PEERLESS® PINNACLE®
PIPING RECOMMENDATIONS SUPPLEMENT

Purpose of this document:

This supplement is intended to provide recommendations for installing Peerless® Pinnacle® boilers with various heating loads. The systems illustrated include systems with multiple heating zones and/or multiple boilers. Each of the systems illustrated show the Pinnacle Boiler piped into Primary/Secondary loops to assure adequate flow through the boiler and eliminate noise and vibration in the boiler due to low flow conditions.

General Piping:

The boiler supply and return piping is to be sized in accordance with the system requirements. Do not use piping smaller than the boiler connections.

In hydronic systems where sediment may exist, install a basket-type strainer in the boiler return piping to prevent particles and pipe scale from entering the boiler heat exchanger coil.

Install this boiler so that the gas ignition system components are protected from water (dripping, spraying, etc.) during appliance operation and service (circulator replacement, condensate trap cleaning, control replacements, etc.).

⚠ NOTICE

All piping must be properly supported. Do not allow the boiler piping to be supported by the boiler.

If this boiler is used in conjunction with a chilled medium system, pipe the chiller in parallel with the boiler system. Install flow control valves to prevent the chilled medium from entering the boiler.

When the boiler is connected to heating coils in a forced air system, where they may be exposed to chilled air circulation, install flow control valves or other automatic means to prevent gravity circulation of the boiler water during cooling cycles.

In accordance with ANSI Z21.13, if the boiler is installed above the level of the connected radiation, the contractor must install a low water cut off in the boiler piping.

Operating Parameters:

The Peerless Pinnacle Boiler is designed to operate in a closed loop hydronic system at approximately 15 psi. A pressure limit in the boiler header will prevent the unit from operating if the pressure drops below 10 psi. This is to protect the stainless steel heat exchanger in the event of a system leak.

The following chart shows the minimum flow rate for the Peerless Pinnacle Boiler.

Boiler Model	Total Water Volume	Minimum Flow Rate
PI-80	0.50 Gallon (1.89 Liter)	4 GPM
PI-140	0.93 Gallon (3.50 Liter)	6 GPM
PI-199	1.13 Gallon (4.26 Liter)	8 GPM

PeerlessBoilers.com

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Pressure/Temperature Gauge:

A combination pressure/temperature gauge is provide with the unit to be mounted in the piping from the boiler supply to the system. Installation of this gauge is required by most local codes.

Air Elimination:

Each hydronic system in which the Pinnacle boiler is used must have an air elimination device. As the system water is heated, dissolved oxygen and carbon dioxide will separate from the liquid. An air elimination device (such as a TACO 430 Series Air Scoop with an automatic air vent) is required to remove the dissolved gasses from the system preventing corrosion in the piping system and eliminating system noise.

Expansion Tank:

As the Pinnacle boiler heats the system media, the water or glycol solution will expand. An expansion tank is required to provide room for this expansion.

Consult the expansion tank manufacturer's instructions for specific information regarding installation. Size the expansion tank for the required system volume and capacity. Be sure the expansion tank is sized based on the proper heating medium.

Freeze Protection:

Use glycol solutions specifically formulated for hydronic heating applications. It includes oxidation inhibitors that prevent the glycol from attacking metallic components of the system. Make sure that the solution is checked for the correct glycol concentration and inhibitor level.

⚠ WARNING

Use only inhibited propylene glycol solutions of up to 50% by volume. Ethylene glycol is toxic and can attack gaskets and seals used in hydronic systems.

The antifreeze solution should be tested by a trained professional annually and/or as recommended by the glycol supplier.

Antifreeze solutions expand more than water. For example, the volume of a 50% solution (by volume) expands 4.8% in volume for a temperature increase from 32°F to 180°F, while water expands 3% with the same temperature rise. Allowance must be made for this additional expansion in the system.

Primary/Secondary Piping

The following illustrations show recommended piping configurations for some typical Pinnacle boiler applications. Since the Pinnacle is a fully condensing boiler, it is not necessary to provide a system bypass to temper the system return water.

When piping a boiler into a secondary loop, always install the pump on the boiler return so it is pumping away from the common piping. The pipes attaching to the system loop should be as close together as possible and should not exceed four pipe diameters between them. The following indicates how this circulator is to be sized based on the heating input.

