connected to an electrical power supply, it will automatically prevent the water from freezing inside the unit.
  - b. The unit’s freeze protection system will not prevent the water in surrounding pipes from freezing.

### NOTICE

*If there is a power failure, the unit’s freeze protection system will not operate and can result in water freezing inside the heat engine. To prevent damage to the water heater, turn OFF the gas supply and inlet water valve. Completely drain the unit as per “14.1 Draining the Water Heater” on page 50. Damage caused by freezing water is not covered by the warranty.*

## 5. Wall Mounting

### 5.1 Mounting the Unit to the Wall

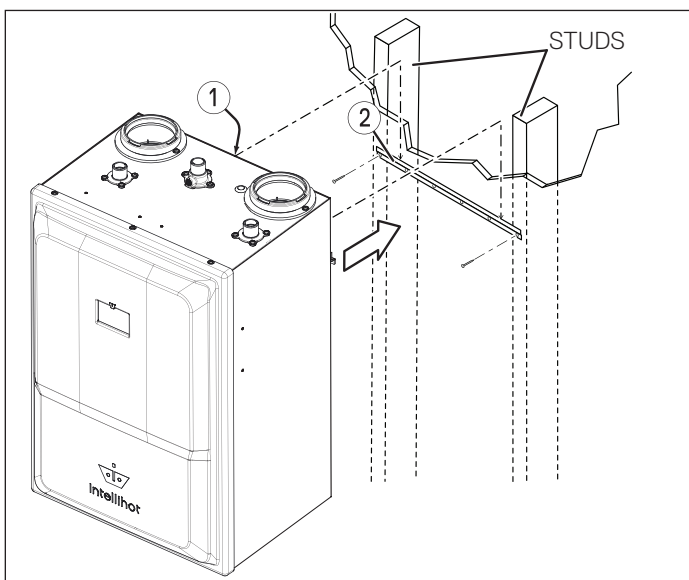
All water heaters come with an upper mounting bracket with predrilled holes spaced on 16 inch centers to facilitate easy installation on standard wall studs.

If the strength of the wall is insufficient or if the framing is nonstandard or uneven, reinforce the area using a sheet of plywood before installing the water heater.

Avoid installation on inside walls that can transmit operational noises to occupants while the unit is operating.

To mount the water heater to the wall:

1. Place the upper mounting bracket on the wall and ensure that it is level. Use two appropriately sized wood screws to mount the bracket securely to the studs. Ensure that it is affixed securely and can support the weight of the 90 pound unit.



#### SAFETY INSTRUCTIONS

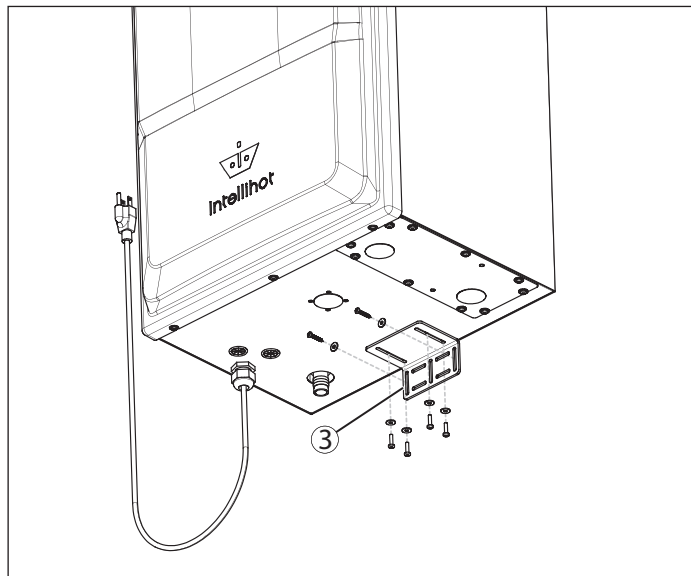
Only the brackets included with the water heater should be used to mount the unit. Water heaters weigh approximately 90 lbs. and must be securely attached to the wall.

### ⚠ CAUTION



According to the National Institute for Occupational Safety and Health, the recommended maximum safe lifting weight is 51 lbs., with all lifting conditions perfect; minimal forward reach, steady load close to the body, straight back, load between knees and shoulders, and good grips. To avoid personal injury, always use these proper lifting techniques and use two people to move the water heater, which weighs 90 lbs.

2. With assistance, hang the unit's interlocking bracket (1) onto wall bracket (2).
3. Loosen the four mounting screws in the lower bracket, and slide it against the wall to create a 5/8" air space.



4. Retighten the four mounting screws and install two appropriately sized wood screws in lower bracket (3) to secure the unit to the wall.
5. Make sure the unit is plumb and level, and tighten the four sheet metal screws on bottom bracket (3). When properly installed, there should be a 5/8" air space between the back of the water heater and the wall.



## 6. Gas Connection

### **WARNING**

#### **FIRE AND/OR EXPLOSION HAZARD**

To avoid serious injury or even death, the gas pipe installation and the gas pipe inlet pressure test must be done by a licensed professional.

Always match the water heater with the type of gas supplied to the unit (natural gas or propane). The water heater is factory preset for natural gas.

Make sure the gas pipe pressures are within normal limits. Pressures outside normal limits can result in poor performance and hazardous operating conditions.

### 6.1 Quick Reference Installation Instructions

1. Determine fuel source; natural gas or propane, as shown in “6.2 Fuel Source” on page 15.
2. Measure gas pressure, as shown in “6.3 Gas Pressure Requirements” on page 15.
3. Install a gas pressure regulator and vent pipe if gas pressure is above maximum recommendations, as shown in “6.4 Gas Pressure Regulator” on page 15.
4. Measure the length of the supply pipe, as shown in “6.5 Length of Gas Supply Pipe” on page 15”.
5. Select the proper gas piping material, as shown in “6.5 Length of Gas Supply Pipe” on page 15.
6. Select the proper gas piping diameter, as shown in “6.7 Determine Correct Gas Pipe Diameter” on page 16.
7. Install a drip leg on the gas pipe, as shown in “6.8 Gas Pipe Drip Leg and Shut-off Valve” on page 16.
8. Install a manual shut-off valve, as shown in “6.8 Gas Pipe Drip Leg and Shut-off Valve” on page 16.
9. Test all gas pipe connections for leaks.

### **NOTICE**

*Do not fire (operate) the water heater until all connections have been completed and the heat engine is filled with water.*

### 6.2 Fuel Source

1. Natural gas is the factory preset.
2. To convert the unit to propane, refer to “11. Natural Gas to Propane Conversion” on page 38.

### 6.3 Gas Pressure Requirements

iQ series water heaters are designed to operate at gas pressures as low as 2.5” W.C. (at maximum firing rate). Gas inlet pressures to the unit should not exceed 14” W.C. under any condition (when unit is firing or not firing).

Natural Gas Static Gas Pressure	
Parameters	Specifications
Minimum Static Gas Pressure 1/2” (black iron pipe)	6” W.C.
Minimum Static Gas Pressure 3/4” (black iron pipe)	2.5” W.C.
Recommended Gas Pressure	8” W.C.
Maximum Static Gas Pressure	14” W.C.

### 6.4 Gas Pressure Regulator

1. If the gas inlet pressure is higher than recommended, install a gas pressure regulator to lower gas pressure to an acceptable level.
2. The gas pressure regulator must have the same or higher minimum to maximum modulation range as the iQ model it is regulating. For example, an iQ251D gas pressure regulator should have a modulation range of 30,000 BTU/h to 251,000 BTU/h.
3. When multiple units are connected, use a dedicated gas pressure regulator for each unit.
4. Regulators should be mounted with a minimum of 12” of straight length pipe on either side.

#### 6.4.1 Venting of Gas Supply Regulators

Make sure the gas supply regulator is properly vented by following all local codes and the gas regulator manufacturer’s recommendations.

1. The vent pipe must be at least the same size as the regulator vent.
2. When multiple units are connected, each regulator must have a separate vent pipe.
3. Vent pipes must not be connected together or connected with any other appliance requiring external venting.
4. When selecting the size, the pipe diameter must be increased by one size for every 20 feet of pipe.
  - a. Each 90° elbow is equivalent to approximately:  
4.5 feet for nominal pipe sizes of up to 1-1/2”  
10.5 feet for nominal pipe sizes of up to 4”.
  - b. Each 45° elbow is equivalent to approximately:  
2 feet for nominal pipe sizes of up to 1-1/2”  
5 feet for nominal pipe sizes of up to 4”.

### 6.5 Length of Gas Supply Pipe

1. Make sure the length of the supply pipe does not exceed the maximum recommended length as per “6.9 Gas Pipe Sizing Tables” on page 16.
  - a. Measure the straight length of the gas supply pipe from the gas meter to the water heater or other appliances requiring gas. Include the additional length for any elbows into the calculation. The diameter of the pipe must be in relation to the length.



- The total straight length of gas pipe, as well as the additional length for any elbows, must be considered when sizing the gas pipe. Total equivalent length should be calculated from the meter or source location to the last connected water heater.
- Gas pipe size should be selected on the total equivalent length. The gas volume for cubic feet per hour (CFH) flow will be the input divided by the calorific value of the fuel to be supplied.
- Use "6.9 Gas Pipe Sizing Tables" on page 16 or refer to the gas pipe manufacturers sizing information to determine the correct diameter for the supply pipe.
- The diameter of the gas pipe will vary according to the specific installation requirements.

## 6.6 Gas Piping Material

- All gas pipe and components must comply with NFPA local codes and utility requirements minimum. Only gas approved fittings, valves, or pipe should be used.
- Standard industry practice for gas pipe is Schedule 40 iron pipe and fittings. All high and low gas pressure piping systems must comply with local utility and building codes.
- Assembled pipe should be clean of all scale, debris, metal particles, or foreign material.
- The piping must be supported from the floor, ceiling, or walls and not by the water heater itself.

## 6.7 Determine Correct Gas Pipe Diameter

**Note:** The water heater should be the first appliance to be connected to the gas supply pipe.

- Determine the gas requirement of the water heater(s) and other appliances requiring gas.
- Size the pipe diameter according to the COMBINED total maximum BTUH volume for all the appliances as if they were all operating at the same time. Use "6.9 Gas Pipe Sizing Tables" on page 16.
- Select the proper header pipe according to the number of units being connected together, as shown in the chart.

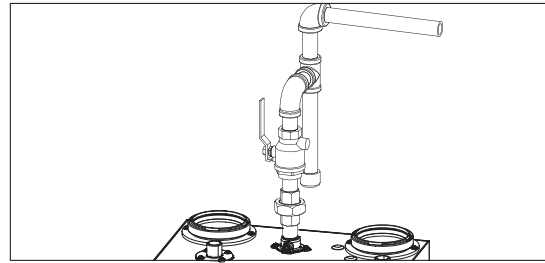
Header Sizing for Multiple iQ Units				
Number of Heaters	1	2	3	4
Sch 40 Iron Pipe	2"	2"	3"	3"

- The maximum pressure drop from the source to the final water heater must not exceed 0.3" W.C.
- 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 for natural gas or 2,520 BTU per cubic foot for propane).

**Note:** 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.

## 6.8 Gas Pipe Drip Leg and Shut-off Valve

- Install a shut-off valve. Local codes may require multiple units to have a shut-off valve on the main gas supply pipe and one on each unit.
- Install a gas pipe drip leg on each water heater to prevent dirt, condensation, or debris from entering the gas inlet.

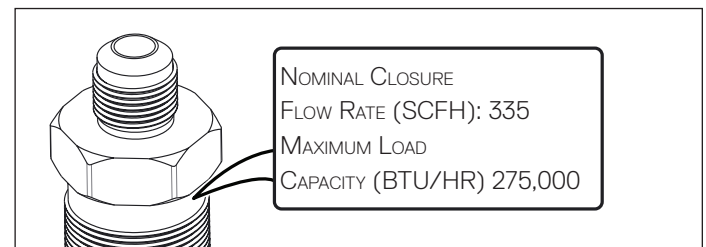


- Local codes may require multiple units to have a full size drip leg on the main gas supply pipe and one on each unit.
- The drip leg should have a removable clean-out cap.
- The gas pipe must not be supported by the water heater or the drip leg.

## ⚠ DANGER

The drip leg is required to protect the gas valve from debris and metal shavings. If the local plumbing code does not allow drip leg, an alternative mechanism such as filter shall be installed to protect the gas valve. The warranty does not cover if the gas valve is stuck open due to missing drip leg (or not including alternative method).

- If an excess flow valve (EFV) is installed in the gas pipe, check the manufacturer's minimum and maximum flow capacity rating. An improperly sized EFV will not allow the full flow of gas to the water heater and will cause the unit to malfunction.



- Continue installing pipe to reach the main gas supply connection.
- Test all gas pipe connections.
  - All the gas pipe connections should be tested as prescribed in NFPA 54.
  - In multiple unit applications, each unit should be isolated before testing any piping system that may exceed the allowable pressure of 14.0" W.C.

## NOTICE

*Do not fire (operate) the water heater until all connections have been completed and the heat engine is filled with water.*

## 6.9 Gas Pipe Sizing Tables

This information is for reference only. Refer to gas pipe manufacturer specifications for actual delivery capacity. Contact the local gas supplier for actual BTU/ft<sup>3</sup> rating. This data has been copied from the National Fire Protection Association Article 54 (NFPA 54).

Pipe Sizes and BTU/h Capacity (NATURAL GAS). Use this table for static gas pressure LESS THAN 5" W.C.								
Length including fittings (feet)	3/4"	1"	1-1/4"	1-1/2"	2"	2-1/2"	3"	4"
10	360,000	678,000	1,390,000	2,090,000	4,020,000	6,400,000	11,300,000	23,100,000
20	247,000	466,000	957,000	1,430,000	2,760,000	4,400,000	7,780,000	15,900,000
30	199,000	374,000	768,000	1,150,000	2,220,000	3,530,000	6,250,000	12,700,000
40	-	320,000	657,000	985,000	1,900,000	3,020,000	5,350,000	10,900,000
50	-	284,000	583,000	873,000	1,680,000	2,680,000	4,740,000	9,660,000
60	-	257,000	528,000	791,000	1,520,000	2,430,000	4,290,000	8,760,000
70	-	237,000	486,000	728,000	1,400,000	2,230,000	3,950,000	8,050,000
80	-	220,000	452,000	677,000	1,300,000	2,080,000	3,670,000	7,490,000
90	-	207,000	424,000	635,000	1,220,000	1,950,000	3,450,000	7,030,000
100	-	-	400,000	600,000	1,160,000	1,840,000	3,260,000	6,640,000
125	-	-	355,000	532,000	1,020,000	1,630,000	2,890,000	5,890,000
150	-	-	322,000	482,000	928,000	1,480,000	2,610,000	5,330,000
175	-	-	296,000	443,000	854,000	1,360,000	2,410,000	4,910,000
200	-	-	275,000	412,000	794,000	1,270,000	2,240,000	4,560,000
Note: BTU/h capacities are based on specific gravity of 0.6, pressure drop of 0.5" W.C.								

