Mega-Stor® II

Stainless Steel, Buffer Tanks

INSTALLATION AND OPERATING INSTRUCTIONS

Quality Value & Service

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IMPORTANT INFORMATION - READ CAREFULLY

NOTE: The equipment shall be installed in accordance with those installation regulations enforced in the area where the installation is to be made. These regulations shall be carefully followed in all cases. Authorities having jurisdiction shall be consulted before installations are made.

The following terms are used throughout this manual to bring attention to the presence of hazards of various risk levels, or to important information concerning product life.

DANGER

Indicates an imminently hazardous situation which, if not avoided, will result in death, serious injury or substantial property damage.

CAUTION

Indicates a potentially hazardous situation which, if not avoided, may result in moderate or minor injury or property damage.

WARNING

Indicates a potentially hazardous situation which, if not avoided, could result in death, serious injury or substantial property damage.

NOTICE

Indicates special instructions on installation, operation, or maintenance which are important but not related to personal injury hazards.

WARNING

Improper installation, adjustment, alteration, service or maintenance can cause property damage, personal injury or loss of life. Read and understand the entire manual before attempting installation, start-up operation, or service. Installation and service must be performed only by an experienced, skilled, and knowledgeable installer or service agency.

Burn Hazard. This tank contains very hot water under high pressure. Do not unscrew any pipe fittings nor attempt to disconnect any components without positively assuring the water is cool and has no pressure. Always wear protective clothing and equipment when installing, starting up or servicing this product to prevent scald injuries. Do not rely on the pressure or temperature gauges to determine the temperature and pressure of the water heater. Portions of this tank and connected piping become very hot while operating. Do not touch any components unless they are cool.

Failure to follow all instructions in the proper order can cause personal injury or death. Read all instructions, including all those contained in component manufacturers manuals which are provided before installing, starting up, operating, maintaining or servicing.

WARNINGS FOR THE HOMEOWNER

FOLLOW ALL INSTRUCTIONS and warnings printed in this manual and posted on the indirect water heater.

IF YOU ARE NOT QUALIFIED to install or service heating equipment, do not install or service this one.

THIS TANK MAY LEAK WATER at the end of its useful life. Be sure to protect walls, carpets, and valuables from water that could leak from the tank.

PROTECT YOUR HOME IN FREEZING WEATHER. A power outage, safety lockout, or component failure will prevent your boiler from lighting. In winter, your pipes or this tank may freeze and cause extensive property damage. Do not leave the heating system unattended during cold weather unless alarms or other safeguards are in place to prevent such damage.

CONTENTS

I. PRODUCT DESCRIPTION

This buffer tank is designed for installation in a closed low pressure hot water space heating system where it has two principle purposes:

- Hydraulic separation – When installed as specified, the flow rate through the boiler loop will be essentially independent of that through the heating system. This is particularly beneficial when the boiler requires a minimum flow rate which is higher than that though the system at lower heating demands (e.g. when only one small zone is calling for heat).
- Reduction in burner cycling – This tank adds mass to the system which results in longer burner on cycles if the tank is applied properly.

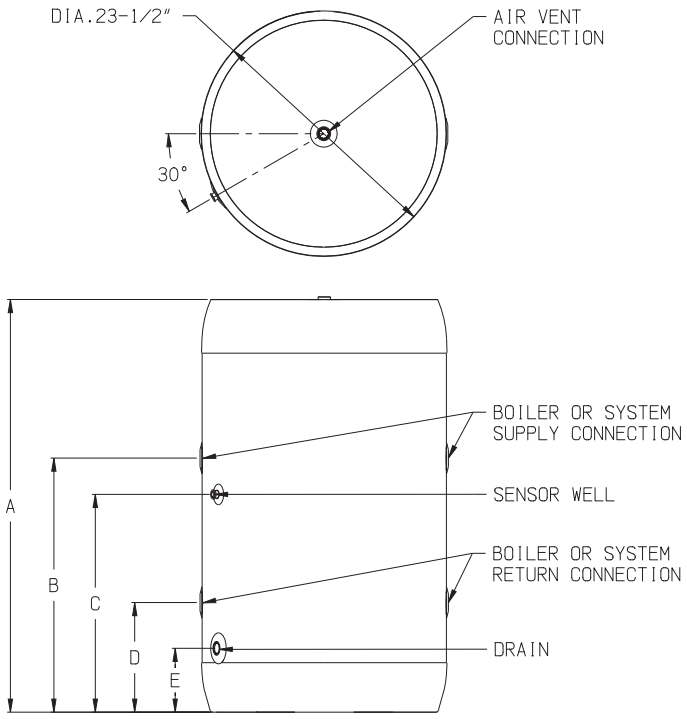
Because of the low velocities in the tank, the buffer tank also serves as an excellent air separator.