Circulator Sizing:

The following shows how to size a circulator based on the boiler net output. The boiler Net I=B=R Output is listed in the chart below. This value includes a piping pickup factor of 1.15.

Boiler Model	Boiler Input (Btu/hr)	Net I=B=R Output (Btu/hr)
PI-80	80,000	64,000
PI-140	140,000	112,000
PI-199	199,000	159,000

The Pinnacle Boiler imposes a small pressure drop on the heating medium that must be accounted for in circulator sizing. This pressure drop for each model, based on a 20°F temperature rise, is as follows:

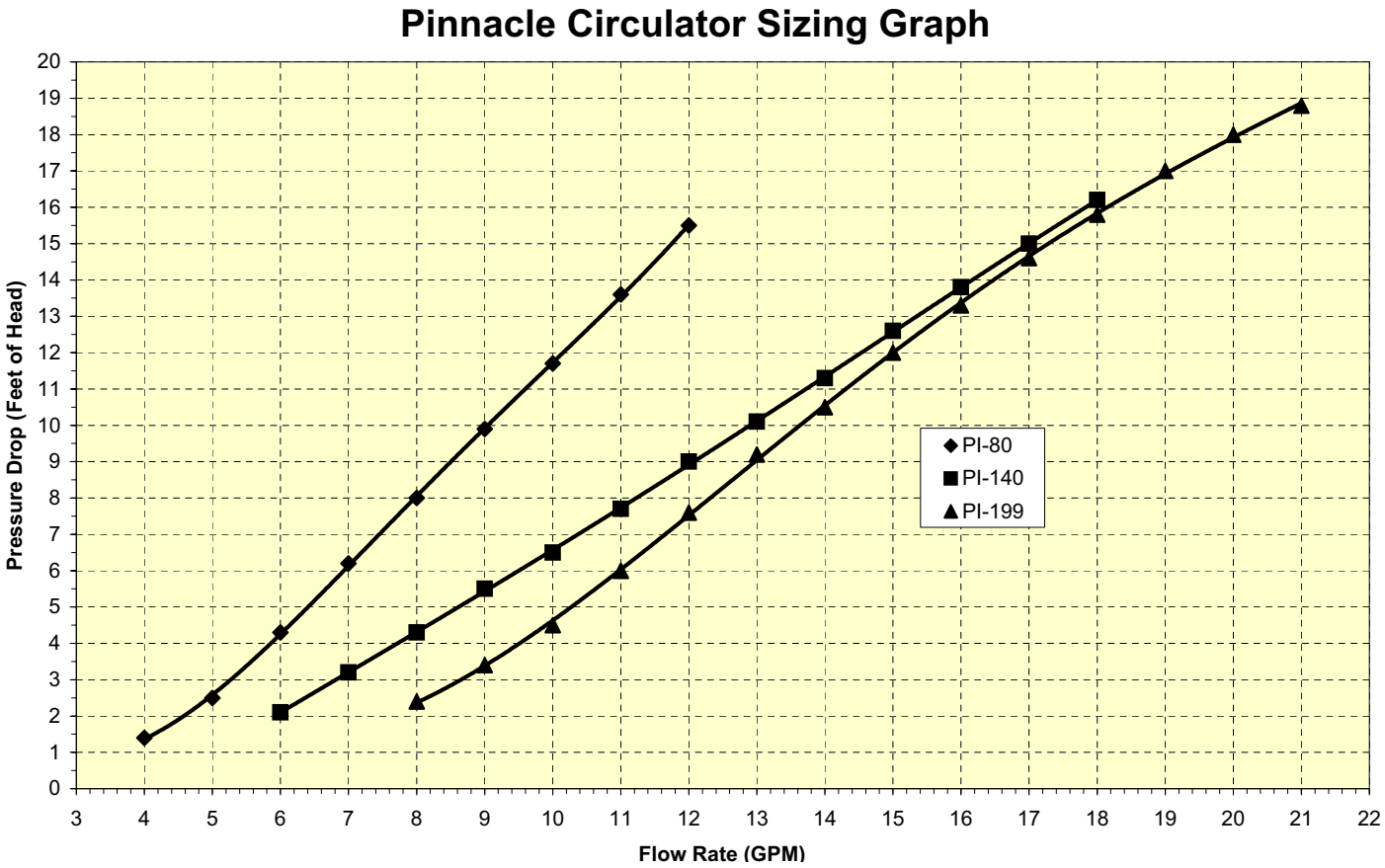
Boiler Model	Flow Rate (GPM)	Pressure Drop (Feet)
PI-80	6.4	5.0
PI-140	11.2	8.0
PI-199	15.9	13.2

