Lochinvar®

High Efficiency Water Heaters And Boilers

DESIGNER'S GUIDE COPPER-FIN® WATER HEATER

90,000 – 3,080,000 BTUs

Dear Specifier/Project Manager,

At Lochinvar, we have long recognized the importance of innovation to any product or service. Those who enter into business must also accept the challenge of meeting constantly changing needs.

The designer's guide you are now holding has been designed to make it more convenient for you to select the perfect Lochinvar water heater for your projects and provide correct specifications for your teams.

All information has been organized and presented in a succinct, easy-to-use manner, so you can use and share information confidently and with minimal effort.

However, it is important to remember that this guide is not intended to replace our installation manual. Installers should still refer to our installation manual for specific installation instructions.

We hope our new manual will make your work easier and more productive.
As always, we greatly appreciate your input on additional improvements for the future.

Thanks once again for specifying the Lochinvar family of quality standard and custom-built water heaters and boilers.

Sincerely,

Lochinvar®
High Efficiency Water Heaters And Boilers
Lochinvar Corporation

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Supplement A: Electrical Diagrams

In designing a water heater system, pay special attention to:

- ❑ **Water Velocity**
  (See page 14 for Required Degree Rise chart.)
- ❑ **Factory Supplied Pump Capacity**
  (See page 14 for Pump Operation.)
- ❑ **Manifold Pipe Size**
  When using more than one heater *(See page 15 for Common Water Manifold Size for Multiple Water Heater Installation Table.)*
- ❑ **Storage Tank Circulating Tappings**
  (See page 15 for Manifold Pipe Size.)
- ❑ **Placement of Cold Water Inlet and Building Return**
  (See Appendix A for Water Heater Piping Diagrams.)
- ❑ **Water Hardness**
  (See page 15 for Water Treatment Information.)

CODES

Installation **MUST** conform to the requirements of the authority with jurisdiction, or in the absence of such, to the latest edition of the *National Fuel Gas Code, ANSI Z223.1.*

LOCATION OF WATER HEATER

1. Locate the unit so that if there is a leak, water damage will not occur. When such locations cannot be avoided, it is recommended that a suitable drain pan be installed under the unit. The pan **MUST NOT** restrict combustion air flow. *Under no circumstances is the manufacturer to be held liable for water damage in connection with this unit, or any of its components.*

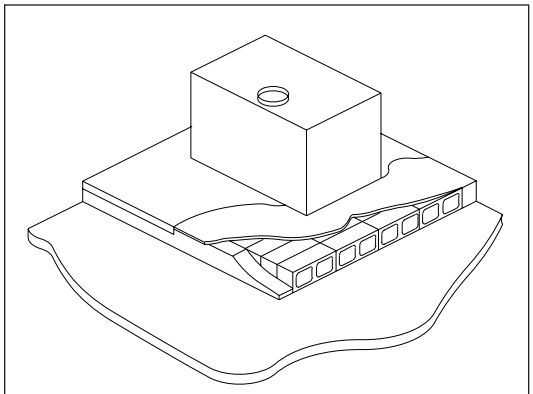
2. Install indoor units so that ignition system components are protected from water (dripping, spraying, etc.) during operation and service (circulator replacement, control replacement, etc.).

3. Place appliance on a level, non-combustible floor. Concrete over wood is **not** considered non-combustible (See Figures 1 and 2). Do **not** install on carpet.

4. Allow sufficient space for servicing pipe connections, pump, and other auxiliary equipment, as well as the water heater.

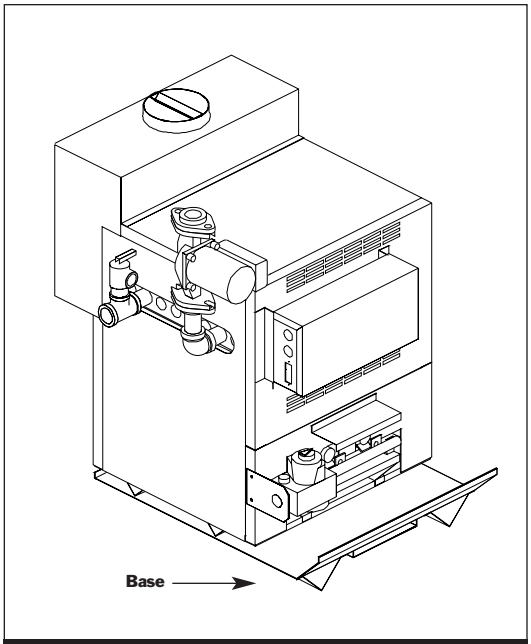
5. In cold weather areas the water heater should be located within a room having a temperature safely above freezing (32˚F). If the unit is supplied with a constant* running circulating pump, it will help prevent freezing when properly installed.

**Solid state intermittent pump controller is optional.*



(FIG. 1) CW495-3080 REQUIREMENTS FOR INSTALLATION OVER COMBUSTIBLE FLOOR

- Provide a base of hollow clay tile or concrete blocks from 8” to 12” thick and extending 24” beyond the sides.
- The blocks **MUST** be placed in line so that the holes line up horizontally to provide a clear passage through the blocks.
- This procedure should also be followed if electrical conduit or radiant heat distribution piping runs through the floor, and beneath the appliance.
- Insure that combustible floor base meets local fire code requirements.



(FIG. 2) RW90-360 SPECIAL COMBUSTIBLE FLOOR BASE (OPTIONAL)

Units may be installed on combustible flooring only when installed on special base.

CAUTION!

Proper freeze protection MUST be provided for outdoor installations, units installed in unheated mechanical rooms, or where temperatures may drop to the freezing point or lower.

SPECIAL LOCATION: OUTDOOR USE
(Models CW495-2065 only)

Copper Fin Models CW495-2065 are approved for outdoor installations. Outdoor models have additional location and clearance requirements.

