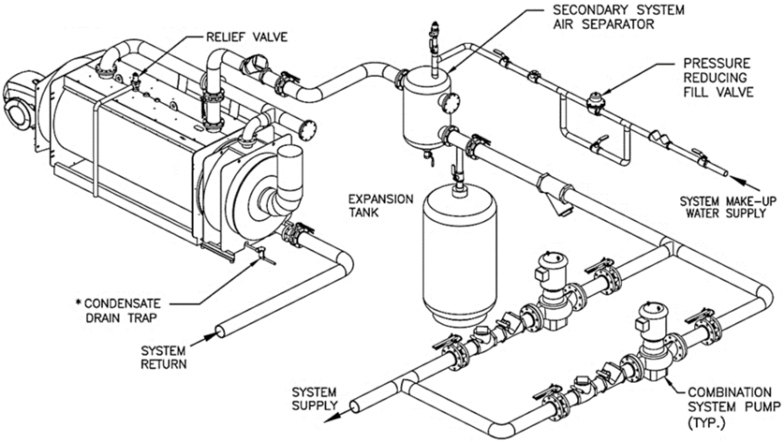
Boiler Application Guide

MFC Series Multi-Fuel Condensing Boilers

Piping and Controls, Water Quality, and Single/Multi Installations

Applies to MFC Series Models:

- MFC 3000
- MFC 4000
- MFC 5000
- MFC 6000
- MFC 8000
- MFC 10000



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SECTION 1: Table of Contents

SECTION 1: GENERAL

AERCO Multi-Fuel Condensing (MFC) boilers can be used in any hydronic closed-loop heating system application, within the limitations of temperature and pressure ratings. Because of their extreme flexibility and precise control, they can be used to supplement any hot water system. This guide is intended to help designers apply AERCO boilers to the most common types of systems. If a special application is needed, please call your local AERCO Representative or the AERCO factory for specific application information. CAD drawing packages are available for layout specification.

SECTION 2: SINGLE AND MULTIPLE APPLICATIONS

AERCO MFC boilers can be applied either as stand-alone single units or in multiple batteries of boilers with unlimited input. MFC multiple boiler systems modulate under partial loads to match the changing requirements of the energy input.

Actual boiler sizing and selection are the responsibility of the designer. ASHRAE standards recommend sizing equipment with a minimum of over sizing for maximum system efficiency. A multiple MFC boiler installation matches any load fluctuation from 0 to 100% without overshoot. AERCO subscribes to and recommends the methods used by ASHRAE to develop required loads and sizes.

SECTION 3: PIPING

3.1 Pressure, Temperature, and Flow Restrictions:

All MFC Series units are ASME certified for working pressures of up to 80 psig (552 kPa). MFC boilers cannot be used in applications where their allowable pressure ratings can be exceeded, or irreparable damage may result. Individual ASME pressure relief valves are supplied on each boiler in one of the following setpoints, as specified:

30 psig (207 kPa)
50 psig (345 kPa)
60 psig (414 kPa)
75 psig (517 kPa)
80 psig (552 kPa)

NOTE:
The piping connections illustrated throughout this bulletin are based on the MFC 10000. See dimensional drawings for connection locations of the MFC 3000, MFC 4000, MFC 5000, MFC 6000 and MFC 8000 units.

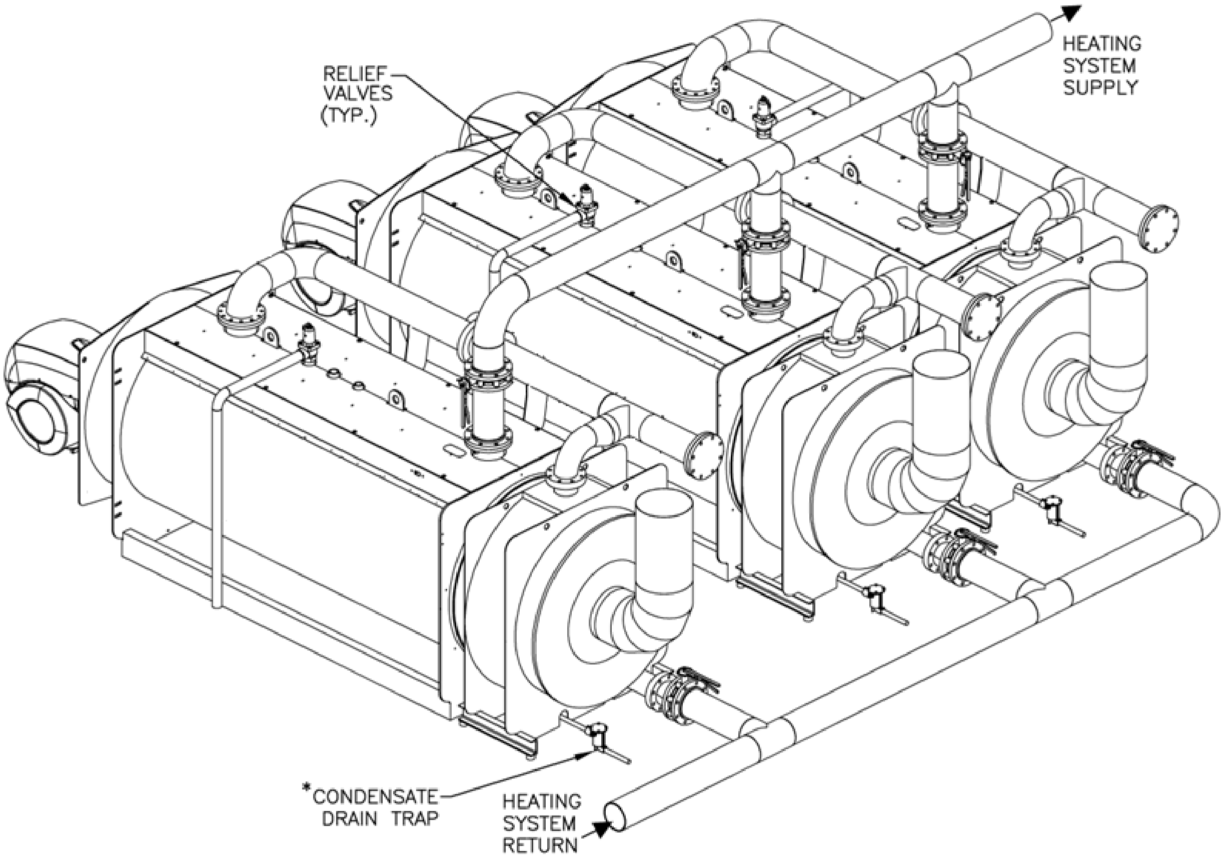


Diagram 1: Proper Multi-Boiler Piping (MFC 10000 units shown)

AERCO MFC Series boilers have no minimum flow and the heat exchanger will not be harmed by low flow or zero flow conditions. However, it is not recommended to operate the boiler in this manner for more than 5 minutes to prevent over-temperature faults. Nonetheless, the following minimum flows are recommended for optimal performance.

TABLE 1: Recommended Minimum Flows		
MFC 3000	20 gallons per minute	(76 L/min)
MFC 4000	27 gallons per minute	(102 L/min)
MFC 5000	33 gallons per minute	(125 L/min)
MFC 6000	40 gallons per minute	(151 L/min)
MFC 8000	53 gallons per minute	(201 L/min)
MFC 10000	67 gallons per minute	(254 L/min)

To prevent erosion of construction materials, maximum flows are limited to the following:

TABLE 2: Maximum Flow Limits		
MFC 3000	350 gallons per minute	(1325 L/min)
MFC 4000	520 gallons per minute	(1968 L/min)
MFC 5000	610 gallons per minute	(2309 L/min)
MFC 6000	750 gallons per minute	(2839 L/min)
MFC 8000	1000 gallons per minute	(3785 L/min)
MFC 10000	1100 gallons per minute	(4164 L/min)

MFC Series units are applicable to systems with temperatures of 125°F to 230°F. Due to their condensing design, normal low temperature restrictions do not apply.

The minimum return temperature to the primary section of the boiler is 100°F (38°C) (see Diagram 1) for 50% heat input or higher (2:1 turndown capability). For higher turndown capabilities, the system can be designed with higher return temperatures as shown in Table 3.

TABLE 3: Return Temperatures

Turndown	Lowest Heat Input	Minimum Return Temperature
5:1	20%	118°F (48 °C)
4:1	25%	113°F (45 °C)
3:1	33%	107°F (42 °C)
2:1	50%	100°F (38 °C)

To achieve return temeratures greater than 100°F (38°C) (turndown more than 2:1), a shunt pump may be installed. The task of the shunt pump is to circulate supply water from the outlet pipe into the return pipe (top connection), increasing the return temperature. For applications requiring shunt pump, please contact AERCO or an AERCO representatives for additional information.

While most common heating applications are designed with a 20°F (11°C) temperature drop, MFC Series boilers are capable of 54°F (30°C) temperature drop through the heat exchanger without thermal stress. The minimum temperature drop is 15°F (8°C).

3.2 Water Quality

3.2.1 Make-up or Feed Water Quality

Make-up or feed water is water added to a closed hydronic system to replenish water lost through evaporation, maintenance, 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.

3.2.2 Boiler Water Chemistry Requirements

System water chemistry requirements are as follows. Water in the installation should be checked, monitored, and treated for the following conditions and characteristics.

TABLE 4: Water Quality Requirements

Characteristics	Value
pH Range	7-11
Oxygen	100 ppb
Iron/Copper	100 ppb
Chloride	150 m

3.2.3 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.