We can determine the required flow based on the design temperature difference and the Net I=B=R Output. For this example, we will use 20°F. The calculation is as follows:

$$\text{GPM} = \frac{Output}{\Delta T \times 500} = \frac{64{,}000}{20 \times 500} = 6.40 \text{ GPM}$$

So, for a PI-80 with a 20°F design temperature differential a circulator sized for 6.40 GPM should be used. The pressure drop should be calculated based on this flow rate.

The boiler pressure drop for different flow rates can be determined by using the Pinnacle Circulator Sizing Graph Below.



System Piping

Zone Circulators:

On the following illustrations, each zone has its own circulator. This assures the proper flow through the zone and should not be effected by the operation of other zones. Notice the air separation is up stream of the system loop pumps and is tied into the expansion tank and system fill valve.

Figure 1 shows a single boiler, a Peerless Partner indirect water heater, and a single heating zone. This system is applicable to systems where the supply temperature of the heating zone is similar to that of the indirect water heater.

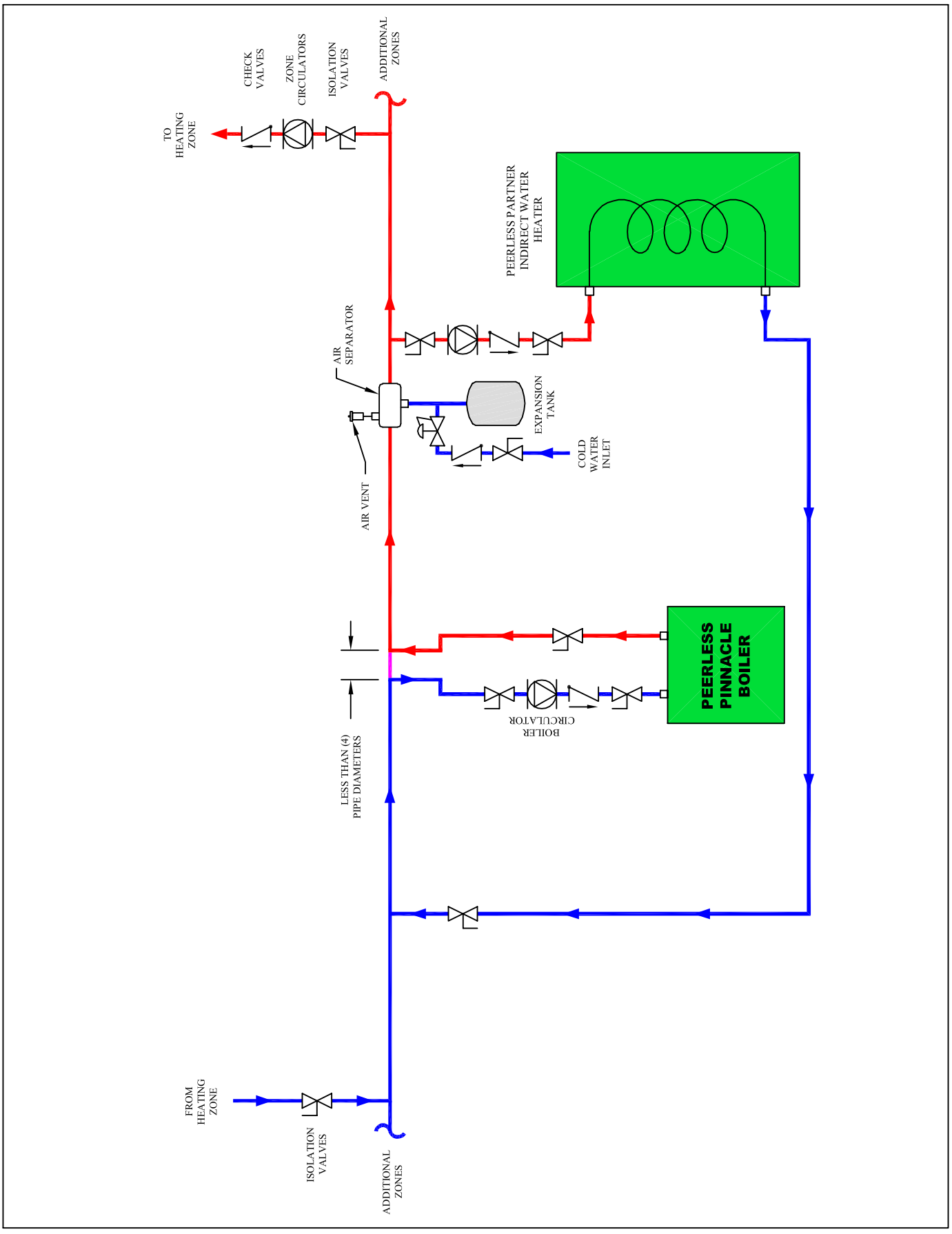
Figure 2 shows an additional zone in which baseboard radiation is the heat load. Baseboard radiation requires temperatures similar to that of the indirect water heater.