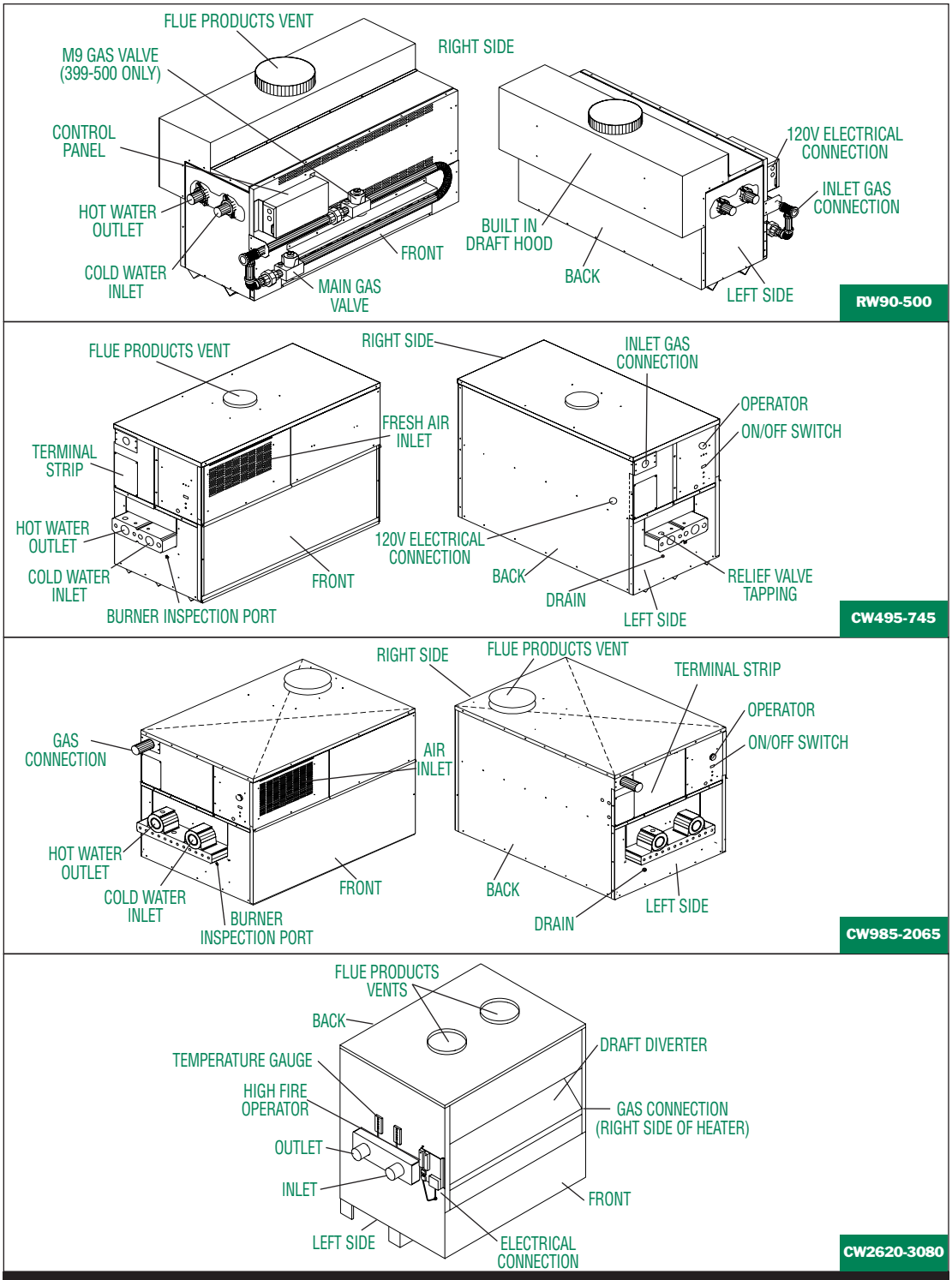
These requirements **MUST** be adhered to carefully, since wind, rain, snow and cold cannot be controlled in outdoor applications.

See **Outdoor Installation, Models CW495-2065 only**, in the venting section on page 10.

(TABLE A) – CLEARANCES FROM COMBUSTIBLE CONSTRUCTION

CLEARANCES	RW90-180	RW199-500	CW495-2065	CW2620-3080 (Service Clearance Included)
Right Side	6"	6"	3"	24"
Rear	6"	6"	3"	24"
Left Side	6" (24" for Service)	6" (24" for Service)	3" (30" for Service)	24"
Front	6"† (24" for Service)	ALCOVE* (24" for Service)	ALCOVE* (24" for Service)	24"
Top	14" (Measured from Draft Hood)	29" (Measured from Draft Hood)	3"	24"
Flue	1"+	1"+	1"+	1"+

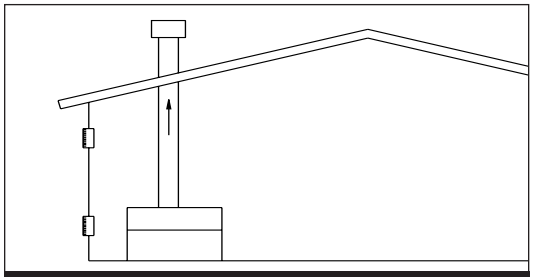
* Alcove is a closet without a door.
\+ Consult local codes and/or vent material manufacturer.
† Measured from gas valve.



(FIG. 3) WATER HEATER EQUIPMENT AND CONTROL ORIENTATION

COMBUSTION & VENTILATION AIR

Provisions for combustion and ventilation air **MUST** be in accordance with Section 5.3, Air For Combustion And Ventilation, of the latest edition of the *National Fuel Gas Code ANSI Z223.1*, or applicable provisions of the local building codes.

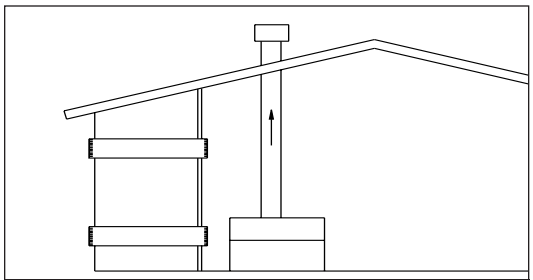


(FIG. 4) COMBUSTION & VENTILATION AIR

1. If air is taken directly from outside the building with no duct (FIG. 4):

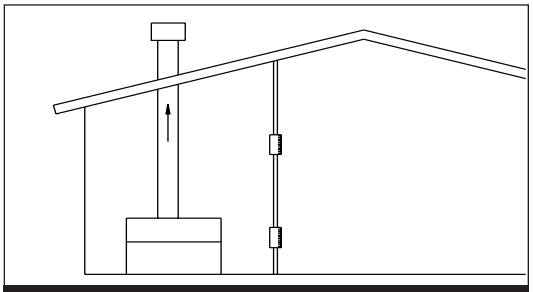
A. Combustion air opening, one square inch per 4000 BTU input. This opening **MUST** be located near the floor.

B. Ventilation air opening, one square inch per 4000 BTU input. This opening **MUST** be located near the ceiling.



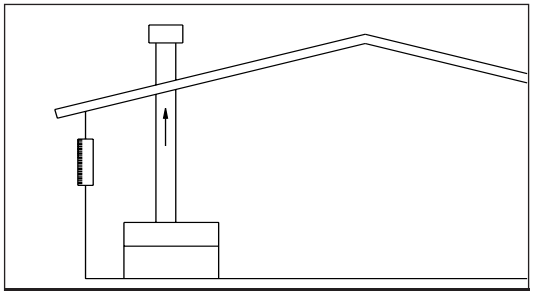
(FIG. 5) COMBUSTION & VENTILATION AIR

2. If combustion and ventilation air is taken from the outdoors using a duct to deliver the air to the mechanical room (FIG.5), each opening should have a net free area of one square inch per 2000 BTU input.



