AERCO
A WATTS Brand

Technical Application Guide

AM Series Piping Application Guide

Applies to the following AM Series models:

AM Boilers

- AM 399B
- AM 500B
- AM 750B
- AM 1000B

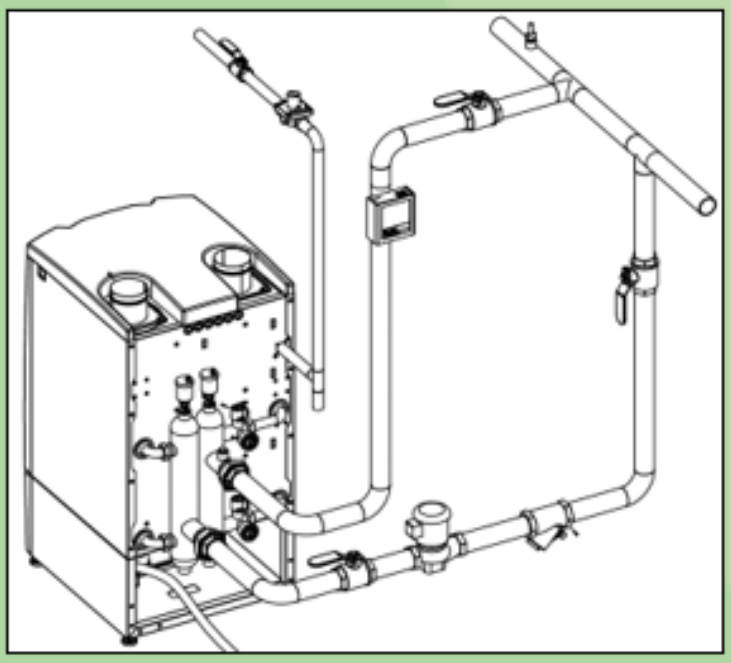
AM Water Heaters

Standard Models:

- AM 399W
- AM 500W
- AM 750W
- AM 1000W

Rapid Recovery:

- AM 199R
- AM 250R
- AM 399R
- AM 500R
- AM 750R



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SEC 1: MANDATORY REQUIREMENTS

The following actions are mandatory to ensure proper piping and drainage of the AM Series system.

CAUTION!
Local codes and authorities should be consulted prior to installation.

- AERCO requires that the boiler loop to be de-coupled from the system loop. This can be achieved by one of the following:
  - Employing primary-secondary piping.
  - Installation of a hydraulic separator between the boiler and the system loop.
  - Installation of a heat exchanger (for example, plate heat exchanger) between the boiler and the system loop.
- For water heating installations, a storage tank provides the required de-coupling.
- AERCO requires cleaning of the whole system and to fit a mandatory Y-strainer on the return pipe to the boiler, equipped with isolation valves (See Figures 11 to 18 at the end of this document).
- For boiler replacement installations, cleaning of the whole system is required before connecting the boiler (See Section 2.3 for Flushing, Treatment, and Cleansing tips and guidelines). Failure to clean a system will limit it from the full benefits offered by the high efficiency AM Series.
- Boiler drain valve and condensate neutralizer drain should be arranged to permit the fluids to drain freely, by gravity, to a convenient floor drain.
- For units installed in environments likely to experience freezing temperatures, it is necessary to ensure that the condensate line and exhaust manifold are equipped with suitable freeze protection, such as a heat trace line or insulation.
- All piping and electrical connections (i.e. service switches, conduit boxes, etc.) should be located at a minimum of 6 inches from the boiler panels and covers.
- See Table 1 (Section 2) for sizing guidelines for the mandatory primary pump and boiler strainer.
- A discharge pipe must be used and must not have an internal cross-sectional area less than the outlet of the relief valve.
- The discharge pipe must be installed so that there will be no danger of scalding to the boiler attendants. See Figure 1 for a discharge pipe example of an AM Series unit.
- The relief valve point of discharge piping must have provisions for proper drainage.
- When connecting the hot water outlet and cold water inlet to building piping, first make sure the threads are thoroughly clean. AERCO recommends using Loctite ® 7649 to prime the threads and then Loctite 567 as pipe dope. **Do *NOT* use Teflon tape.**

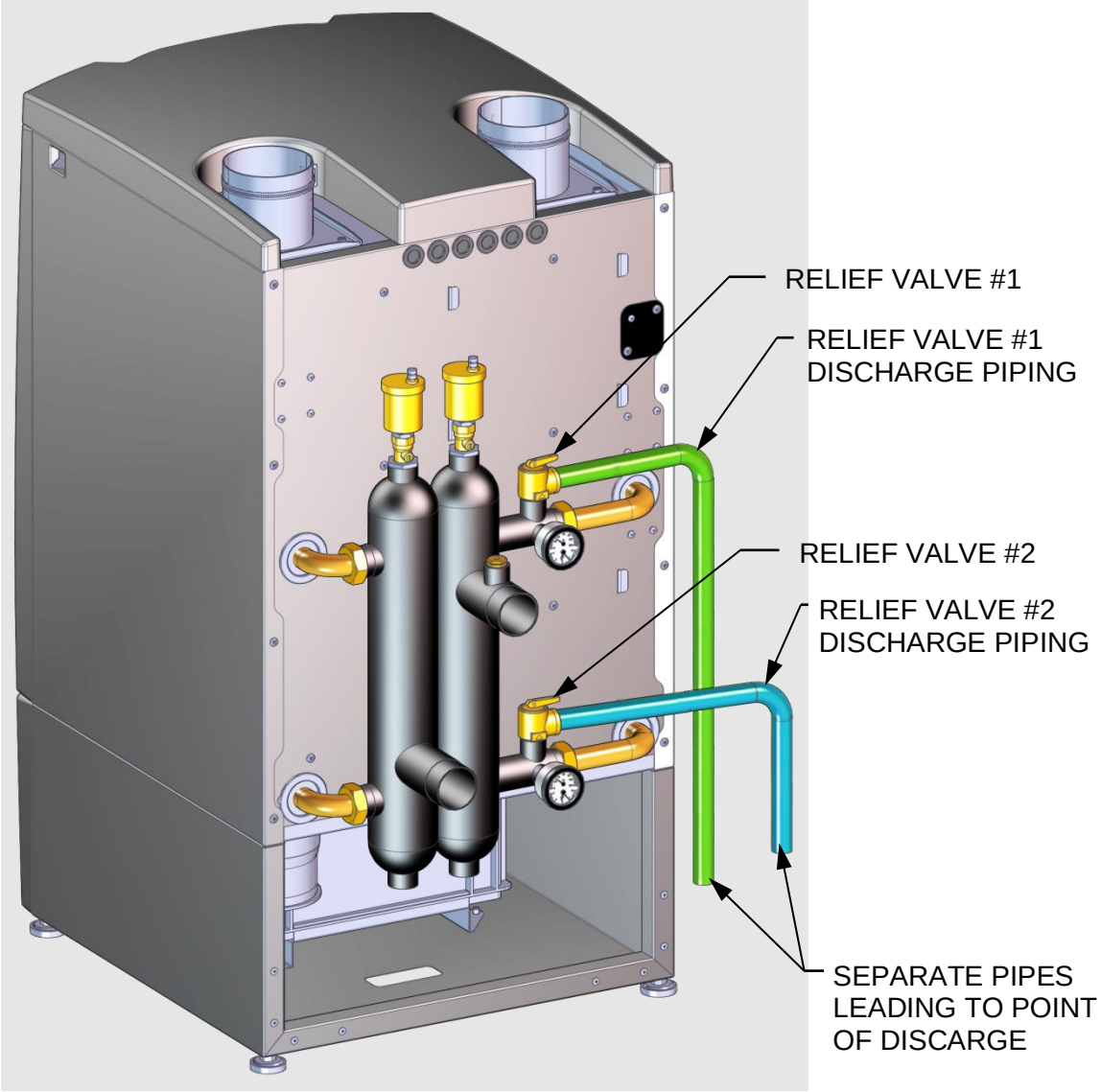


Figure 1: AM 399/500 Relief Valve Point of Discharge Example

CAUTION!
Each relief valve must have its own discharge piping all the way to the point of discharge, and must never be manifolded, attached to, or combined with any other piping.

SEC 2: BOILER QUALITY AND MAINTENANCE

2.1. Boiler Water Chemistry - Hydronic/Closed Loop Applications

Scale and Corrosion

Free oxygen can cause the formation of rust (iron oxides), which degrade metallic materials. Magnetite is formed in un-inhibited water if there is electrolytic action in the presence of oxygen. Sludge is formed when calcium compounds, primarily CaCO3, are heated. Rust and magnetite, when combined with sludge, can form a very hard scale, which significantly reduces system efficiency and life expectancy of the heating system. Scale reduces heat exchange due to its low heat conductivity, which may cause dangerous localized overheating. Waterside corrosion of all heating circuit surfaces is also a major concern.

Make-up or Feed Water Quality

Make-up or feed water is added to a closed hydronic system to replenish water lost through evaporation or leakage. The quality of make-up or feed water, which may contain dissolved oxygen, minerals and other dissolved contaminants, is extremely important. Such introduced water must be chemically treated or strictly limited when ensuring neutral chemical conditions in boiler system water. Generally, any closed hydronic heating system should be restricted from receiving untreated makeup water of no more than 5% of the total volume of system water per year.

Treating Water to Prevent Freezing

When using anti-freeze solutions, their compatibility with the AM Series 316 (Ti) heat exchanger and other components of the heating system must be determined prior to use. If a glycol solution is used as anti-freeze protection, a backflow preventer must be installed upstream of the fill/makeup valve.

Only virgin glycol should be used for systems requiring freeze protection, and it must be treated with an inhibitor compatible with the particular chemical treatment being used in the system. Note that glycol must be changed from time to time due to its limited useful life.

Use only inhibited propylene glycol solutions, formulated for hydronic systems. Ethylene glycol is toxic and can attack gaskets and seals used in hydronic systems.

Water Treatment Certification

When using chemical treatments in hydronic systems, it is necessary to ensure that the chosen treatment is appropriate and certified by the manufacturer for such environments. The manufacturer should also guarantee that the treatment, when applied according to the manufacturer's recommendations, will not cause harm to the boiler, pumps, piping, and other components of the hydronic boiler system.

2.2. Testing and Maintenance of Water Quality

Water in the installation should be checked, monitored, and treated for the following. *For all applications, the pH, a measure of the acidic, neutrality, and alkalinity of the water must always be between 6.5 and 8.5.*

Potable Water Applications

Total Dissolved Solids (TDS) - This measures the overall risk of water corrosivity/hardness/ salinity/color in domestic water applications. The EPA recommends keeping a level below 500 ppm.

Calcium Hardness - For units installed at sites with hard water (>10.5 grains/gal, >180 mg/L), AERCO strongly recommends use of AERCO AquaSolve anti-scaling system (note, this system does not protect against orthophosphates, which can also cause scale deposits). It provides an economical, chemical free treatment of hard water, allowing the water heater to perform at its peak heat transfer efficiency, thereby reducing heating cost. The waterside of the unit must be cleaned in accordance with the Installation, Operation and Maintenance manual.

Orthophosphate - Many water systems also carry orthophosphate chemicals for corrosion protection that form orthophosphate scale. Conventional water softening techniques that treat calcium scale may not treat orthophosphate scale. Systems may also contain polyphosphates that sequester and mitigate water hardness. Over time, these chemicals break down in the system to form orthophosphates. The waterside of the unit must be cleaned in accordance with the Installation, Operation and Maintenance manual.

Chloride - Chloride limits are set to prevent corrosion of the heat exchanger. The EPA recommends keeping a level below 250 ppm.

Free Chlorine - Free chlorine is added to protect from harmful microbes. Most public water supplies have been treated to a safe level, but care must be taken when building owners perform supplemental treatment. Batch feeding or poorly controlled methods will cause free chlorine spikes that will damage any equipment in the system. When added in excess, free chlorine is a powerful oxidant that can cause corrosion. Inlet water fed to the heater should always be below 0.5 ppm free chlorine, regardless of where in the system the chemical feed pump is positioned.

Hydronic/Closed Loop Applications

Oxygen - All precautions should be taken to avoid the formation and localization of oxygen in the water of a heating system. Water that is low in minerals (soft water) absorbs oxygen much more readily than mineralized (hard) water. For this reason it is necessary that in heating systems using floor radiant heating, the plastic pipes used be impermeable to oxygen.

Scale and Corrosion - The use of an inhibitor is advisable to treat feed and make-up water and to protect heating systems against scale, corrosion and microbiologic growth. To prevent freezing, the use of an anti-freezing agent together with the inhibitor is advisable. Qualified companies can also provide boiler de-scaling. Water treatment is also advisable in the following cases: very large heating systems and systems with high quantities of replenished water due to leakages or maintenance work. Do NOT use artificially softened water. Artificial softening agents generally use salt, which creates a chloride water chemistry, a major contributor to the corrosion of the types of metals used in hydronic systems. Elevated salt levels also contribute to higher conductivity levels, another undesirable characteristic in hydronic systems.

Chloride - Chlorides are salts resulting from the combination of the gas chlorine with a metal and are instrumental in accelerating corrosion in metals used in hydronic systems. Chlorides may be introduced into the water naturally. Concentrations of chlorides should be less than 150 ppm.