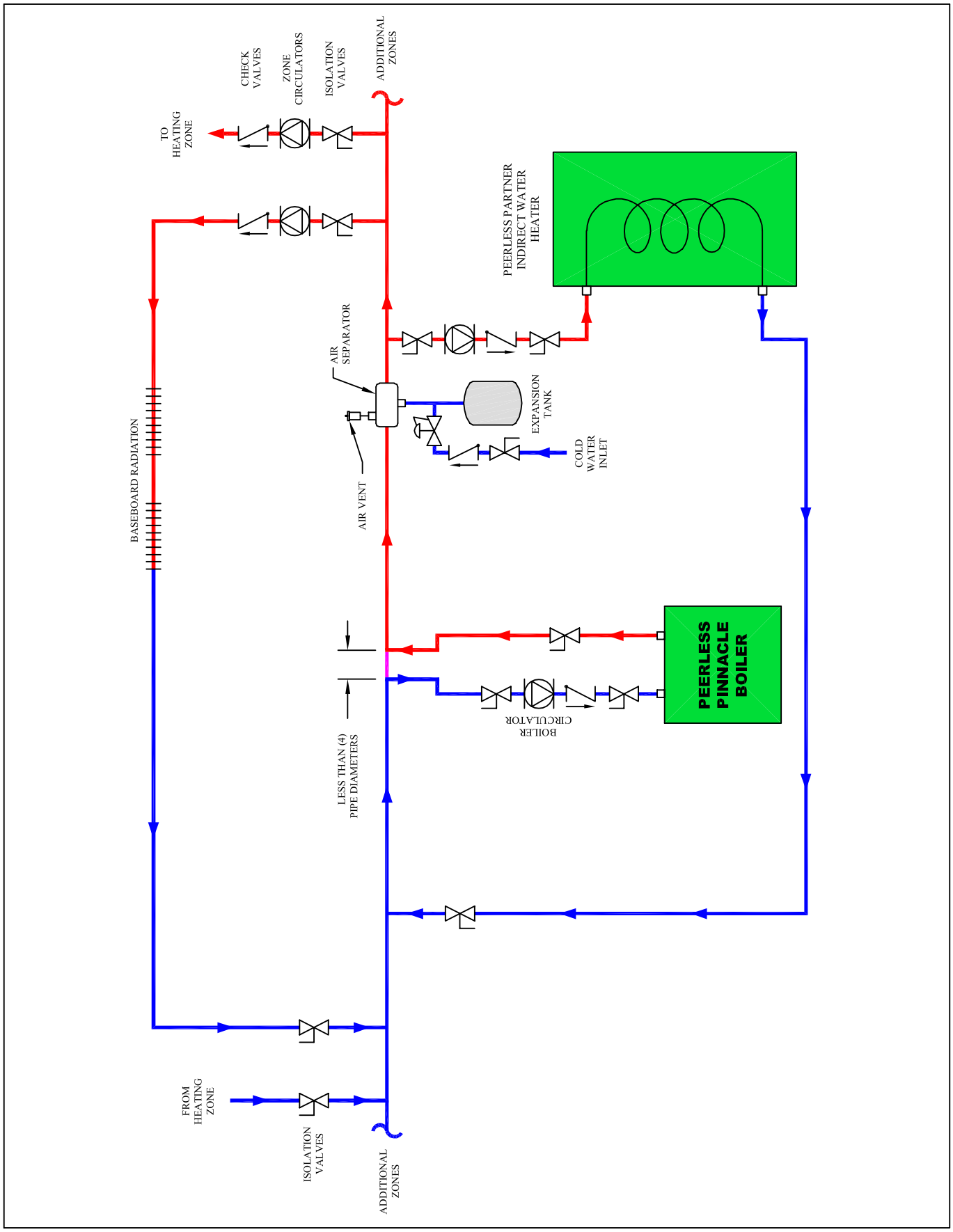
In **Figure 3**, diverter tees are used in combination with conventional hydronic radiators on an additional zone. Also, a second boiler is added in this illustration. Notice that the boilers are piped in parallel on the secondary loop. It is important that the common headers are sized to match the system piping. Smaller headers may result in flow fluctuations through the boilers.