(FIG. 6) COMBUSTION & VENTILATION AIR

3. If air is taken from another interior space (FIG. 6), each opening specified above should have a net free area of one square inch for each 1000 BTU input.



(FIG. 7) COMBUSTION & VENTILATION AIR

4. If a single combustion air opening is provided to bring combustion air in directly from the outdoors (FIG. 7), the opening should have a net free area of one square inch per 3000 BTU input.

CAUTION: Under no circumstances should the equipment room be under a negative pressure, when atmospheric combustion equipment is installed in the room.

EXAMPLE OF SIZING FOR COMBUSTION & VENTILATION AIR OPENINGS (WATER HEATER WITH 2,065,000 BTU INPUT):

When combustion and ventilated air is taken from directly outside the building (FIG. 4), divide the total BTU's by 4,000. This yields 516.25 sq.in. of "Free Area" without restriction. (2,065,000/4000 = 516.25 sq.in.) Since the air opening is 50% closed due to screens and louvers, the total opening MUST be multiplied by 2. (516.25 sq. in. x 2 = 1,032.5 sq.in.) This project requires one Ventilation Air Opening with net "Free Area" of 1,032.5 square inches with louver dimensions of 30" x 35" = 1,032.50 sq. in. and one Combustion Air Opening with net "Free Area" of 1,059 square inches with louver dimensions of 30" x 35".

CONTAMINANTS

Combustion air drawn from an interior or exterior space **MUST** be free of any chemical fumes which could be corrosive to the water heater. Burning chemical fumes results in the formation of corrosive acids which attack the water heater, cause improper combustion and premature failure of the water heater and vent.

These fumes are often present in areas where refrigerants, salts, and solvents are used. Therefore, be mindful of swimming pool equipment, water softening, and cooling system placement.

VENTING

General

Vent installations for connection to gas vents or chimneys should be in accordance with Part 7, "Venting of Equipment," of the latest edition of the *National Fuel Gas Code, ANSI Z223.1*, or applicable provisions of the local building codes.

The connection from the appliance vent to the stack **MUST** be as direct as possible and sized correctly, using the proper vent table. The horizontal breeching of a vent **MUST** have at least 1/4" rise per linear foot.

The horizontal portions shall also be supported for the design and weight of the material employed to maintain clearances, prevent physical damage and separation of joints.

The connection from the appliance vent to the stack or vent termination outside the building **MUST** be made with listed **Type "B" double wall vent** (or equivalent). Material should be sized according to vent sizing tables in the latest edition of the *National Fuel Gas Code*.

The **Type "B" vent** and accessories, such as firestop spacers, thimbles, caps, etc., **MUST** be installed in accordance with the manufacturer's listing.

The vent connector and firestop **MUST** provide correct spacing to combustible surfaces and seal to the vent connector on the upper and lower sides of each floor or ceiling through which the vent connector passes.

The venting system **MUST** be adequately supported in compliance with local and other applicable codes. All connections should be secured with rustproof sheet metal screws.

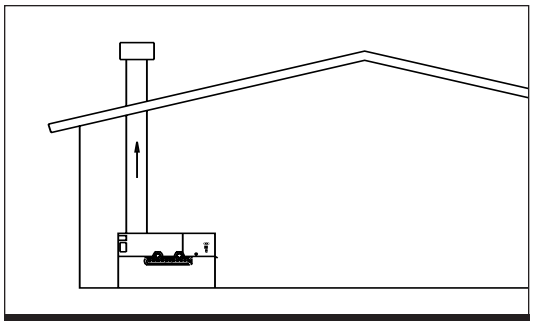
WARNING

Vent connectors serving gas appliances which operate under a negative vent pressure shall not be connected into any portion of mechanical draft systems operating under positive vent pressure.

NOTE:

The weight of the venting system MUST not rest on the water heater. It should be properly supported when necessary.

VENTING INFORMATION



(FIG. 8) CONVENTIONAL VENTING

IMPORTANT!
The vent cap should have a minimum clearance of 4 feet horizontally from electric meters, gas meters, regulators, air inlets and air relief equipment. Additionally, the vent cap should never be located above or below these items, unless a 4 foot horizontal distance is maintained.

The vent **MUST** terminate outside the building and should be at least 2 feet above the highest point of the roof within a 10 foot radius of the termination.

The distance of the vent terminal from adjacent public walkways, adjacent buildings, windows that open and building openings **MUST** comply with the latest edition of the *National Fuel Gas Code, ANSI Z223.1*.

Any improper operation of the common venting system in the existing building should be corrected when new equipment is installed so that the installation conforms to the latest edition of the *National Fuel Gas Code, ANSI Z223.1.*

When resizing any portion of the common venting system, it should be resized to approach the minimum size as determined using the appropriate tables in the *National Fuel Gas Code*.

When locating the vent cap, consider the effects of snow, leaf dropping, etc., to insure that no blockage occurs.

Models RW90-500 Atmospheric Combustion

Size vent material according to the "NAT" columns of vent sizing tables in the latest edition of the *National Fuel Gas Code*. "NAT" applies to natural draft vent appliances with atmospheric combustion and draft hoods.

The water heater is designed with a "built in" draft diverter. No additional diverter is required. The negative draft **MUST** be within the range of .02 to .05 negative to insure proper operation.

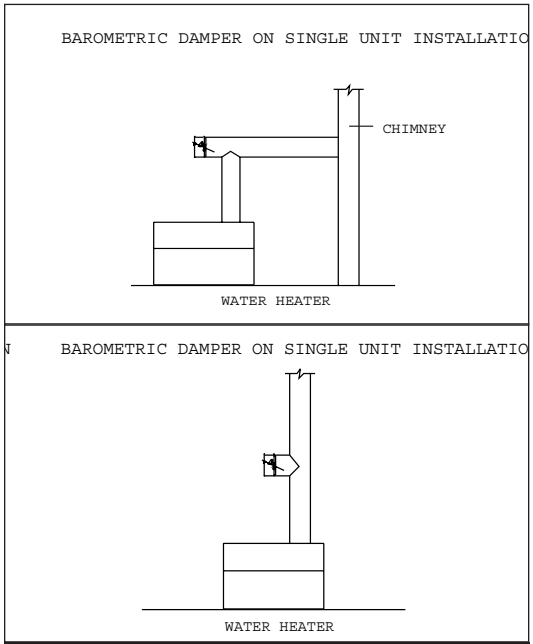
All draft readings are to be made while the unit is in stable operation (approximately 5 minutes).

Models CW495-2065 Fan-Assisted Combustion

Size vent material according to the "FAN" column of vent sizing tables in the latest edition of the *National Fuel Gas Code*. "FAN" applies to Category I fan-assisted combustion appliances with natural draft.

The vent connection on the water heater is made directly to the top of the unit. No additional draft diverter is required on single unit installations.