Conductivity - Dissolved metals and minerals increase the conductivity of water and indicate not only

the presence of undesired corrosive agents, but also contribute to the transfer and migration of ions and charged particles in the water that contribute to fouling of sensors, valves, and other devices used in a hydronic/closed loop system. Additionally, high conductivity contributes to galvanic corrosion, in which one metal will preferentially corrode when in contact with another type of metal, when both are in contact with an electrolyte. Conductivity should be less than 3000 µS (microsiemens).

2.3. System Flushing, Treatment, and Cleansing - Hydronic/Closed Loop Applications

Note that prior to cleaning the heating system, **the boiler MUST be isolated from the piping to prevent infusion of containments, including sludge, into the boiler**. Section 2.3 provides recommendations for flushing, cleaning, and treating the water used in the AM Series system.

IMPORTANT!

Cleaning solution and inhibitors must be compatible with heat exchanger material. Corrosion/scale inhibitor will be ineffective if added to a dirty system; it is very important to clean the system first.

AERCO recommends the following products for hydronic/closed loop applications. Please visit www.aerco.com for Product Fact sheet and Material Safety Data Sheets:

- **Water Quality Testing — X100 Quick Test Kit**
  Part number 99152-1
- **Corrosion/Scale Inhibitor — Sentinel X100 Liquid Inhibitor**
  4 x 1 gallon case – part number 99153-2
  5 gallon jug – part number 99153-1
- **Boiler Noise Reducer — Sentinel X200 Liquid Noise Inhibitor**
  4 x 1 gallon case – part number 99154-2
  5 gallon jug – part number 99154-1
- **System Cleaner — Sentinel X300 Liquid System Cleaner**
  4 x 1 gallon case – part number 99199-2
  5 gallon jug – part number 99199-1
- **Cleaning solution — Sentinel X400 Liquid System Restorer**
  4 x 1 gallon case – part number 99155-2
  5 gallon jug – part number 99155-1
- **Antifreeze — Sentinel X500 Liquid Inhibited Antifreeze**
  5 gallon jug – part number 99156-1
  55 gallon jug – part number 99156-2
  275 gallon tote – part number 99156-3

WARNING!

Do not use these products for potable water applications.

When cleaning, treating, and maintaining, a heating system, consult a qualified professional. The following are AERCO's tips/guidelines for cleaning a heating system – these do NOT take precedence over detailed instructions from qualified professionals.

System Flushing Recommendations

- Make sure to use an appropriate amount of cleaning solution, carefully following the manufacturer's instructions. Follow the chemical manufacturer's recommendations when introducing cleaning agents into the system.
- Ensure that the cleaning solution is circulated thoroughly in the system.
- Flush the system thoroughly to remove contaminants. When emptying the system, make sure it is done as quickly as possible using all drain off points and ensuring all low lying pipework is fully drained. Opening all bleed valves ensures the system will be completely emptied.
- A reliable test to determine if a system is clean is if the Total Dissolved Solids (TDS) of the water being drained is within 10% of the make-up water TDS. This indicates that sufficient contamination has been flushed. If the difference in TDS is more than 10%, repeat the cleaning process until that is achieved. A turbidity test can determine if a system is clean.
- For boiler retrofit/replacement installation, repeat cleaning process until the draining water is clear. Once clear, the above TDS comparison (or a turbidity test) should be performed.
- If a flushing machine is used in cleaning, carefully follow the manufacturer's instructions. If the flushing machine is designed to flush individual zones, the TDS comparison must be made between each zone and the make-up water, or the turbidity test performed for each zone.
- Add corrosion and scale inhibitor after the system has been declared clean, using the appropriate amount recommended by the manufacturer. Introduce the protector/scale inhibitor to the system following the chemical treatment manufacturer's instructions. Adding inhibitor to a dirty system reduces its effectiveness.

When refilling the system, ensure the boiler is not air-bound by opening the pressure-relief valve located at the rear of the boiler. Leave the relief valve open until a steady flow of water is observed. Close the valve and finish filling the system.

Water Quality Maintenance and Boiler Warranty

Heat exchanger failures due to improperly cleaned/treated and poorly maintained water are not covered under warranty. Scheduled system/boiler water maintenance is required to maintain the heat exchanger warranty. AERCO shall reserve the right to require maintenance records when evaluating warranty claims.

Water Treatment Analysis and Scheduling

The proper mixture of water, chemical treatment, and glycol (if used) should be ascertained based on a sample of the system water and the make-up water. Your local water treatment company, or one of the manufacturers listed below, may analyze your sample. Adjust the chemical composition of your system water based on the analysis. After this initial analysis, the chemical composition of your system water should be tested at the beginning of each heating season. For boilers operating year round, this analysis should be made at least twice a year.

2.4. Primary Pump

The primary pump shall have a discharge pressure able to assure the designed water flow rate, taking into account pressure drop losses as shown in Figure 2. When selecting a pump, take into account the pressure drop across the unit, fittings, accessories, and piping. The primary pump electrical connection shall be made as shown in Figure 4 for boilers and Figure 5 for water heaters (terminals 113 and 114). AERCO provides guidelines and offers Primary Pump kits for Hydronic Applications (see Section 0) and Potable Water Applications (Section 0).

Pumps shall be calculated by installers or engineers according to boiler and system parameters. The pump is not an integral part of the boiler.

Size your water system according to the following hardness guidelines to prevent scaling of the heat exchanger. See Figure 3 for corresponding water flow.

- If the water calcium hardness is **5 to 8 grains per gallon**, this is SOFT water and you have to size the system for a 4 ft/sec minimum water velocity.
- If the water calcium hardness is **8 to 18 grains per gallon**, this is NORMAL water and you have to size the system for a 4 to 8 ft/sec minimum water velocity.
- If the water calcium hardness is **18 to 23 grains per gallon**, this is HARD water and you have to size the system for a 8 ft/sec minimum water velocity.

NOTE: Select the pump flow rate so that the boiler water outlet temperature is 190°F (87.8°C) or below.