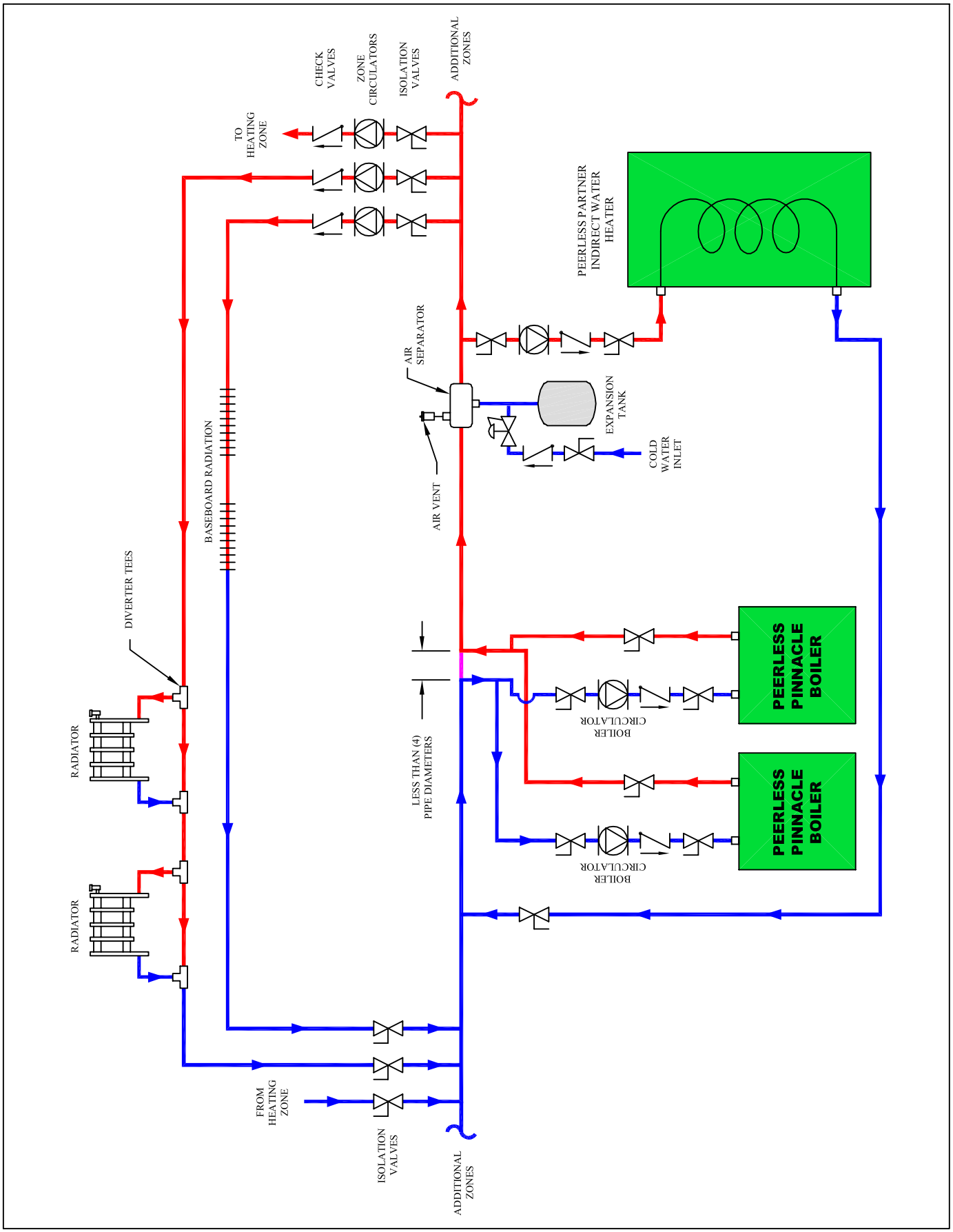
Figure 4 shows a system in which different types of loads and multiple boilers are shown. This system illustrates how different temperature loops can be combined by mixing down the supply temperature through a bypass. Radiant flooring typically requires much lower temperatures than baseboard radiation and indirect water heating, therefore a three way mixing valve is used to temper the supply.