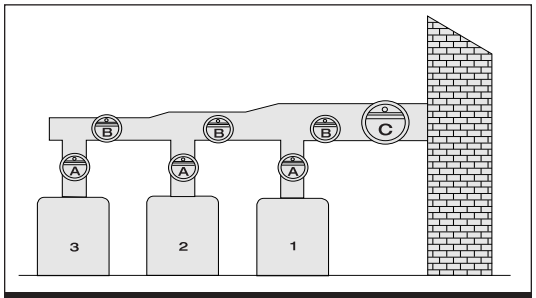
On installations with individual vents, when draft is higher than the specified range (0.01 to 0.08 inches of water negative), a barometric damper will be necessary.



(FIG. 9) BAROMETRIC DAMPER INSTALLATION

Multiple unit installations with combined venting **require** barometric dampers to regulate draft at each unit. The negative draft **MUST** be within the range of 0.01 to 0.08 inches of water negative to insure proper operation.

All draft readings are made while unit is in stable operation (approximately 2 to 5 minutes).



(FIG. 10) MULTIPLE UNIT BAROMETRIC DAMPER INSTALLATION

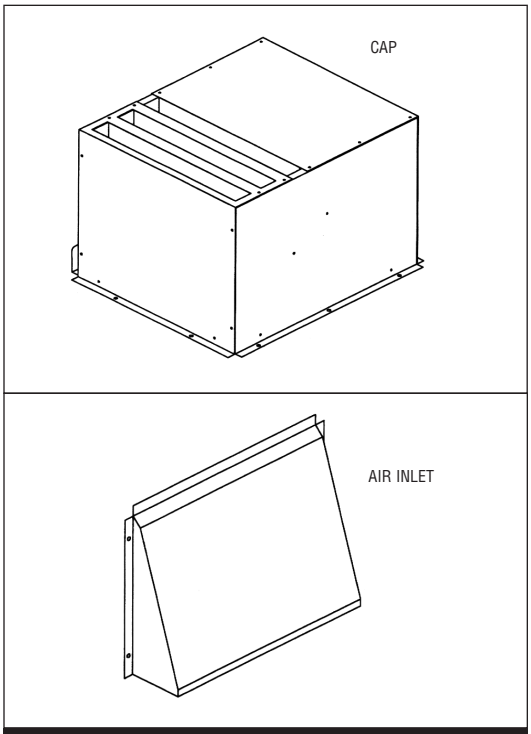
For this type of installation, it is best to use a draft control for each water heater located on the riser between the vent outlet and the breeching – Location "A". When this riser is too short to permit the installation of a control, locate a separate control for each water heater on the main breeching as illustrated in Location "B". If, because of general crowding or other reasons, neither of these locations are possible, use a single large control in the breeching between the water heater nearest the chimney and the chimney, as shown in Location "C".

NOTE:
Outdoor models MUST have an optional vent cap and air inlet shield installed.

OUTDOOR INSTALLATION (Models CW495-2065 only)

Units are self venting and can be used outdoors when installed with the optional Outdoor Cap and Air Inlet Shield.
The flue cap (FIG. 11) mounts over the flue outlet on top of the unit and no additional vent piping is required. The air inlet shield mounts over air inlet grill on the front of the unit.

NOTE:
Some discoloration to building exterior or unit surfaces can be expected. Adjacent brick or masonry surfaces should be protected with a rust resistant sheet metal plate.

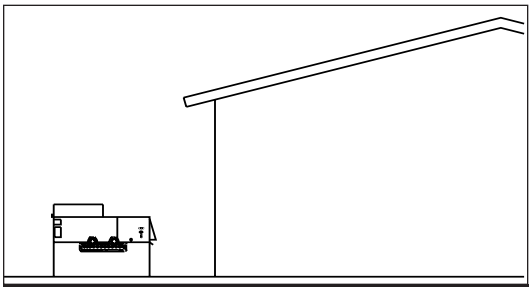


(FIG. 11) OUTDOOR INSTALLATION CAP

The venting areas MUST never be obstructed. Keep area clean and free of combustible, corrosive and flammable materials. Maintain a minimum clearance of 3" to combustible surfaces and a minimum of 3" clearance to the air inlet.

Placement Of Outdoor Unit

A unit should be located so that high winds cannot deflect off adjacent walls, buildings or shrubbery causing recirculation. Recirculation of flue products may cause operational problems, bad combustion or damage to controls.
The unit should be located at least 3 feet (0.19m) from any wall or vertical surface to prevent adverse wind conditions from affecting performance.



(FIG. 12) OUTDOOR INSTALLATION

The unit **MUST** be at least 10 feet (3.05m) away from any forced air inlet and at least 3 feet (0.91m) outside any overhang.
Do not install in locations where rain from building runoff drains will spill onto the water heater.

Flue gas condensate can freeze on exterior walls or on the vent cap. Frozen condensate on the vent cap can result in a blocked flue condition.

MULTIPLE UNIT OUTDOOR INSTALLATION

Multiple unit outdoor installations require 4 feet (1.22m) clearance between caps. The outdoor cap **MUST** be located 4 feet (1.22m) below and 4 feet (1.22m) horizontally from any window, door, walkway or air intake. The combustion air inlet shield of the outdoor cap assembly **MUST** be located at least one foot (0.30m) above grade and above normal snow levels.

Freeze Protection – Outdoor Installation

1. A snow screen should be installed to prevent snow and ice accumulation around the appliance or its venting system.

2. If for any reason the unit is to be shut off:
   (a.) Shut off water supply.
   (b.) Drain unit completely.
   (c.) Drain pump and piping.

If freeze protection is not provided for the system, a low ambient temperature alarm or automatic drain system is recommended.

Models CW2620-3080 Atmospheric Combustion

Size vent material according to the "NAT" column of vent sizing tables in the latest edition of the *National Fuel Gas Code*. "NAT" applies to natural draft appliances, atmospheric combustion and draft hoods.

This water heater is designed with a built-in draft diverter. No additional diverter is required.

The negative draft **MUST** be within the range of .02 to .08 negative to insure proper operation.

All draft readings are made while unit is in stable operation (approximately 5 minutes).

EXAMPLE OF HIGH ALTITUDE APPLICATIONS

For example, if a unit's input is 100,000 Btu/hr at sea level, the rated input at 4000 feet of elevation can be calculated by derating input 4% per 1000 fet above sea level.

[Btu/hr Input] [1.00 - (Elevation / 1000' x 0.04)] = Btu/hr Input at Specified Elevation [100,000] [1.00 - (4000' / 1000' x 0.04)] = Btu/hr Input at 4000' Elevation [100,000] [0.84] = 84,000 Btu/hr Input at 4000' Elevation

GAS SUPPLY

1. Safe operation of unit requires properly sized gas supply piping (See TABLE B).
2. Gas pipe size may be larger than the heater connection.
3. An internal gas pressure regulator is required if upstream pressure exceeds 6 oz. (10.5" water column), an intermediate gas pressure regulator, of the lockup type, **MUST** be installed.
4. Installation of a union is suggested for ease of service.
5. Install a manual main gas shutoff valve with test plug, outside of the appliance gas connection and before the gas valve, when local codes require.
6. A trap (drip leg) should be provided in the inlet of the gas connection to the unit.