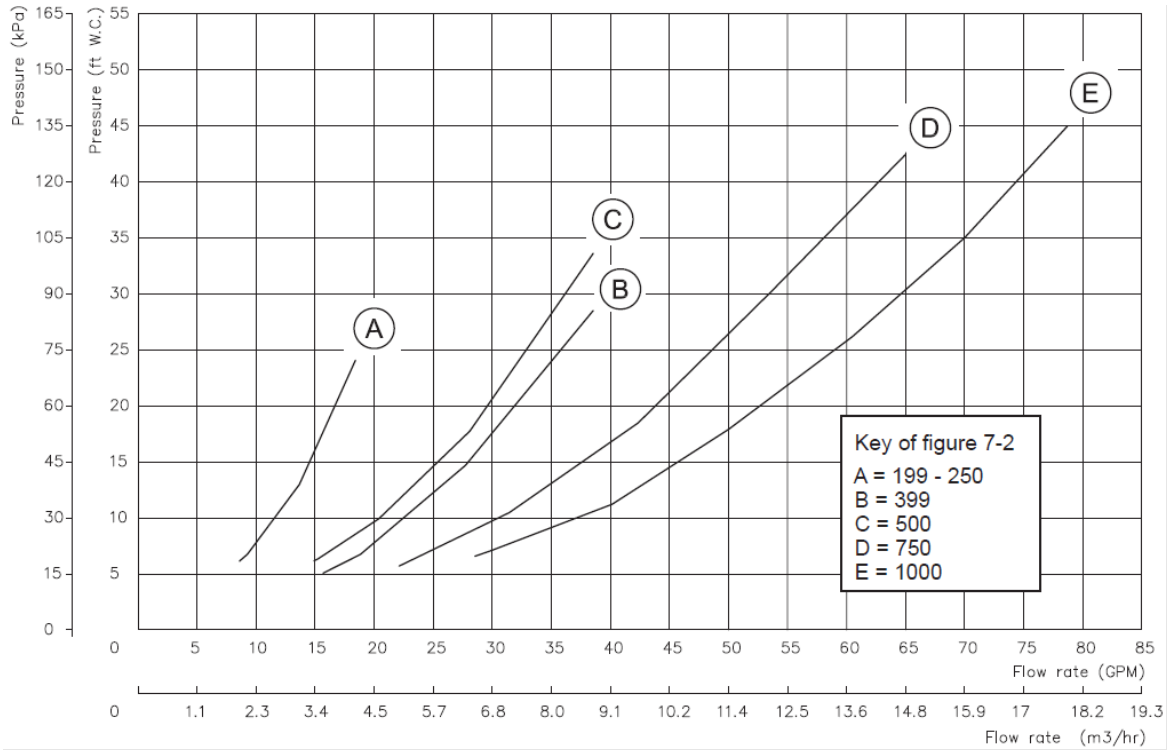


Figure 2: Water Side Pressure Loss Chart

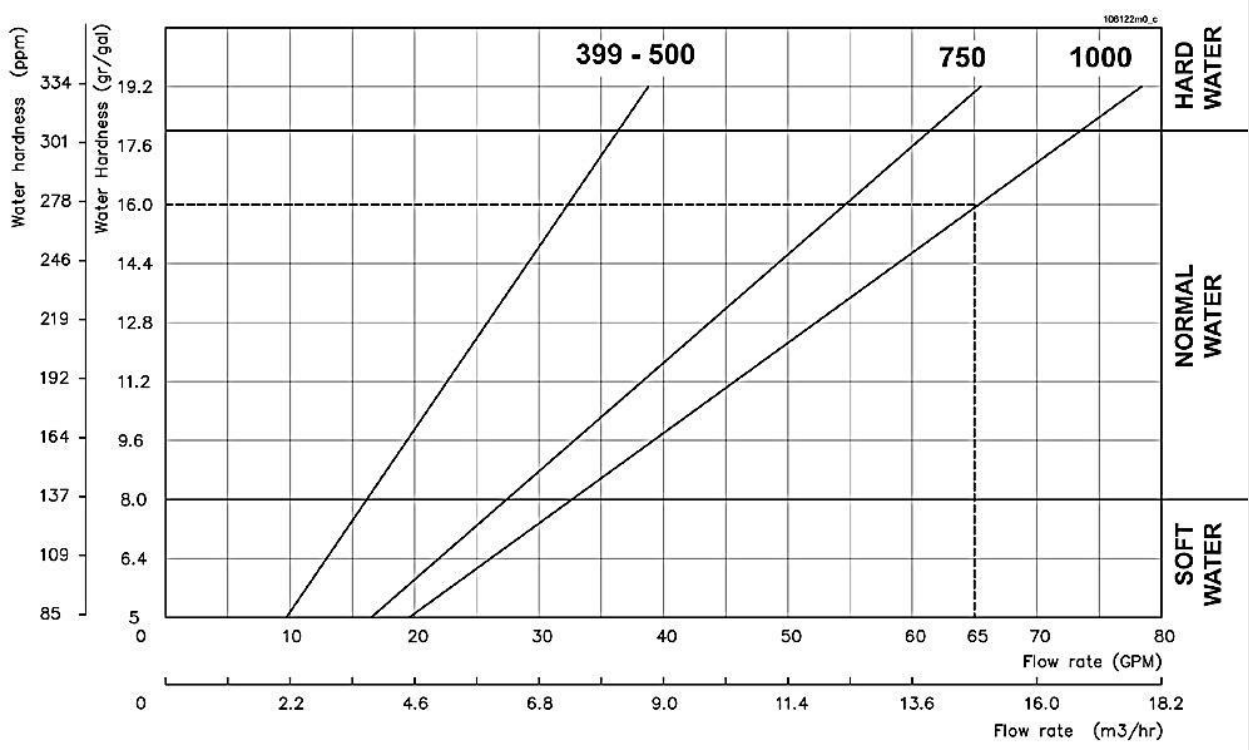


Figure 3: Minimum/Maximum Water Flow in Relation to Water Hardness

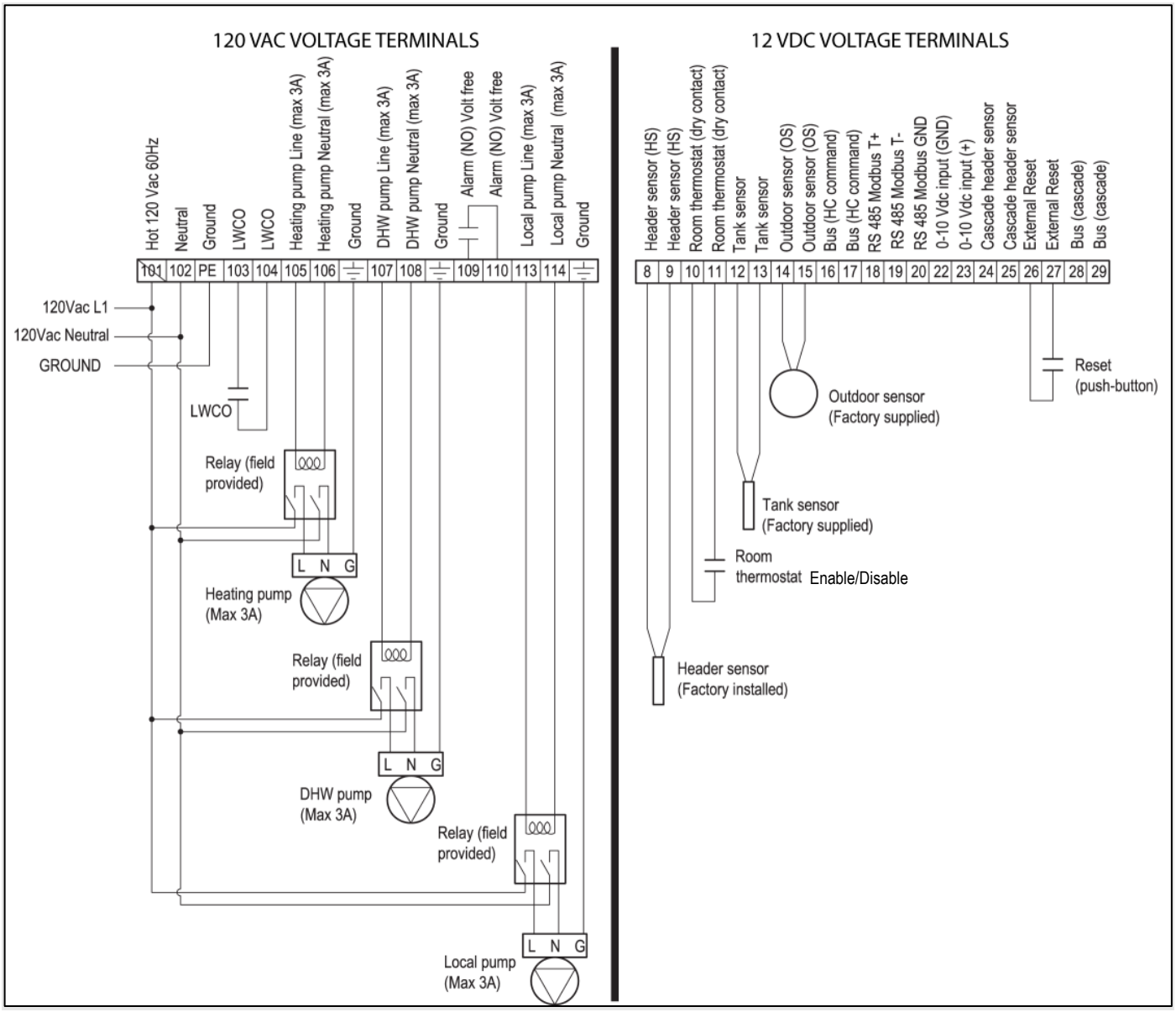


Figure 4: AM BOILER: Electrical Connections

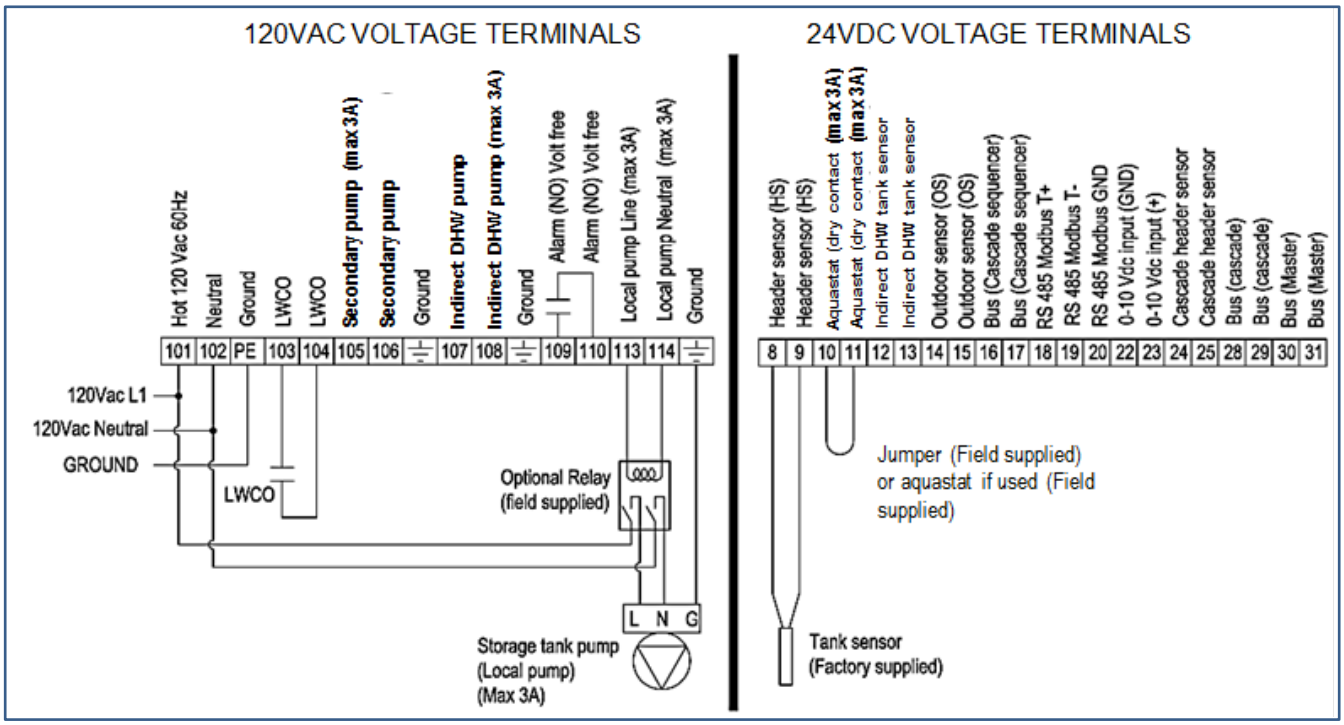


Figure 5: Water Heater Electrical Box Connections

Boiler Loop Design Guidelines

For proper and safe operation of the water tube AM boiler, the primary (boiler) loop piping and the associated fittings and accessories must be designed/selected as discussed in the following sections. Table 2 shows the required minimum flow rates at various system designed temperature rises. Also shown are pressure drops through strainers typically needed in the boiler loop (see paragraph 2.5 for strainer requirement details).

TABLE 1: Minimum and Maximum Flow Rates				
	AM 399	**AM 500**	**AM 750**	**AM 1000**
Minimum Water Flow at Min. Fire (GPM)	11	12	12	12
Minimum Water Flow at Full Fire (GPM)	22	24	36	48
Maximum Water Flow (GPM)	40	40	60	80

The following primary/secondary piping design guidelines should be used for AERCO AM Series Boiler and Water Heater installations. The following data was calculated based upon systems with Return Water Temperatures above 80°F. A 20-mesh strainer (or finer) is required at each boiler inlet. Water flow rates and pressure drops shown below are for the primary loop. Flow rates vary with system design parameters. **The boiler loop fittings and strainer pressure drops shown below are <u>examples only</u> – actual pressure drops will vary depending on actual piping layout and strainer size/type used.** The pump kits listed are for boiler applications only and are not approved for potable water. See section 2.3.5 for potable water applications.

TABLE 2: Flow Rate and Pressure Drop				
40°F ΔT Loop Conditions		**AM 500**	**AM 750**	**AM 1000**
Water Flow (GPM) @ **40°F ΔT**		24	36	48
Water Pressure Drop (Ft. of Hd.) across the Boiler @ 40°F ΔT		14	14	16
Strainer ΔP (Ft. of Hd.) – ('Y' Strainer, 20 mesh)		0.85	0.56	1.00
ΔP (Ft. of Hd.) – (20' SCH.40, 4 x 90°, 2 x reducing couplings, 2 x Ball Valve)		1.64	1.11	1.74
Total Primary Loop ΔP (Ft. of Hd.) @ ΔT of 40°F		**16.48**	**16.67**	**18.73**
VARIABLE SPEED PUMP				
Recommended AERCO Pump Kit for piping configurations not exceeding what is shown in the sample ΔP calculation above.		**99251-1**	**99251-2**	**99251-2**
Kit includes: Pump Flange Size		1-1/2"	1-1/2"	1-1/2"
Recommended AERCO AM Boiler Installation Kit (kit **already includes** above Pump, plus Strainer, Isolation Valve, and pipe fittings).		**58145-1**	**58145-3**	**58145-4**
Installation Kit designed for supply/return piping diam: Strainer and Isolation valves sizes (NPT):		1-1/2"	2"	2-1/2"
CONSTANT SPEED PUMP				
Recommended AERCO Pump+Circuit Setter Kit for piping configurations not exceeding what is shown in the sample ΔP calculation above.		**99127-1**	**99127-10**	**99127-9**
Kit includes: Pump Flange Size:		1-1/2"	2"	2"
Kit includes: Circuit Setter Size (NPT):		1-1/2"	2"	2-1/2"
Recommended AERCO AM Boiler Installation Kit (Installation Kit already includes above Pump/Circuit setter kit, plus Strainer, Isolation Valve, and pipe fittings).		**58134-1**	**58134-8**	**58134-9**
Installation Kit designed for supply/return piping diam: Strainer and Isolation valves sizes (NPT):		1-1/2"	2"	2-1/2"

30°F ΔT Loop Conditions	**AM 399**	**AM 500**	**AM 750**	**AM 1000**
Water Flow (GPM) @ **30°F ΔT**	24.5	30.7	46.0	61.3
Water Pressure Drop (Ft. of Hd.) across Boiler @ 30°F ΔT Flow	13	25	23	27
Strainer ΔP (Ft. of Hd.) – ('Y' Strainer, 20 mesh)	0.96	0.44	1.00	1.77
ΔP (Ft. of Hd.) – (20' SCH.40, 4 x 90°, 2 x reducing couplings, 2 x Ball Valve)	1.76	0.75	1.74	3.11
Total Primary Loop ΔP (Ft. of Hd.) @ ΔT of 30°F	**15.72**	**26.19**	**25.73**	**31.88**
VARIABLE SPEED PUMP				
Recommended AERCO Pump Kit for piping configurations not exceeding what is shown in the sample ΔP calculation above	**99251-1**	**99251-2**	**99251-2**	**99251-4**
Kit includes: Pump Flange Size	1-1/2"	1-1/2"	1-1/2"	2-1/2"
Recommended AERCO AM Boiler Installation Kit (kit includes Pump, plus Strainer, Isolation Valve, and pipe fittings).	**58145-1**	**58145-6**	**58145-4**	**58145-7**
Installation Kit designed for supply/return piping diam: Strainer and Isolation valves sizes (NPT):	1-1/2"	2"	2-1/2"	2-1/2"
CONSTANT SPEED PUMP				
Recommended AERCO Pump+Circuit Setter Kit for piping configurations not exceeding what is shown in the sample ΔP calculation above.	**99127-1**	**99127-10**	**99127-9**	**99208-2**
Kit includes: Pump Flange Size:	1-1/2"	2"	2"	2"
Kit includes: Circuit Setter Size (NPT):	1-1/2"	2"	2-1/2"	2-1/2"
Recommended AERCO AM Boiler Installation Kit (Kit **includes** above Pump/Circuit setter kit, plus Strainer, Isolation Valve, and pipe fittings).	**58134-1**	**58134-10**	**58134-9**	**58134-7**
Installation Kit designed for supply/return piping diam: Strainer and Isolation valves sizes (NPT):	1-1/2"	2"	2-1/2"	2-1/2"

25°F ΔT Loop Conditions	AM 399	AM 500	AM 750	AM 1000
Water Flow (GPM) @ **ΔT of 25°F**	29.4	36.8	55.2	73.6
Water Pressure Drop (Ft. of Hd.) across the Boiler @ 25°F ΔT Flow	19	35	32	39
Strainer ΔP (Ft. of Hd.) – ('Y' Strainer, 20 mesh)	0.41	0.64	0.70	1.25
ΔP (Ft. of Hd.) – (20' SCH.40, 4 x 90°, 2 x reducing couplings, 2 x Ball Valve)	0.71	1.21	0.92	1.76
Total Primary Loop ΔP (Ft. of Hd.) @ ΔT of 25°F	**20.12**	**36.85**	**33.62**	**42.01**
VARIABLE SPEED PUMP				
Recommended AERCO Pump+Circuit Setter Kit for piping configurations not exceeding what is shown in the sample ΔP calculation above.	**99251-2**	**99251-2**	**99251-4**	**99251-4**
Kit includes: Pump Flange Size	1-1/2"	1 1/2"	2-1/2"	2-1/2"
Recommended AERCO AM Boiler Installation Kit (Installation Kit **already includes** above Pump, plus Strainer, Isolation Valve, and pipe fittings).	**58145-6**	**58145-6**	**58145-7**	**58145-7**
Installation Kit designed for supply/return piping diam: Strainer and Isolation valves sizes (NPT):	2"	2"	2-1/2"	2-1/2"
CONSTANT SPEED PUMP				
Recommended AERCO Pump+Circuit Setter Kit for piping configurations not exceeding what is shown in the sample ΔP calculation above.	**99127-10**	**99208-2**	**99208-2**	**99208-2**
Kit includes: Pump Flange Size:	2"	2"	2"	2"
Kit includes: Circuit Setter Size (NPT):	2"	2-1/2"	2-1/2"	2-1/2"
Recommended AERCO AM Boiler Installation Kit (kit includes above Pump/Circuit setter kit, plus Strainer, Isolation Valve, and pipe fittings).	**58134-10**	**58134-11**	**58134-7**	**58134-7**
Installation Kit designed for supply/return piping diam: Strainer and Isolation valves sizes (NPT):	2"	2-1/2"	2-1/2"	2-1/2"

NOTE: Units with outlet connections matching pipe size do not include reducer.