Pipe Sizes and BTU/h Capacity (NATURAL GAS). Use this table for static gas pressure GREATER THAN 5" W.C.									
Length including fittings (feet)	1/2"	3/4"	1"	1-1/4"	1-1/2"	2"	2-1/2"	3"	4"
10	404,000	949,000	1,787,000	3,669,000	5,497,000	10,588,000	16,875,000	29,832,000	43,678,000
20	286,000	652,000	1,228,000	2,522,000	3,778,000	7,277,000	11,598,000	20,503,000	30,020,000
30	233,000	524,000	986,000	2,025,000	3,034,000	5,844,000	9,314,000	16,465,000	24,107,000
40	202,000	448,000	844,000	1,733,000	2,597,000	5,001,000	7,971,000	14,092,000	20,632,000
50	-	397,000	748,000	1,536,000	2,302,000	4,433,000	7,065,000	12,489,000	18,286,000
60	-	360,000	678,000	1,392,000	2,085,000	4,016,000	6,401,000	11,316,000	16,569,000
70	-	331,000	624,000	1,280,000	1,919,000	3,695,000	5,889,000	10,411,000	15,243,000
80	-	308,000	580,000	1,191,000	1,785,000	3,437,000	5,479,000	9,685,000	14,181,000
90	-	289,000	544,000	1,118,000	1,675,000	3,225,000	5,140,000	9,087,000	13,305,000
100	-	273,000	514,000	1,056,000	1,582,000	3,046,000	4,856,000	8,584,000	12,568,000
125	-	242,000	456,000	936,000	1,402,000	2,700,000	4,303,000	7,608,000	11,139,000
150	-	219,000	413,000	848,000	1,270,000	2,446,000	3,899,000	6,893,000	10,093,000
175	-	202,000	380,000	780,000	1,169,000	2,251,000	3,587,000	6,342,000	9,285,000
200	-	-	353,000	726,000	1,087,000	2,094,000	3,337,000	5,900,000	8,638,000
Note: For 1/2" pipe BTU/h capacities are based on specific gravity of 0.6, pressure drop of 4.6" W.C. For all other pipe sizes, capacities are based on specific gravity of 0.6, pressure drop of 3.0" W.C.									

Pipe sizes and BTU/h capacity (PROPANE). Use this table for static gas pressure GREATER THAN 5" W.C.									
Length including fittings (feet)	1/2"	3/4"	1"	1-1/4"	1-1/2"	2"	2-1/2"	3"	4"
10	409,000	608,000	1,150,000	2,350,000	3,520,000	6,790,000	10,800,000	19,100,000	39,000,000
20	289,000	418,000	787,000	1,620,000	2,420,000	4,660,000	7,430,000	13,100,000	26,800,000
30	236,000	336,000	632,000	1,300,000	1,940,000	3,750,000	5,970,000	10,600,000	21,500,000
40	204,000	287,000	541,000	1,110,000	1,660,000	3,210,000	5,110,000	9,030,000	18,400,000
50	-	255,000	480,000	985,000	1,480,000	2,840,000	4,530,000	8,000,000	16,300,000
60	-	231,000	434,000	892,000	1,340,000	2,570,000	4,100,000	7,250,000	14,800,000
80	-	212,000	400,000	821,000	1,230,000	2,370,000	3,770,000	6,670,000	13,600,000
100	-	-	372,000	763,000	1,140,000	2,200,000	3,510,000	6,210,000	12,700,000
125	-	-	349,000	716,000	1,070,000	2,070,000	3,290,000	5,820,000	11,900,000
150	-	-	330,000	677,000	1,010,000	1,950,000	3,110,000	5,500,000	11,200,000
175	-	-	292,000	600,000	899,000	1,730,000	2,760,000	4,880,000	9,950,000
200	-	-	265,000	543,000	814,000	1,570,000	2,500,000	4,420,000	9,010,000
Note: The pipe BTU/h capacities are based on specific gravity of 1.5, pressure drop of 0.5" W.C.									

## 7. Air Intake Inlet and Exhaust Gas Outlet Pipe Connections

### **DANGER**



**Improper venting of the water heater will result in excessive levels of carbon monoxide, which can lead to severe personal injury or death. This water heater must be vented in accordance with the “Venting of Equipment” section of the latest edition of the ANSI Z223.1 / NFPA 54 (Natural Fuel Gas Code) in the USA, or in Canada refer to the “Venting Systems and Air Supply for Appliances” section in the latest version of CAN/CGA B149.1 (Natural Gas and Propane Installation Code), and all applicable local building codes. The installation of the exhaust gas outlet pipe should be performed only by a licensed professional.**

### **WARNING**



#### **BREATHING HAZARD CARBON MONOXIDE GAS**

- Do not operate flood damaged water heaters.
- Install venting system according to the required codes and material manufacturers specifications.
- Do not obstruct fresh air intakes or exhaust outlets. Adequately support all vent system piping.
- Do not place vapor emitting products near water heater or air intake.
- Place working carbon monoxide detectors outside each sleeping area.
- Do not operate the water heater before properly installing the exhaust outlet.
- Visually inspect the vent system and eliminate any possible area where condensation could create a blockage of intake or exhaust air.

Breathing concentrated levels of carbon monoxide, even for a short period of time, will cause brain damage and can even lead to death.

**Note:** This water heater falls into the Category IV appliance.

### 7.1 Quick Reference Installation Guide

1. Select the desired type of venting system: Two Pipe Vent System (Direct) or Single Pipe Vent System (Power).

“7.3 Two Pipe Vent System (Direct Vent)” on page 20.

“7.4 Single Pipe Venting System (Power Vent)” on page 22.

2. Select the desired termination of the air intake inlet and exhaust gas outlet pipe; outside wall or roof.

“7.3.3 Side Wall Air Intake Inlet and Exhaust Gas Outlet Pipe Termination” on page 21.

“7.3.4 Roof Air Intake Inlet and Exhaust Gas Outlet Pipe Termination” on page 22.

3. Determine the straight pipe distance and the number of elbows required to route the air intake inlet and exhaust gas outlet pipes to their termination point.  
“7.6 Intake Air Inlet and Exhaust Gas Outlet Pipe Diameter and Length” on page 25.
4. Determine the diameter of pipe required to properly bring in intake air and vent exhaust gas.  
“7.6 Intake Air Inlet and Exhaust Gas Outlet Pipe Diameter and Length” on page 25.
5. Verify the location of the air intake inlet and exhaust gas outlet terminations are within state and local codes.  
“7.7 Venting Clearance Specifications” on page 26.
6. Select an approved material for the air intake inlet pipe as per “7.9 Air Intake Inlet Pipe Vent Materials” on page 27.
7. Select an approved material for the exhaust gas outlet pipe as per “7.8 Exhaust Gas Outlet Pipe Materials” on page 27.

### 7.2 Typical Single Unit Air Intake Inlet and Exhaust Gas Outlet Pipe Installation

1. Select one of the two venting configurations: two pipes (direct vent) configuration or with one pipe (power vent) configuration.
2. Select the desired termination location and make sure each pipe terminates within all local and state codes.
3. Select the desired material for the air intake inlet and exhaust gas outlet pipes.

### **CAUTION**



This water heater has a factory preset control to limit the exhaust gas temperature to 149°F (65°C) when PVC is selected in the “Flue Type” programming section. As a result, the water heater can be vented with Schedule 40 PVC. If the incoming (or recirculation return) water temperature does not exceed 150°F (66°C), the exhaust gas temperature will not exceed 149°F (65°C).

### **WARNING**

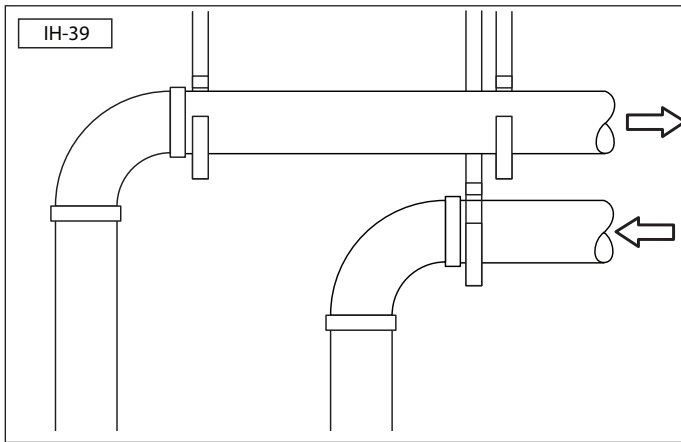
**When the unit is set for CPVC (polypropylene pipe), flue temperatures can reach 190°F (88°C). PVC pipe will melt at temperatures above 149°F (65°C) and could, therefore, result in a fire. Make sure the setting and the type of material (“7.8 Exhaust Gas Outlet Pipe Materials” on page 27) being used for the flue are compatible.**

**For this application use Schedule 80 CPVC or Approved Polypropylene in the USA or Type BH Special Gas Vent Class IIB (CPCV) or Class IC (Polypropylene) that conforms to ULC-S636 in Canada. Also refer to “7.8 Exhaust Gas Outlet Pipe Materials” on page 27.**

**SAFETY  
INSTRUCTIONS**

On multiple unit installations, the air intake inlet and exhaust gas outlet pipe from each water heater must be connected into the properly-sized common piping. Use the table in “7.6 Intake Air Inlet and Exhaust Gas Outlet Pipe Diameter and Length” on page 25 to determine the diameter of the common connecting piping between each individual water heater.

4. Determine the length and corresponding diameter for the air inlet pipe and route the pipe to the desired termination location.
  - a. For termination of the pipe to the outside, continue installing the required pipe to a suitable outside location. Glue all connections, making sure the joints are sealed airtight.
  - b. Install suitable pipe support hangers every four to five feet, or as local building codes require.



5. Determine the length and corresponding diameter for the exhaust gas outlet pipe and route it to a suitable outside location.
  - a. Glue all connections, making sure the joints are sealed airtight.
  - b. Install all horizontal exhaust gas outlet pipe with a minimum two degree ( $1/4$ " per foot) slope back toward the water heater. This allows any condensate that accumulates in the exhaust gas outlet pipe to properly drain back into the unit.
  - c. Install suitable pipe support hangers every four to five feet, or as local building codes require.

**SAFETY  
INSTRUCTIONS**

**Do not connect any other appliance vents to the water heater inlet or outlet pipes.**

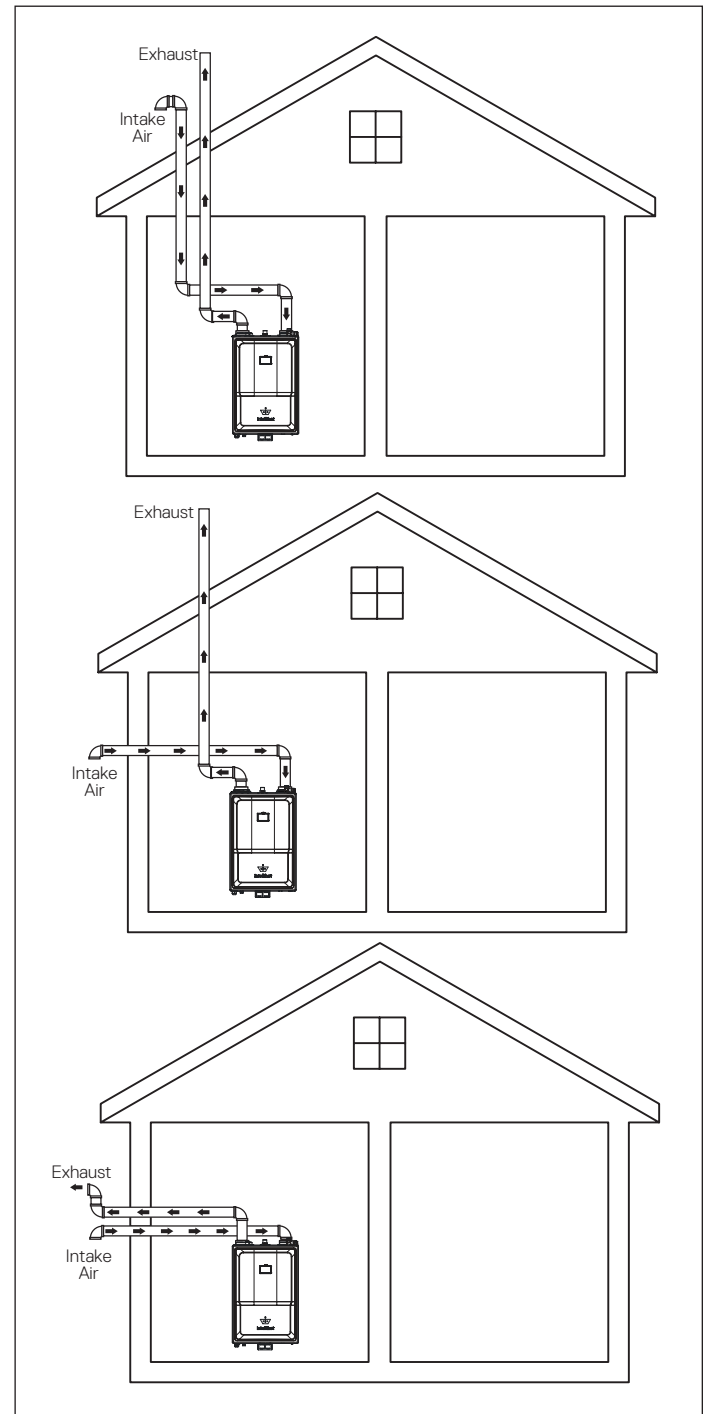
6. If multiple units are installed, make sure the diameter of the connecting exhaust gas outlet pipe is properly sized for the number of units being installed.

## 7.3 Two Pipe Vent System (Direct Vent)

### 7.3.1 Single Unit Configurations

The water heater can be directly vented without any modification using a three inch diameter pipe.

The following diagrams represent some typical direct venting configurations and are included to assist in designing the vent system. Possible configurations are not limited to the following diagrams.