High Altitude Applications

Atmospheric pressure decreases as the height above sea level increases. At any altitude above sea level, a cubic foot will contain less gas than a cubic foot at sea level. Thus, the heating value of a cubic foot of fuel gas will decrease as height above sea level increases. Specific gravity of a gas with respect to sea level also decreases with altitude. These changes in heating value and specific gravity tend to offset each other. However, as elevation above sea level is increased, there is less oxygen per cubic foot of air. Therefore, heat input rate should be reduced in an appliance above 2000 feet. Ratings should be reduced at the rate of 4 percent for each 1000 feet above sea level.

Table B indicates the proper size and length of standard black steel pipe to install from gas meter to the appliance.

(TABLE B) – GAS SUPPLY PIPE SIZING

	Length of Pipe In Straight Feet													
Nominal Iron Pipe Size, Inches	**10**	**20**	**30**	**40**	**50**	**60**	**70**	**80**	**90**	**100**	**125**	**150**	**175**	**200**
¾	369	256	205	174	155	141	128	121	113	106	95	86	79	74
1	697	477	384	328	292	267	246	256	210	200	179	164	149	138
1 ¼	1,400	974	789	677	595	543	502	472	441	410	369	333	308	287
1 ½	2,150	1,500	1,210	1,020	923	830	769	707	666	636	564	513	472	441
2	4,100	2,820	2,260	1,950	1,720	1,560	1,440	1,330	1,250	1,180	1,100	974	871	820
3	6,460	4,460	3,610	3,100	2,720	2,460	2,310	2,100	2,000	1,900	1,700	1,540	1,400	1,300
2 ½	11,200	7,900	6,400	5,400	4,870	4,410	4,000	3,800	3,540	3,300	3,000	2,720	2,500	2,340
4	23,500	16,100	13,100	11,100	10,000	9,000	8,300	7,690	7,380	6,870	6,150	5,640	5,130	4,720

Maximum capacity of pipe in thousands of BTU's per hour for gas pressures of 14" Inches Water Column (0.5 PSIG) or less and a total system pressure drop of 0.05 Inch Water Column (Based on NAT GAS, 1025 BTU's per Cubic Foot of Gas and 0.60 Specific Gravity).

(TABLE C) – INLET GAS PRESSURE MODELS	NAT. GAS	LPG
RW 90,000-500,000		
Minimum Allowable (inches-water column)	5”	11”
Maximum Allowable (inches-water column)	10.5”	13”
CW 495,000-645,000		
Minimum Allowable (inches-water column)	5”	11”
Maximum Allowable (inches-water column)	10.5”	13”
CW 745,000		
Minimum Allowable (inches-water column)	5.5”	11”
Maximum Allowable (inches-water column)	10.5”	13”
CW 985,000-2,065,000		
Minimum Allowable (inches-water column)	5”	11”
Maximum Allowable (inches-water column)	10.5”	13”
CW 2,620,000-3,080,000		
Minimum Allowable (inches-water column)	6”	11”
Maximum Allowable (inches-water column)	10.5”	13”

WATER CONNECTIONS

Inlet and Outlet Water Connections

For ease of service, install unions on inlet and outlet of the water heater.

The connection on the unit marked “Inlet” should be used for return water from the storage tank. The connection on the header marked “Outlet” should be connected to the inlet of the storage tank. (See Appendix A/Water Heater Piping diagrams).

LOW WATER TEMPERATURE SYSTEMS

A number of water heating applications may require delivered water temperature in a system below 140 degrees F. Systems such as nursing homes and hospitals would be an example of this type of system. A water heating system that will be operated at less than 140 degrees F **MUST** use a mixing valve on the outlet side of the storage tank in order to insure that the products of combustion do not condense inside the combustion chamber of the water heater. This mixing valve allows the water heater to operate above 140 degrees F to protect from condensation, while still allowing a delivery of colder water to the fixtures. Also inherent in this design is the protection of occupants from water containing bacteria such as legionaella. Legionella can be significantly reduced in the water storage vessel by heating the water to a minimum of 140 degrees.
(See Appendix pg. A3 for piping details)

NOTE:
Care should be taken to measure temperature rise and maintain proper water velocity in the heat exchanger.

WATER VELOCITY CONTROL

IMPORTANT

To insure proper velocity through the heat exchanger, it is necessary to regulate the temperature rise across the heat exchanger from inlet to outlet. (*This **MUST** be done on initial installation and periodically rechecked.)*

NOTE:
A larger pump can be utilized in situations where the distance between the water heater and tank exceed those specified.

NOTE:
Because poor water quality can contribute to the premature failure of a water heater, it is suggested that water quality be tested during the design phase of a new or retrofit system.

With the correct temperature rise across the heat exchanger (See TABLE D), you may be assured of the proper velocity in the tubes and long life and economical operation from the water heater.

(TABLE D) – REQUIRED TEMPERATURE RISE

MODEL	BTUs INPUT	TEMPERATURE RISE
RW	90,000	5
	135,000	7
	180,000	10
	199,000	11
	225,000	12
	270,000	15
	315,000	17
	360,000	20
	399,000	22
	500,000	28
CW	495,000	15
	645,000	19
	745,000	22
	985,000	18
	1,255,000	23
	1,435,000	26
	1,795,000	32
	2,065,000	37
	2,620,000	45
	3,080,000	50

PUMP OPERATION

1. The water heater **MUST** be connected with a properly sized and installed continuously running pump that circulates water between heater and storage tank. (Intermittent pump is optional).

2. Pump is sized to heater input and water hardness. Should water hardness exceed 25 grains/350 TDS, consult factory for pump sizing.

The pump chart (Table E) is based on the following fittings:

6-90° elbows	2 ball valves
2 unions	1 cold water supply tee

Due to pump capacity the following specifications cannot be exceeded when using the standard pump.

- Not more than 25 feet of straight pipe (Model RW399-500).
- Not more than 45 feet of straight pipe (Model CW495-3,080 and RW90-360).
- For every elbow and tee in excess of those shown above, DEDUCT 5 FEET from maximum allowable straight pipe in heater-to-tank circulating loop.