Potable Applications Primary Loop Design Guidelines

For proper and safe operation of the water tube AM water heater, the primary (heater) loop piping and the associated fittings and accessories must be designed/selected as discussed in the following sections. Table 3 shows the required minimum flow rates at various potable water hardness. Also shown are pressure drops through strainers typically needed in the boiler loop (see 2.5 for strainer requirement details).

TABLE 3: Minimum and Maximum Flow Rates				
	AM 399	**AM 500**	**AM 750**	**AM 1000**
Minimum Water Flow at Min. Fire (GPM)	11	12	12	12
Minimum Water Flow at Full Fire (GPM)	22	24	36	48
Maximum Water Flow (GPM)	40	40	60	80

The following primary/secondary piping design guidelines should be used for AM Series potable water

applications. A 20-mesh strainer (or finer) is required at each inlet. Water flow rates and pressure drops shown below are for the primary loop. Flow rates vary with system design parameters. The water heater loop fittings and strainer pressure drops shown below are examples only - actual pressure drops will vary depending on actual piping layout and strainer size/type used.

TABLE 4: Potable Applications				
MAXIMUM Potable Water Hardness = 10 grains per gallon				
	AM 399	**AM 500**	**AM 750**	**AM 1000**
Water Flow (GPM)	22	24	36	48
Water Press. Drop (Ft. of Hd.) across AM Series	10	14	14	17
Strainer ΔP (Ft. of Hd.) – ('Y' Strainer, 20 mesh) plus ΔP (Ft. of Hd.) – (20' SCH.40, 4 x 90°, 2 x reducing couplings, 2 x Ball Valve)	2.15	2.15	1.65	2.25
Total Primary Loop ΔP (Ft. of Hd.)	12.15	16.15	15.65	19.25
Recommended AERCO Pump+Circuit Setter Kit for piping configurations not exceeding sample ΔP calculation above.	**99237-1**	**99237-2**	**99237-2**	**99237-5**
Kit includes: Pump Flange Size	1-1/4"	1-1/4"	1-1/2"	1-1/2"
Kit includes: Circuit Setter Size (NPT)	1-1/2"	1-1/2"	2"	2"
Recommended AERCO AM DHW Installation Kit (Installation Kit **already includes** above Pump/Circuit setter kit, plus Strainer, Isolation Valve, and pipe fittings).	**58135-1**	**58135-2**	**58135-2**	**58135-3**
Installation Kit designed for inlet/outlet piping diameter: Strainer and Isolation valves sizes (NPT):	1-1/2"	2"	2"	2"
MAXIMUM Potable Water Hardness = 18 grains per gallon				
Water Flow (GPM)	37	37	60	75
Water Press. Drop (Ft. of Hd.) across AM Series	27	32	38	41
Strainer ΔP (Ft. of Hd.) – ('Y' Strainer, 20 mesh) plus ΔP (Ft. of Hd.) – (20' SCH.40, 4 x 90°, 2 x reducing couplings, 2 x Ball Valve)	1.88	1.88	2.20	3.05
Total Primary Loop ΔP (Ft. of Hd.)	**28.88**	**33.88**	**40.20**	**44.05**
Recommended AERCO Pump+Circuit Setter Kit for piping configurations not exceeding sample ΔP calculation above.	**99237-5**	**99237-5**	**99227-5**	**99227-5**
Kit includes: Pump Flange Size	1-1/2"	1-1/2"	2"	2"
Kit includes: Circuit Setter Size (NPT)	2"	2"	2-1/2"	2-1/2"
Recommended AERCO AM DHW Installation Kit (Installation Kit **already includes** above Pump/Circuit setter kit, plus Strainer, Isolation Valve, and pipe fittings).	**58135-3**	**58135-3**	**58135-4**	**58135-4**
Installation Kit designed for inlet/outlet piping diameter: Strainer and Isolation valves sizes (NPT):	2"	2"	2-1/2"	2-1/2"

NOTE: Units with outlet connections matching pipe size do not include reducer.

2.5. Strainers

AERCO requires the installation of a Y strainer to keep dirt out of the system and boiler. The strainer should be installed in the return piping with isolation valves to allow for cleaning as necessary. The Y strainer shall have a 20 mesh or finer strainer. Such filter shall protect the boiler from heating system dirt. It should be regularly cleaned to prevent problems.

2.6. Isolation Valves

It is MANDATORY that ball or other type of shut-off valves be installed in the system supply and return piping to isolate the boiler if necessary. In this case the boiler can be disconnected or drained without having to drain the whole system.

WARNING!

NEVER bypass safety devices, such as safety valves and expansion vessels.

2.7. Air Venting of The Heating System

AM Series units come standard with automatic air vents on each of the headers on the rear (see Figures 6a and 6b). These vents are for the unit only, *not* the entire heating system. An effective air vent for the entire heating system must be installed at the highest point of the system piping.

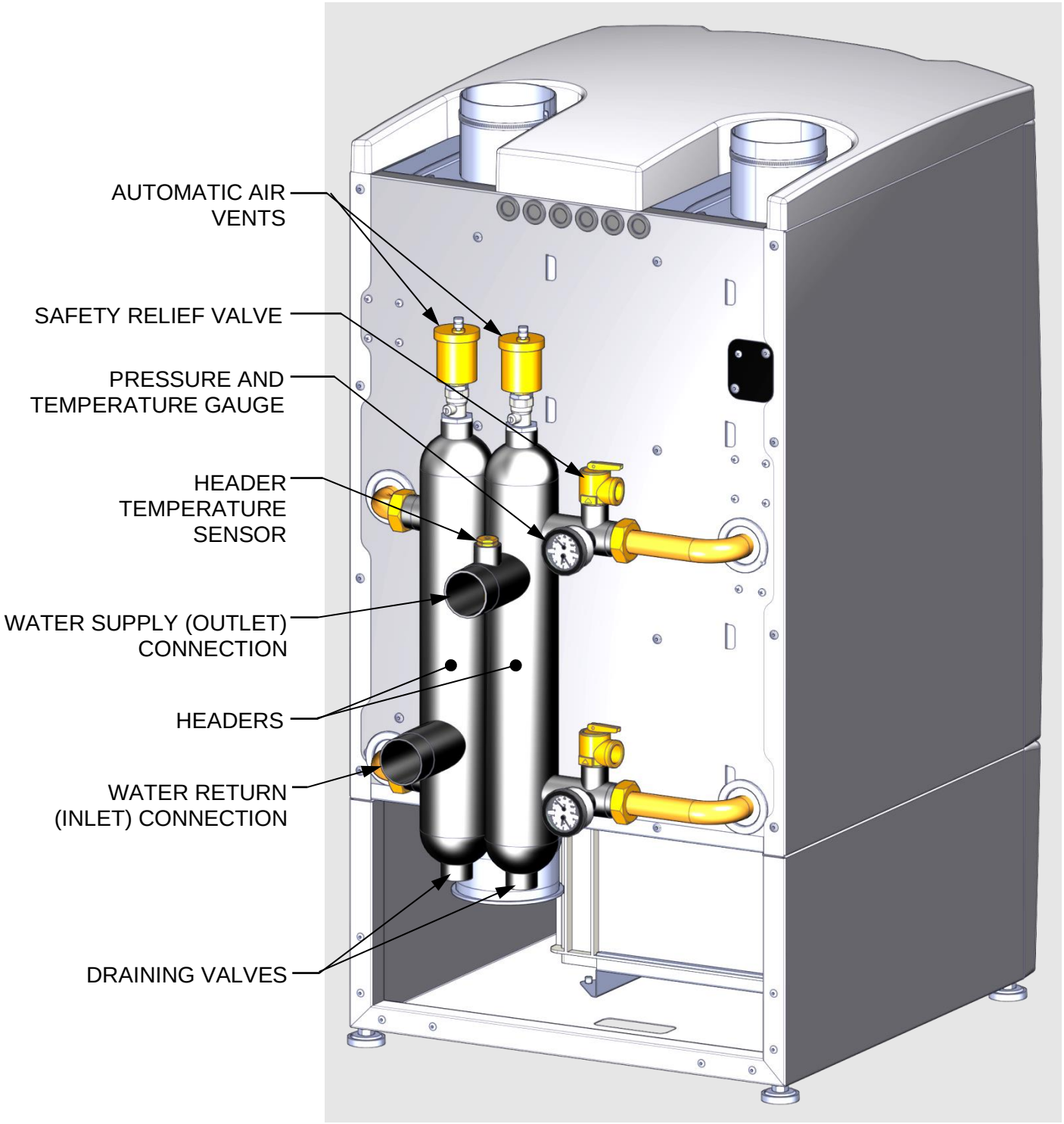


Figure 6a: AM 399/500 Rear Panel Connections

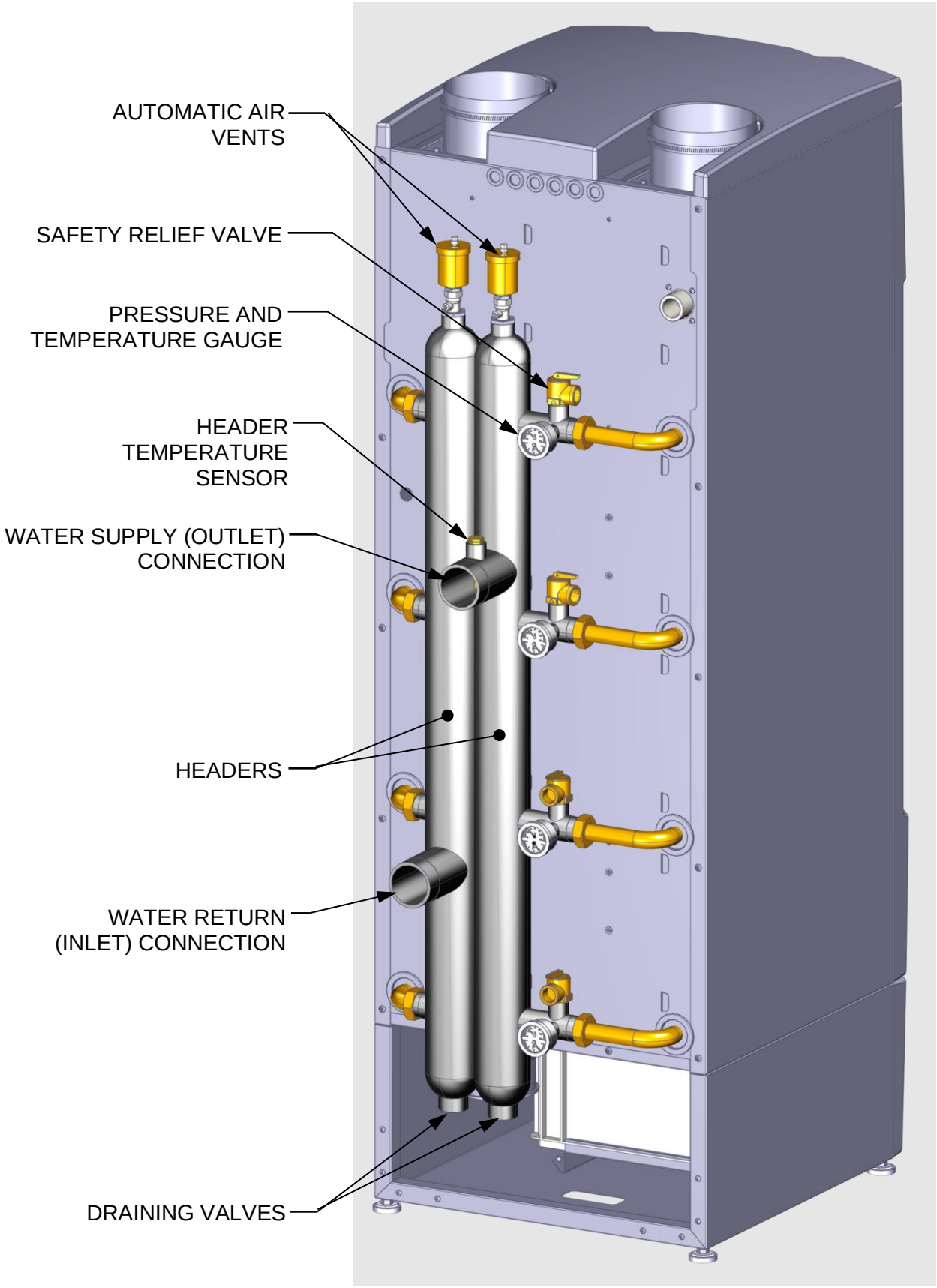


Figure 6b: AM 750/1000 Rear Panel Connections

2.8. Low Water Cutoff (Lwco)

The low water cutoff (LWCO) is required (see Figure 7). This is shipped from AERCO. When installing such a device, you must consult and abide by all local codes and regulations in force.

Figure 7: Low Water Cutoff (LWCO)

NOTE: Use Teflon tape or a suitable pipe joint compound for component and piping connections.

2.9. Mixing Valve

An anti-scald mixing valve is required on all potable water applications. This valve is field supplied. When installing this valve, you must consult and abide by all local codes and regulations in force.

SEC 3: CONNECTIONS

3.1. Primary-Secondary Piping

Primary-secondary piping must be utilized. This can be accomplished by using a common pipe (see Figures 11, 13, 15, 17) or a hydraulic separator. Primary – secondary piping decouples the boiler loop from the system loop, making it independent from system loop pressure fluctuations associated with opening/closing of zone valves or 3-way valves.