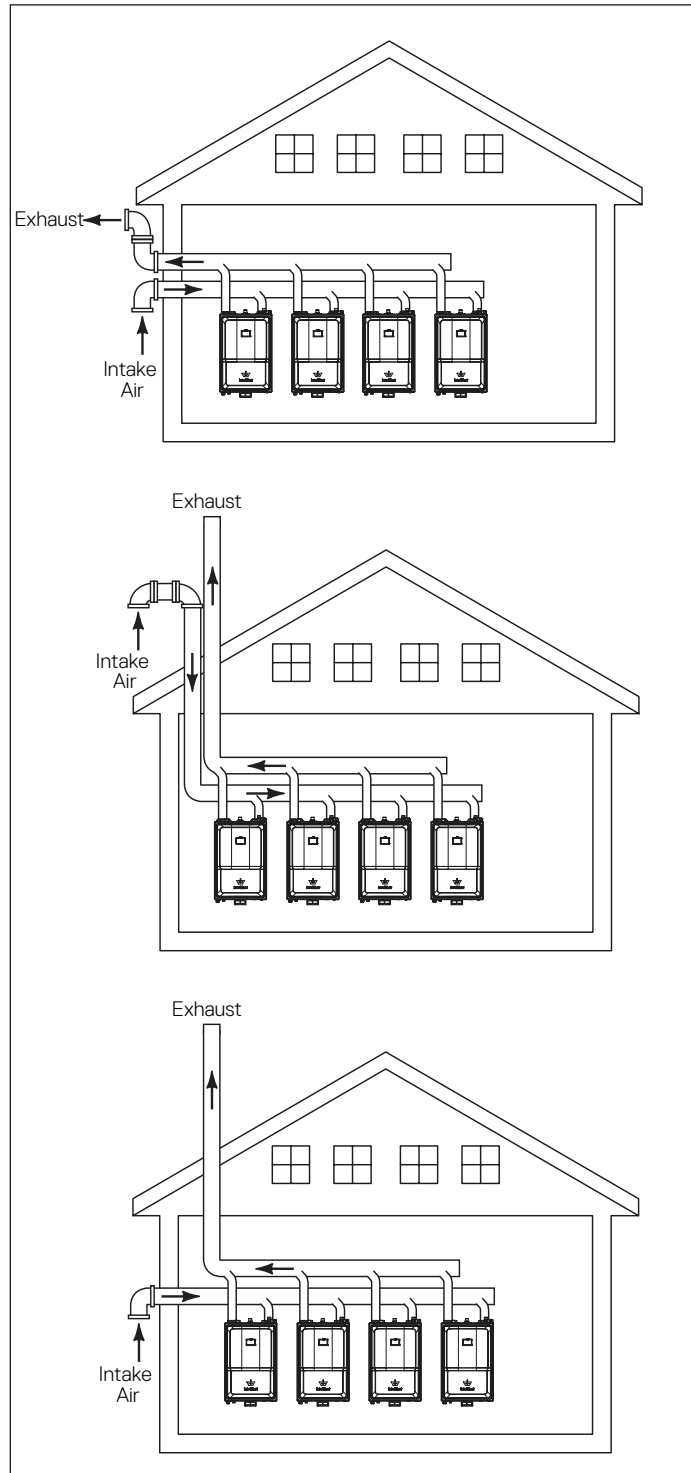


### 7.3.2 Multiple Units Configurations

When more than one unit is installed, refer to “7.6 Intake Air Inlet and Exhaust Gas Outlet Pipe Diameter and Length” on page 25.

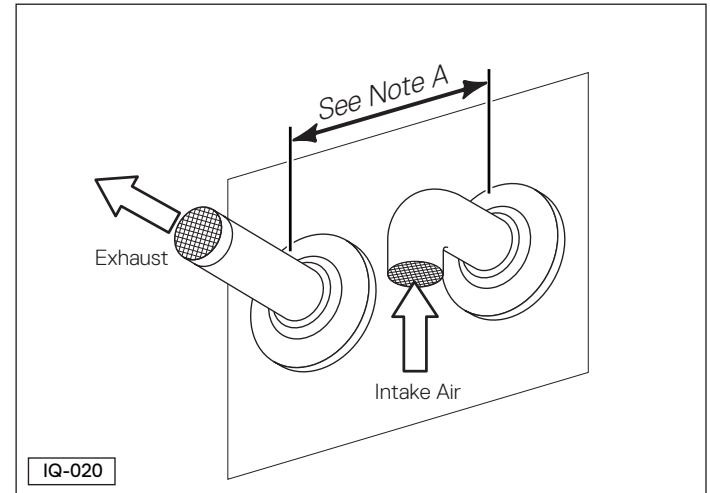
Connecting multiple units together requires proper sizing of the air intake inlet and exhaust gas outlet pipes. Up to ten water heaters can be connected (cascading) together. Units common vented must be cascaded together, refer to “13. Connecting Multiple Units”

The following diagrams represent some typical direct venting configurations and are included to assist in designing the vent system. Possible configurations are not limited to the following diagrams.

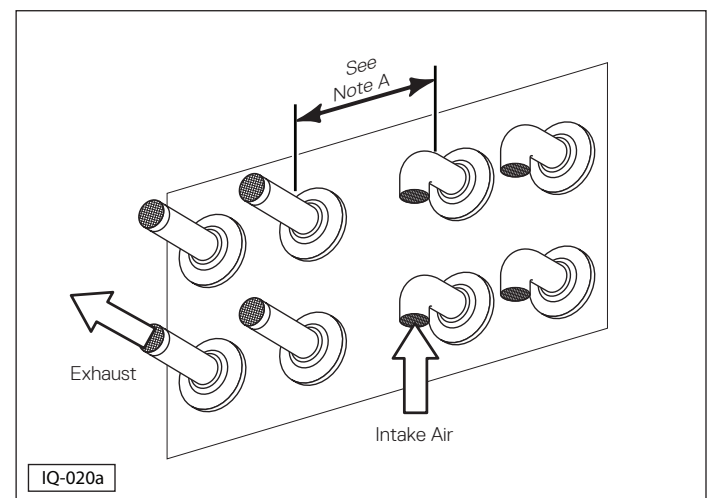


### 7.3.3 Side Wall Air Intake Inlet and Exhaust Gas Outlet Pipe Termination

1. Terminate the air intake inlet pipe with a 90° elbow (angled down). Use a flange and PVC screen (not supplied).
2. Terminate the exhaust gas outlet pipe on the exterior wall at least 12" above ground and at least 18" away from the air intake inlet pipe, or as required by local building codes. In areas of high snow fall, protect the vent terminations from blockage. Use a flange and PVC guard to seal the opening against weather infiltration.



Single unit.



Multiple units.

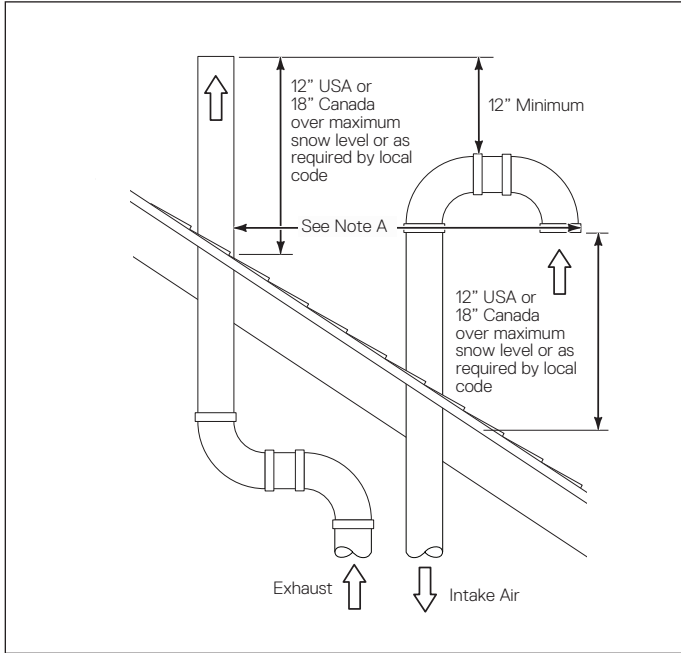
**Note A:** The distance between any exhaust gas outlet and air intake inlet pipe should be between 18 and 36 inches apart. If this minimum specification cannot be met, the air intake inlet and exhaust gas outlet pipes should be spaced 72 inches apart or farther.

3. To avoid moisture and frost build-up to openings on adjacent homes, use 45° elbows, 90° elbows, or tees for the exhaust gas outlet termination to direct the exhaust gas fumes away from the building.

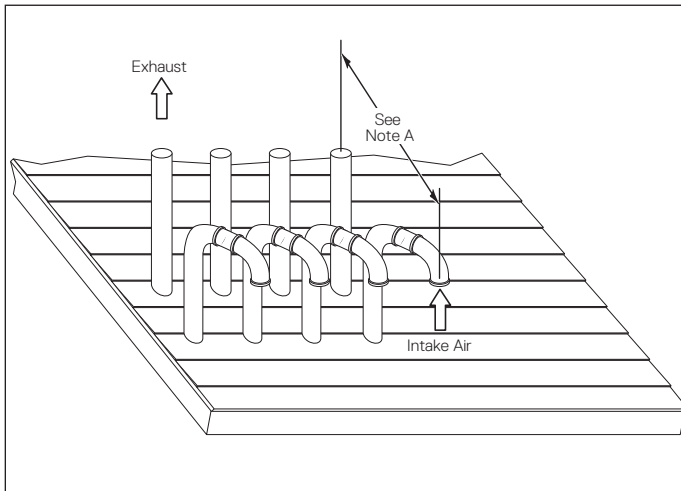
### 7.3.4 Roof Air Intake Inlet and Exhaust Gas Outlet Pipe Termination

Venting the unit through the roof is also an option. With this installation method, the terminations must extend at least 12" over maximum potential snow levels, or as required by local building codes. In areas of high snow fall, protect the vent terminations from blockage.

Terminate the air intake inlet pipe with two 90° elbows (angled down). A suitable roof flashing and vent cap (not supplied) should be installed.



Single unit.



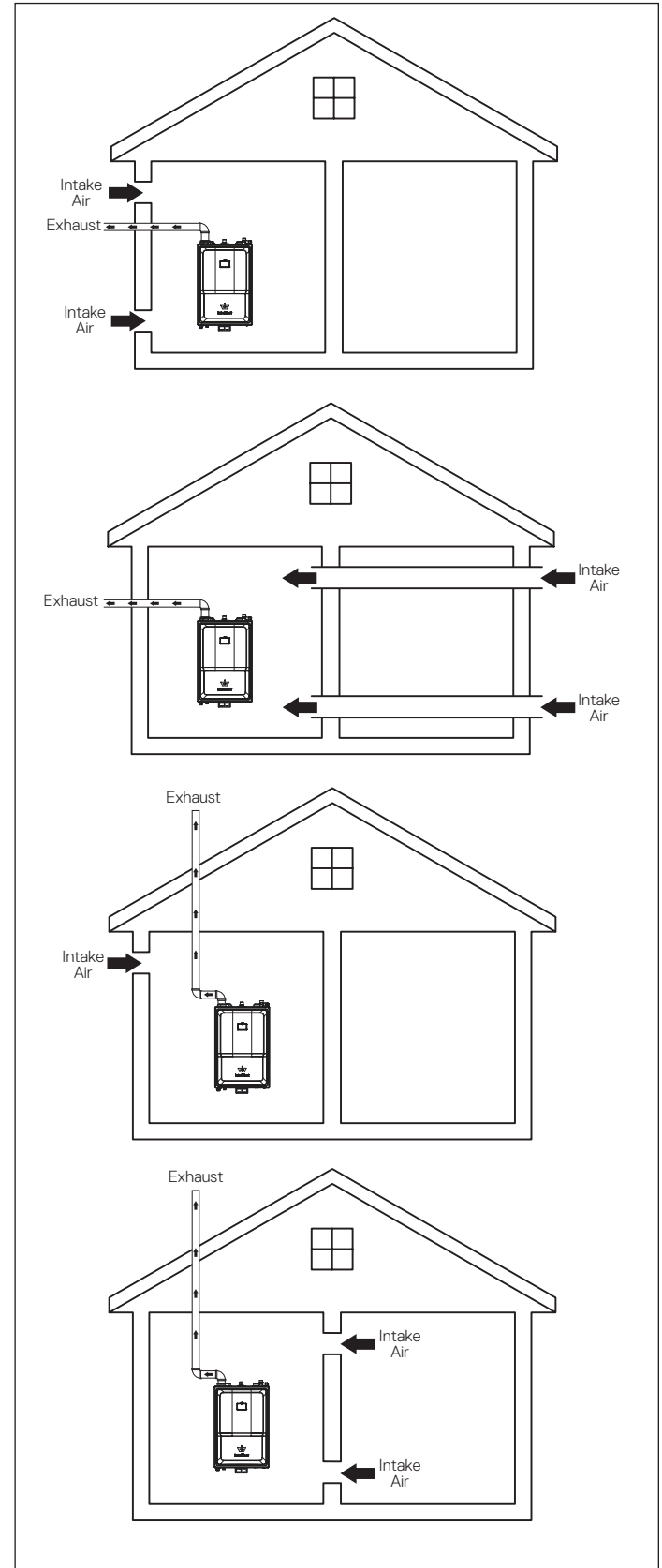
Multiple units.

**Note A:** The distance between any exhaust gas outlet and air intake inlet pipe should be between 18 and 36 inches apart. If this minimum specification cannot be met, the air intake inlet and exhaust gas outlet pipes should be spaced 72 inches apart or farther.

### 7.4 Single Pipe Venting System (Power Vent)

#### 7.4.1 Single Unit

The following illustrations represent some typical power venting configurations and are included to assist in designing the vent system. Possible configurations are not limited to these designs.

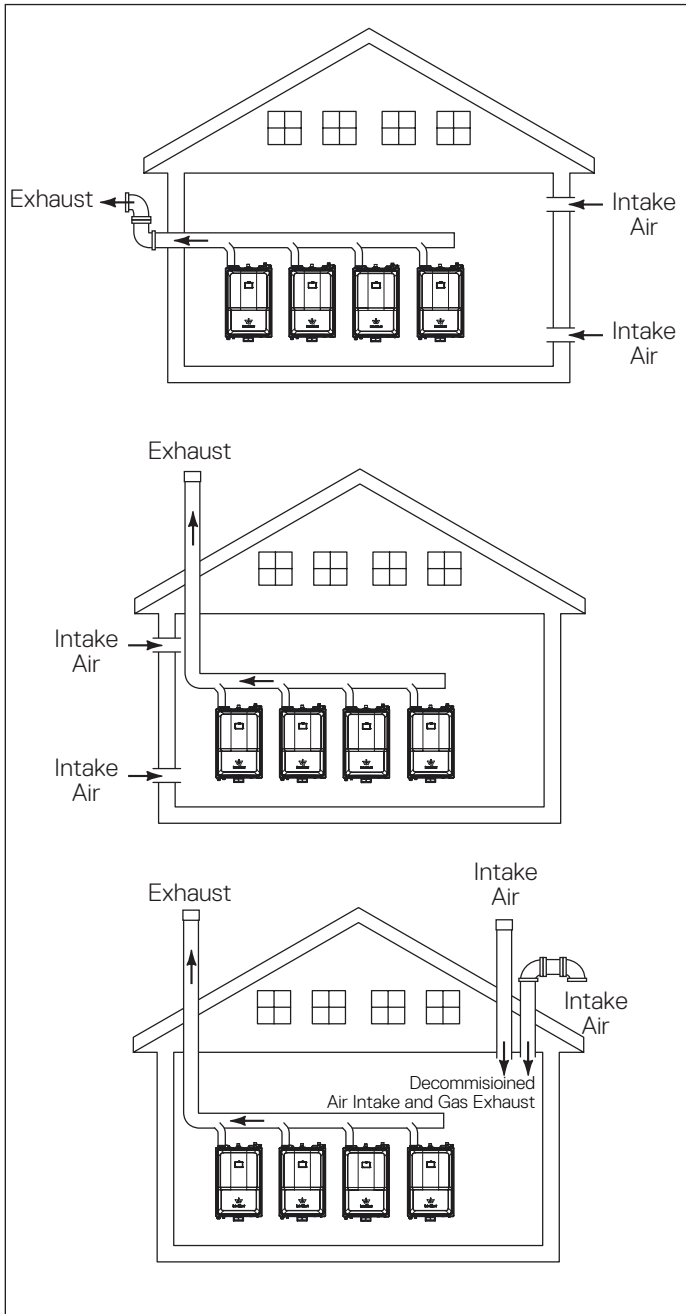




## 7.4.2 Multiple Units

When installing multiple units, refer to “7.6 Intake Air Inlet and Exhaust Gas Outlet Pipe Diameter and Length” on page 25.