3.2.4 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.

TABLE 5: Pumping Information For Temperature Rise Applications at Full

Model	20°F (11°C)		30°F (17°C)		40°F (22°C)		60°F (33°C)	
	Flow (GPM)	Pressure Drop (PSI)	Flow (GPM)	Pressure Drop (PSI)	Flow (GPM)	Pressure Drop (PSI)	Flow (GPM)	Pressure Drop (PSI)
MFC 3000	285	2.17	190	0.96	143	0.55	95	0.24
MFC 4000	380	0.90	253	0.40	190	0.23	127	0.10
MFC 5000	475	1.17	317	0.52	238	0.29	158	0.13
MFC6000	570	1.71	380	0.76	285	0.43	190	0.19
MFC 8000	760	0.99	507	0.44	380	0.25	253	0.11
MFC 10000	950	1.53	633	0.68	475	0.38	317	0.17

Values based on a **95% Operating Efficiency*

Model	20°F (11°C)		30°F (17°C)		40°F (22°C)		60°F (33°C)	
	Flow (GPM)	Pressure Drop (PSI)	Flow (GPM)	Pressure Drop (PSI)	Flow (GPM)	Pressure Drop (PSI)	Flow (GPM)	Pressure Drop (PSI)
MFC 3000	276	2.03	184	0.90	138	0.51	92	0.23
MFC 4000	368	0.85	245	0.38	184	0.21	123	0.09
MFC 5000	460	1.10	307	0.49	230	0.28	153	0.12
MFC6000	552	1.61	368	0.71	276	0.40	184	0.18
MFC 8000	736	0.93	491	0.41	368	0.23	245	0.10
MFC 10000	920	1.44	613	0.64	460	0.36	307	0.16

Values based on a **92% Operating Efficiency*

Model	20°F (11°C)		30°F (17°C)		40°F (22°C)		60°F (33°C)	
	Flow (GPM)	Pressure Drop (PSI)	Flow (GPM)	Pressure Drop (PSI)	Flow (GPM)	Pressure Drop (PSI)	Flow (GPM)	Pressure Drop (PSI)
MFC 3000	261	1.82	174	0.81	131	0.46	87	0.20
MFC 4000	348	0.76	232	0.34	174	0.19	116	0.08
MFC 5000	435	0.98	290	0.44	218	0.25	145	0.11
MFC6000	522	1.44	348	0.64	261	0.36	174	0.16
MFC 8000	696	0.83	464	0.37	348	0.21	232	0.09
MFC 10000	870	1.29	580	0.57	435	0.32	290	0.14

Values based on a **87% Operating Efficiency*

3.3 Multiple Boiler Piping Design

For multiple boiler installations, the piping must be designed to ensure balanced flow through all the boilers. This can be accomplished by using reverse-return piping or a balancing valve at the outlet of each boiler. Failure to balance flow evenly through the boilers will prevent full delivery of boiler capability at design conditions and may cause over-cycling and unnecessary stress on the boilers.

3.4 Service Provisions

For maintenance purposes, each MFC Series boiler should be individually valved on supply and return from the system. The MFC Series boiler is approved for 6” side clearance in two-unit pairs in applications where space is at a premium. Piping should be located to allow free access between boilers. Each unit has an individual factory-installed drain in the boiler shell.

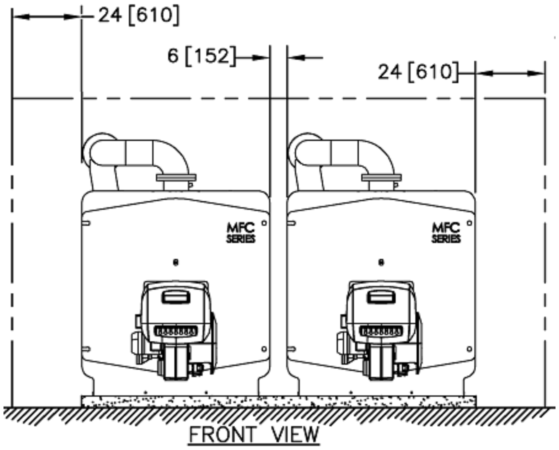


Diagram 2: Approved Minimum Side Clearance Dimensions for Each Two-Unit Pair

3.5 Hydronic System Accessories

AERCO MFC Series boilers must be used in conjunction with appropriate hydronic accessories, such as pumps, expansion tanks and air elimination equipment.

Normal commercial and industrial systems employ constant-speed pumping equipment. Variable-flow pumping equipment may also be employed, as long as the system is operated within the recommended maximum boiler flow limits. Controls should activate heating pumps whenever MFC Series boilers are in operation.

Automatic air elimination in conjunction with pre-charged diaphragm expansion tanks is preferable to air control. Make-up systems must be employed as required by codes.

Fill valves must be used with backflow preventers, as required. Traditional flow control or mixing devices (primary-secondary pumping, 3-way valves) are not required with AERCO MFC boilers. However, when such devices are employed, they should always provide the minimum flows required for a single or multiple boiler installation. When used with a refrigeration (chiller) system, the boiler must be installed so as to prevent the chilled medium from entering the boiler. Consult your local AERCO representative for application advice.

3.6 Condensate Piping

Each AERCO MFC boiler has a separate indirect condensate drain and is supplied with a trap that must be permanently piped as part of the installation. MFC boilers must be installed on a 4-inch pad, minimum, to enable the condensate to drain from the exhaust outlet connection.

Each unit will produce the following approximate condensate quantities in the full condensing mode, depending on the local temperature and humidity:

TABLE 6: Approximate Condensate Production

MFC 3000	20 gallons per hour (1.26 L/min)
MFC 4000	27 gallons per hour (1.70 L/min)
MFC 5000	34 gallons per hour (2.15 L/min)
MFC 6000	40 gallons per hour (2.52 L/min)
MFC 8000	54 gallons per hour (3.41 L/min)
MFC 10000	68 gallons per hour (4.29 L/min)

Condensate drain systems must be sized for full condensing mode.

In multiple boiler applications, it is common to manifold these drains together in a plastic pipe manifold to a floor drain. Condensate manifolds must be large enough to handle the anticipated flow and must be properly secured and protected. Manifolds are generally located behind the boilers so that short runs of plastic tubing into the manifold can be used for the condensate drain. A base drain must be installed at the bottom of vertical common flue piping (see Diagram 1 of MFC Series Venting Application Guide, GF-148-V).

Condensate can be drained by gravity to a floor drain, or condensate may be drained into a small condensate pump (such as used with air conditioning equipment) and pumped to a convenient drain.

The pH level of the condensate produced by MFC Series boilers ranges between 3.0 and 3.2 when firing on natural gas or propane. The installation should be designed in accordance with local codes that specify acceptable pH limits. If the condensate pH level needs to be raised to comply with local codes, the AERCO Condensate Neutralizer Kit may be used. See Technical Instructions TID-0074 for details. Even if there are no local code requirements, use of the AERCO condensate neutralizer kit is always recommended.

When firing on backup #2 fuel oil, boiler return temperatures must be maintained above 140°F (60°C) to prevent flue gas condensation. Operating below 140°F (60°C) while firing #2 fuel oil risks damaging the heat exchanger due to excessively acidic (<2 pH) condensate and particulates. Heat Exchanger damage due to condensing while firing on #2 fuel will void heat exchanger warranty. However, if the fuel oil utilized is certified to be ultra-low sulfur (<15 ppm sulfur content), the boiler return temperature may be no less than 100°F (38°C), thus allowing the boiler to condense when firing #2 fuel oil as backup. MFC Series boilers, when operating on #2 fuel oil as back-up, require that a visual inspection of the 4th pass be conducted every 5 days or 120 hours to ensure there is no particulate build up and to maintain optimal performance. If any particulate buildup is found, this can be cleaned using compressed air or water via the side access inspection ports, two per side (see Diagram 3). Consult the MFC Series O&M manual GF-148 for additional information.

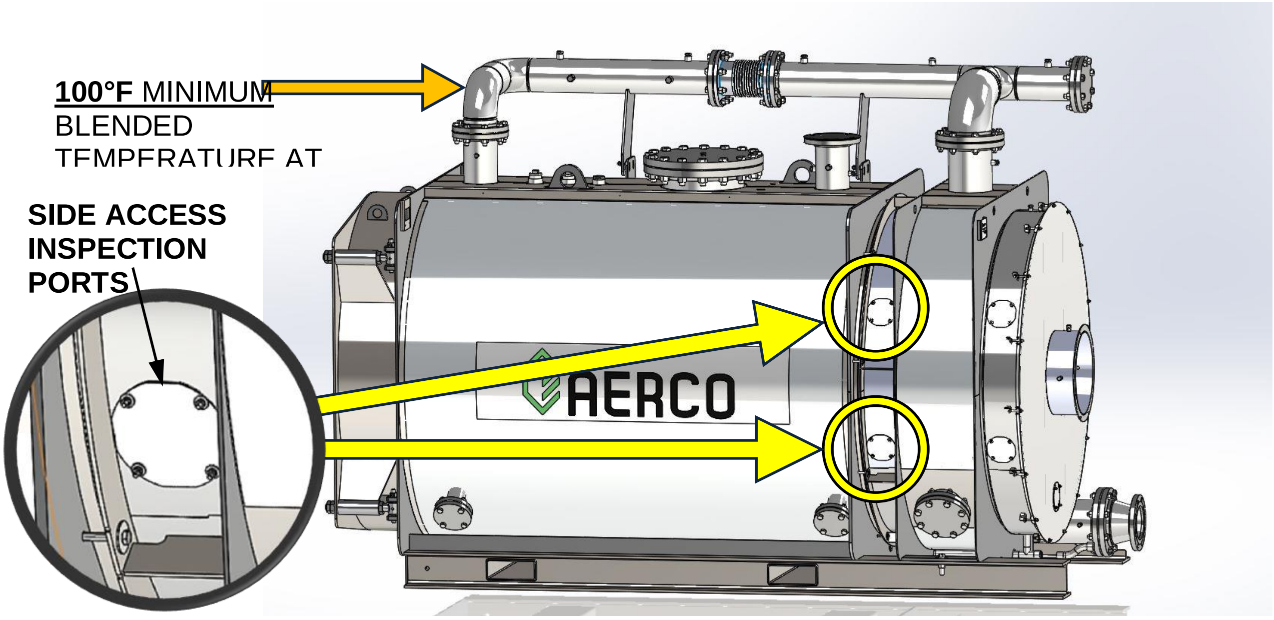


Diagram 3: Location of Side Access Inspection Ports (Two Each Side)