3.2. System Filling And Draining

The boiler is equipped with its own header drains (see Figures 6a and 6b for the drain locations). **NEVER USE IT TO DRAIN THE ENTIRE SYSTEM**, since the system dirt could gather in the boiler and compromise its operation. The system itself shall be equipped with its own drain, whose size will depend on the system capacity.

- For filling the system, a filling tap has to be inserted on the system return pipe.
- The filling can also be done through the draining tap on the boiler return manifold (see drain valve locations in Figure 6a and Figure 6b).
- In both cases, an approved hydraulic disconnection system has to be fitted.
- Before connecting the boiler, carefully rinse out the whole system, as specified in Section 2.3 or by local code and best practices.

3.3. Condensate Drain

To maintain proper flow the drain pipe must have a slope toward the drain of at least 3/8 in./ft. (31 mm/m). In order to prevent ice from forming, the condensate piping must be well insulated.

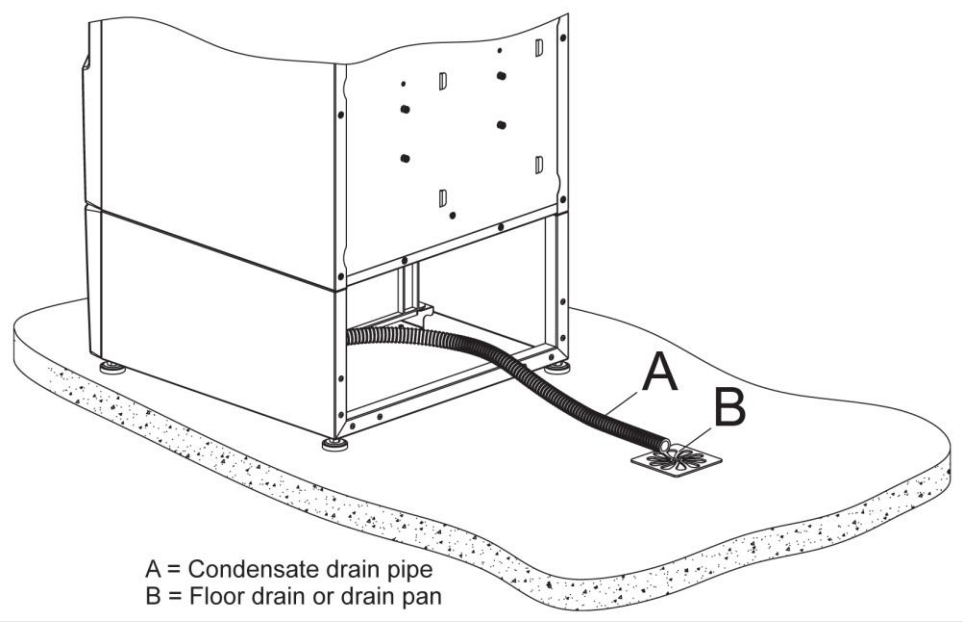


Figure 8: Typical Condensate Drain Installation

The AM Series of boilers and water heaters come equipped with a condensate trap and neutralizer tank (see Figure 9). It is crucial that these be filled with water to prevent combustion gases from entering the room and/or gases flowing backwards through the condensate line. A corrugated tube is provided to pipe neutralized condensate to a drain. It may be necessary to add additional piping to the condensate removal system in order to reach an appropriate drain.

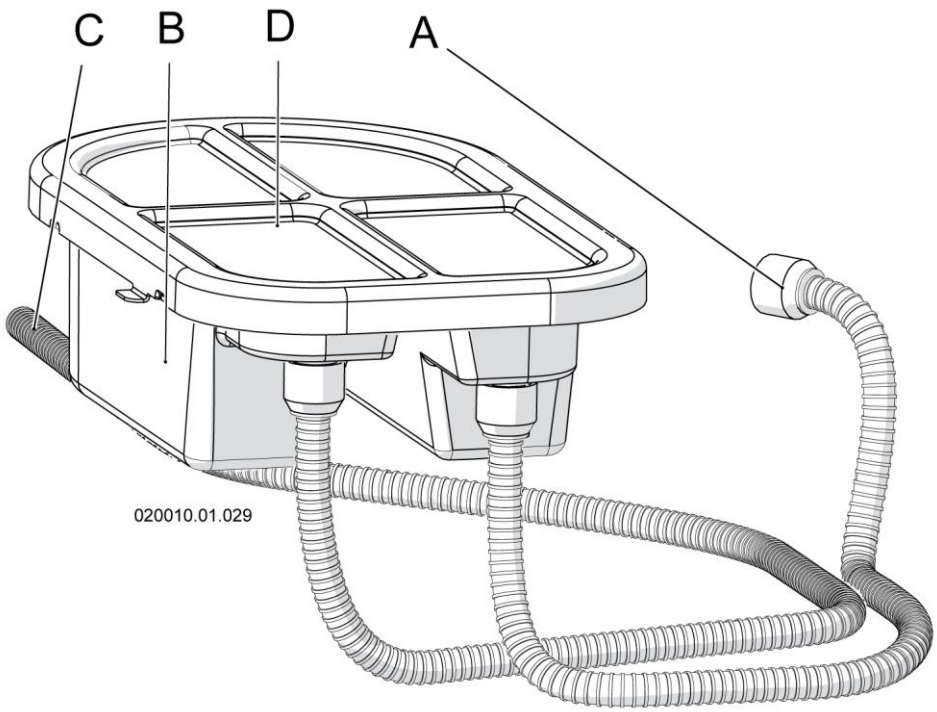


Figure 9: Condensate Drain Assembly Components

WARNING
The condensate collection box must be filled with water to prevent flue gas emissions from escaping during unit operation. Failure to comply with this requirement can result in dangerous levels of carbon monoxide and other dangerous gases.

SEC 4: PIPING DIAGRAMS

IMPORTANT PIPING NOTES!

- For actual sizes and locations of piping and other connections to the boiler, see appropriate dimensional drawing.
- Drain valve and condensate drain hose should be arranged to permit the fluids to drain freely by gravity to a convenient floor drain. The relief valve should be piped vertically to a height 18" above the floor.
- All piping and electric connections (service switches, conduit boxes, etc.) should be 6" away from side panels.
- **Mandatory:** primary pump
- **Mandatory:** boiler strainer (20 mesh or finer).
- Recommended: Gas regulator (and is **required** when supply pressure is greater than 13" W.C.)
- All drawings are of typical installations. Local codes and authorities should be consulted.