WARNING

This buffer tank is for use in low pressure hydronic systems only:

- **Do not use in potable water systems.**
- **Do not operate above the temperature and pressure ratings shown on the rating plate.**

II. SPECIFICATIONS



MSB030 THRU MSB075

FIGURE 2.1: MEGA-STOR II BUFFER TANK

TABLE 2.2: PHYSICAL SPECIFICATIONS

Model	Volume (Gal.)	Dimensions in Inches					Weight	
		A	B	C	D	E	Net	Full
MSB030	31.4	33-1/8	20-7/8	16-1/8	11-1/4	6-1/8	71	333
MSB050	52.6	49-3/4	37-5/8	24-1/2	11-1/4	6-1/8	82	520
MSB075	76.3	68-3/4	56-1/2	33-7/8	11-1/4	6-1/8	115	751

TABLE 2.3: CONNECTION SIZE (in. NPT)

Description	Model
	MSB030 - MSB075
Boiler Supply/Return	1-1/2”F
System Supply/Return	1-1/2”F
Top (Air Vent)	1”F
Drain	3/4”F

III. BEFORE STARTING INSTALLATION

1) Be sure that the planned installation is in accordance with all local codes.

2) Be certain the water supply used to fill the hydronic system has physical and chemical characteristics that fall within limits shown below. Where questions exist as to the composition of the water on the job, a qualified water treatment expert should be consulted.

3) Read and understand all application and installation requirements in this manual.

CAUTION

Water used in this indirect water heater must have characteristics falling within the following limits:

PH 6.0 – 8.0

Chloride Content – Less than 80PPM

Water failing to meet these requirements may severely shorten the life of this product due to corrosion. Such corrosion damage is not covered by the warranty.

IV. BUFFER TANK APPLICATION

A) SIZING

Buffer tanks are sized using the following equation:

$$V = \frac{(Qb - Qs)\ x\ t}{500\ x\ \Delta TD}$$

Where:

V = Required total volume (in Gallons) for the buffer tank, boiler, boiler loop piping, and any system loop piping that will always have water flowing through it regardless of what zone is calling (using V as the required buffer tank volume will yield more conservative results).

Qb = Boiler output (BTU/hr). For modulating boilers use the low fire output.

Qs = Smallest system heating load (BTU/hr)

t = Minimum acceptable burner on time (minutes). Ten minutes is the minimum recommended value for t.

ΔTD = Operating control's differential (i.e. the difference between the temperature at which the operating control turns off the burner and the temperature at which the burner will come back on).

Example: A condensing boiler having an output of 150MBH with 5:1 turndown is to be used. The differential on this particular boiler is defined in terms of a 10F "differential above" (temperature above set-point at which the burner shuts off) and a 5F "differential below" (temperature below set-point at which the burner comes on). The smallest heating zone on the system is 5000 BTU/hr. We want the burner to run for at least 10 minutes any time it fires. The volume of the boiler is 1 gallon, the boiler loop piping contains 5 gallons, and there is 6 gallons in the system piping that is common to all zones.