SECTION 4: CONTROLS

4.1 Safety Control

MFC Series boilers are equipped with a manual reset high-limit aquastat. Each MFC Series boiler has safety controls that comply with ASME Section IV for low pressure heating boilers. These controls are factory supplied and installed during field installation. An external, electric, probe-type, low water cutoff and a manual-reset high-limit temperature device comply with ASME standards. Other locally-required external safety devices (flow switches, pressure controls, etc.) should be provided and installed locally. Designers should check with local authorities having jurisdiction to assure compliance with all applicable codes.

4.2 Boiler Operating Control Options

MFC Series boilers can be shipped with a Riello power burner complete with both combustion safeguard controls and operating controls:

TABLE 7: Boiler Control Modes

DESCRIPTION	OUTPUT
Internal Setpoint	Constant Discharge Temp
External Setpoint	Outdoor Reset
Modbus	*Fire Rate Response to Modbus signal
Remote Signal	*Fire Rate Response to BAS/EMS signal (0–10V signal)

For MFC boilers packaged with Riello burner from AERCO, see Instructions OMM-0104 for wiring diagrams. For other burners, refer to the wiring diagrams provided by the manufacturer.

* For Fire Rate Response control modes in Table 7, below is the suggested sequence of operation:

1. For the application, determine the boiler Lowest Heat Input from Table 3 in Section 3.
2. In steps 3 to 6 below, if isolation valves are employed, ensure a boiler's valve is opened prior to firing.
3. Start firing the first boiler.
4. When the first boiler reaches a firing rate of ≥ [Lowest Heat Input x 2], bring on the next boiler and modulate the firing rates of the two boilers to maintain the system setpoint temperature. For example, for a 4:1 turn down boiler (Lowest Heat Input is 25%), bring on the next boiler when the operating boiler is at or just over 50% firing rate.
5. As the heating load increases, and each boiler reaches a firing rate of ≥ [Lowest Heat Input x 2], bring on the third boiler and modulate the firing rates of the three boilers to maintain the system setpoint temperature.
6. As the heating load continues to increase, bring on subsequent boilers following the above logic.
7. In steps 8 to 9 below, if isolation valves are employed, after a boiler is dropped off from the sequence, it is recommended to keep its isolation valve open a minimum of 2 minutes before closing.
8. As the heating load decreases, when the firing rates of the boilers decrease to the Lowest Heat Input, drop off one of the boilers, and increase the firing rates of the remaining boilers to maintain the system setpoint temperature. For example, for a 4:1 turn down boiler (Lowest

Heat Input is 25%) and three boilers were firing, when the firing rates decrease to 25% each, drop off one of the boilers and increase the firing rates of the remaining two boilers to maintain the system setpoint temperature. To equalize run times, consider dropping off boilers based on run hours, or dropping the first boiler fired in the last sequence (first on/first off).

9. As the heating load continues to decrease, perform the above logic when the firing rates of the two boilers decrease to the Lowest Heat Input and fire only one boiler, increasing its firing rate to maintain the system setpoint temperature. When the last boiler's firing rate decrease to the Lowest Heat Input, put all boilers in standby; if the system pump is constant speed – avoid a dead head condition by opening the isolation valves for all the boilers.

4.3 Field Sensor Location

When a single MFC Series boiler is used, all water sensors are internal to the boiler unit and are field installed in the designated boiler ports as per the MFC Series O&M manual. When multiple boilers are used, and therefore have a common sensor such as a Header Sensor, the sensor must be located in the field piping. **It should be placed in the common supply at least 2 to 10 feet downstream of the point where the last boiler connects into the supply header.**

All outdoor air sensors should be positioned on the North wall of the building served, and not in direct sunlight. The outdoor air sensor should not be placed inside the boiler air inlet duct, or near the boiler exhaust outlet connection. A sunshield is provided as part of the outdoor air sensor kit.

4.4 Multiple Boiler Control

An optional AERCO supplied 64128 Boiler Controller panel can control from two to four boilers, as well as auxiliary equipment. This panel is designed to maximize plant efficiency through a sophisticated PID control system which will control the modulation of up to four boilers. If more than four boilers are required to be sequenced, contact AERCO or an AERCO representatives for additional information.

SECTION 5: TYPICAL APPLICATIONS

MFC Series boilers can be used in any closed-loop heating system within design limitations. The following typical piping and wiring schematic diagrams represent the most common types of installation detail. These diagrams are not intended for any particular system, but are rather composites of how AERCO boilers interface with heating applications in the real world.

The designer should incorporate MFC Series boiler(s) in each system so as to achieve maximum operating efficiency. With ultimate control over the energy transfer process under a broad range of temperatures, the designer should first consider how the system best needs the supplied energy. The boilers should then be applied in the manner that best enables them to use their finite control and capability to supplement the system, using minimum applied energy.

The following examples illustrate typical piping and wiring diagrams with brief explanations of design considerations and sequences of operation. The examples include:

Diagram 4:	Single Boiler Piping Schematic
Diagram 5:	Multiple Boiler Piping Schematic with Sequencing Panel
Diagram 6:	Multiple-Boiler Piping Combination Plant with SmartPlate Installation
Diagram 7	Multiple-Boiler Piping Snowmelt System and Combination Plant with SmartPlate, Sequencing Valves
Diagram 8:	Multiple-Boiler Piping with Motorized Sequencing Valves
Diagram 9:	Three-Boiler Combination Heating with Motorized Sequencing Valves and SmartPlate/DHW Plant
Diagram 10:	Two-Boiler Combination Heating & Domestic Water Plant
Diagram 11:	Multi-Boiler Installation

Designers are encouraged to work with their AERCO representative to fully explore and apply the ultimate exchange of energy with control in hydronic heating.

5.1 Single Heating Boiler — Heating Only

Sequence of Operation: Boiler plant should be activated by a system start device, such as an outdoor air thermostat or building management system.

A manual switch can be used, but it would place the burden of starting and stopping on the boiler attendant. Automatic controls are more desirable.

Utilizing the available pump relay through the factory supplied Riello burner, the system's circulating pump should be started with the MFC Series unit and can be constant run or variable (variable speed control supplied locally). A flow switch or other method should be used to prevent the MFC Series unit from firing under no flow. If used, the flow switch shall be wired to the enable/disable terminal of the Controls (see Manual GF-148 for details). A unit energized to fire with insufficient or no flow will trip out on high temperature limit. Once activated, the internal boiler temperature controls will modulate the input of the boiler to match the control algorithm set.

With indoor/outdoor reset mode, the temperature of the boiler water to the system will increase as the outdoor temperature decreases. The rate of change can be varied by the adjustable reset ratio on the boiler control panel. If utilizing an internal setpoint control mode, the boiler will maintain a water temperature that is constant at any adjustable setpoint from 125°F to 230°F (52°C to 110°C).

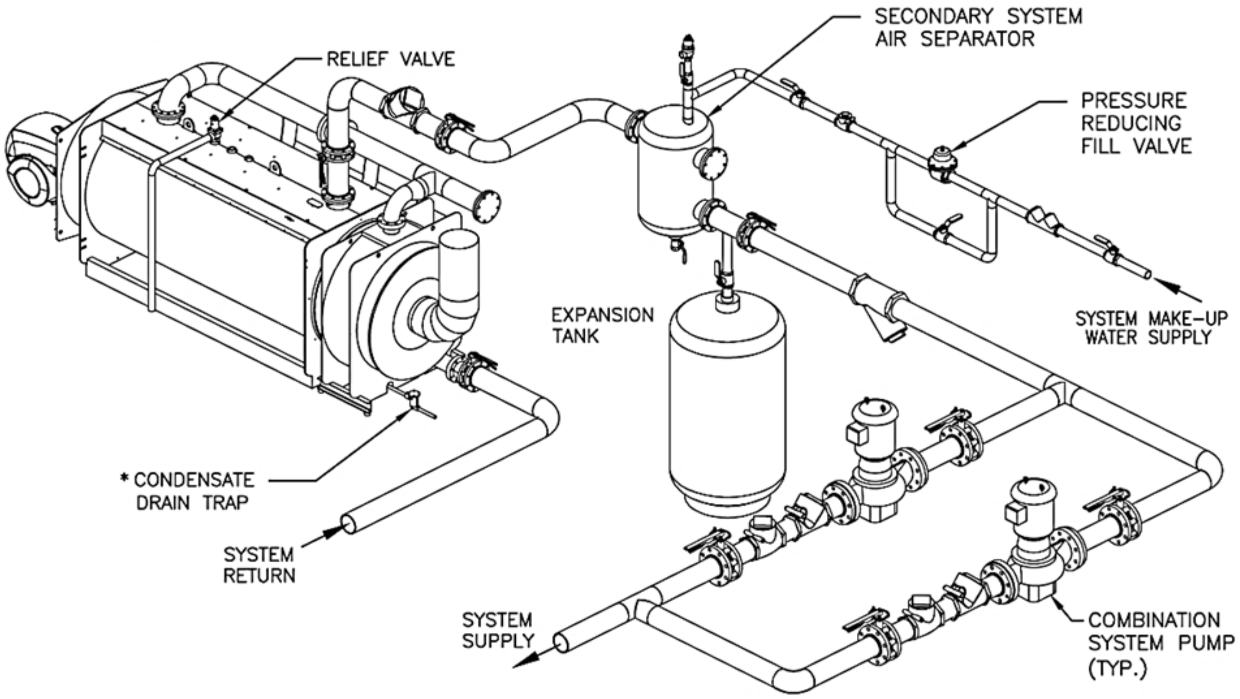


Diagram 4: Single Boiler Piping Schematic (MFC 10000 shown)