(TABLE E) – REQUIRED PUMP PERFORMANCE FOR WATER HARDNESS OF 5 TO 25 GRAINS

MODEL	GPM	FT. HD	AMP DRAW	HORSE POWER	VOLTAGE/ PHASE
RW90-500	30	8	3.6	1/6	120/1
CW495-745	55	10	5.0	1/4	120/1
CW985-2065	90	15	7.4	1/2	120/1
CW2620-3080	90	9	5.4	1/3	120/1

WATER TREATMENT

In hard water areas, water treatment should be used to reduce introduction of minerals into the system. Minerals in the water can collect in the heat exchanger tubes causing noise and inefficient operation. *Excessive buildup of materials in the heat exchanger can cause a non-warrantable failure.*

Acceptable Water Quality Levels

Maximum Water Hardness = 25 Grains
Minimum Water Hardness = 5 Grains
Maximum Total Dissolved Solids = 350 PPM
Range of Acceptable pH = 7.2 to 7.8

Standard production Lochinvar water heaters are designed to operate free of impurity build-up in the heat exchanger when properly installed and operated under the specified water quality conditions.

For installation in areas outside these parameters, please consult the factory.

Water Flow Switch

Due to the low water content of the Copper Finned Tube heat exchanger (between 1 and 6 gallons), a flow switch is recommended when a low water cut off device is required. A water flow switch is standard on models up to 3080. The flow switch should be installed in the outlet piping of the water heater and wired into the ignition system. In most localities a flow switch

(TABLE F) – COMMON WATER MANIFOLD SIZE FOR MULTIPLE WATER HEATER INSTALLATION

Pipe sizing chart provides minimum pipe size for common manifold piping to insure adequate flow.

NUMBER OF UNITS	COMMON MANIFOLD SIZE (Min.)
RW 90,000 thru 500,000	
1	1 1/2"
2	2"
3	2 1/2"
4	3"
5	3 1/2"
6	3 1/2"
CW 495,000 thru 745,000	
1	2"
2	3"
3	3 1/2"
4	4"
5	5"
6	5"
CW 985,000 thru 2,065,000	
1	2 1/2"
2	4"
3	4"
4	5"
5	6"
6	6"
CW 2,620,000 thru 3,080,000	
1	3"
2	3 1/2"
3	4"
4	5"
5	6"
6	6"

NOTE:
Incorrect piping of the cold water supply to the system will result in condensate formation on the heat exchanger and operational problems. See installation drawings provided with the unit for correct piping. Higher water temperatures reduce condensate formation.
Refer to drawings in Appendix A.

NOTE:
When the unit is installed in Canada, it MUST conform to the CAE C22.1, Canadian Electrical Code, Part 1, and/or local Electrical Codes.

is accepted as a low water cut off for water heaters requiring forced circulation (see CSD-1 CW-210, part A). It is prudent to verify preference with the local code official.

A special sealed flow switch and conduit is furnished for outdoor installations.

Relief Valve

This water heater is supplied with temperature and pressure relief valve(s) sized in accordance with *ASME Boiler and Pressure Vessel Code, Section IV "Heating Boilers."*

ELECTRICAL REQUIREMENTS (North America)

The appliance is wired for 120 volts.

1. All wiring between the unit and field installed devices shall be made of type T wire [63°F (35°C) rise].

2. The pump **MUST** be wired to run continuously when unit is firing. Intermittent pump operation is available as an option.

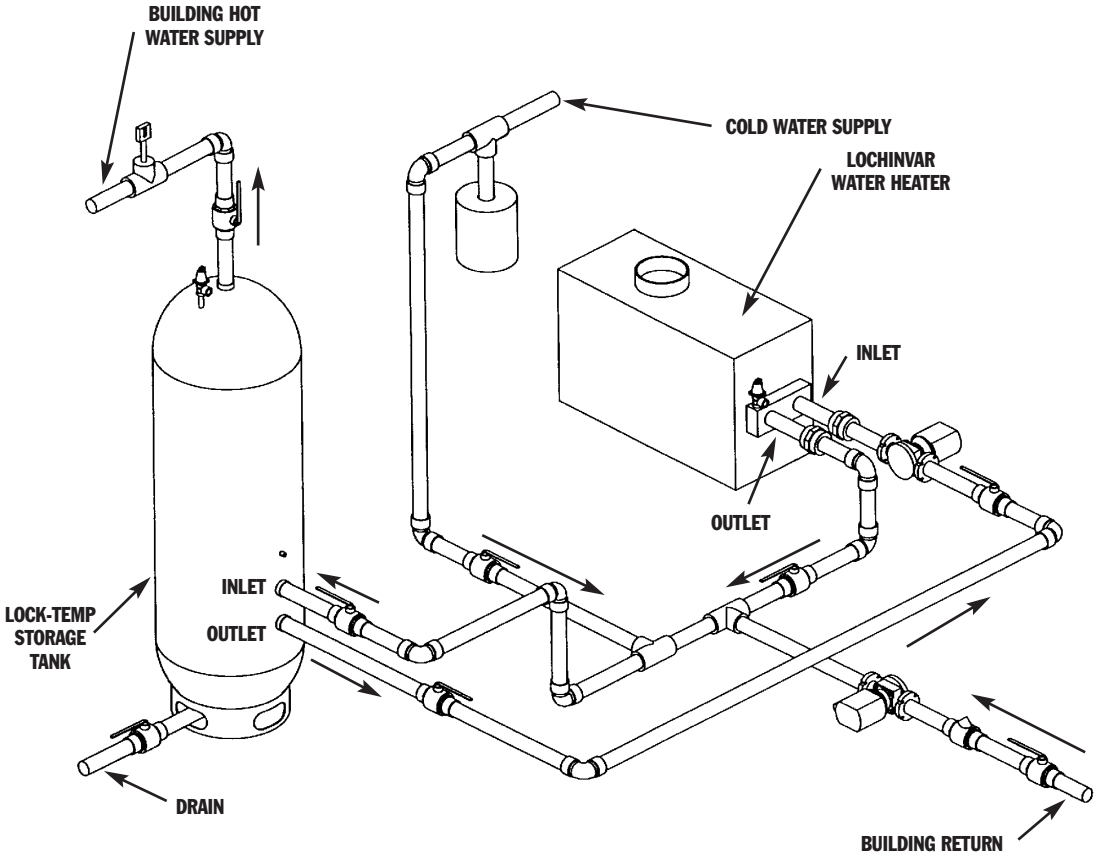
3. It is recommended that the water heater and pump be wired on separate circuits with properly sized breakers.