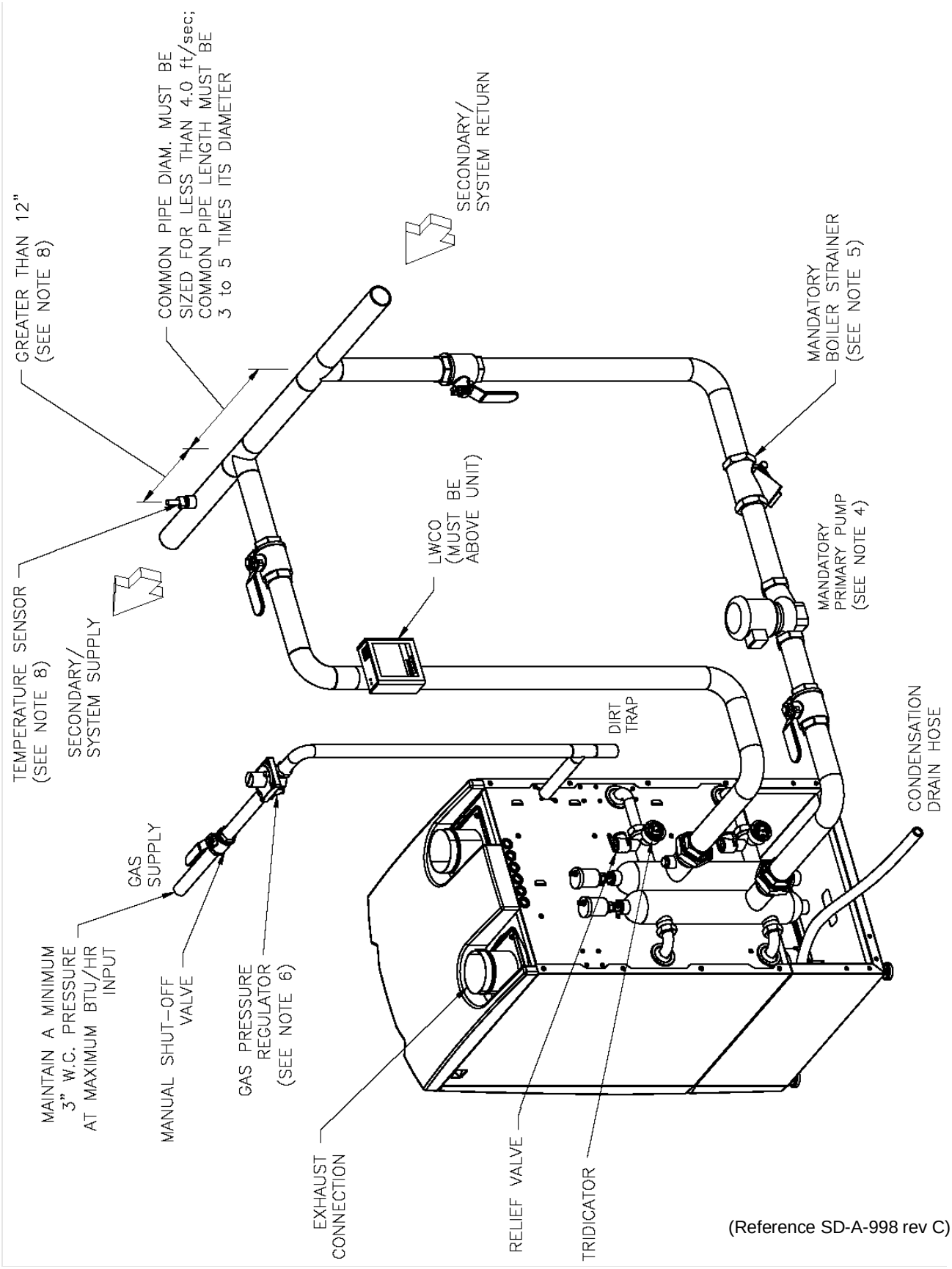


Figure 10: AM 399/500 Single Unit Installation

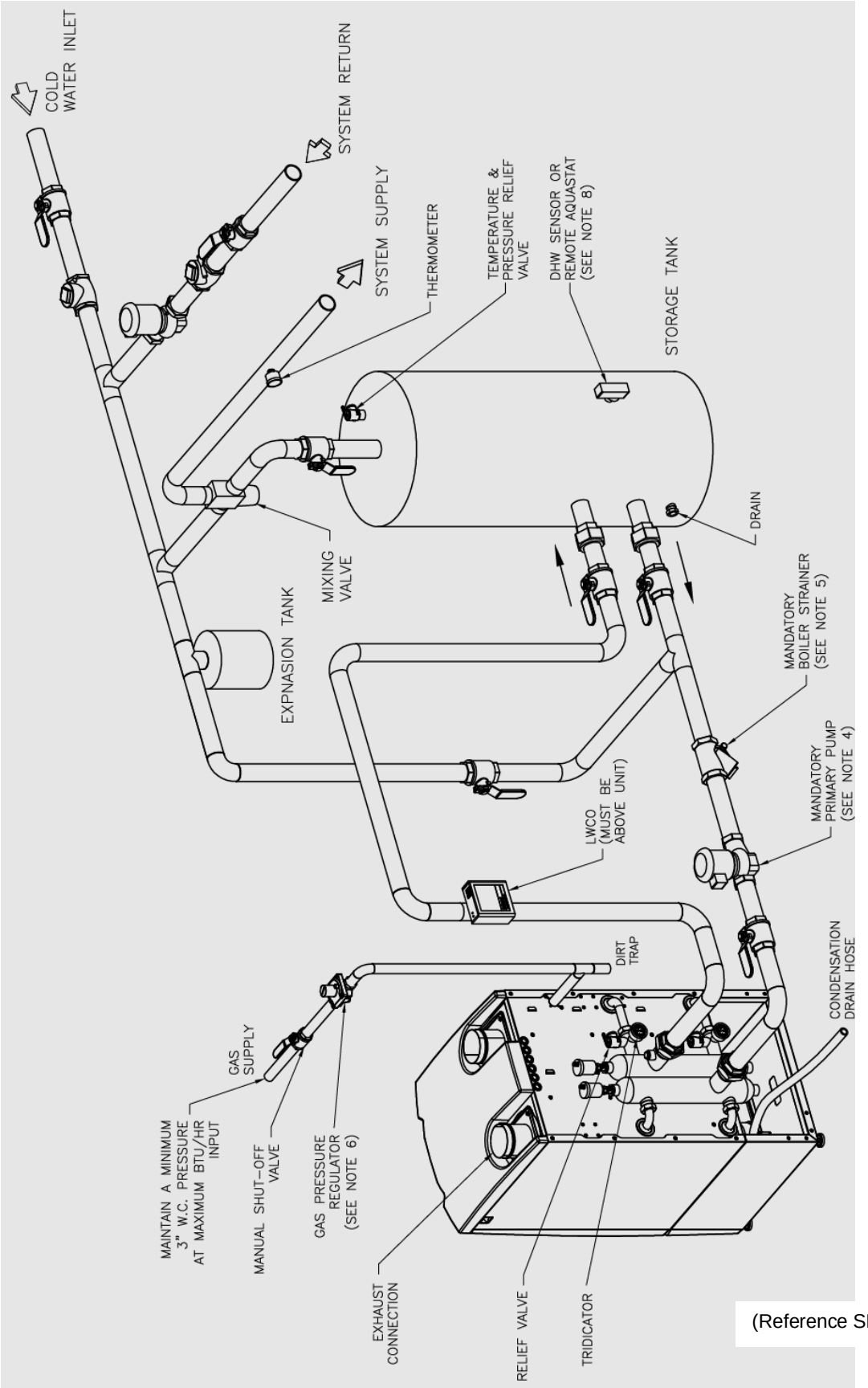
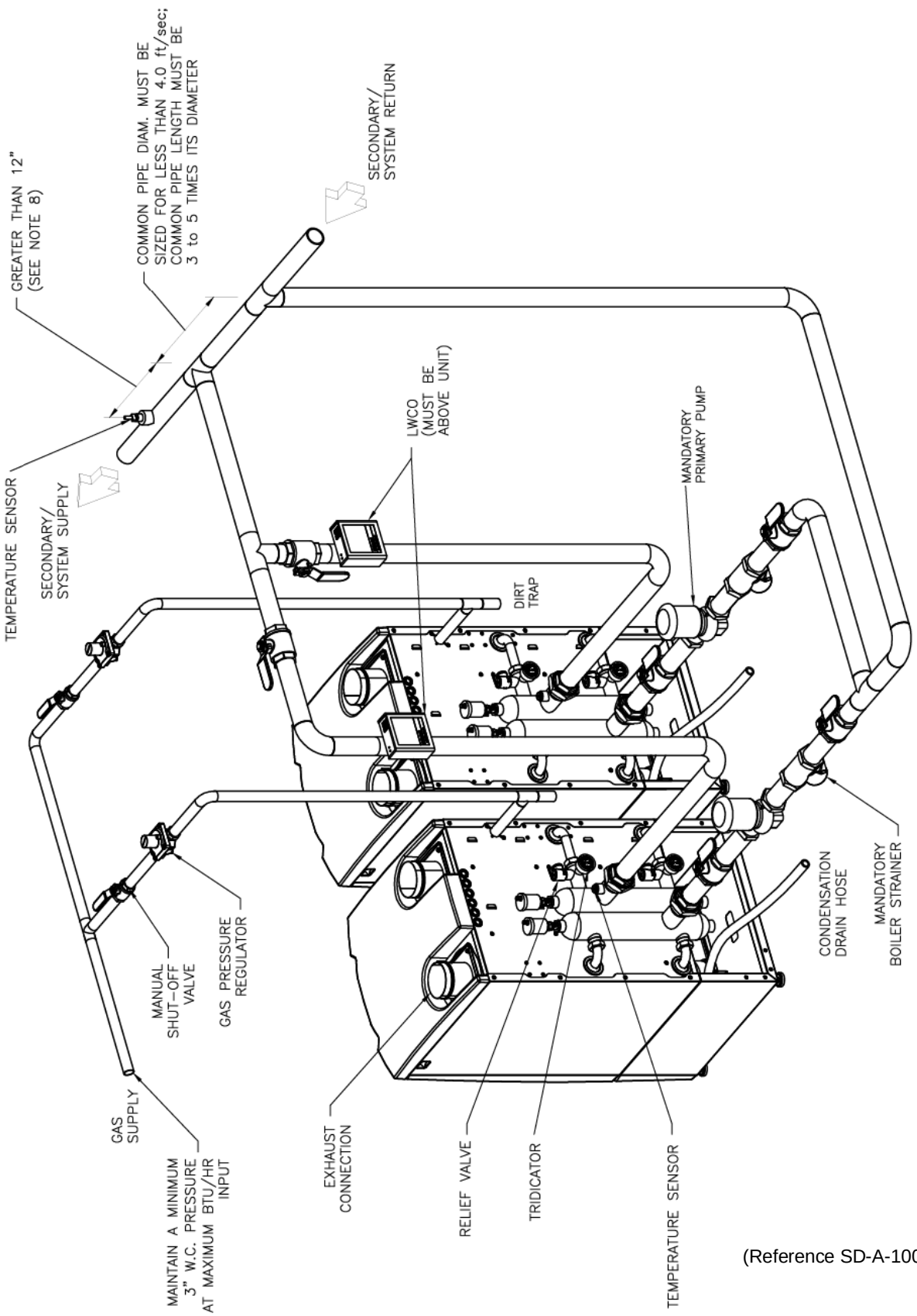
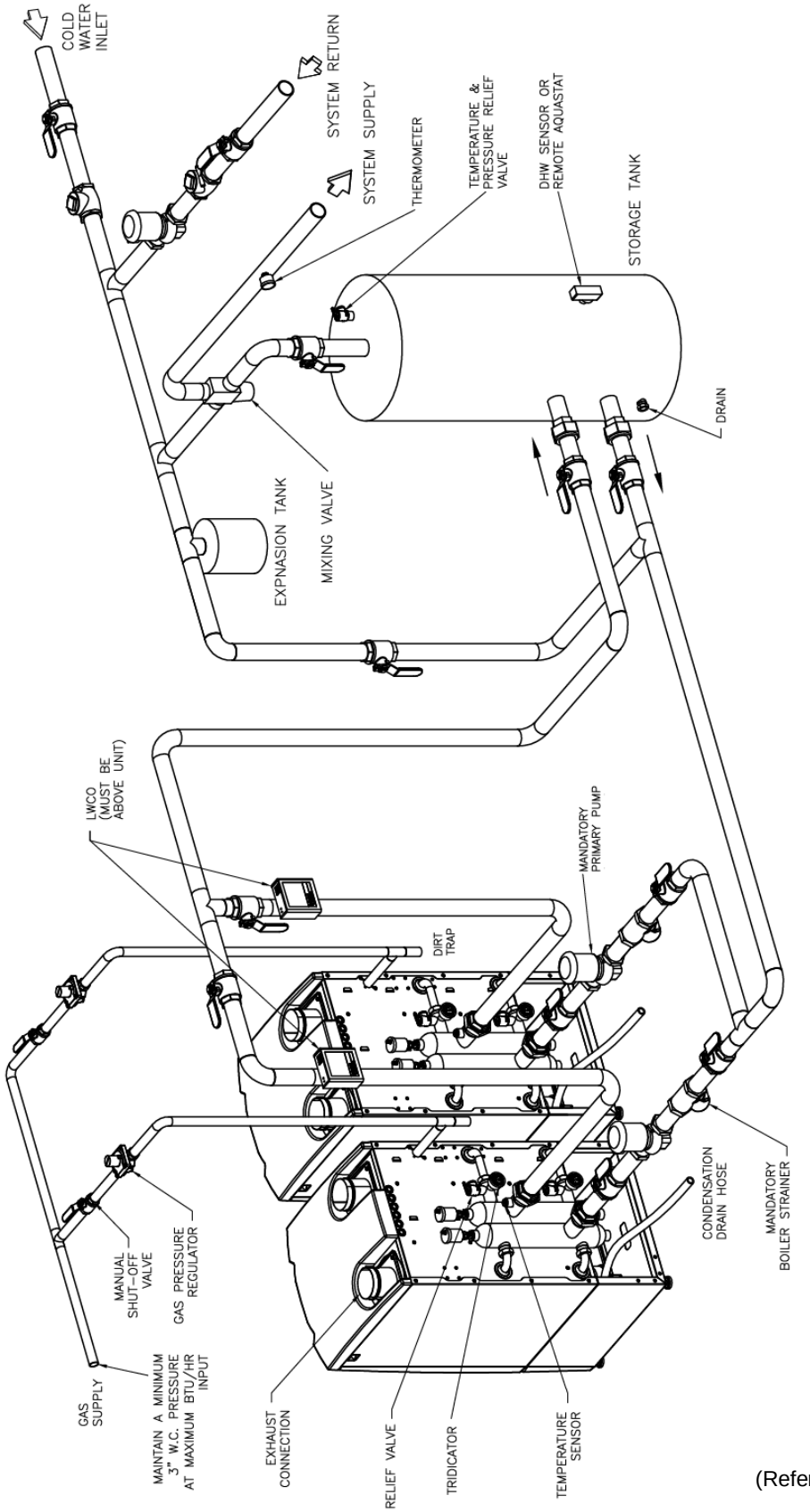


Figure 11: AM Series 399/500 Single Unit Installation with DHW Installed



(Reference SD-A-1000 rev C)

Figure 12: AM Series 399/500 Multiple Unit Installation



(Reference SD-A-1001 rev D)

Figure 13: AM Series 399/500 Multiple unit Installation with DHW Installed

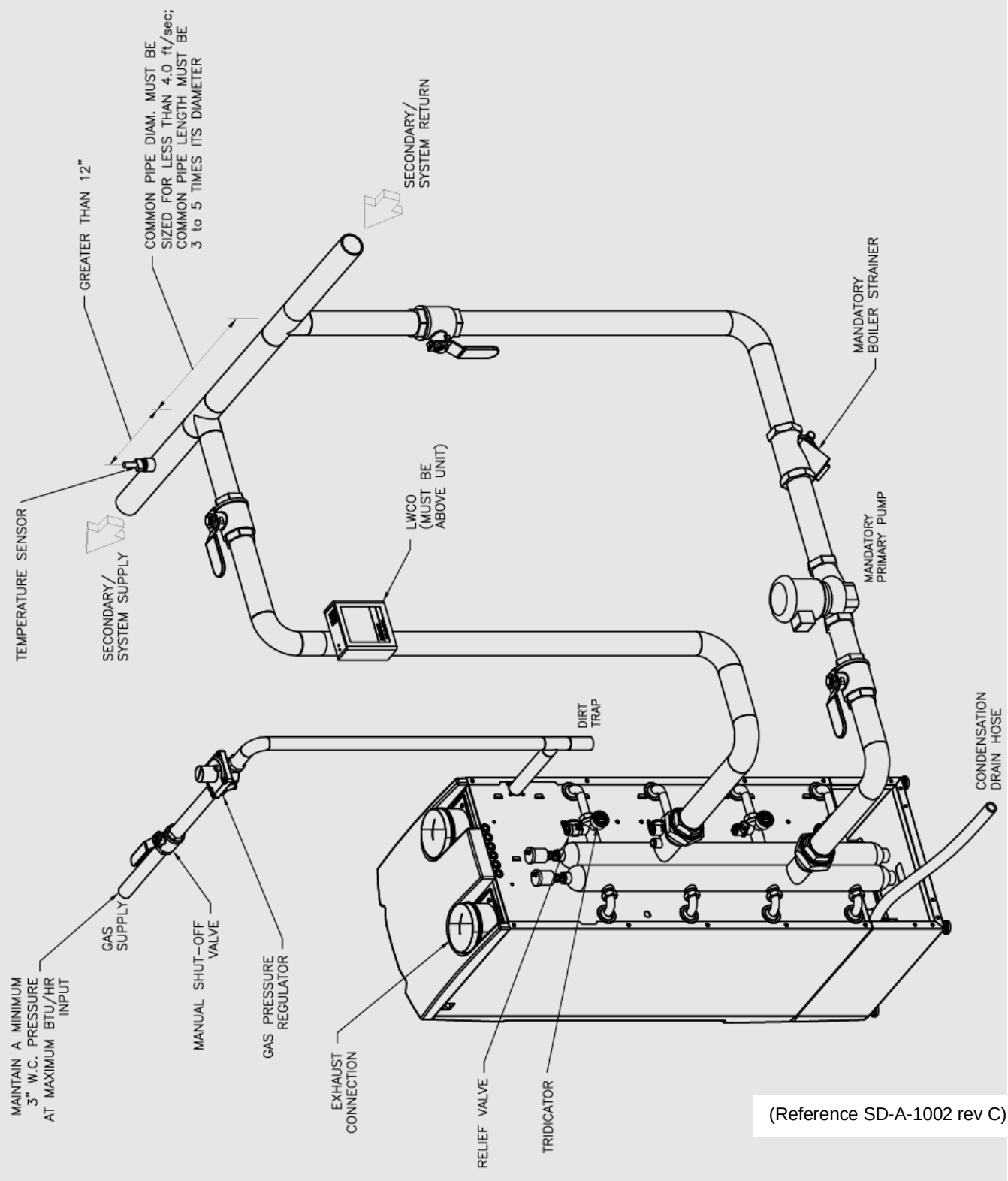
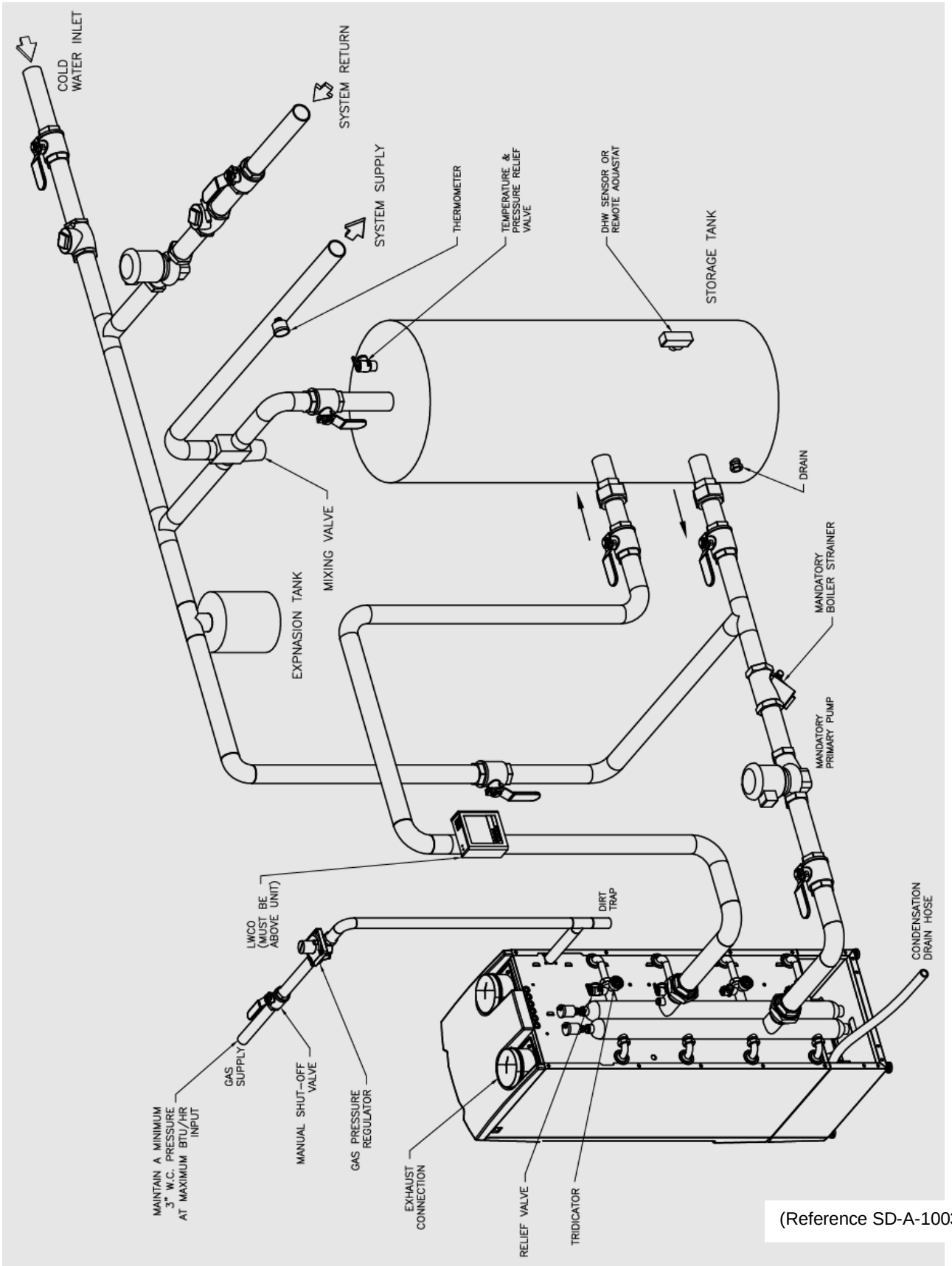