Connecting multiple units together requires proper sizing of the air intake inlet and exhaust gas outlet pipes. Up to ten water heaters can be connected (cascaded) together. Units common vented must be cascaded together, refer to “13. Connecting Multiple Units”

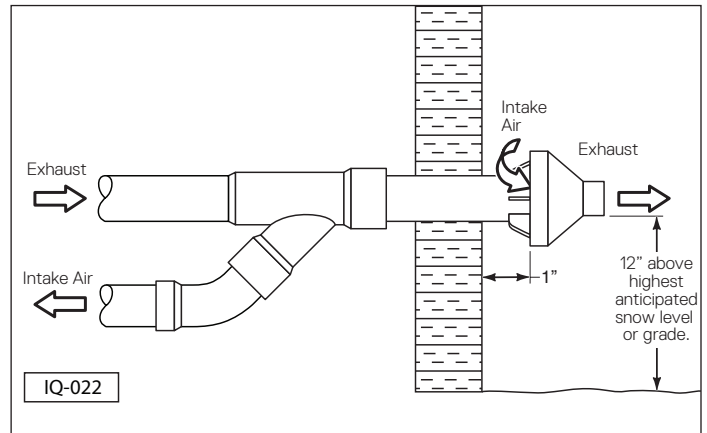


## 7.4.3 Concentric Venting Termination (Single Unit)

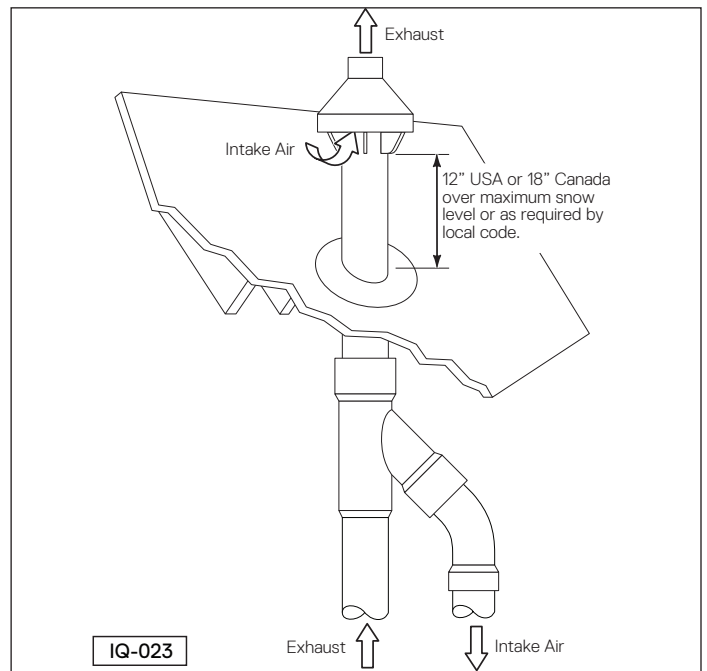
If desired, an optional concentric venting system, which uses one 5" opening through an exterior wall or roof, can be used, as opposed to cutting two 3" openings.

To avoid moisture and frost build-up to openings on adjacent homes, use a 45° elbow, a 90° elbow, or a tee for the vent termination to direct the exhaust gas fumes away from the building.

Follow all installation instructions included with the concentric vent kit when installing this type of vent system.



Concentric Venting System Through a Side Wall.

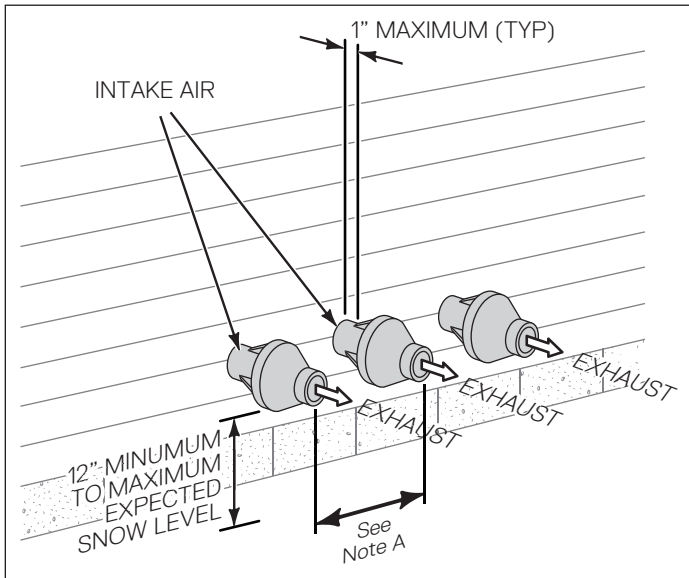


Concentric Venting System Through the Roof.

#### 7.4.4 Concentric Venting Termination (Multiple Units)

In order to conform to some national codes, when two or more water heaters are installed they must be individually vented. When two or more units are vented near each other, each vent termination must be installed, as shown, to avoid recirculation of flue gases. A minimum distance of 18 inches must be maintained between each vent termination.

Follow all installation instructions included with the concentric vent kit when installing this type of vent system.



Multiple Concentric Units.

**Note A:** The distance between any exhaust gas outlet and air intake inlet pipe should be between 18 and 36 inches apart. If this minimum specification cannot be met, the air intake inlet and exhaust gas outlet pipes should be 72 inches apart or more.

To avoid moisture and frost build-up to openings on adjacent homes, use a 45° elbow, a 90° elbow, or a tee for the vent termination to direct the exhaust gas fumes away from the building.

## 7.5 Intake Air Requirements

When using the single exhaust gas outlet pipe or power vent method, the following table outlines the required opening sizes for the intake air coming into the room and the required CFM requirements per water heater.

### SAFETY INSTRUCTIONS

**Do not operate the unit in an area that will draw in outside air contaminated with high levels of dust, sawdust, aerosols, such as paint, or other airborne contaminants.**

**If necessary, purchase and install appropriate air filters and follow a regular cleaning program to ensure an adequate supply of clean, outside intake air.**

Required Combustion and Ventilation Air Opening Sizes (sq. in) Per Heater Per Room					
Input BTU/hr	Air Type	Air is drawn directly from outside into the room			Example #4 Air is drawn from another interior space inside the building
		Example #1 through two openings*, direct or vertical	Example #2 through one opening**	Example #3 through two horizontal ducts	
251,000	Combustion Air	63	84	125	84
	Ventilation Air	63		125	84

\*Where two openings are used, one must be within 12" of the floor and the other opening must be within 12" of the ceiling.  
 \*\*Where one opening is used, it must be located within 12" of the ceiling.

## 7.6 Intake Air Inlet and Exhaust Gas Outlet Pipe Diameter and Length

The iQ251D comes factory installed with three inch polypropylene (PP) venting. The following chart outlines the maximum length of venting allowable for each model.

A vent system's length is calculated by adding the length of all straight runs used (both horizontal and vertical) and then adding the equivalent lengths of each turn (90° or 45° elbow) used in the system.

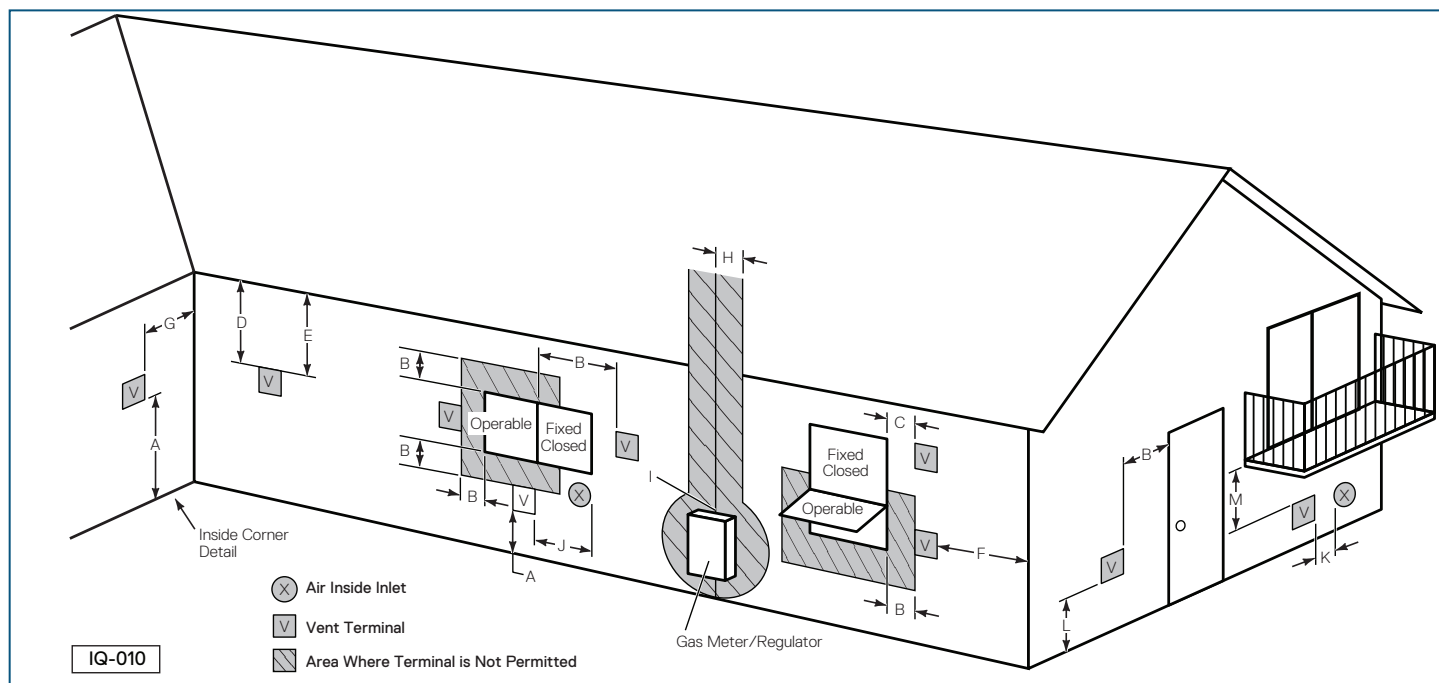
### SAFETY INSTRUCTIONS

**A vent system's length must not exceed the maximum length outlined in the chart below.**

Maximum Pipe Length in Feet					
Number of Units	Venting Type	Diameter, Model, and Length in Feet			
		3" Diameter	4" Diameter	6" Diameter	8" Diameter
		iQ251D	iQ251D	iQ251D	iQ251D
1	1 Pipe	130	200	200	200
	2 Pipes	65	100	100	100
2	1 Pipe		150	200	200
	2 Pipes		75	100	100
3	1 Pipe		70	200	200
	2 Pipes		35	100	100
4	1 Pipe			200	200
	2 Pipes			100	100
5	1 Pipe			200	200
	2 Pipes			100	100
6	1 Pipe			140	200
	2 Pipes			70	100
7	1 Pipe			100	200
	2 Pipes			50	100
8	1 Pipe			80	200
	2 Pipes			40	100
9	1 Pipe				200
	2 Pipes				100
10	1 Pipe				200
	2 Pipes				100

**PV** = Power Vent  
**DV** = Direct Vent  
**Note:**  
 1. Reduce the maximum equivalent length above by 5 feet per 90° elbow used and by 2 feet per 45° elbow used. Do not exceed the above set limits.  
 2. For Direct Vent (DV), the above table shows the maximum length for both the air intake and exhaust.

## 7.7 Venting Clearance Specifications



Venting Clearance Specifications			
Item	Description	Clearance Distance	
		USA <sup>1</sup>	Canada <sup>2</sup>
A	Clearances above grade, veranda, porch, deck, or balcony	1 foot	1 foot
B	Clearances to window or door that may be opened	1 foot**	3 feet
C	Clearances to permanently closed window	*	*
D	Vertical clearance to a ventilated soffit, eaves, or overhang	*	*
E	Clearances to unventilated soffit, eaves, or overhang	*	*
F	Clearances to outside corner	*	*
G	Clearances to inside corner	*	*
H	Clearances to each side of centerline extended from meter/regulator	*	3 feet within a height 15 feet above meter or regulator assembly
I	Clearances to gas meter regulator vent outlet	*	3 feet
J	Clearances to nonmechanical air intake inlet to any other appliance	1 foot**	3 feet
K	Clearances to mechanical air supply inlet	3 feet above if within 10 feet horizontally	6 feet
L	Clearances above paved sidewalk or paved driveway on public property	*	7 feet
M	Clearances under veranda, porch, deck, or balcony	*	1 foot
<p>*Per local/gas supplier codes. Use clearances in accordance with local building codes and local gas supplier.</p> <p>** For single vent pipe (power vent) allow four feet (1.2 m) below or to the side of opening and one foot above opening.</p> <p><sup>1</sup> In accordance with Z223.1</p> <p><sup>2</sup> In accordance with CSA B149.1</p>			

**Note:** The vent for this appliance shall not terminate:

- Over public walkways; or
- Near soffit vents or crawl space vents or other areas where condensate or vapor could create a nuisance or hazard or cause property damage; or
- Where condensate vapor could cause damage or could be detrimental to the operation of regulators, relief valves, or other equipment.

7.8 Exhaust Gas Outlet Pipe Materials

SAFETY INSTRUCTIONS

For Canadian installations, plastic exhaust gas outlet piping must comply with CAN/CGA B149.1 and be certified to the Standard For Type BH Gas Venting Systems, ULC-S636. Components of this listed system must not be interchanged with other vent systems or unlisted pipes or fittings. All plastic components and specified primers and glues must be from a single system manufacturer and must not be intermixed with another system manufacturer’s products.

All units come factory installed with 3 inch polypropylene (PP) venting. The maximum allowable venting distances are the same regardless of vent material selected.

The materials listed in the tables below outline the acceptable exhaust gas outlet pipe materials:

United States Exhaust Gas Outlet Pipe Standards	
Material	Description*
Exhaust Gas Outlet Pipe	PVC Schedule 40 (ASTM D1785)
	CPVC Schedule 40, 80
	Approved Polypropylene
	AL29-4C Stainless Steel
Canadian Exhaust Gas Outlet Pipe Standards	
Material	Description (approved to ULC-S636)**
Exhaust Gas Outlet Pipe	Type BH Special Gas Vent Class IIA (PVC)
	Type BH Special Gas Vent Class IIB (CPVC)
	Type BH Special Gas Vent Class IIC (Polypropylene)
	Type BH Special Gas Vent Class I (AL29-4C Stainless Steel)
*Note: Use of cellular core PVC (ASTM F891), cellular core CPVC, or Radel (PPSU - polyphenylsulfone) in nonmetallic venting systems is prohibited. Covering nonmetallic vent pipe and fittings with thermal insulation is prohibited.	
**Note: The components (pipe, fittings, primers, and glues) must be from a single manufacturer; do not interchange. Follow the pipe manufacturer’s certified instructions.	