5.2 Multiple Boiler — Heating Only

MFC Series multiple boiler plants provide the ultimate energy conversion for building space heating, longevity and ease of installation. Boiler plants incorporating from two to four boilers can be controlled via an optional AERCO supplied sequencing panel. Boilers can be arranged in back-to-back or inline piping applications, as space permits. Boiler plant layouts should incorporate sufficient space for normal maintenance and operation.

In a multiple-boiler plant consisting of two to four boilers, utilizing the optional AERCO supplied sequencing panel is recommended. For boiler plants of more than four boilers, consult your local AERCO representative or the AERCO factory for additional information.

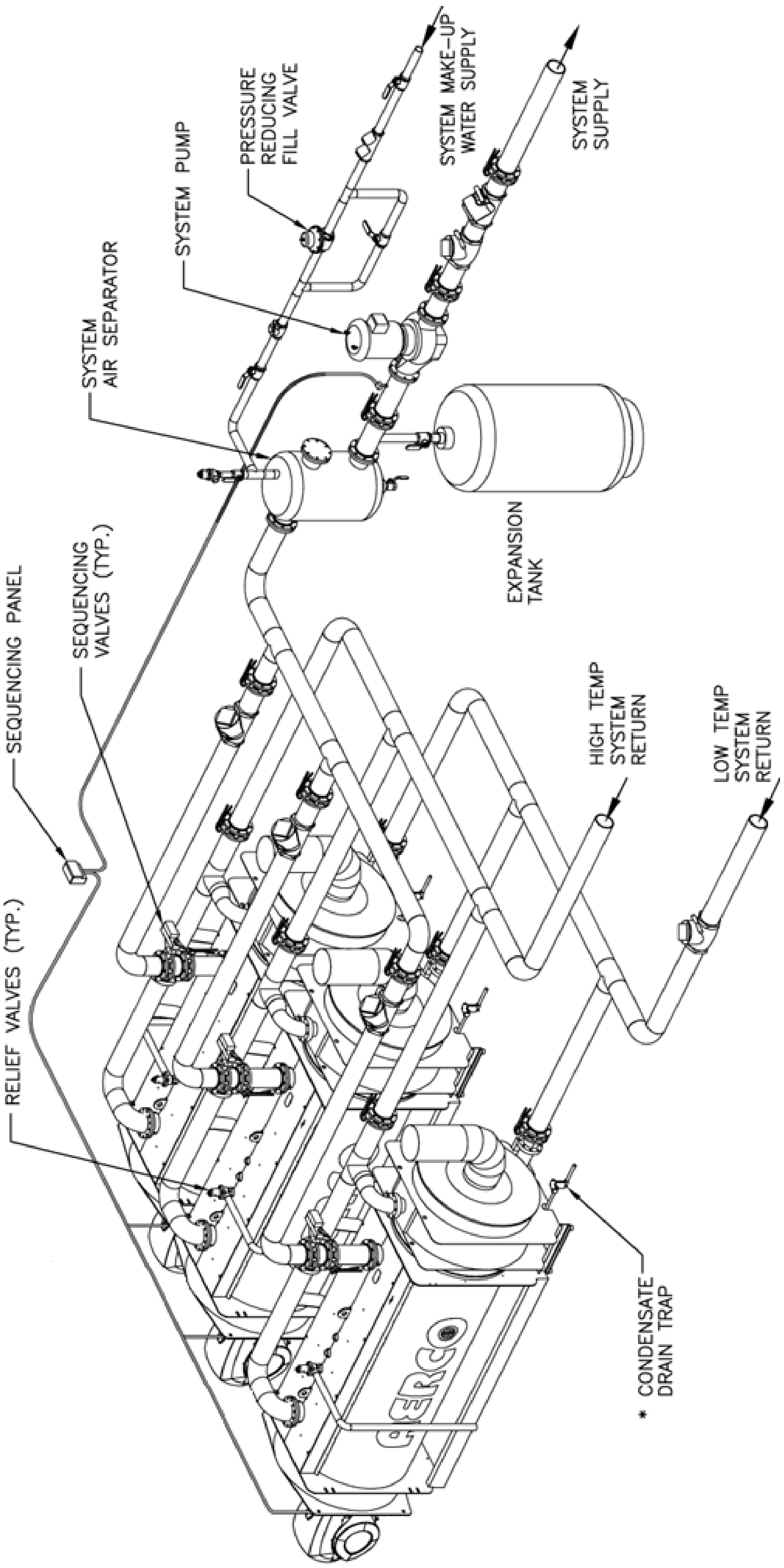


Diagram 5: Multiple Boiler Piping Schematic with Sequencing Panel (MFC 10000 units shown)

5.3 Multiple Boiler Heating Plant — with Individual Isolation Valves

Systems designed with variable speed pumps (VFD) enable plants to use less pump energy during low heating load conditions. For these types of systems, when an operating boiler is satisfied and becomes idle, operators should allow a minimum of 2 minutes before isolating it from the system flow. This ensures that heat is dissipated from the heat exchanger and prevents nuisance over-temperature conditions.

When the system load is satisfied, all the isolation valves for all of the boilers should open to prevent deadheading the system pump(s).

5.4 Primary-Secondary Pumping

The typical piping layouts discussed in the previous paragraphs cover most MFC Series applications. Ordinarily, primary-secondary pumping is not required for proper operation of MFC Series boiler systems. However, if the system is designed with primary-secondary pumping, Diagram 6 provides a guideline for near-boiler piping to ensure correct boiler flow rate. A water source heat pump is an example of an application in which primary-secondary pumping may be used.

If a sequencing panel is used in a primary-secondary MFC Series application (see Diagram 6), then:

- A header sensor must be installed in the header, between 2 and 10 feet from the pipe junction.
- If desired, individual boiler pumps may be enabled through the optional boiler pump relay (refer to MFC Series Manual, GF-148, for wiring schematics).

5.5 Water Source Heat Pumps

In water source heat pump systems, the boilers supplement the loop to maintain a constant water temperature. MFC boilers excel in this type of application because the low return water temperature, as low as 100°F (38°C), maximizes their condensing capability. AERCO MFC series units are built with a 316Ti stainless steel construction fourth pass to withstand corrosion.

Normally, the boiler plant is activated from the Main Heat Pump Control/Sequence Panel when the system requires auxiliary heat. Once activated, the boilers will modulate independently to maintain the loop temperature.

If a sequencing panel is used, the Main Controls will activate the panel, which in turn modulates the boilers to maintain the loop temperature. Extremely close tolerances to the temperature setpoint will be maintained.

5.6 Boiler Combination Heating and Domestic Water System

A combination heating and domestic hot water plant can be specified to share the loads among common boilers. Some benefits of combining heating and domestic load into a single plant include first-cost control, simplified venting, and simplified operation. See Diagram 7 for an example.

The heating load should be developed from ASHRAE or industry standard methods, and the domestic water load should be sized using conventional sizing criteria.

The domestic water can be generated in an external hot water storage generator (a storage tank with a water-to-water exchanger), or through an instantaneous or semi-instantaneous system.

When using a hot water storage generator design for a replacement system, the size of the storage tank is fixed and sufficient recovery must be provided. For a new application, tank storage should be sized with sufficient capacity to prevent the boiler(s) from short-cycling under low loads.

When using instantaneous or semi-instantaneous systems, thermal mass within the MFC boiler water loop will serve as a buffer to dampen out fast transitions and minimize boiler cycling. These conditions can occur either during zero load or during low load situations in which the only load is generated by recirculation piping losses. The AERCO supplied the AERCO 64128 Boiler Controller panel is required for this application.

Diagram 7 illustrates AERCO's packaged plate heat exchanger (SmartPlate), piped as a zone with the boilers and the combination heating/domestic hot water system.