Figure 14: AM 750/1000 Single Unit Installation



(Reference SD-A-1003 rev D)

Figure 15: AM Series 750/1000 Single Unit Installation with DHW Installed

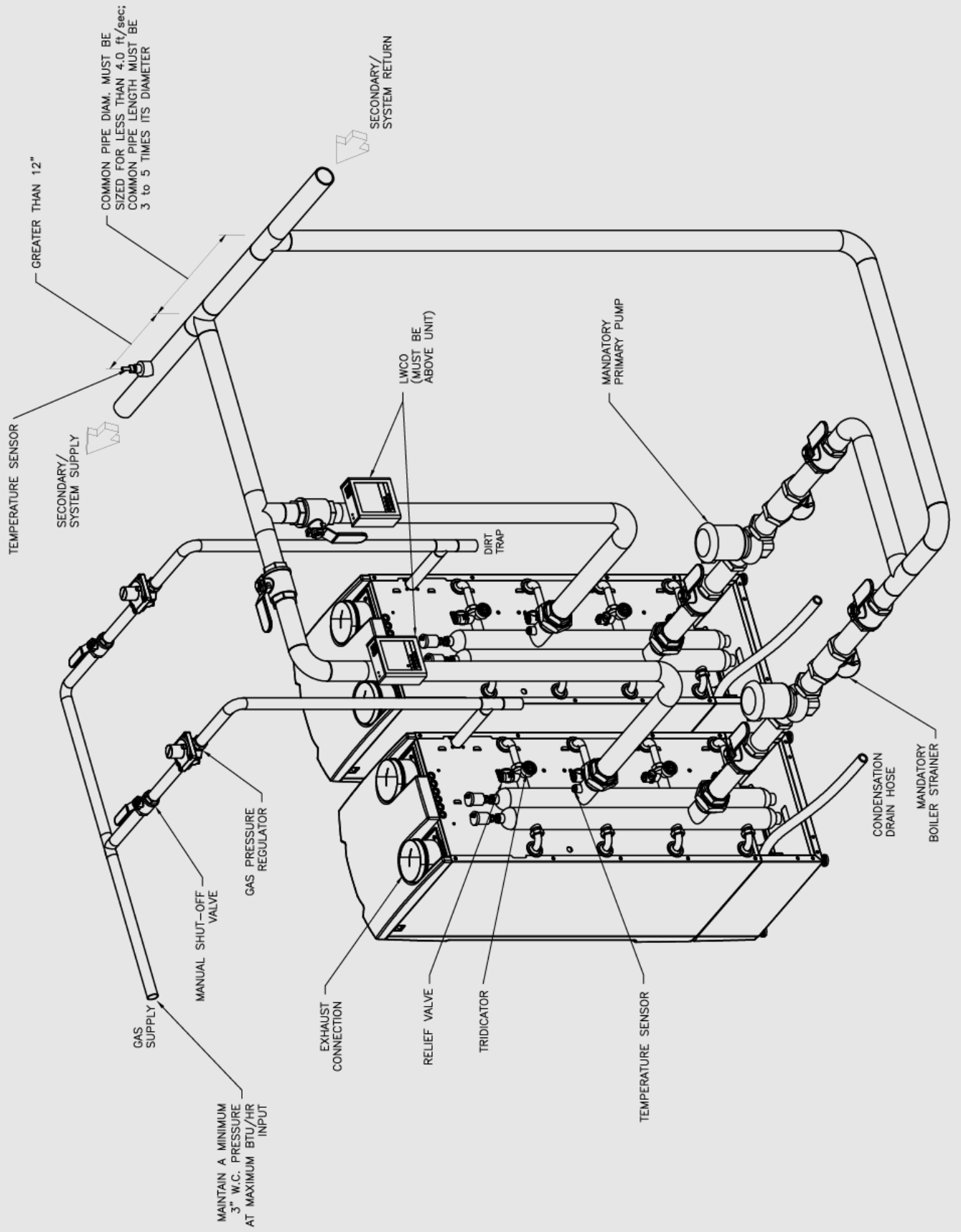
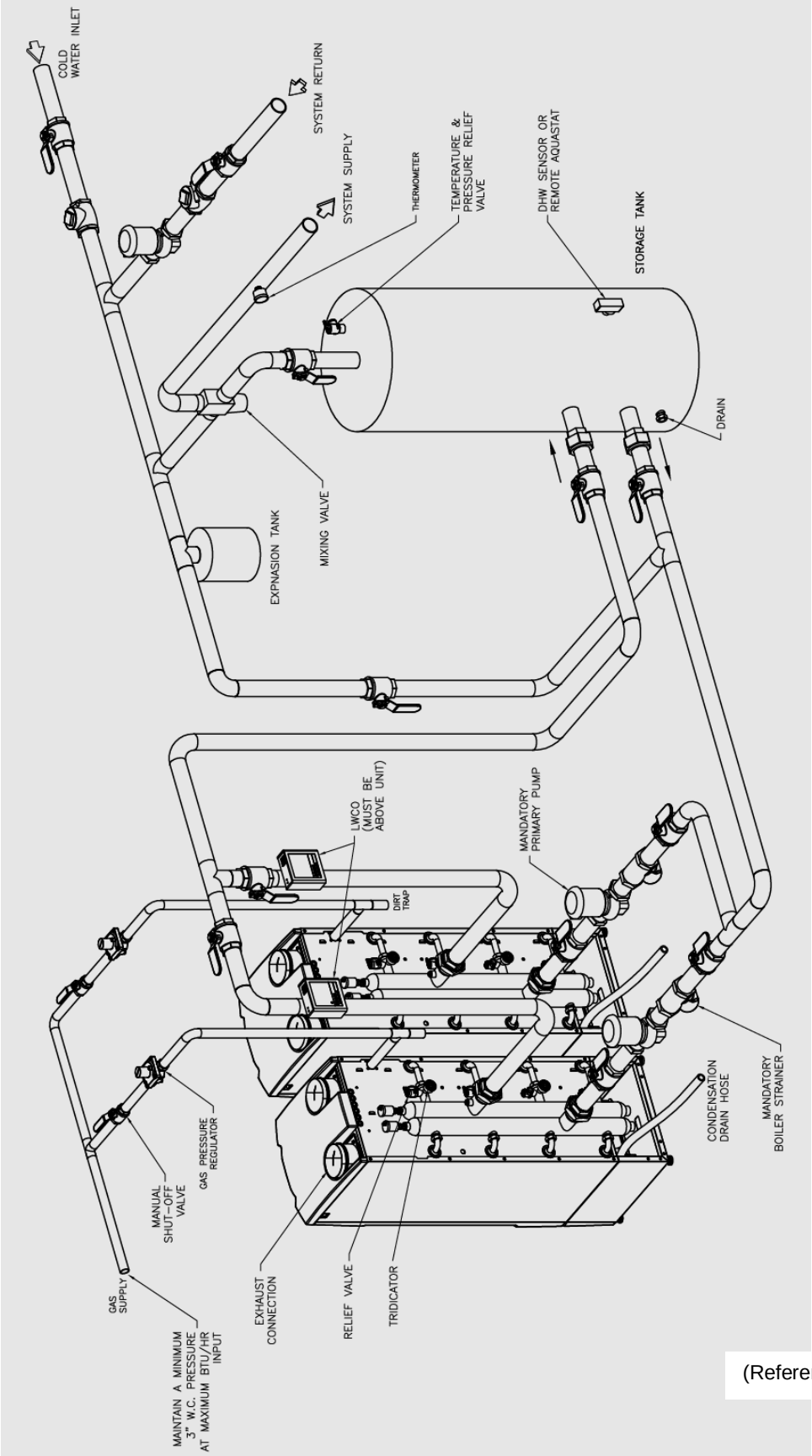


Figure 16: AM Series 750/1000 Multiple Unit Installation



(Reference SD-A-1005 rev D)

Figure 17: AM Series 750/1000 Multiple unit Installation with DHW Installed

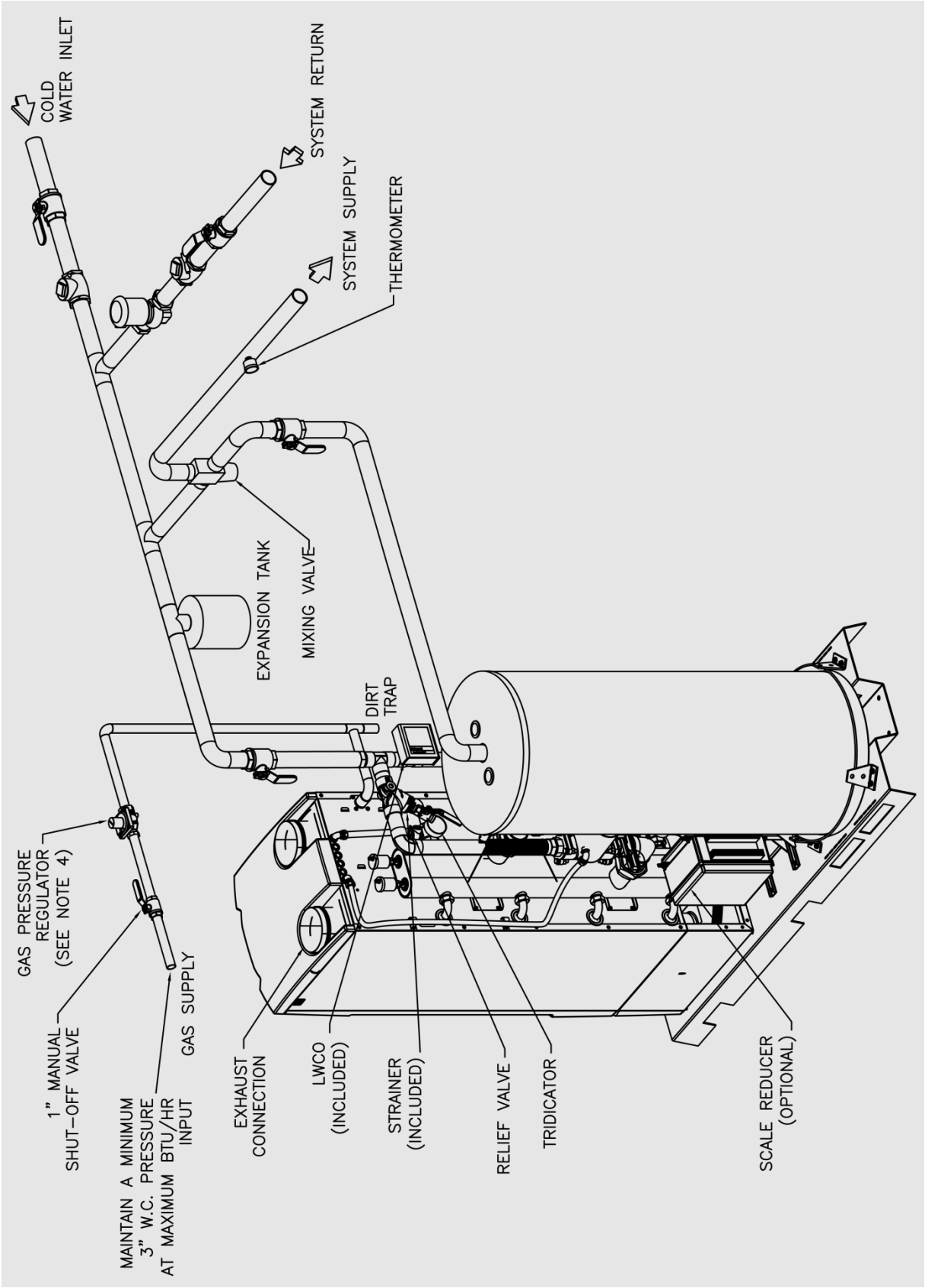


Figure 18: AM Series 750R/1000R, Single Unit Installation with Optional Scale Reducer