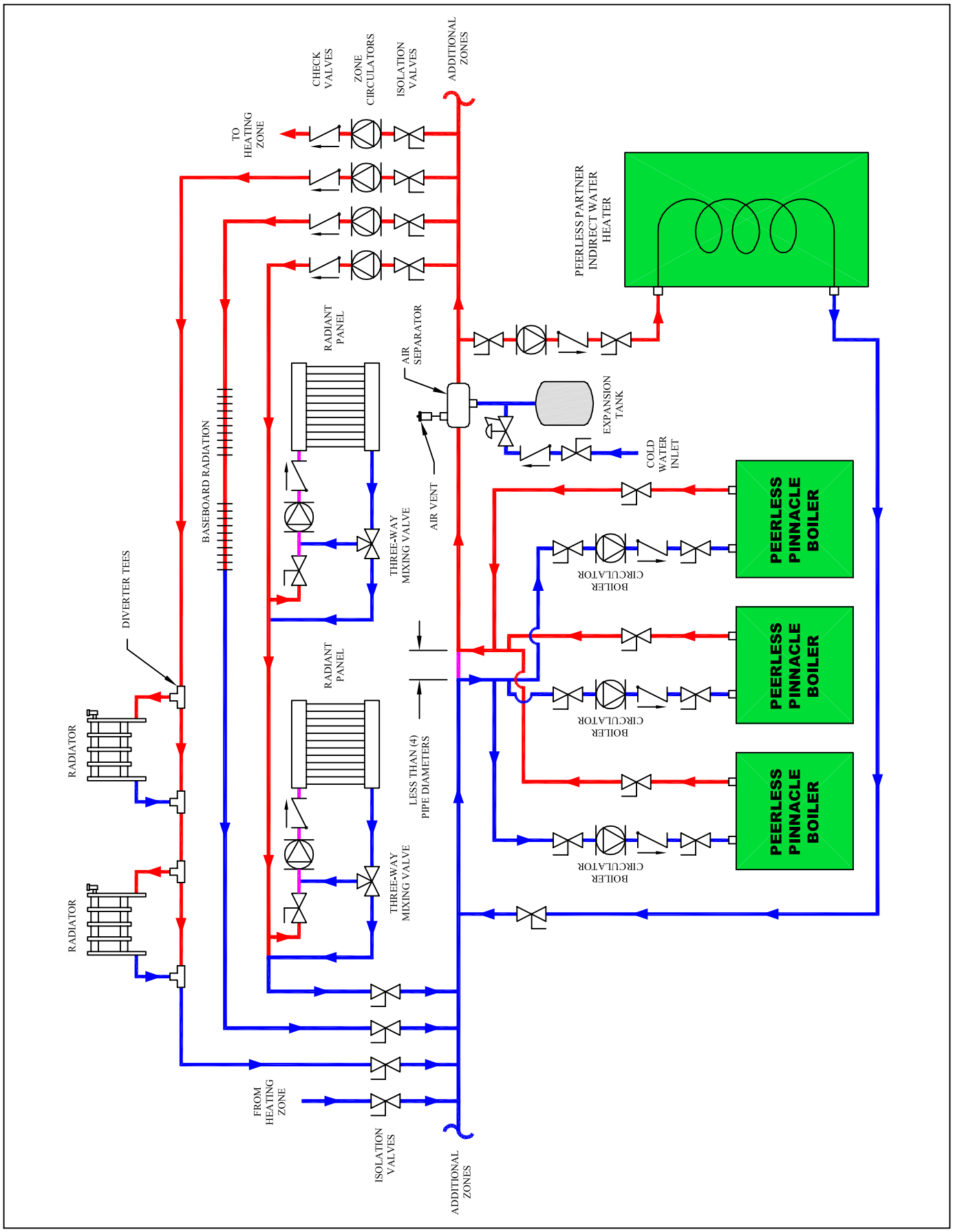
Zone Valves:

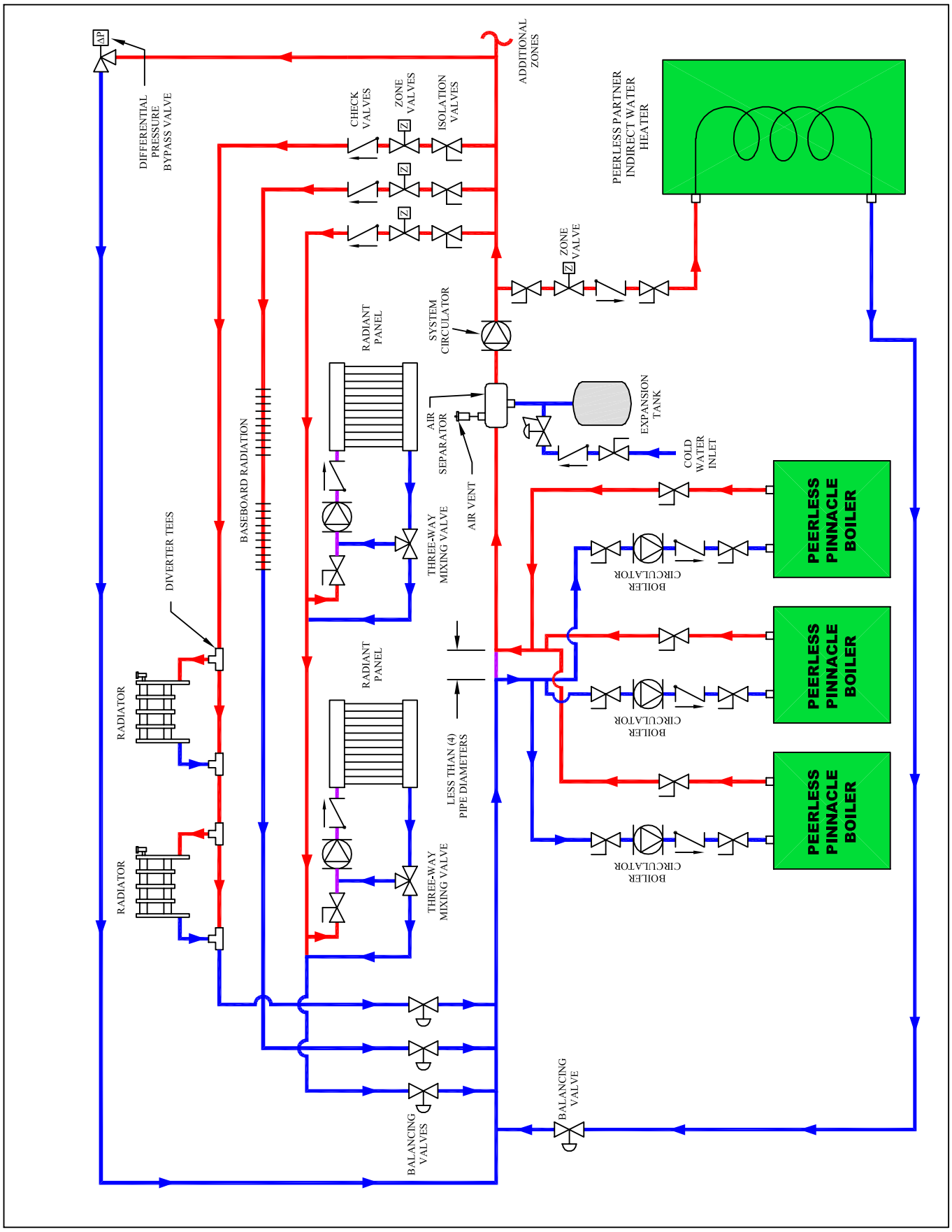
Figure 5 shows a system in which zone valves are used in place of zone circulators. Notice that this system utilizes reverse return piping, which makes it easier to balance the system. If the heating loops are very different in length, then the balancing valves, shown on the return side of each loop, are required.