(TABLE G) – AMP DRAW DATA

BTU INPUT	FAN(S)	CONTROLS	PUMP	APPRX. TOTAL AMPS @ 120 VAC
RW 90,000	NA	1.2	3.6	4.8
RW 135,000	NA	1.2	3.6	4.8
RW 180,000	NA	1.2	3.6	4.8
RW 199,000	NA	1.2	3.6	4.8
RW 225,000	NA	1.2	3.6	4.8
RW 315,000	NA	1.2	3.6	4.8
RW 360,000	NA	1.2	3.6	4.8
RW 399,000	NA	1.9	3.6	5.5
RW 500,000	NA	1.9	3.6	5.5
CW 495,000	3.6	3.6	5.0	12.2
CW 645,000	3.6	3.6	5.0	12.2
CW 745,000	3.6	3.6	5.0	12.2
CW 985,000	7.2	3.6	7.4	18.2
CW 1,255,000	7.2	3.6	7.4	18.2
CW 1,435,000	7.2	3.6	7.4	18.2
CW 1,795,000	10.8	3.6	7.4	21.8
CW 2,065,000	10.8	3.6	7.4	21.8
CW 2,620,000	NA	3.4	5.4	8.8
CW 3,080,000	NA	3.4	5.4	8.8

WATER HEATER PIPING DIAGRAMS

PIPING DIAGRAM — SINGLE HEATER - SINGLE TANK



(TABLE F) – COMMON WATER MANIFOLD SIZE FOR MULTIPLE WATER HEATER INSTALLATION

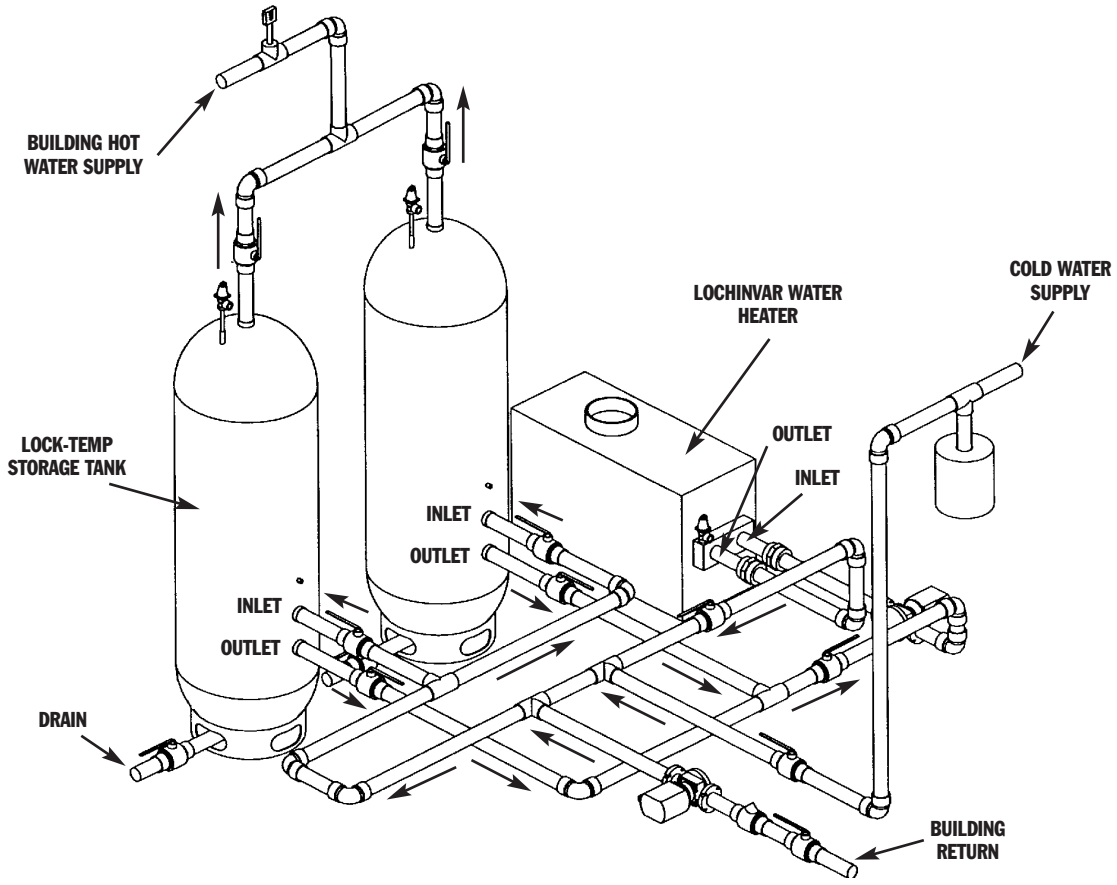
Pipe sizing chart provides minimum pipe size for common manifold piping to insure adequate flow.

NUMBER OF UNITS	COMMON MANIFOLD SIZE (Min.)	NUMBER OF UNITS	COMMON MANIFOLD SIZE (Min.)	NUMBER OF UNITS	COMMON MANIFOLD SIZE (Min.)	NUMBER OF UNITS	COMMON MANIFOLD SIZE (Min.)
RW 90,000 thru 500,000		**CW 495 thru 745 CF 300 thru 751**		**CW 985 thru 2065 CF 990 thru 2070**		**CW 2,620,000 thru 3,080,000**	
1	1 1/2"	1	2"	1	2 1/2"	1	3"
2	2"	2	3"	2	4"	2	3 1/2"
3	2 1/2"	3	3 1/2"	3	4"	3	4"
4	3"	4	4"	4	5"	4	5"
5	3 1/2"	5	5"	5	6"	5	6"
6	3 1/2"	6	5"	6	6"	6	6"