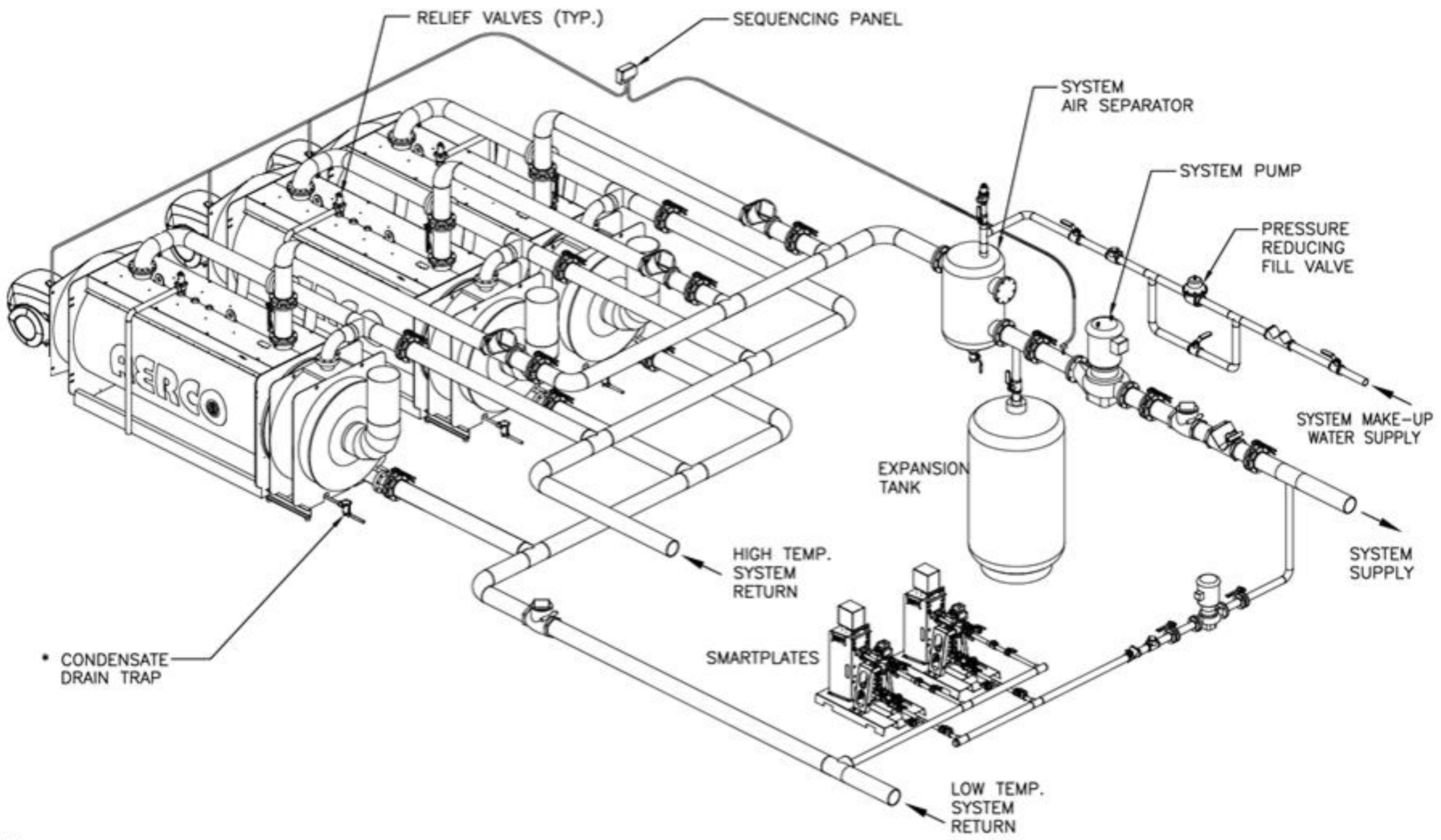
Sequence of Operation: The SmartPlate setpoint is set for the desired domestic water temperature. As domestic load occurs, the SmartPlate will open its control valve to permit boiler water to flow through the plate heat exchanger. The sequencing panel will fire the boilers as necessary to deliver the required energy. The pump between the SmartPlate and the boiler loop can be activated when needed or can constantly circulate boiler water, by-passing the plate heat exchanger when the domestic load is satisfied.

5.7 Dual Returns

The MFC series offers dual return connections standard. Utilizing this feature can boost seasonal efficiency by up to 10%. Installations with space heating or process heating along with the following applications that can take advantage of this feature include:

- Domestic hot water applications
- Higher ΔT zones with lower return temperatures
- Air preheat
- Heat pump injection
- And more

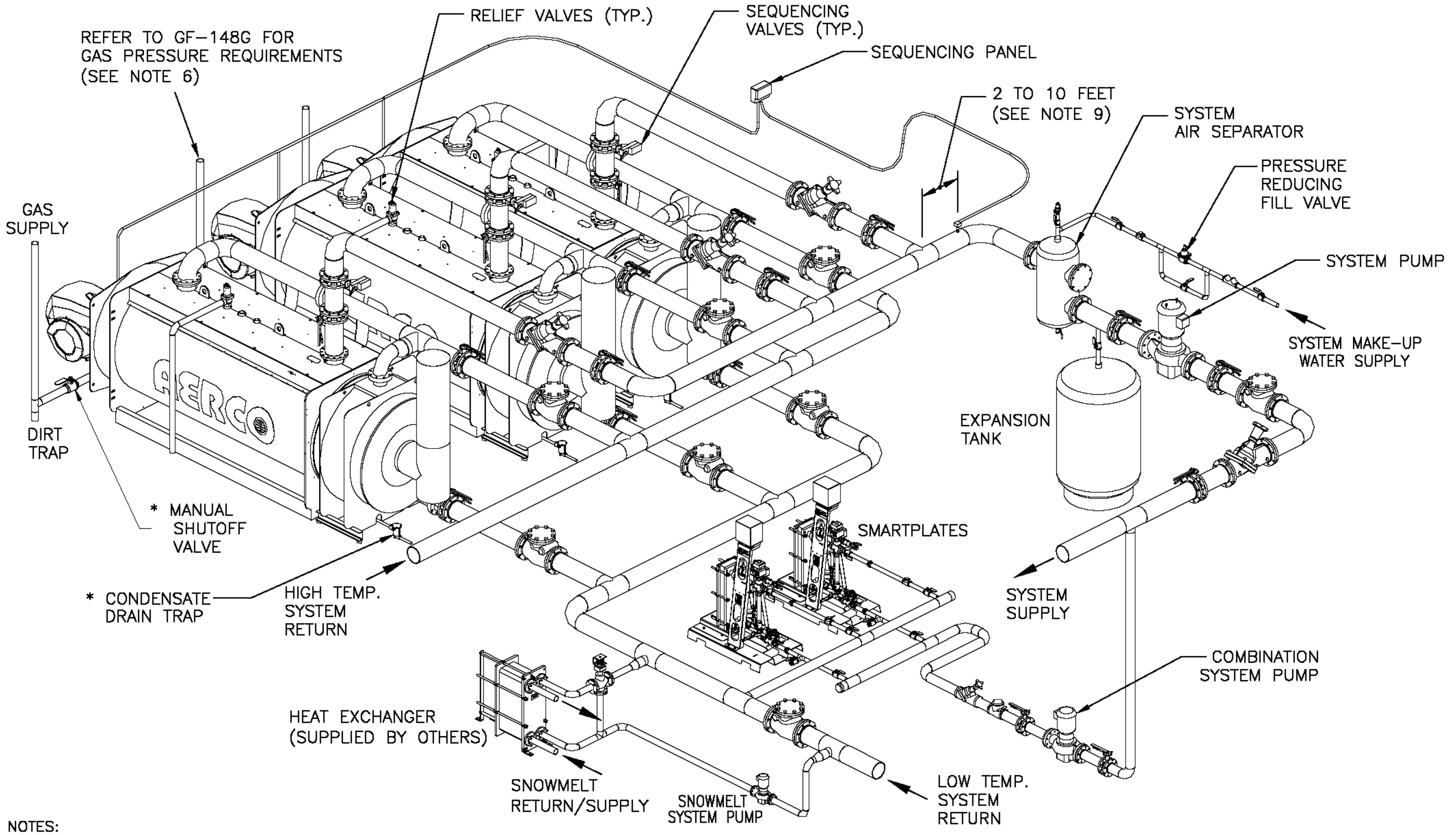
Rather than blend the separate zones, the lower return temperature zones/systems could be piped separately to the primary water connection, raising the overall thermal efficiency and allowing the boiler to be in condensing zone for longer periods throughout the year. See Diagram 7.



NOTES:
1. FOR ACTUAL SIZES AND LOCATIONS OF PIPING AND OTHER CONNECTIONS TO THE HEATER, SEE DIMENSIONAL DRAWINGS.
2. SHELL DRAIN VALVE AND CONDENSATE HOSE SHOULD BE ARRANGED TO PERMIT THE FLUIDS TO DRAIN FREELY, BY GRAVITY, TO A FLOOR DRAIN. RELIEF VALVE DISCHARGE SHOULD BE PIPED TO THE NEAREST FLOOR DRAIN. WHEN NO FLOOR DRAIN IS AVAILABLE, THE RELIEF VALVE DISCHARGE SHOULD BE PIPED VERTICALLY TO A HEIGHT MAXIMUM 18" ABOVE THE FLOOR.
3. ALL (*) ITEMS ARE INCLUDED SEPARATELY IN SHIPMENT FROM FACTORY.
4. THIS IS A TYPICAL INSTALLATION DRAWING. LOCAL CODES AND AUTHORITIES SHOULD BE CONSULTED.
5. LOCATE WATER INLET AND OUTLET FITTINGS (i.e.UNIONS, ELBOWS, ETC.) A MINIMUM OF 18" FROM WATER HEATER FITTINGS, TO PREVENT INTERFERENCE WITH SERVICE.
6. GAS PRESSURE RANGE IS DEPENDENT ON GAS TRAIN ORDERED. CONSULT MFC SERIES FUEL SUPPLY GUIDE GF-148G FOR ADDITIONAL DETAILS.
7. WHEN USING THE AERCO CONDENSATE NEUTRALIZER TANK, FOR PROPER CONDENSATE DRAINAGE, THE NEUTRALIZER TANK MUST BE INSTALLED IN A PIT <u>OR</u> THE BOILER AND THE AERCO CONDENSATE TRAP MUST BE ELEVATED HIGHER THAN 4" ABOVE THE FLOOR. SEE CONDENSATE TANK INSTRUCTIONS TID-0074 FOR DETAILS.