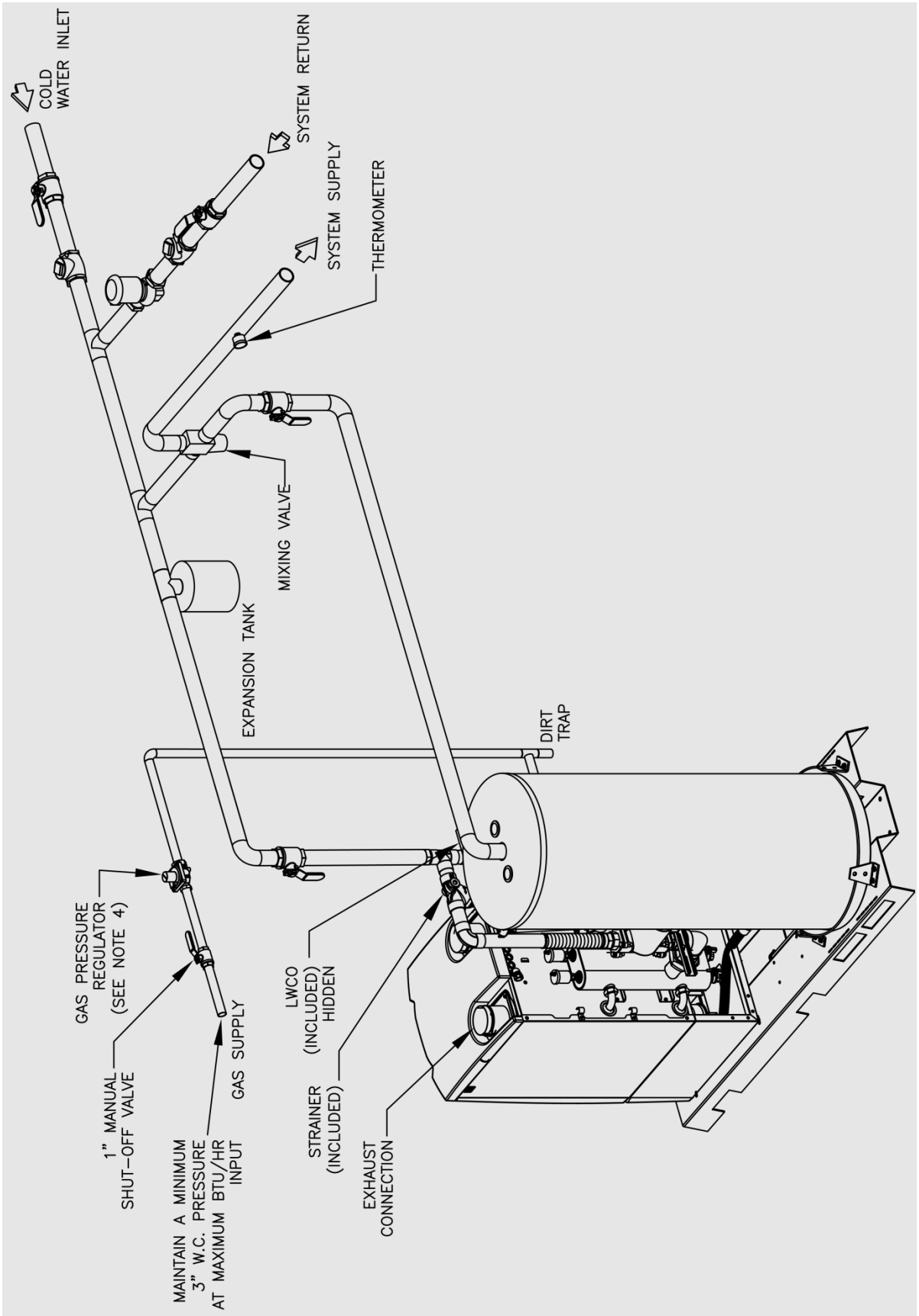


Figure 19: AM Series 399R/500R, Single Unit Installation

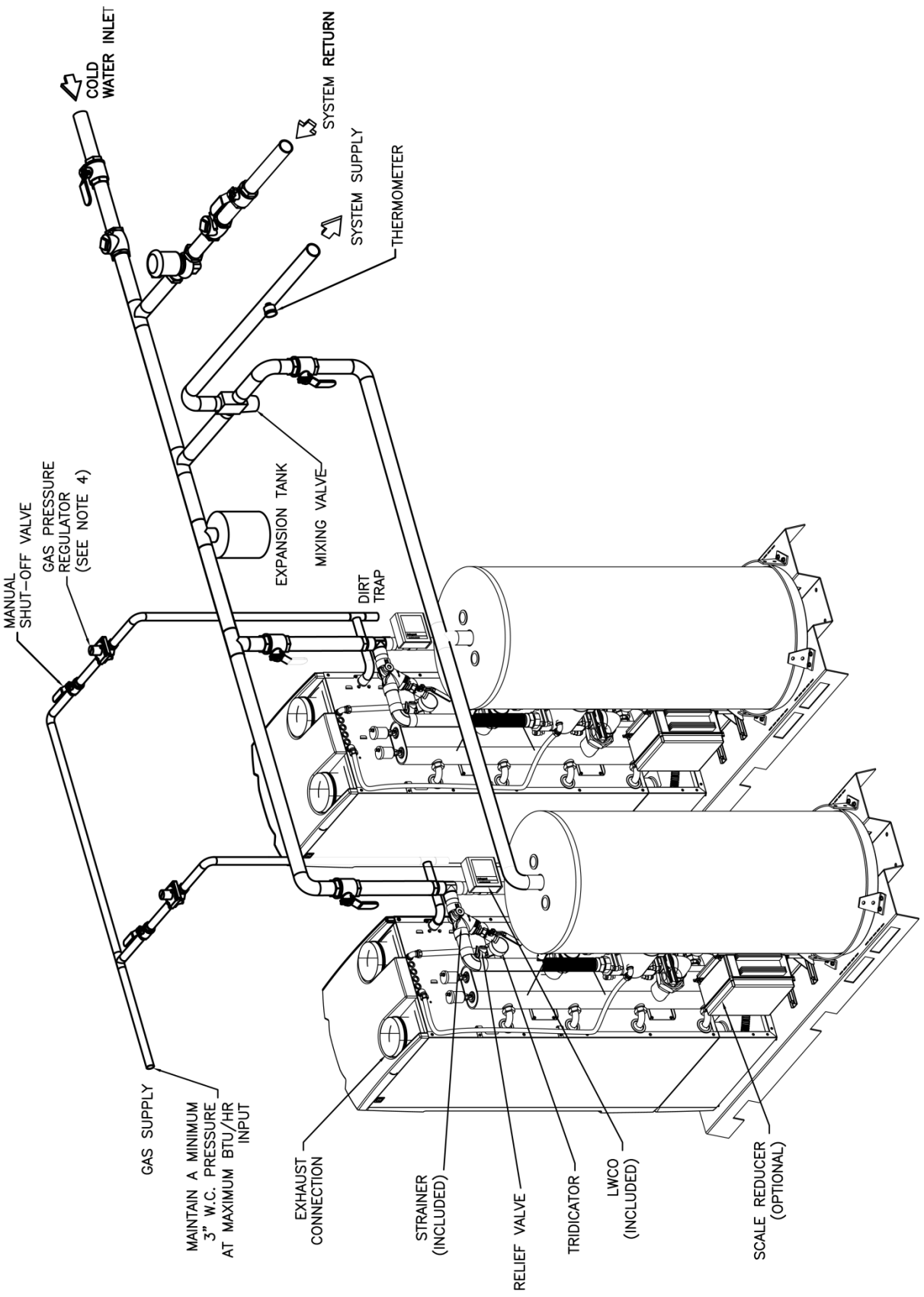


Figure 20: AM Series 750R/1000R, Multiple Unit Installation with Optional Scale Reducer

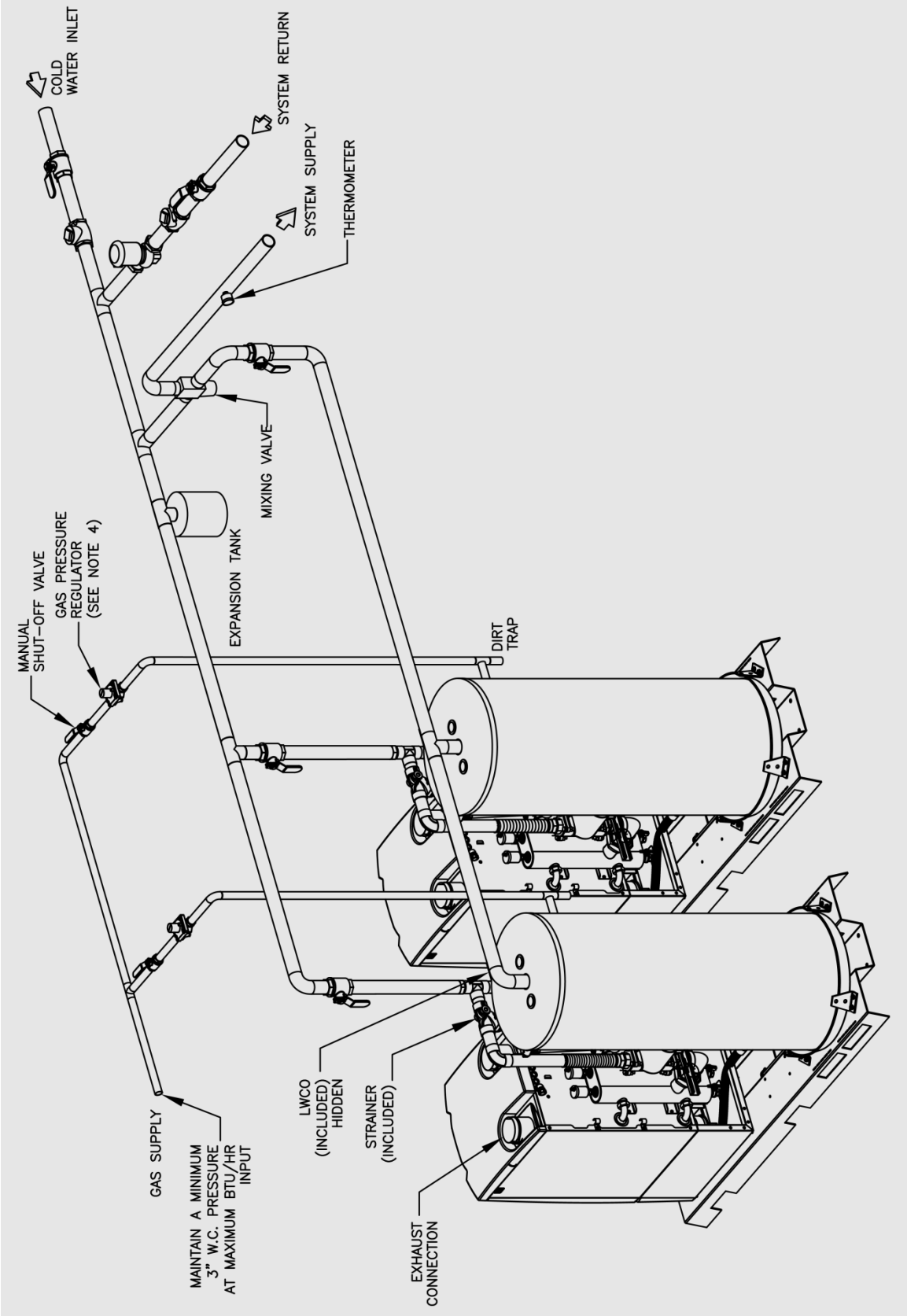


Figure 21: AM Series 399R/500R, Multiple Unit Installation