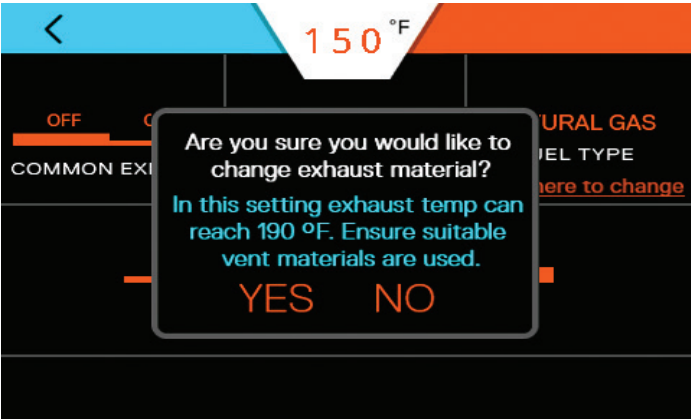
SAFETY INSTRUCTIONS

Do not use cellular foam core pipe to vent exhaust gases.

This water heater has a built-in exhaust gas outlet temperature control that limits the exhaust gas temperature to a maximum of 149°F (65°C) for PVC pipe. In commercial applications, which require higher water temperatures, exhaust gas temperature can reach 190°F (88°C) and require materials, such as polypropylene (PP), stainless steel (SS), or CPVC.

If the temperature approaches the upper limit, the burner will turn off automatically to protect the vent pipe. Once the exhaust gas temperature has dropped to a normal operating level, the unit will automatically restart.

If the inlet/return water temperature will exceed 150°F (66°C), do not use PVC pipe. Follow the display prompts to set the maximum water temperature for the exhaust gas outlet pipe material being used.



7.9 Air Intake Inlet Pipe Vent Materials

The air intake inlet pipe can be made of any approved plastic or metal vent material. ABS, PVC, polypropylene, galvanized steel, and/or flexible corrugated ducting are all examples. When using a corrugated material, ensure there is no inadvertent crimping or blockage to the air intake inlet pipe.

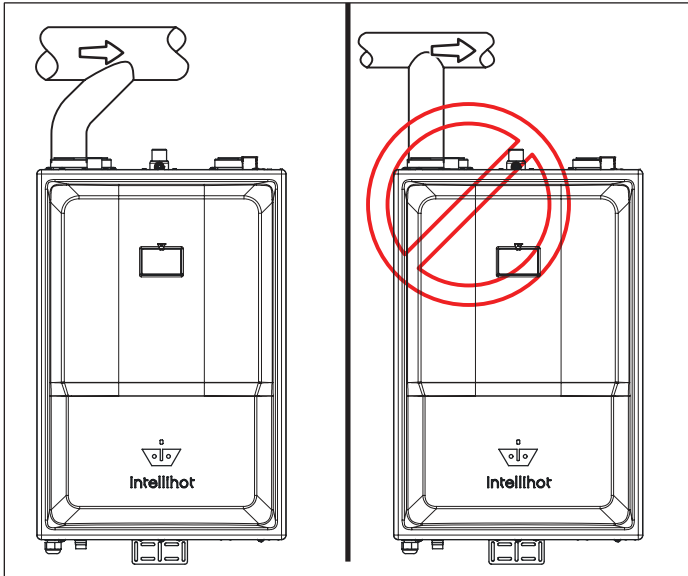
Refer to the table below for a list of approved materials.

United States Vent Pipe Standards	
Material	Description
Air Intake Inlet Pipe	PVC Schedule 40
	CPVC Schedule 80
	Approved Polypropylene

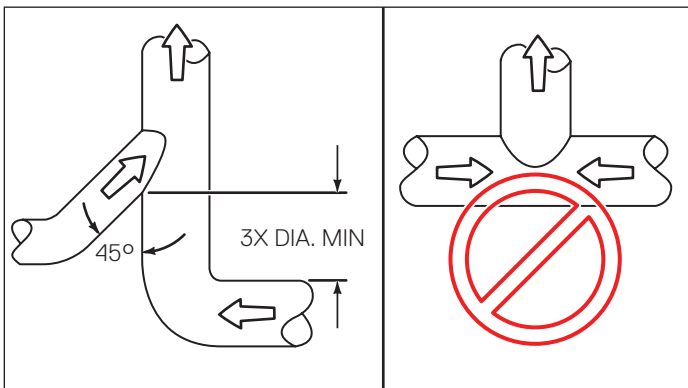
Canadian Vent Pipe Standards	
Material	Description
Air Intake Inlet Pipe	Type BH Special Gas Vent Class IIA (PVC)
	Type BH Special Gas Vent Class IIB (CPVC)
	Type BH Special Gas Vent Class IIC (Polypropylene)

**Note:** In addition to these charts, it is recommended to consult the most recent edition of ANSI Z223.1/NFPA 54 or CAN/CGA B149.1, as well as all applicable local codes and regulations when selecting air intake inlet pipe materials.

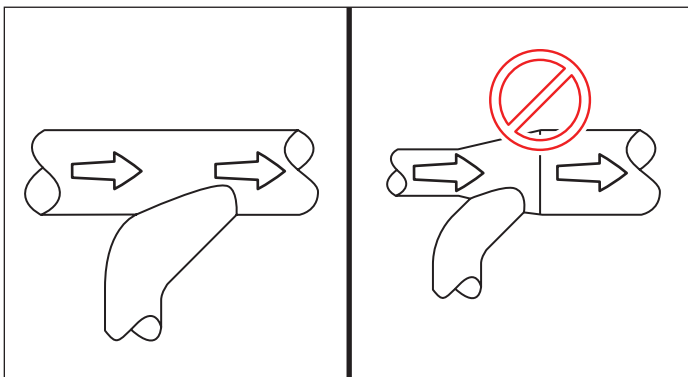
## 7.10 Recommended Exhaust Gas Outlet Pipe Transitions



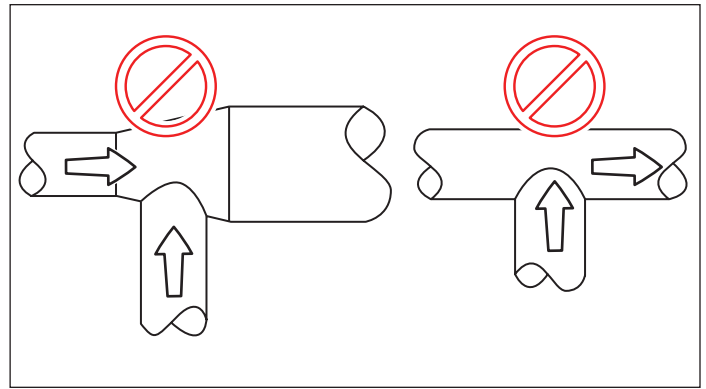
Do not use 90 degree t-fitting for exhaust gas outlet.



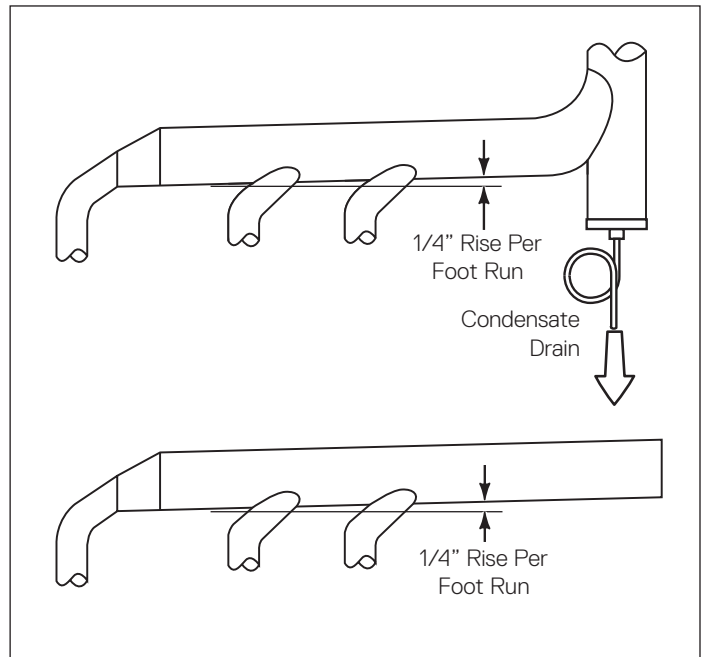
Do not direct exhaust gas from opposite directions. Use a 45 degree transition, as shown.



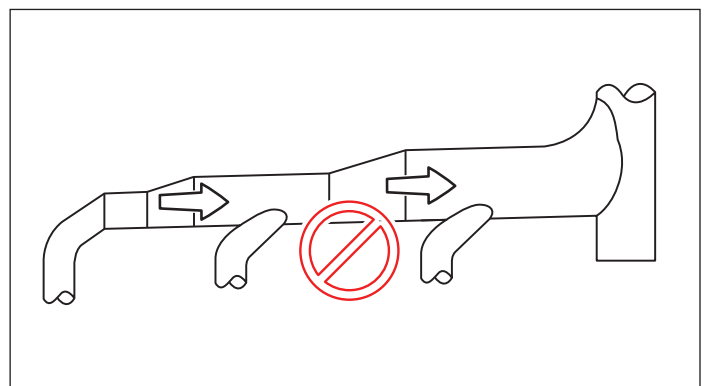
Do not transition into a reducer. Transitions should always be directed into a straight run of pipe.



Do not use 90 degree transition into a reducer or a straight pipe.



Horizontal transitions should be equipped with a condensate drain.



Do not use reducers in a straight run of pipe.

## 8. Water Connections

**Note:** If the flow rate changes faster than ten GPM in one second, an error message will appear and a water hammer arrester must be installed to prevent damage to the water heater.

### 8.1 Quick Reference Installation Instructions

1. Install the hot water pipe and the pressure relief valve (not furnished with the water heater, customer supply their own) as per “8.2 Hot Water Connection” on page 29.

### NOTICE

*When tightening any fittings to the connections on the water heater, care should be exercised not to overtighten these joints and damage the unit.*

2. Install the cold water pipe as per “8.3 Cold Water Connection” on page 30.
3. Install a condensate drain line with the back flow preventer loop as per “8.4 Condensate Drain Line” on page 30.
4. After installation has been completed, fill and test the water heater for proper flow and inspect for leaks as per “14.2 Filling the Water Heater” on page 50.

### 8.2 Hot Water Connection

Install and connect the hot water pipes. Keep the hot water pipes as short as possible to deliver hot water to the fixtures quickly. If an optional hot water storage tank is required, connect the hot water pipes to this tank also.

Since each installation is different, it is up to the installer to route the water pipes using the most efficient routing. The drawings shown here are only suggestions indicating the items needed for the installation.

### CAUTION

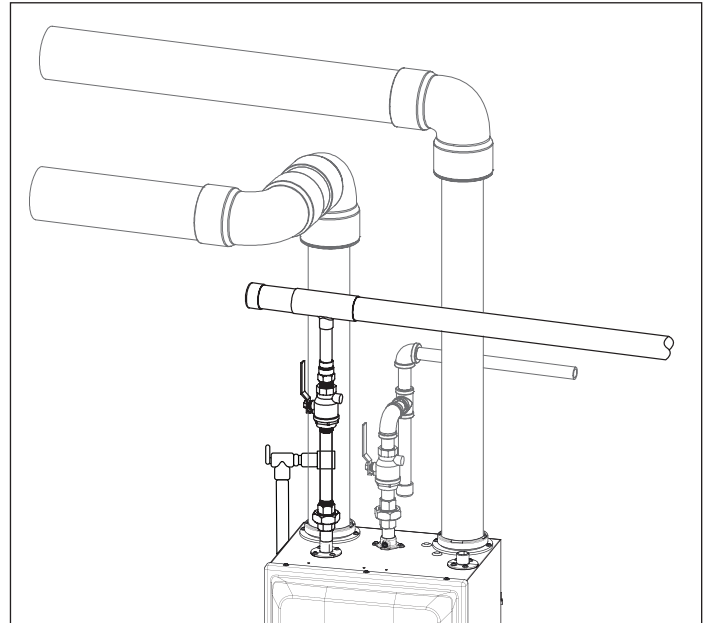
**To prevent adverse health issues, only materials (pipes, fittings, valves, solder, etc.) that are approved for use in potable water systems should be used.**

### NOTICE

**The unit does not include a temperature and pressure relief valve (T&P). The customer is responsible for supplying the T&P based on the application.**

1. Connect a 3/4" NPT coupler to the water heater's hot water connection.
2. Install a 3/4" union connection.
3. Install a customer supplied 3/4" 150 psi maximum pressure relief valve, as required by your local code.

4. Following local building codes, install a 3/4" manual shut-off valve with 3/4" NPT fittings.



### WARNING

**To prevent serious personal injury, do not install any shut-off device between the water heater and the pressure relief valve. This valve is designed to release abnormally high pressure within the water heater in the event of a system problem.**

### NOTICE

*The pressure relief valve must be rated at 150 psi, the maximum btu/h output of the unit (251,000), and comply with all local building codes and standards. Do not install any restrictions or other valves prior to the pressure relief valve.*

5. Install and route a discharge pipe from pressure relief valve to within six inches of the floor and directed away from walkways or other appliances.
  - a. Route the relief valve to within six inches of the floor to prevent injury in the event of a discharge.
  - b. The diameter of the pipe from the relief valve must be equal to the outlet size of the relief valve.
  - c. Do not use reducers in the outlet pipe.
  - d. Do not install any valves, restrictions, elbows, or other blockages in the outlet pipe.
  - e. For multiple unit installations, the outlet piping must not be connected together. Each pipe must be separately routed to a suitable drain.
6. Connect the unit to the building's hot water pipes. If multiple water heaters are being installed, the diameter of both the main cold water pipes and the main hot water pipes need to be sized by an engineering professional.



7. To conserve energy, insulate all hot water pipes and recirculation pipes.

### SAFETY INSTRUCTIONS

#### Do not insulate the pressure relief valve.

8. With the unit OFF, open a nearby hot water faucet and allow the water to flow through the unit until all the trapped air is exhausted from the water pipes and from the water heater.
9. Leak test the water piping. Repair any leaks immediately.

### 8.3 Cold Water Connection

Install and connect the cold water pipes.