AERCO A WATTS Brand INTERNATIONAL, INC. Blauvelt, NY 10913		
MFC SERIES GAS FIRED BOILERS MULTI UNITS WITH SMARTPLATE & COMBINATION PLANT INSTALLATION		
DWN.BY K.S. DATE 041415 SCALE NTS APPD. ____ DATE ____	SD-A-1060	REV A

Diagram 6: Multiple-Boiler Piping Combination Plant with SmartPlate Installation (MFC 10000 units shown)



NOTES:

1. FOR ACTUAL SIZES AND LOCATIONS OF PIPING AND OTHER CONNECTIONS TO THE HEATER, SEE DIMENSIONAL DRAWINGS.
2. SHELL DRAIN VALVE AND CONDENSATE HOSE SHOULD BE ARRANGED TO PERMIT THE FLUIDS TO DRAIN FREELY, BY GRAVITY, TO A FLOOR DRAIN. RELIEF VALVE DISCHARGE SHOULD BE PIPED TO THE NEAREST FLOOR DRAIN. WHEN NO FLOOR DRAIN IS AVAILABLE, THE RELIEF VALVE DISCHARGE SHOULD BE PIPED VERTICALLY TO A HEIGHT MAXIMUM 18" ABOVE THE FLOOR.
3. ALL (*) ITEMS ARE INCLUDED SEPARATELY IN SHIPMENT FROM FACTORY.
4. THIS IS A TYPICAL INSTALLATION DRAWING. LOCAL CODES AND AUTHORITIES SHOULD BE CONSULTED.
5. LOCATE WATER INLET AND OUTLET FITTINGS (i.e.UNIONS, ELBOWS, ETC.) A MINIMUM OF 18" FROM WATER HEATER FITTINGS, TO PREVENT INTERFERENCE WITH SERVICE.
6. GAS PRESSURE RANGE IS DEPENDENT ON GAS TRAIN ORDERED. CONSULT MFC SERIES FUEL SUPPLY GUIDE GF–148G FOR ADDITIONAL DETAILS.
7. WHEN USING THE AERCO CONDENSATE NEUTRALIZER TANK, FOR PROPER CONDENSATE DRAINAGE, THE NEUTRALIZER TANK MUST BE INSTALLED IN A PIT <u>OR</u> THE BOILER AND THE AERCO CONDENSATE TRAP MUST BE ELEVATED HIGHER THAN 4" ABOVE THE FLOOR. SEE CONDENSATE TANK INSTRUCTIONS TID–0074 FOR DETAILS.
8. THE SNOWMELT SYSTEM PUMP MAY BE ENABLED/DISABLED BY SNOWMELT SYSTEM CONTROL.
9. HEADER SENSOR MUST BE INSTALLED BETWEEN 2 TO 10 FEET FROM PIPE JUNCTION AND FROM LAST UNIT.

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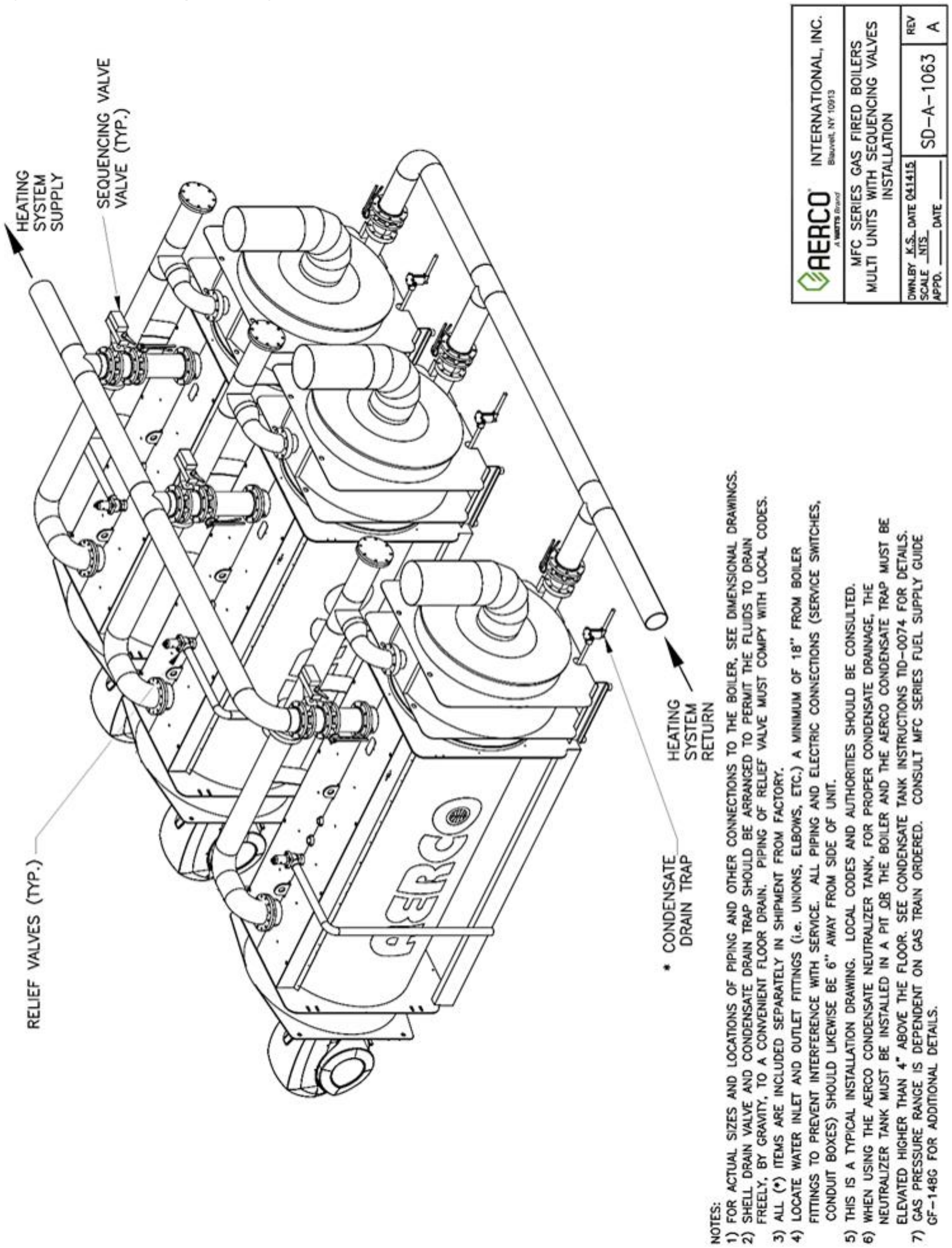
MFC SERIES GAS FIRED BOILERS–MULTI UNIT
WITH SEQUENCING VALVES, SMARTPLATE,
COMBINATION PLANT INSTALLATION & SNOWMELT

DWN.BY K.S. DATE 050815 SCALE NTS APPD. ______ DATE ______	SD–A–1076	REV C

Diagram 7: Multiple-Boiler Piping Snowmelt System and Combination Plant with SmartPlate, Sequencing Valves (MFC 10000 units shown)