Solution: Min Output = 150MBH ÷ 5 = 30MBH = 30000 BTU/hr

Run Time = 10 minutes

ΔTD = 10F + 5F = 15F

$$V = \frac{(30000 - 5000)\ x\ 10}{500\ x\ 15} = 33.3\ Gal.$$

The total volume of the water in the boiler, boiler loop, and common portion of the system loop is

1 + 5 + 6 = 12 Gal.

Minimum required buffer tank volume is therefore

33.3 – 12.0 = 21.3 Gal.

B) TEMPERATURE CONTROL

Temperature Regulation - For best results, regulate the system temperature using a sensor or control located in the buffer tank well. This well will accept a 3/8" sensor or capillary bulb equipped control. See Part VII for additional information.

WARNING

The boiler's safety high limit(s) must remain in the location specified by the boiler manufacturer. Do not move or replace these controls; if necessary, provide a separate operating control for regulation of buffer tank temperature. Failure to observe this warning could result in property damage, personal injury or loss of life.

Predicting Temperature Supplied to the Heating System - The temperature of water supplied to the heating system is dependent upon the boiler supply temperature, the system load, and the relative flow rates through the boiler and system loops. The following rules of thumb can be used to estimate the system supply temperature:

- Boiler Loop Flow Greater Than or Equal to System Loop Flow – System supply temperature is equal to boiler supply temperature
- Boiler Loop Flow Less Than System Loop Flow – The following equation predicts system temperatures:

$$Tss = \frac{\Delta Tb \; x \; Vb}{Vs} + Tr$$

Where:

Tss = System Supply Temp

ΔTb = Boiler temperature rise

Vb = Boiler loop flow rate

Vs = system flow rate

Tr = Boiler Return and System Return Temps (theoretically equal to each other)

Note that these equations assume steady state conditions and minimal turbulence inside the tank. Such turbulence is unavoidable, but can be minimized as follows:

- Avoid unnecessarily high boiler or system flow rates.
- If loop piping is smaller than the tank connections, avoid making the reductions at or near buffer tank connections.
- Never use the air vent or drain connections to circulate water through the tank.

WARNING

When the boiler fires, the boiler's supply temperature will immediately jump based on the boiler loop flow rate and the boiler's output. This can lead to burner cycling even with a correctly sized buffer tank. To avoid this:

- **Do not use the boiler supply as the operating temperature regulation point; use the buffer tank's well as described above.**
- **The sum of the maximum operating system set point, plus the rise across the boiler, should be less than the boiler's high limit setting.**

V. LOCATING THE BUFFER TANK

1) Table 2.2 shows the weight of each buffer tank filled with water. Make sure that the location chosen for the buffer tank is capable of supporting it.
2) Locate the buffer tank in a location where a leak in the tank or the adjacent piping will not damage the surrounding structure. If the surrounding area is highly susceptible to water damage, install the tank in a pan with a drain.

WARNING

Failure to properly support the buffer tank could result in property damage, personal injury or death.

VI. PIPING

This manual shows three alternative "four pipe" buffer tank systems. Regardless of the method used, observe the following general requirements:

- Following any special requirements that the boiler manufacturer has for maximum boiler loop length, pipe size, or boiler pump selection.
- Figures 6.1 to 6.3 do not necessarily show all features that may be required by the boiler manufacturer and/or applicable codes.
- Note that the use of a buffer tank may require a larger size expansion tank than would otherwise be needed.
- At least one automatic air vent is required in the system. In some cases, such as the piping system shown in Figure 6.1 this is the only automatic air vent that is required (although additional manual vents may be needed to adequately purge the system during initial fill). In cases where water is not always circulating though the buffer tank, a second automatic air vent and air separator is recommended in the common boiler loop piping.

Method #1: No indirect water heater used - Figure 6.1 shows recommended piping when there is no indirect water heater in the system.