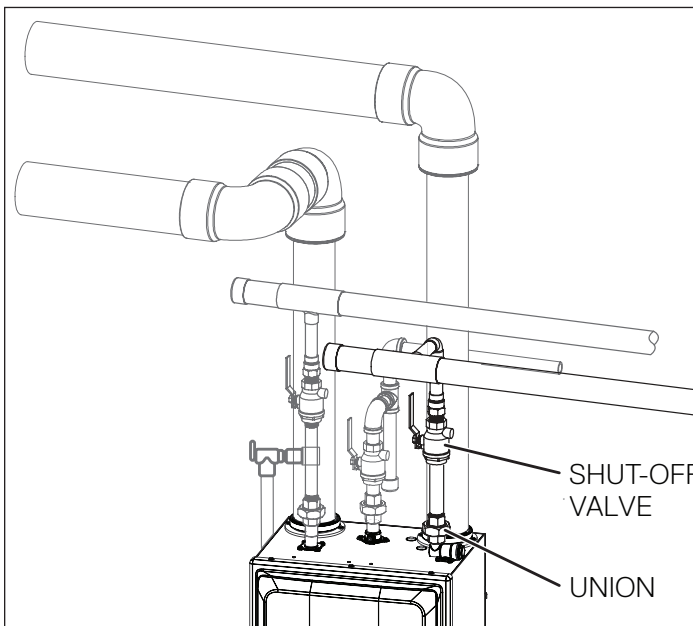
**Note 1:** If the incoming water is known to have a high mineral content or “hardness” (see “18. Warranty” on page 65), treatment is recommended upstream from the water heater.

When the water heater is installed in a closed loop recirculation system, and if the cold water supply pipe has a back flow preventer, then an expansion tank should be installed to allow for water expansion as per the diagrams in “8.5 External Recirculation” on page 32.

### CAUTION

To prevent adverse health issues, only materials (pipes, fittings, valves, solder, etc.) that are approved for use in potable water systems should be used.

1. Connect a 3/4" NPT coupler to the water heater's cold water connection.
2. Install a 3/4" union connection.



3. Following local building codes, install a 3/4" manual shut-off valve with 3/4" NPT fittings.

4. Connect the unit to the existing cold water pipes. If the existing plumbing is 1/2" pipe, adapters may be used to transition from the 3/4" pipe.
  5. Connect the unit to the building's cold water pipes. If multiple water heaters are being installed, the diameter of the main cold water pipe needs to be sized by an engineering professional.
- Note:** Isolation valve kits can be used if incoming water treatment is anticipated (such as a water softener) due to hardness levels or heavy usage of the unit.
6. With the unit OFF, open a nearby cold water faucet and allow the water to flow through the unit until all the trapped air is exhausted from the water pipes and from the water heater.
  7. Leak test the water pipes. Repair any leaks immediately.

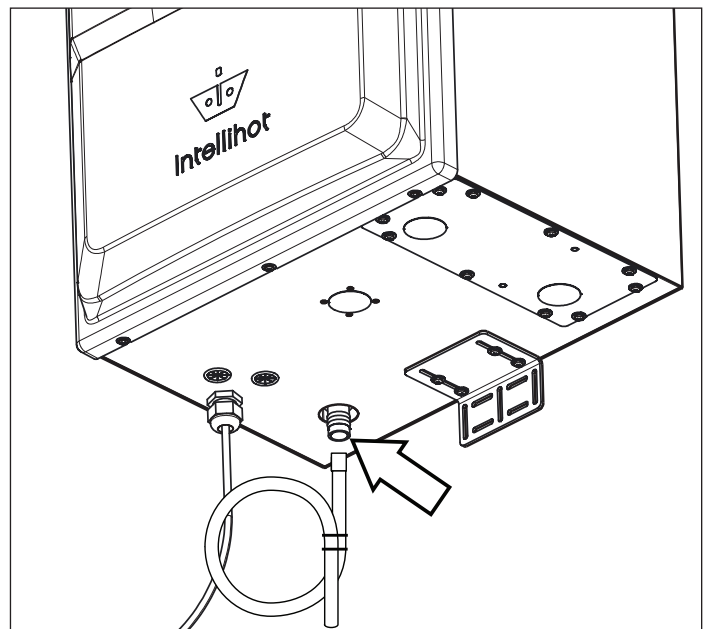
### 8.4 Condensate Drain Line

Due to its efficient design, the water heater produces condensate (water) as a normal by-product of heating the water.

This condensate is acidic, with a pH level between 3 and 4. Local building codes may require an in-line neutralizer, such as the iB301, to be installed (not included) to treat this water.

The maximum condensate flow rate is 1.8 GPH.

1. Attach and tighten the flex hose with the loop to the barb fitting located on the bottom of the unit.



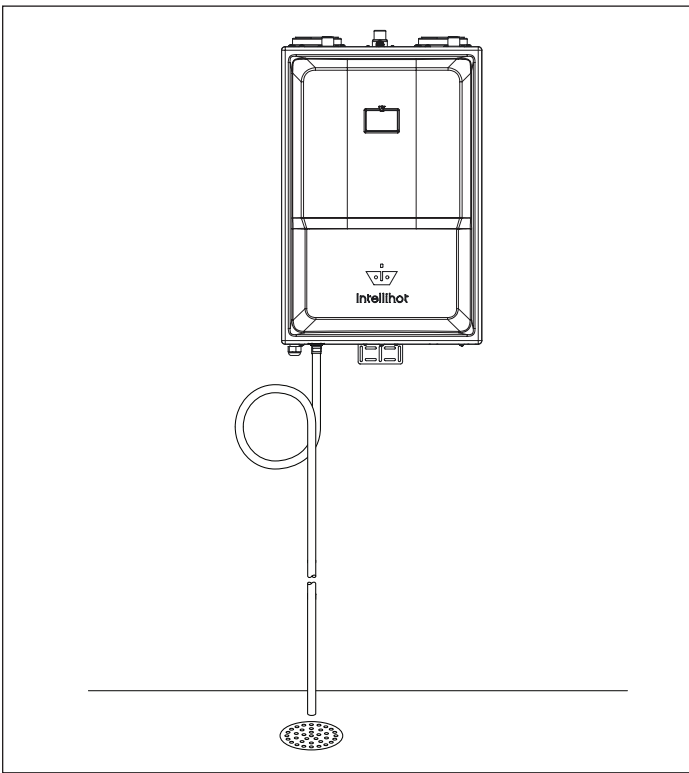
2. Follow applicable local codes and if required, install in-line neutralizer (iB301) to treat the acidic condensate. Follow all the installation instructions included with the neutralizer.

**Note:** Ensure that the flex tube is not pinched or kinked. The tube should freely drain. The tube termination should not be immersed in water.

3. Route the drain line to nearby floor drain, neutralizer, or condensate pump.
  - a. If a floor drain is used to remove the discharge, route the drain hose over or into the drain.
  - b. Long drain lines should contain a union to facilitate servicing the unit or cleaning the drain line.

## **! WARNING**

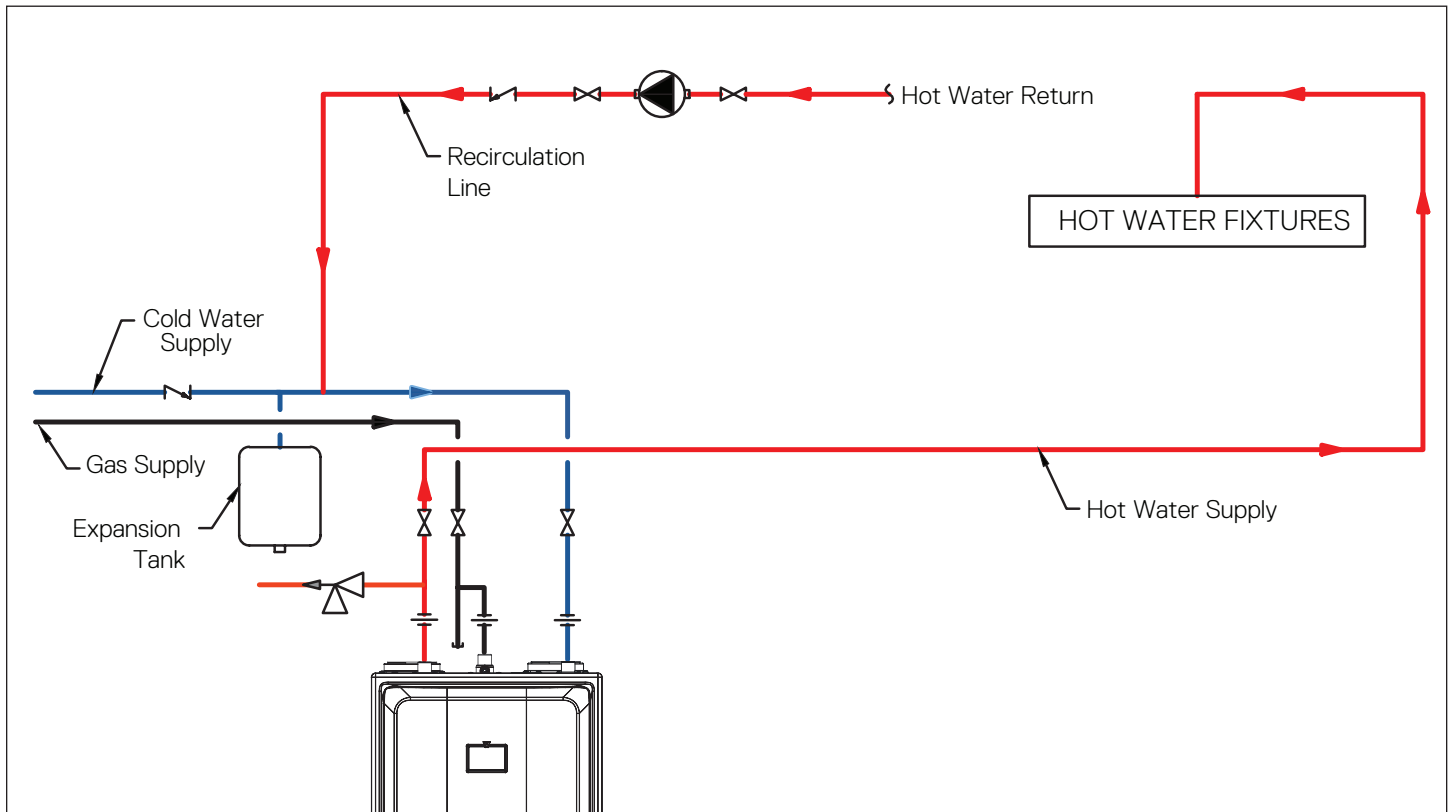
**The drain line is shipped from the factory with a loop held together with plastic ties. Do not remove the ties and/or straighten the loop. This loop forms an air block (trap) which prevents carbon monoxide from exiting the water heater through the drain line. Improper installation of the drain line can result in carbon monoxide build, which can lead to severe personal injury or death.**



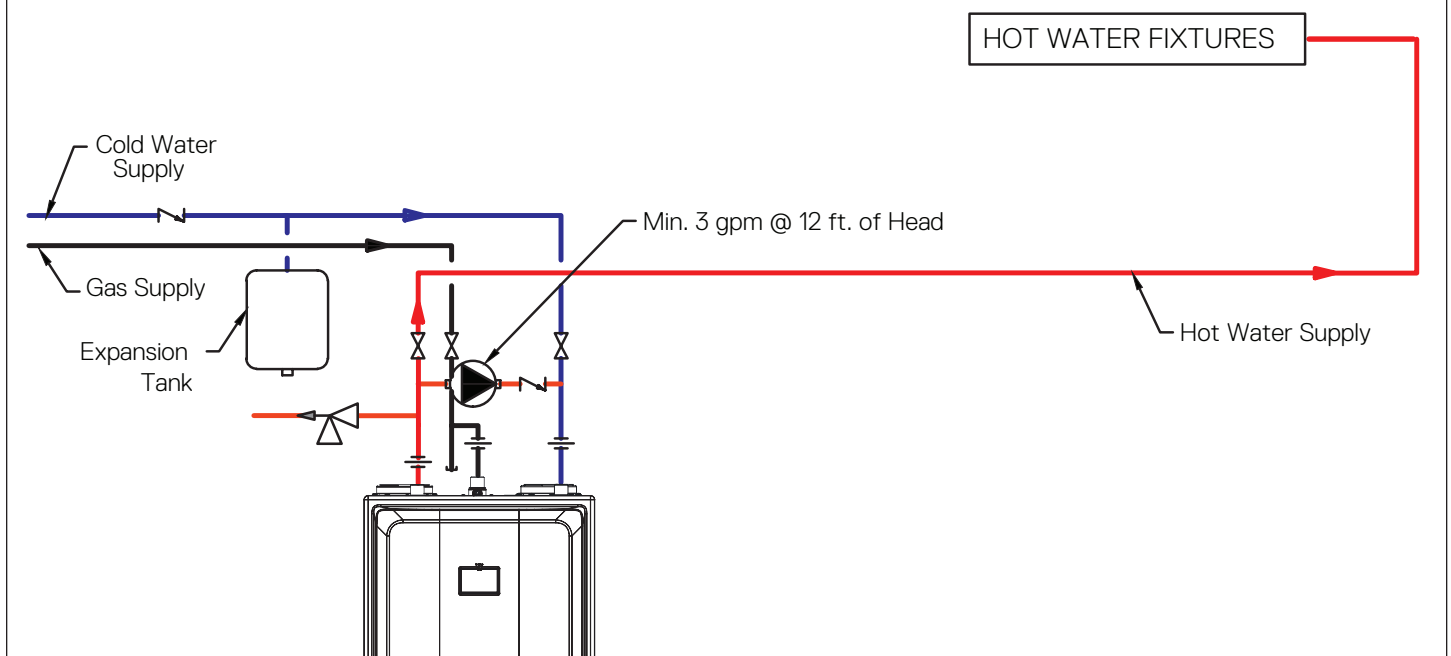
If required, install an in-line neutralizer to treat the acidic condensate. Follow all the installation instructions included with the neutralizer.

## 8.5 External Recirculation

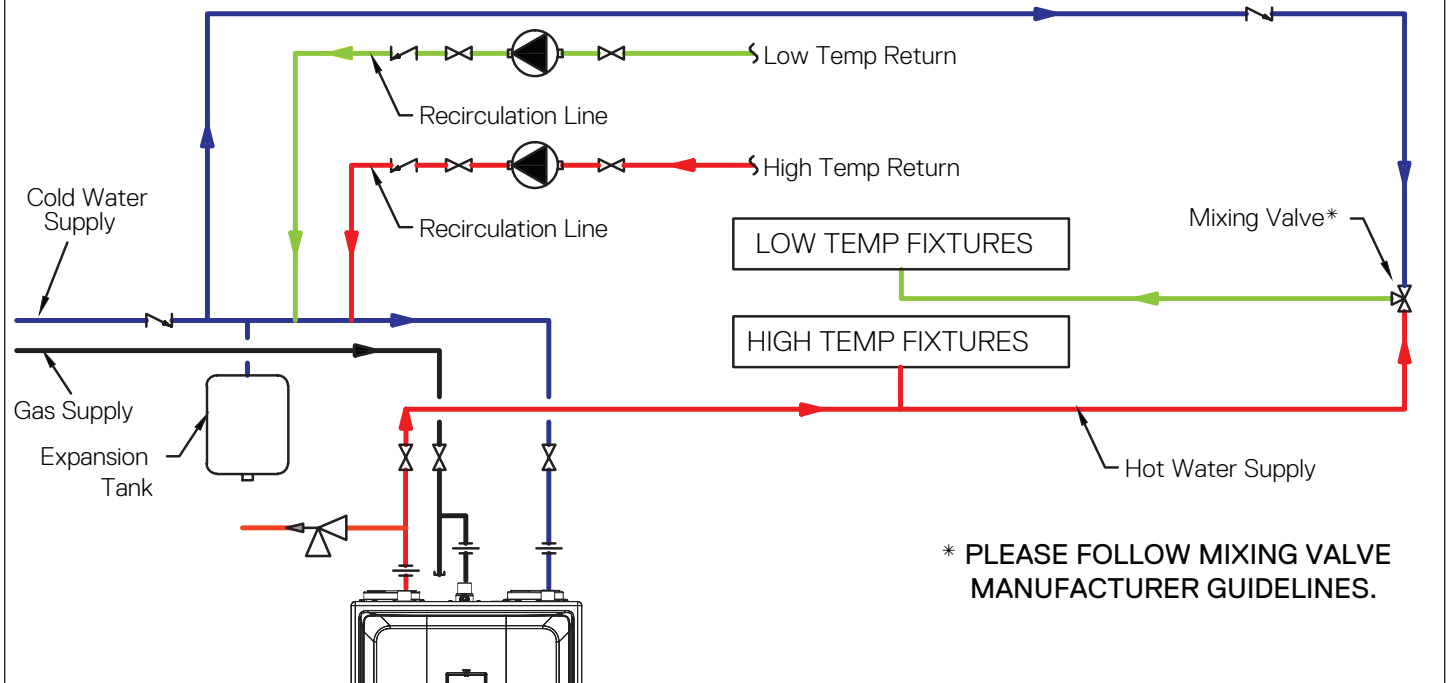
The following illustrations provide possible external recirculation options. Recirculation is required for system to function properly.