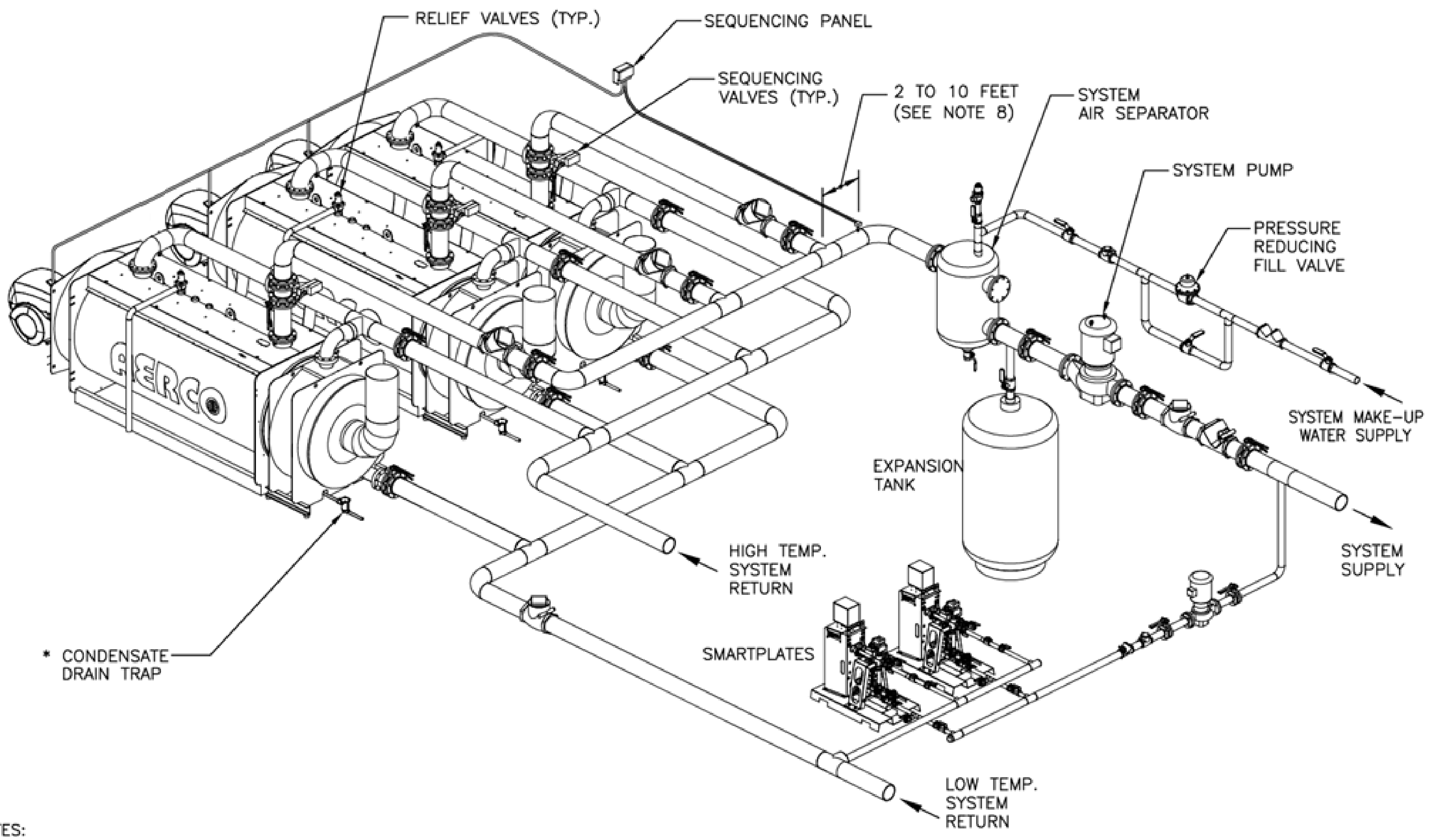
5.8 High Supply Temperature Applications:

The MFC series can meet the needs of high temperature applications with a 240°F (116°C) temperature rating (The maximum operating supply temperature is 230° (110°C) to prevent nuisance over-temperature faults.), yet offer the flexibility to reset system temperature during the shoulder months to take advantage of its condensing capability and further enhance seasonal efficiency and reduce operating costs.



NOTES:
1) FOR ACTUAL SIZES AND LOCATIONS OF PIPING AND OTHER CONNECTIONS TO THE BOILER, SEE DIMENSIONAL DRAWINGS.
2) SHELL DRAIN VALVE AND CONDENSATE DRAIN TRAP SHOULD BE ARRANGED TO PERMIT THE FLUIDS TO DRAIN FREELY, BY GRAVITY, TO A CONVENIENT FLOOR DRAIN. PIPING OF RELIEF VALVE MUST COMPY WITH LOCAL CODES.
3) ALL (*) ITEMS ARE INCLUDED SEPARATELY IN SHIPMENT FROM FACTORY.
4) LOCATE WATER INLET AND OUTLET FITTINGS (i.e. UNIONS, ELBOWS, ETC.) A MINIMUM OF 18" FROM BOILER FITTINGS TO PREVENT INTERFERENCE WITH SERVICE. ALL PIPING AND ELECTRIC CONNECTIONS (SERVICE SWITCHES, CONDUIT BOXES) SHOULD LIKEWISE BE 6" AWAY FROM SIDE OF UNIT.
5) THIS IS A TYPICAL INSTALLATION DRAWING. LOCAL CODES AND AUTHORITIES SHOULD BE CONSULTED.
6) WHEN USING THE AERCO CONDENSATE NEUTRALIZER TANK, FOR PROPER CONDENSATE DRAINAGE, THE NEUTRALIZER TANK MUST BE INSTALLED IN A PIT OR THE BOILER AND THE AERCO CONDENSATE TRAP MUST BE ELEVATED HIGHER THAN 4" ABOVE THE FLOOR. SEE CONDENSATE TANK INSTRUCTIONS TID-0074 FOR DETAILS.
7) GAS PRESSURE RANGE IS DEPENDENT ON GAS TRAIN ORDERED. CONSULT MFC SERIES FUEL SUPPLY GUIDE GF-148G FOR ADDITIONAL DETAILS.

Diagram 8: Multiple-Boiler Piping with Motorized Sequencing Valves (MFC 10000 units shown)



NOTES:
1. FOR ACTUAL SIZES AND LOCATIONS OF PIPING AND OTHER CONNECTIONS TO THE HEATER, SEE DIMENSIONAL DRAWINGS.
2. SHELL DRAIN VALVE AND CONDENSATE HOSE SHOULD BE ARRANGED TO PERMIT THE FLUIDS TO DRAIN FREELY, BY GRAVITY, TO A FLOOR DRAIN. RELIEF VALVE DISCHARGE SHOULD BE PIPED TO THE NEAREST FLOOR DRAIN. WHEN NO FLOOR DRAIN IS AVAILABLE, THE RELIEF VALVE DISCHARGE SHOULD BE PIPED VERTICALLY TO A HEIGHT MAXIMUM 18" ABOVE THE FLOOR.
3. ALL (*) ITEMS ARE INCLUDED SEPARATELY IN SHIPMENT FROM FACTORY.
4. THIS IS A TYPICAL INSTALLATION DRAWING. LOCAL CODES AND AUTHORITIES SHOULD BE CONSULTED.
5. LOCATE WATER INLET AND OUTLET FITTINGS (i.e.UNIONS, ELBOWS, ETC.) A MINIMUM OF 18" FROM WATER HEATER FITTINGS, TO PREVENT INTERFERENCE WITH SERVICE.
6. GAS PRESSURE RANGE IS DEPENDENT ON GAS TRAIN ORDERED. CONSULT MFC SERIES FUEL SUPPLY GUIDE GF-148G FOR ADDITIONAL DETAILS.
7. WHEN USING THE AERCO CONDENSATE NEUTRALIZER TANK, FOR PROPER CONDENSATE DRAINAGE, THE NEUTRALIZER TANK MUST BE INSTALLED IN A PIT OR THE BOILER AND THE AERCO CONDENSATE TRAP MUST BE ELEVATED HIGHER THAN 4" ABOVE THE FLOOR. SEE CONDENSATE TANK INSTRUCTIONS TID-0074 FOR DETAILS.
8. HEADER SENSOR MUST BE INSTALLED BETWEEN 2 TO 10 FEET FROM PIPE JUNCTION.

AERCO INTERNATIONAL, INC.
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MFC SERIES GAS FIRED BOILERS–MULTI UNIT WITH SEQUENCING VALVES, SMARTPLATE & COMBINATION PLANT INSTALLATION

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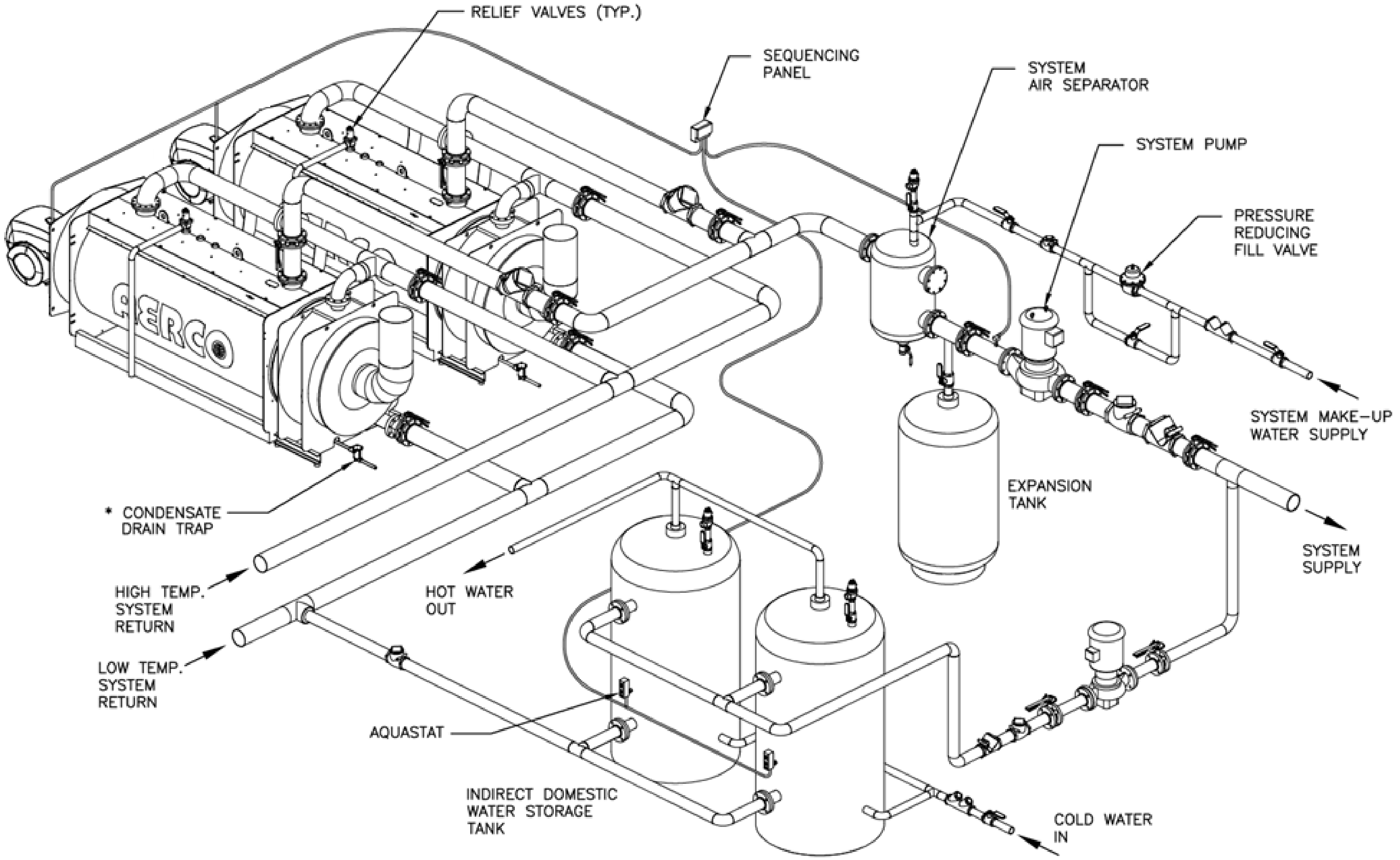
Diagram 9: *Three-Boiler Combination Heating with Motorized Sequencing Valves and SmartPlate/DHW Plant (MFC 10000 units shown)*