TO HEATING ZONE
CHECK VALVES
ZONE CIRCULATORS
ISOLATION VALVES
ADDITIONAL ZONES
PEERLESS PARTNER INDIRECT WATER HEATER
AIR SEPARATOR
EXPANSION TANK
COLD WATER INLET
AIR VENT
PEERLESS PINNACLE BOILER
BOILER CIRCULATOR
LESS THAN (4) PIPE DIAMETERS
FROM HEATING ZONE
ISOLATION VALVES
ADDITIONAL ZONES


ADDITIONAL ZONES
ISOLATION VALVES
ZONE CIRCULATORS
CHECK VALVES
TO HEATING ZONE
PEERLESS PARTNER INDIRECT WATER HEATER
AIR SEPARATOR
EXPANSION TANK
COLD WATER INLET
AIR VENT
BASEBOARD RADIATION
PEERLESS PINNACLE BOILER
BOILER CIRCULATOR
LESS THAN (4) PIPE DIAMETERS
FROM HEATING ZONE
ISOLATION VALVES
ADDITIONAL ZONES


ADDITIONAL ZONES
ISOLATION VALVES
ZONE CIRCULATORS
CHECK VALVES
TO HEATING ZONE
PEERLESS PARTNER INDIRECT WATER HEATER
AIR SEPARATOR
EXPANSION TANK
COLD WATER INLET
AIR VENT
BASEBOARD RADIATION
DIVERTER TEES
RADIATOR
RADIATOR
LESS THAN (4) PIPE DIAMETERS
BOILER CIRCULATOR
BOILER CIRCULATOR
PEERLESS PINNACLE BOILER
PEERLESS PINNACLE BOILER
FROM HEATING ZONE
ISOLATION VALVES
ADDITIONAL ZONES


ADDITIONAL ZONES
ISOLATION VALVES
ZONE CIRCULATORS
CHECK VALVES
TO HEATING ZONE
PEERLESS PARTNER INDIRECT WATER HEATER
RADIANT PANEL
AIR SEPARATOR
EXPANSION TANK
COLD WATER INLET
AIR VENT
BASEBOARD RADIATION
THREE-WAY MIXING VALVE
DIVERTER TEES
RADIATOR
LESS THAN (4) PIPE DIAMETERS
BOILER CIRCULATOR
PEERLESS PINNACLE BOILER
FROM HEATING ZONE


ΔP
DIFFERENTIAL PRESSURE BYPASS VALVE
CHECK VALVES
ZONE VALVES
ISOLATION VALVES
ADDITIONAL ZONES
PEERLESS PARTNER INDIRECT WATER HEATER
ZONE VALVE
SYSTEM CIRCULATOR
RADIANT PANEL
AIR SEPARATOR
EXPANSION TANK
COLD WATER INLET
AIR VENT
BASEBOARD RADIATION
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THREE-WAY MIXING VALVE
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LESS THAN (4) PIPE DIAMETERS
THREE-WAY MIXING VALVE
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BOILER CIRCULATOR
PEERLESS PINNACLE BOILER
BOILER CIRCULATOR
PEERLESS PINNACLE BOILER
BOILER CIRCULATOR
PEERLESS PINNACLE BOILER
BALANCING VALVES
BALANCING VALVE