### "RESTAURANT" OPTION WITH NO BUILDING RECIRCULATION



## MIXING VALVE OPTION



## 9. Electrical

### **WARNING**

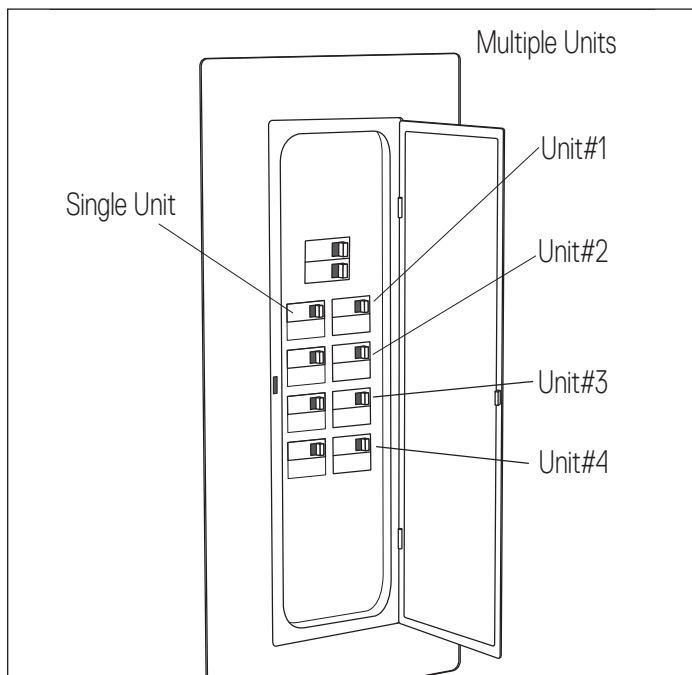


**To avoid serious injury or even death, follow all applicable local, state, and national regulations, mandates, and building codes for guidelines to install the electrical power supply.**

### 9.1 Electrical Code Requirements

Electrical code requirements are different in the USA and Canada. Refer to and follow the local building codes, the latest edition of the National Electrical Code (NFPA 70) in the USA, or the CGA C22.1 Canadian Electrical Code - Part 1.

Depending on the number of water heaters being installed, the circuit breaker(s) should be at least 15 amps for each unit. If more than one unit is installed, then a larger circuit breaker is required or separate 15 amp circuits. Installing a separate circuit breaker for each unit is recommended to isolate units during service or repair.



Use 15 Amp Breakers For Single Units or Larger Breakers For Multiple Units.

**Note:** For an electrical wiring schematic, refer to "15.2 Complete Wiring Diagram (all models)" on page 55 for additional information.

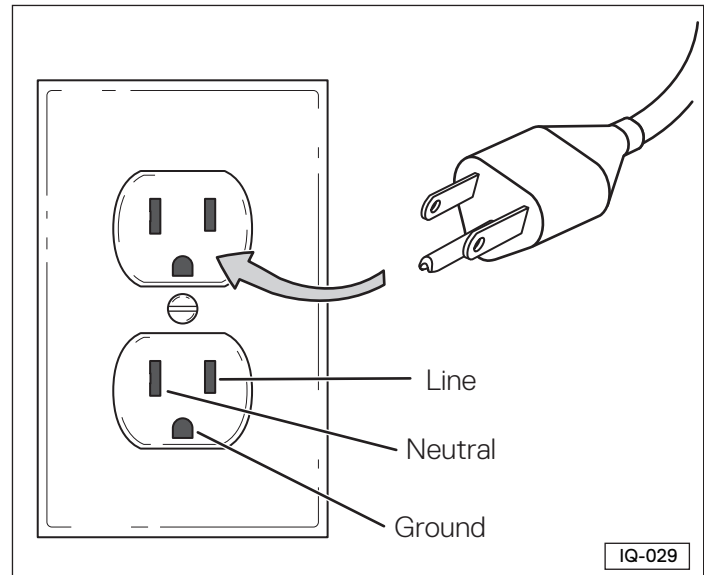
### **NOTICE**

*The electrical connections for the water heaters are polarity-sensitive. Before connecting the water heater to the power source, test the polarity of the electrical circuit.*

*For additional electrical protection, the use of a surge protection device is recommended. Damage(s) caused by power surges is not covered by the warranty.*

### 9.2 Electrical Connection and Polarity

On single unit installations, make sure the electrical outlet being used is wired with at least 12 gauge wire and grounded. A GFI ground fault receptacle is recommended. Only one water heater should be plugged into an outlet with the 12 gauge wire. It should also be connected to at least a 15 Amp circuit breaker. The electrical power required for the water heater is 120V AC at 60 Hz.



### **NOTICE**

#### **POLARITY**

*The plug provided with the unit is polarity sensitive. Ensure that the "line" and "neutral" are at the correct locations in the wall socket using a 3-wire receptacle tester or other similar testing device. If the polarity is reversed, it will cause the unit to malfunction and turn off every 15 seconds.*

### **WARNING**

**To avoid serious injury or even death from electrical hazards, an additional ON/OFF electrical junction box should be installed near the water heater. This switch will allow power to be removed from the water heater prior to service or in the case of an emergency.**

### **SAFETY INSTRUCTIONS**

**If multiple units are being installed, the gauge of wire must be increased to meet the additional electrical load. Consult the electrical codes for the correct wire size.**

**If desired, the water heater can be wired into the electrical system by removing the power cord and replacing it with electrical cable. If this method is used, a separate ON/OFF switch must be installed to remove power from the unit.**

## 10. Adjusting CO<sub>2</sub> Level

### 10.1 General Information

This procedure is required:

- 1) only during installation in a high-altitude location over 2,000 feet, or
- 2) when converting the unit from natural gas to propane.

This procedure should be performed only by a qualified service technician.

### **⚠ DANGER**

A concentration of carbon monoxide (CO) as small as 0.04% (400 parts per million) in the air can be fatal. When making High Fire and/or Low Fire adjustments, CO levels must be monitored using a flue gas analyzer and must not exceed 400 ppm of CO at any time during the operation.

Adjusting the “Low Fire screw” or the “High Fire screw” even in small increments can result in a significant increase in CO concentration. To avoid serious injury or death, DO NOT make any adjustments to the gas valve without monitoring the exhaust gases with a functional and calibrated flue gas analyzer.

CO <sub>2</sub> and CO Standards		
Description	CO <sub>2</sub> Range (%)	Max. CO Level (ppm)
Natural Gas		
High Fire	9.1% to 9.3%	< 200 ppm
Low Fire	9.1% to 9.3%	< 60 ppm
Propane		
High Fire	10.1% to 10.5%	< 200 ppm
Low Fire	10.1% to 10.5%	< 60 ppm

### **NOTICE**

The values listed in the table are for nominal conditions. Variables such as gas pressure, heating value of the gas, humidity, and temperature of intake air can impact CO and CO<sub>2</sub> values. Changes in these variables can result in different CO and CO<sub>2</sub> values on the same water heater.

A qualified service technician must use a calibrated flue gas analyzer to adjust the gas valve to achieve the desired CO<sub>2</sub> and CO values.

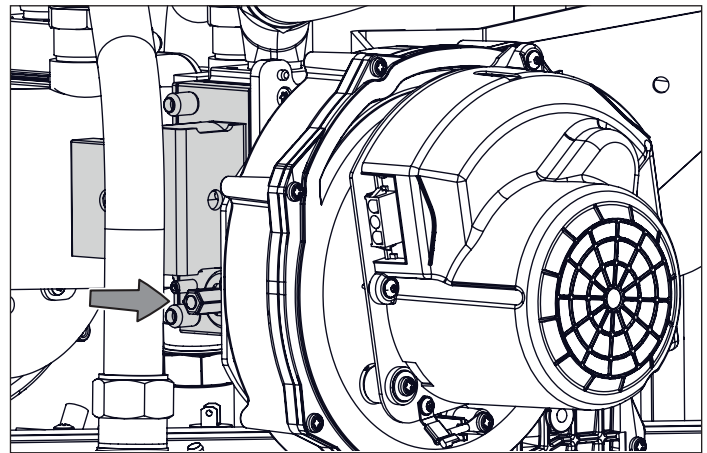
Before any adjustments are made, the service technician must confirm the static gas pressure meets these minimum requirements.

Natural Gas - 8" W.C.

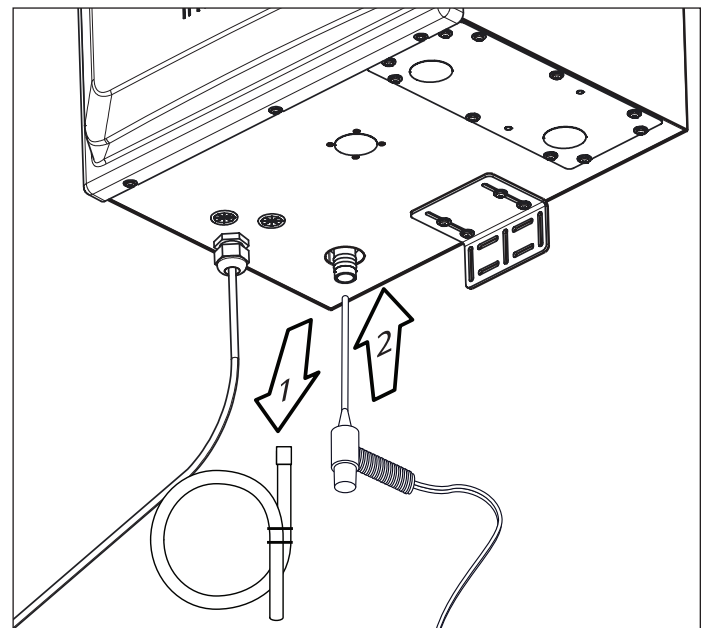
Propane - 11" W.C.

### 10.2 Adjustment Procedure

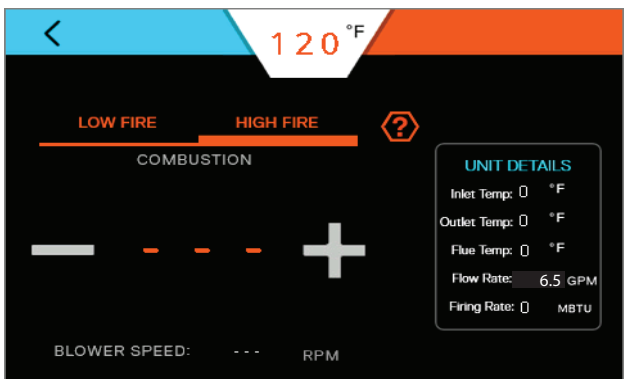
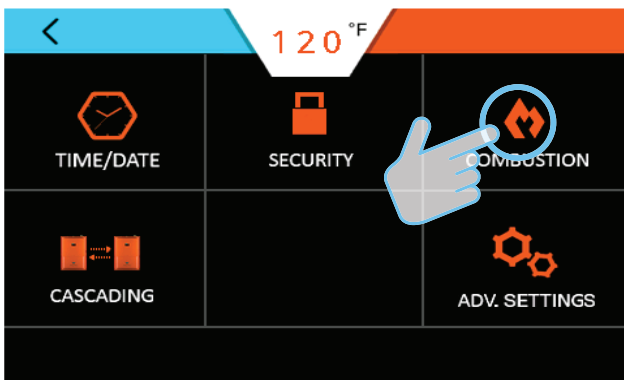
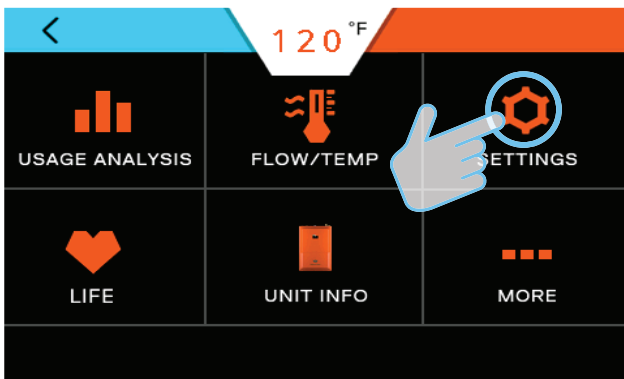
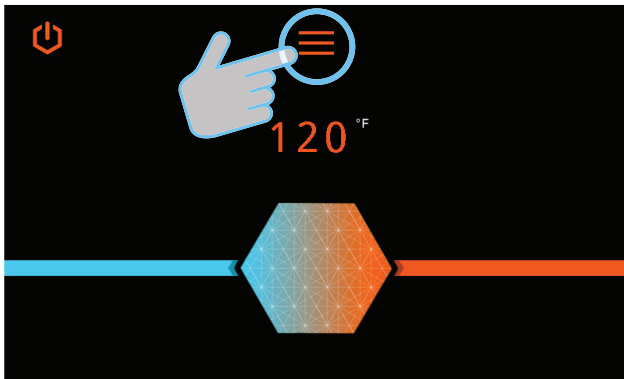
1. Remove the front cover panel.
2. Locate the gas valve on the heat engine.



3. Remove the condensate tube and use that port to insert a calibrated flue CO<sub>2</sub> gas analyzer to check gas levels.



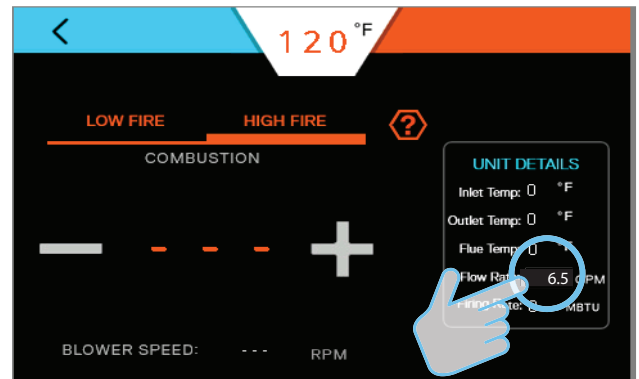
4. Follow the display screens.