NOTES:

1. FOR ACTUAL SIZES AND LOCATIONS OF PIPING AND OTHER CONNECTIONS TO THE HEATER, SEE DIMENSIONAL DRAWINGS.
2. SHELL DRAIN VALVE AND CONDENSATE HOSE SHOULD BE ARRANGED TO PERMIT THE FLUIDS TO DRAIN FREELY, BY GRAVITY, TO A FLOOR DRAIN. RELIEF VALVE DISCHARGE SHOULD BE PIPED TO THE NEAREST FLOOR DRAIN. WHEN NO FLOOR DRAIN IS AVAILABLE, THE RELIEF VALVE DISCHARGE SHOULD BE PIPED VERTICALLY TO A HEIGHT MAXIMUM 18" ABOVE THE FLOOR.
3. ALL (*) ITEMS ARE INCLUDED SEPARATELY IN SHIPMENT FROM FACTORY.
4. THIS IS A TYPICAL INSTALLATION DRAWING. LOCAL CODES AND AUTHORITIES SHOULD BE CONSULTED.
5. LOCATE WATER INLET AND OUTLET FITTINGS (i.e.UNIONS, ELBOWS, ETC.) A MINIMUM OF 18" FROM WATER HEATER FITTINGS, TO PREVENT INTERFERENCE WITH SERVICE.
6. GAS PRESSURE RANGE IS DEPENDENT ON GAS TRAIN ORDERED. CONSULT MFC SERIES FUEL SUPPLY GUIDE GF–148G FOR ADDITIONAL DETAILS.
7. WHEN USING THE AERCO CONDENSATE NEUTRALIZER TANK, FOR PROPER CONDENSATE DRAINAGE, THE NEUTRALIZER TANK MUST BE INSTALLED IN A PIT OR THE BOILER AND THE AERCO CONDENSATE TRAP MUST BE ELEVATED HIGHER THAN 4" ABOVE THE FLOOR. SEE CONDENSATE TANK INSTRUCTIONS TID–0074 FOR DETAILS.

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MFC SERIES GAS FIRED BOILERS
MULTI UNITS HEATING/DOMESTIC HOT WATER
PIPING–COMBINATION PLANT INSTALLATION

DWN.BY K.S. DATE 041415
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APPD. ______ DATE ______
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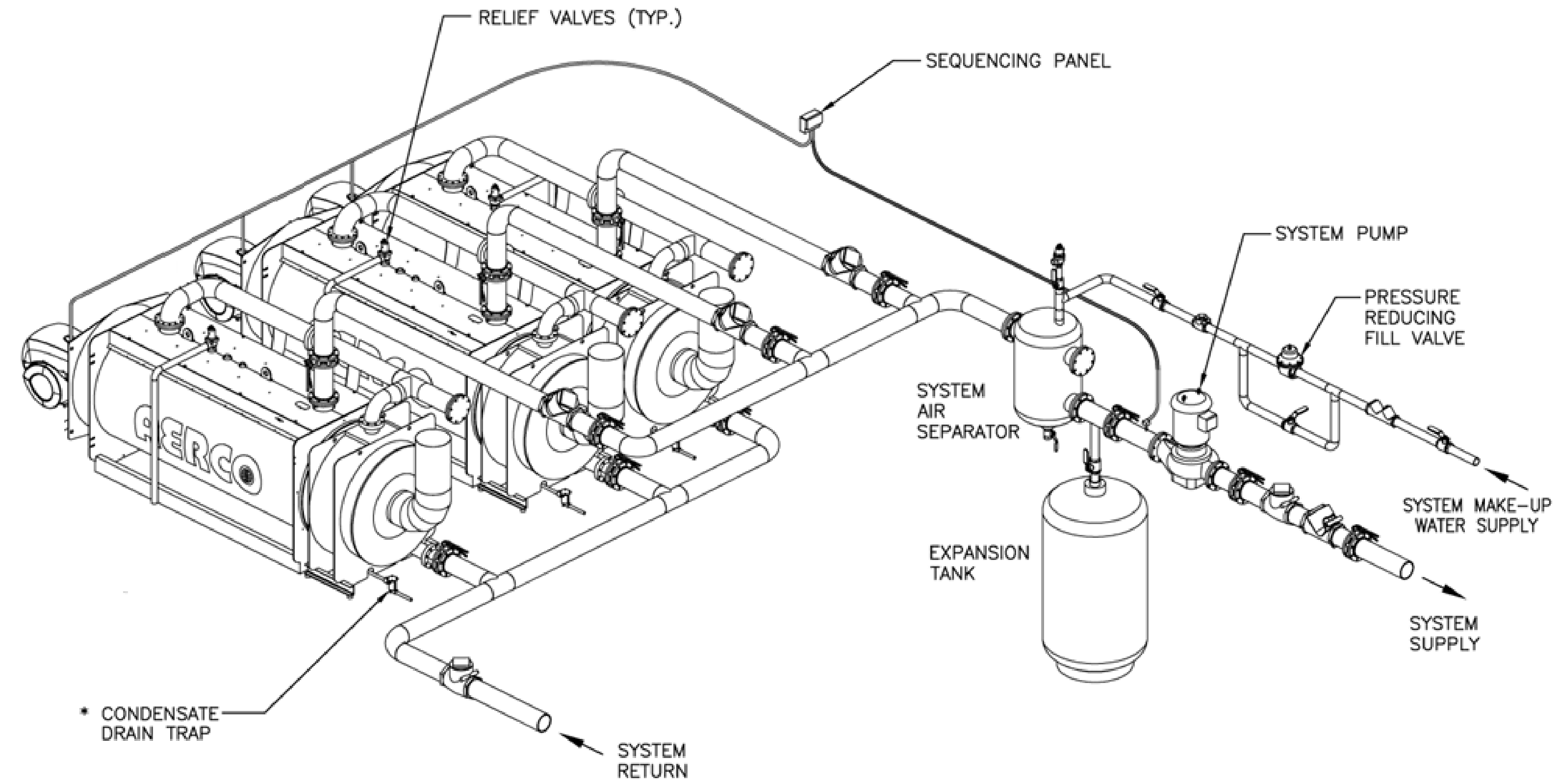
Diagram 10: Two-Boiler Combination Heating & Domestic Water Plant (MFC 10000 units shown)



NOTES:
1. FOR ACTUAL SIZES AND LOCATIONS OF PIPING AND OTHER CONNECTIONS TO THE HEATER, SEE DIMENSIONAL DRAWINGS.
2. SHELL DRAIN VALVE AND CONDENSATE HOSE SHOULD BE ARRANGED TO PERMIT THE FLUIDS TO DRAIN FREELY, BY GRAVITY, TO A FLOOR DRAIN. RELIEF VALVE DISCHARGE SHOULD BE PIPED TO THE NEAREST FLOOR DRAIN. WHEN NO FLOOR DRAIN IS AVAILABLE, THE RELIEF VALVE DISCHARGE SHOULD BE PIPED VERTICALLY TO A HEIGHT MAXIMUM 18" ABOVE THE FLOOR.
3. ALL (*) ITEMS ARE INCLUDED SEPARATELY IN SHIPMENT FROM FACTORY.
4. THIS IS A TYPICAL INSTALLATION DRAWING. LOCAL CODES AND AUTHORITIES SHOULD BE CONSULTED.
5. LOCATE WATER INLET AND OUTLET FITTINGS (i.e.UNIONS, ELBOWS, ETC.) A MINIMUM OF 18" FROM WATER HEATER FITTINGS, TO PREVENT INTERFERENCE WITH SERVICE.
6. GAS PRESSURE RANGE IS DEPENDENT ON GAS TRAIN ORDERED. CONSULT MFC SERIES FUEL SUPPLY GUIDE GF-148G FOR ADDITIONAL DETAILS.
7. WHEN USING THE AERCO CONDENSATE NEUTRALIZER TANK, FOR PROPER CONDENSATE DRAINAGE, THE NEUTRALIZER TANK MUST BE INSTALLED IN A PIT OR THE BOILER AND THE AERCO CONDENSATE TRAP MUST BE ELEVATED HIGHER THAN 4" ABOVE THE FLOOR. SEE CONDENSATE TANK INSTRUCTIONS TID-0074 FOR DETAILS.

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MFC SERIES GAS FIRED BOILERS MULTI UNITS INSTALLATION		
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Diagram 11: Multi-Boiler Installation
(MFC 10000 units shown)