Method #2 – Indirect Water Heater, Boiler Has Externally Mounted Pump – Figure 6.2 shows one way of using a buffer tank and indirect water heater in a system. Recommended piping is designed to avoid circulating water through the buffer tank during a call for domestic hot water (DHW), as doing so will reduce DHW response and may also cause overheating of the water going to the heating system. In this system, the boiler pump runs during a call for central heat (CH) and the DHW pump runs during a call for domestic hot water. Note that the DHW pump must be able to overcome both the pressure drop through the boiler and that through the indirect water heater, while producing the flow rate required by both. When the boiler has a large pressure drop, as is the case of many water tube boilers, this may be impractical or very expensive. In such cases, use Method #3 instead.

Method #3 – Indirect Water Heater, Boiler Has Internal Pump and/or High Pressure Drop – Figure 6.3 shows recommended piping in this case. As with Method #2, this system avoids circulation through the buffer tank during a call for DHW. The boiler pump runs for either a call for CH or DHW. Two system pumps are required, one for each side of the buffer tank. The second system pump only needs to overcome the pressure drop through the loop between the buffer tank and the closely spaced Tees in the boiler loop.

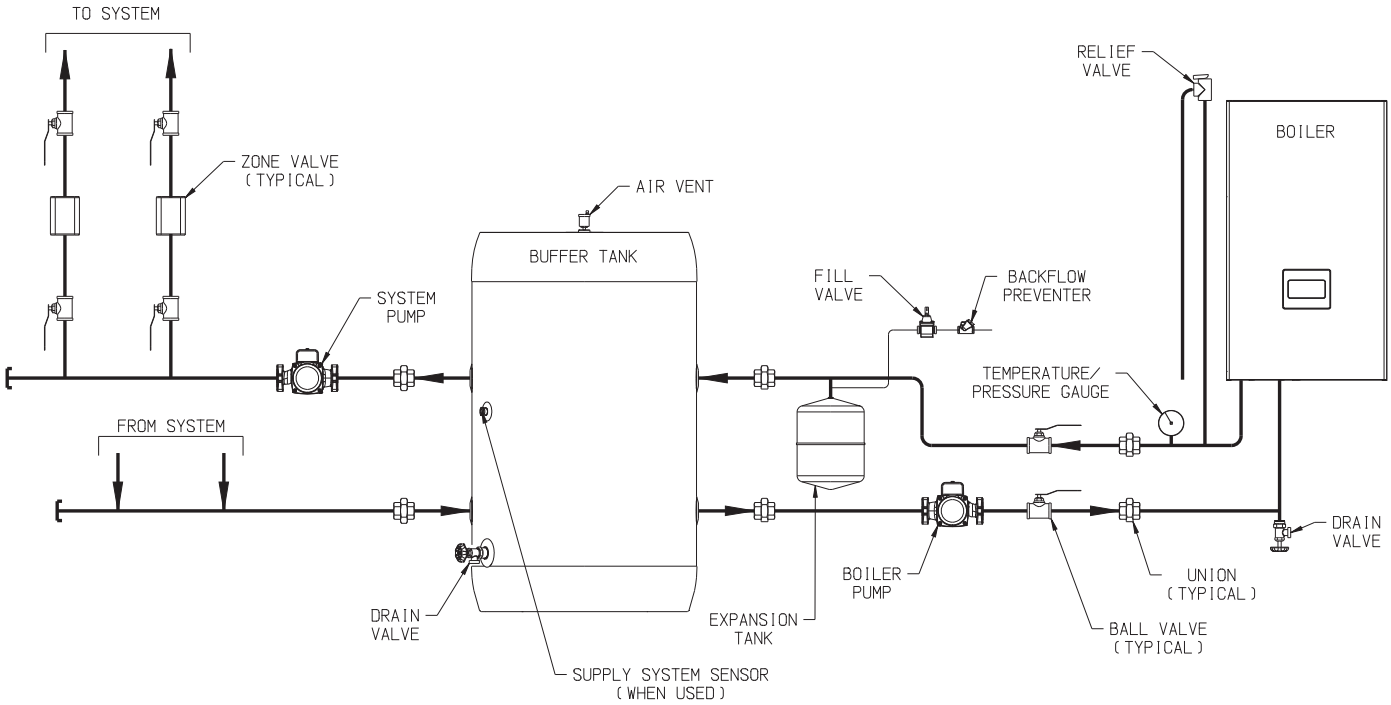


FIGURE 6.1: PIPING METHOD #1 - HEATING ONLY, NO INDIRECT WATER HEATER

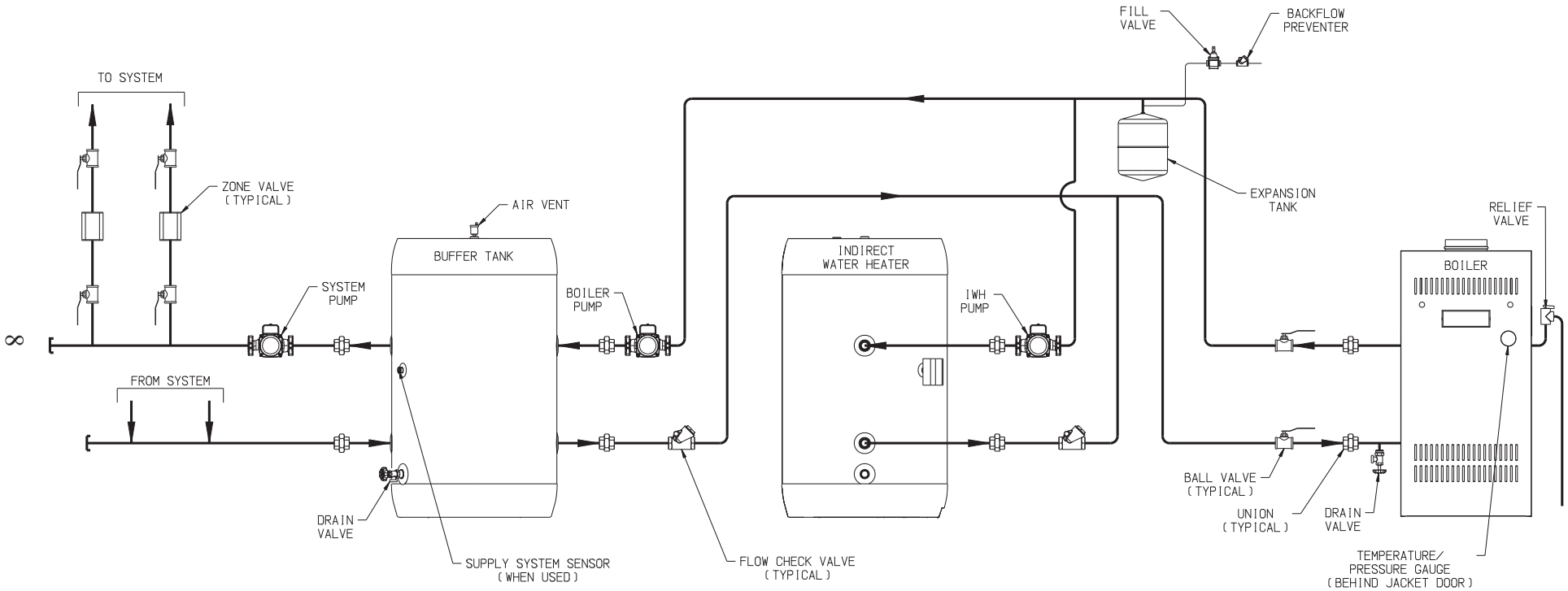


FIGURE 6.2: PIPING METHOD #2 - INDIRECT WATER HEATER, LOW PRESSURE DROP BOILER WITH EXTERNAL PUMP

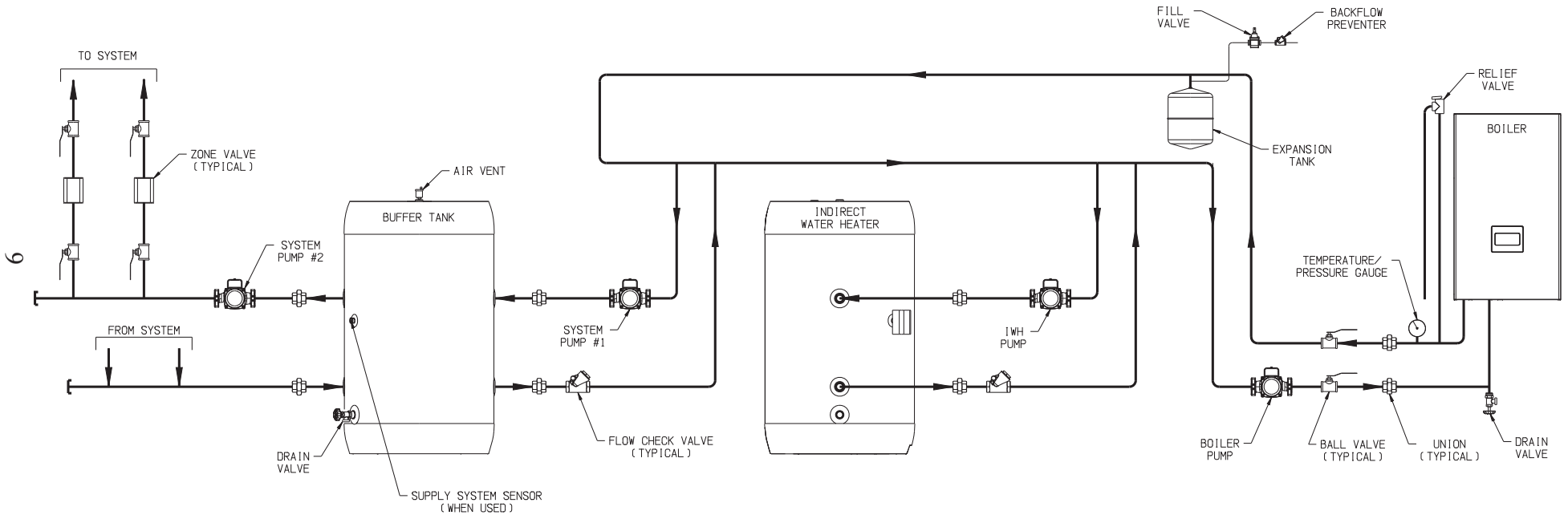


FIGURE 6.3: PIPING METHOD #3 - INDIRECT WATER HEATER, HIGH PRESSURE DROP BOILER OR BUILT IN BOILER PUMP

VII. WIRING and CONTROL SET-UP

- **All wiring and grounding must be done in accordance with the authority having jurisdiction or, in the absence of such requirements, with the National Electrical Code /NFPA 70). In Canada, all wiring and grounding must be done in accordance with the Canadian Electrical Code, Part 1 (CSA C22.1 - latest edition).**
- **Failure to properly wire electrical connections to the boiler may result in serious physical harm.**
- **Electrical power may be suppled from more than one circuit. Make sure all power is off before attempting any electrical work.**
- **Never jump out or make inoperative any safety or operating controls.**

The exact method of wiring and setting up the system containing this buffer tank depends entirely on factors determined by the installer or system designer. The following, however, are some general guidelines relevant to the buffer tank:

1) As previously noted, the control well in the buffer tank is usually the best place to regulate heating system temperature. This well will accept a 3/8" sensor or capillary bulb equipped control.

2) For Velocity Phantom, Phantom X, and Raptor condensing boilers, the following sensor may be used:

   P/N 103104-01 (Honeywell 32003971-003)

   Wire this to the header sensor terminals on the boiler and follow the instructions in the boiler manual to use this sensor for CH temperature regulation.

3) If a sensor is used, it must have a 3/8" nominal diameter so that it fits snugly into the well. Clamp the sensor in place so that it is not accidently pulled out. For best results, apply a heat conductive grease to the sensor, such as Honeywell 107408. The wiring between the header sensor and the control should be routed away from sources of electrical noise. Where it is impossible to avoid such noise sources, follow shielding instructions provided by the boiler or control manufacturer.