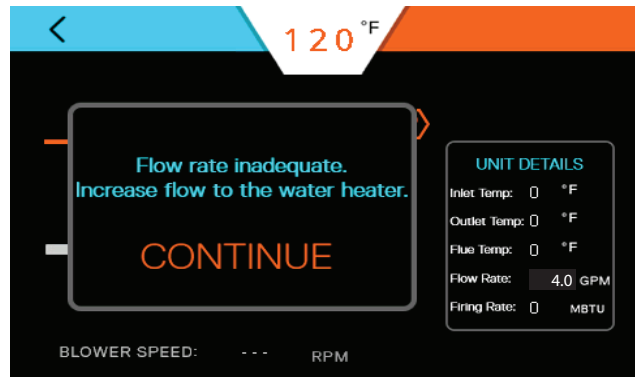
## NOTICE

*Do NOT change the blower speed settings. This adjustment MUST be performed by factory personnel ONLY. Changing this setting WILL VOID the warranty!*

5. Create a hot water flow of at least 6.0 GPM, as shown on the display screen.



**Note:** If flow rate is inadequate, a pop-up message will notify to increase the flow.

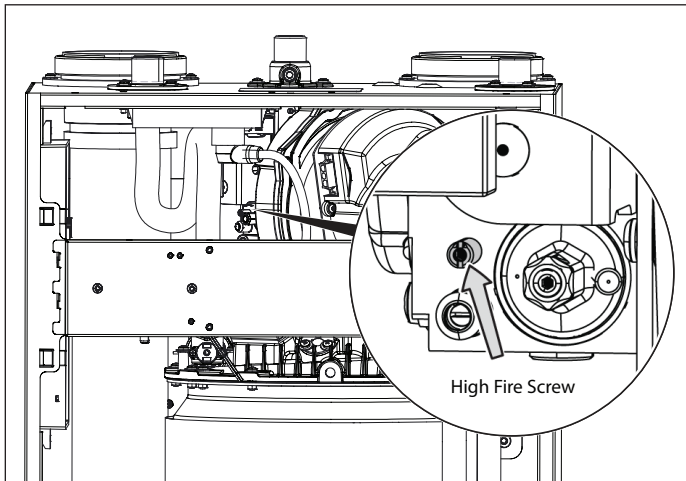


6. At a flow rate of at least 6.0 GPM, the heat engine will start.

7. Allow three minutes of operation at High Fire.



8. Record "initial output" in High Fire Recorded Values table.
9. If the CO<sub>2</sub> values are within appropriate range, proceed to Step 10; otherwise, continue.
  - a. Use a flat blade screwdriver to turn the High Fire screw clockwise to decrease and counterclockwise to increase the CO<sub>2</sub> value.
  - b. Adjust in ¼ turn increments.
  - c. Wait three minutes to stabilize flue gas readings and recheck values.
  - d. Adjust until values fall with specified range.

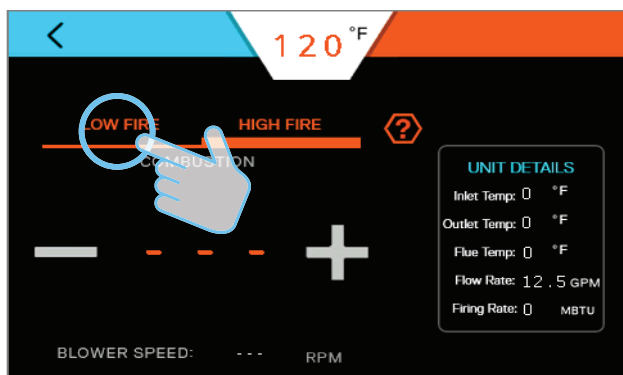


10. Once the desired values are achieved, record the new High Fire CO<sub>2</sub> "adjusted values" in the table.

CO <sub>2</sub> and CO Standards		
Description	CO <sub>2</sub> Range	Max. CO Level
Natural Gas High Fire	9.1% to 9.3%	< 200 ppm
Propane High Fire	10.1% to 10.5%	< 200 ppm

High Fire Recorded Values		
Date ____ / ____ / ____		
Heat Engine	Initial Output	Adjusted Value
CO <sub>2</sub> Value %		
Max CO ppm		

11. Press LOW FIRE on the display screen.

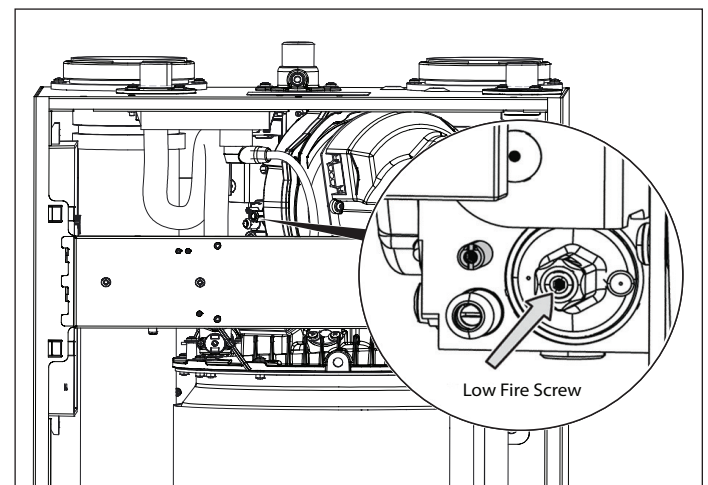


12. Record "initial output" in Low Fire Recorded Values table.

CO <sub>2</sub> and CO Standards		
Description	CO <sub>2</sub> Range	Max. CO Level
Natural Gas Low Fire	9.1% to 9.3%	< 60 ppm
Propane Low Fire	10.1% to 10.5%	< 60 ppm

Low Fire Recorded Values		
Date ____ / ____ / ____		
Heat Engine	Initial Output	Adjusted Value
CO <sub>2</sub> Value %		
Max CO ppm		

13. Adjust the Low Fire screw while the burner operates at low fire using a 2mm hex wrench. Turn clockwise to increase CO<sub>2</sub> and counterclockwise to decrease CO<sub>2</sub>.



14. Once the desired values are achieved, record the new Low Fire CO<sub>2</sub> "adjusted values" in the table.
15. When the heat engine has been properly adjusted, turn off water flow.
16. Remove flue gas analyzer probe and reinstall condensate hose.
17. Press the back button to return to the main screen.



18. Check for gas leaks using a leak detector.
19. Install the front cover. If converting to propane, proceed to section "11. Natural Gas to Propane Conversion" on page 38.

11. Natural Gas to Propane Conversion

SAFETY INSTRUCTIONS

A qualified service technician MUST make the required changes to convert the water heater from Natural Gas to Propane.

11.1 General Information

**Note:** This conversion process also requires the CO<sub>2</sub> levels to be adjusted. Refer to "10. Adjusting CO<sub>2</sub> Level" on page 35 for instructions.

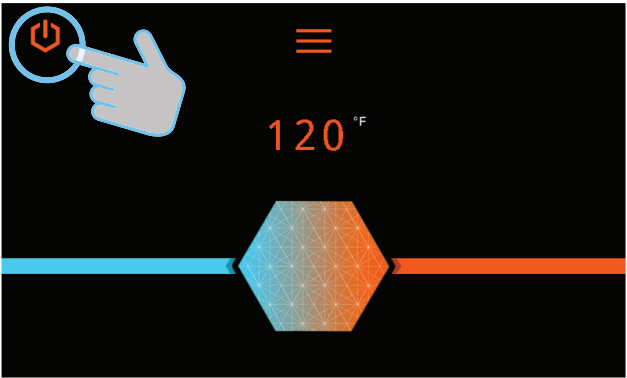
Before converting the unit for propane, verify the current gas inlet pressure meets the recommended pressure and record it in the space below.

Propane Static Gas Pressure	
Parameters	Specifications
Minimum Static Propane Gas Pressure	8" W.C. (non-corrugated, black iron)
Recommended Propane Gas Pressure	11" W.C.
Maximum Static Propane Gas Pressure	14" W.C.

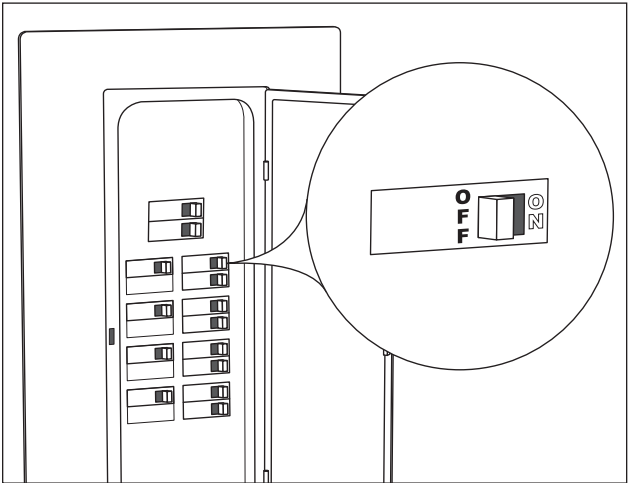
Current Static Propane Gas Pressure \_\_\_\_\_W.C.  
Date \_\_\_\_\_

11.2 Conversion Procedure

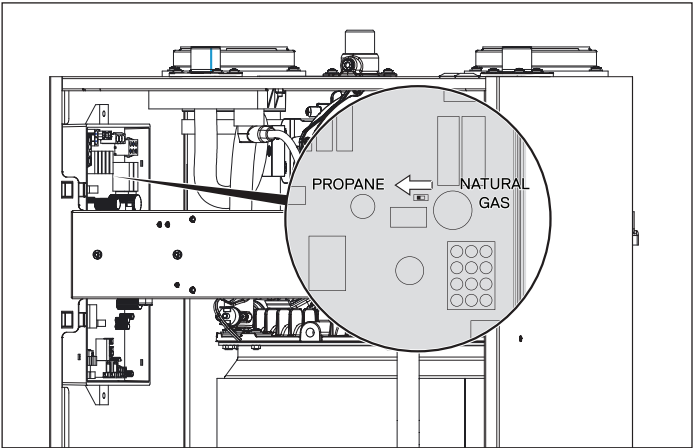
- 1. Follow these steps before repositioning the DIP switches.
  - a. Turn the water heater OFF using the display screen.



- b. Place the circuit breaker for the water heater at the main electrical panel in the OFF position. Verify there is no power to the unit(s).

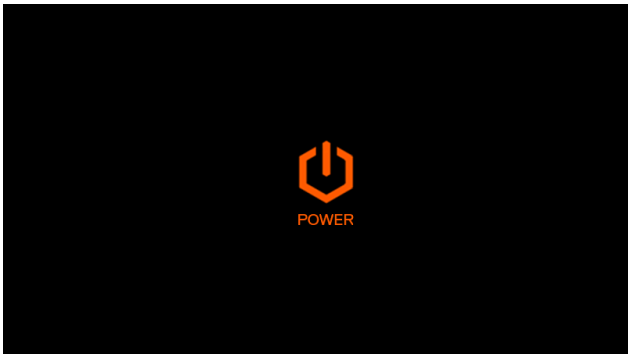


- c. Remove the front cover panel and locate the main circuit board.
- d. Locate DIP Switch 1.
- e. Move the DIP switch into the Propane position.

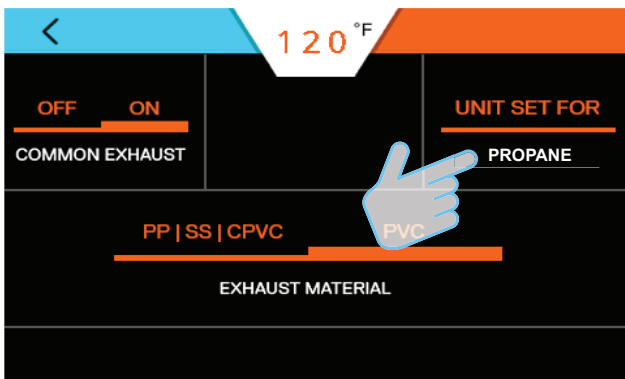
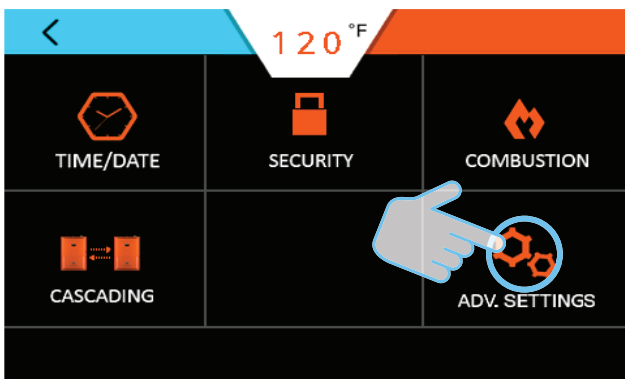
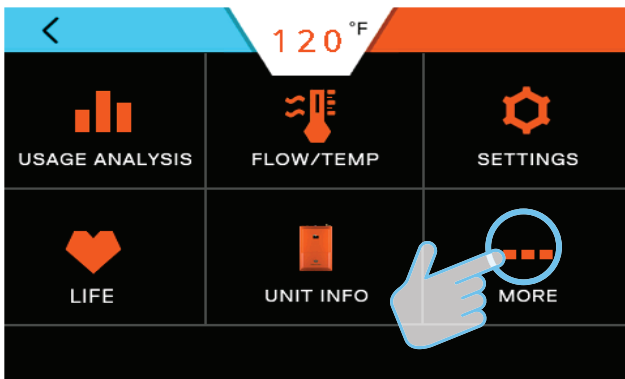
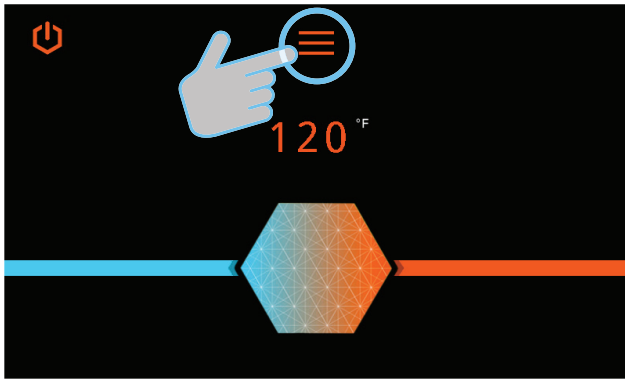


DIP Switch Settings		
SW1	<input checked="" type="checkbox"/> Propane	<input type="checkbox"/> Natural Gas

- f. Reset the circuit breaker to the ON position. Turn the water heater ON using the display screen.



2. Follow the display screens to make sure if the unit is now set to propane.



Verify unit is now set to PROPANE.

3. Refer to section "10. Adjusting CO<sub>2</sub> Level" on page 35 in this manual for instructions to adjust CO<sub>2</sub> levels.