LIT0133

LEGEND

FULL PORT BALL VALVE	SYSTEM PUMP	SYSTEM RELIEF VALVE	TEE	ELBOW	UNION	EXPANSION TANK	CHECK VALVE	THERMOMETER



(TABLE F) – COMMON WATER MANIFOLD SIZE FOR MULTIPLE WATER HEATER INSTALLATION

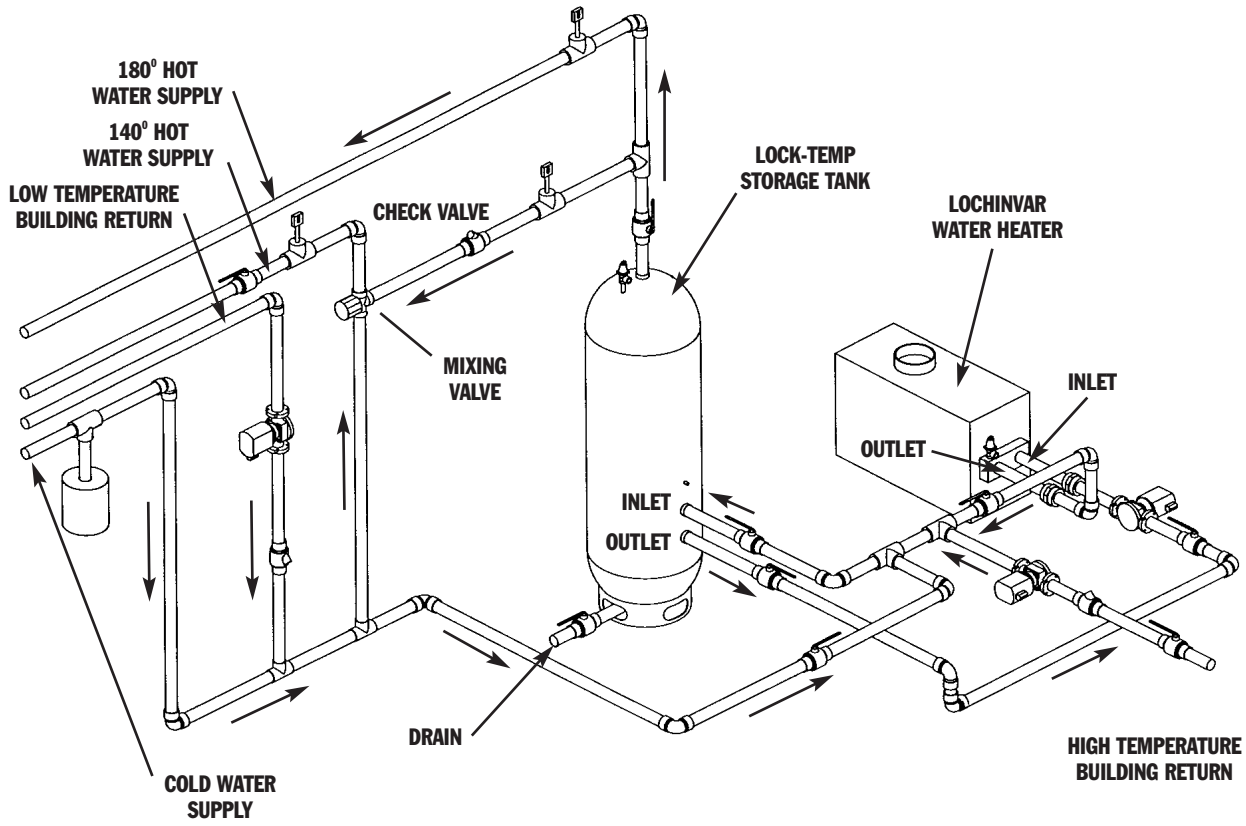
Pipe sizing chart provides minimum pipe size for common manifold piping to insure adequate flow.

NUMBER OF UNITS	COMMON MANIFOLD SIZE (Min.)	NUMBER OF UNITS	COMMON MANIFOLD SIZE (Min.)	NUMBER OF UNITS	COMMON MANIFOLD SIZE (Min.)	NUMBER OF UNITS	COMMON MANIFOLD SIZE (Min.)
RW 90,000 thru 500,000		**CW 495,000 thru 745,000**		**CW 985,000 thru 2,065,000**		**CW 2,620,000 thru 3,080,000**	
1	1 1/2"	1	2"	1	2 1/2"	1	3"
2	2"	2	3"	2	4"	2	3 1/2"
3	2 1/2"	3	3 1/2"	3	4"	3	4"
4	3"	4	4"	4	5"	4	5"
5	3 1/2"	5	5"	5	6"	5	6"
6	3 1/2"	6	5"	6	6"	6	6"

LIT0135

L E G E N D

FULL PORT BALL VALVE	SYSTEM PUMP	SYSTEM RELIEF VALVE	TEE	ELBOW	UNION	EXPANSION TANK	CHECK VALVE	THERMOMETER



(TABLE F) – COMMON WATER MANIFOLD SIZE FOR MULTIPLE WATER HEATER INSTALLATION

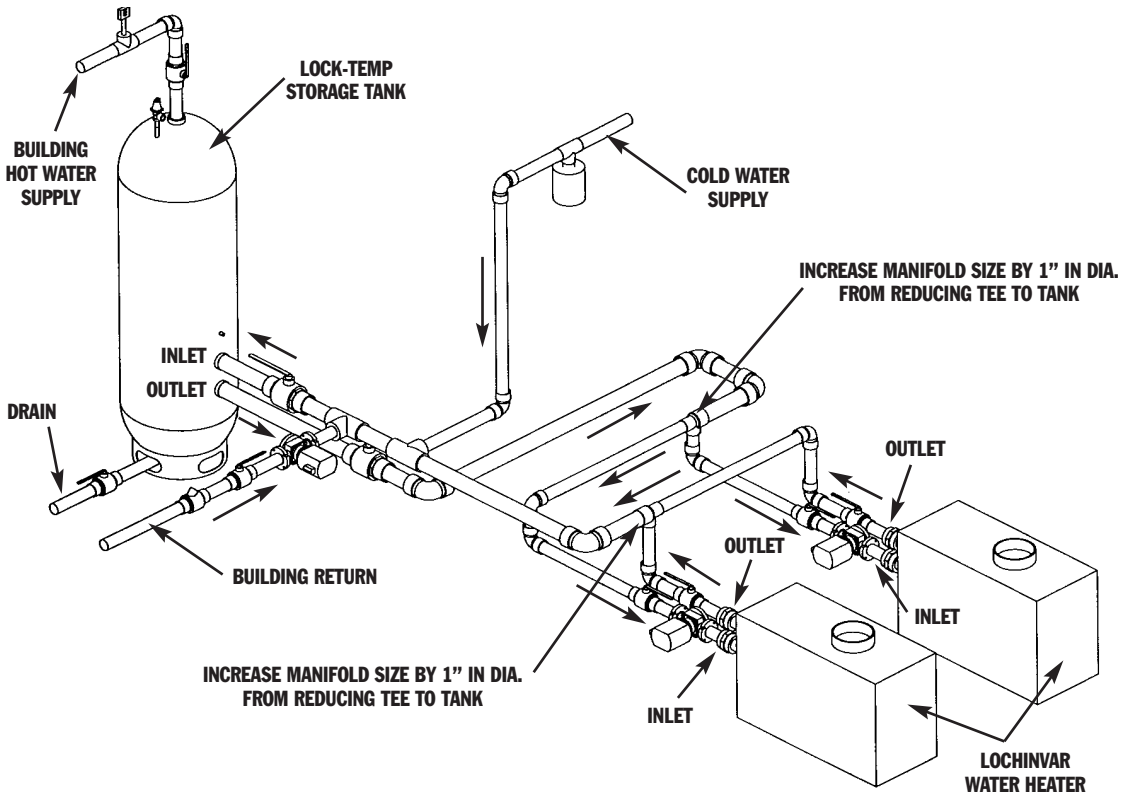
Pipe sizing chart provides minimum pipe size for common manifold piping to insure adequate flow.

NUMBER OF UNITS	COMMON MANIFOLD SIZE (Min.)	NUMBER OF UNITS	COMMON MANIFOLD SIZE (Min.)	NUMBER OF UNITS	COMMON MANIFOLD SIZE (Min.)	NUMBER OF UNITS	COMMON MANIFOLD SIZE (Min.)
RW 90,000 thru 500,000		**CW 495,000 thru 745,000**		**CW 985,000 thru 2,065,000**		**CW 2,620,000 thru 3,080,000**	
1	1 1/2"	1	2"	1	2 1/2"	1	3"
2	2"	2	3"	2	4"	2	3 1/2"
3	2 1/2"	3	3 1/2"	3	4"	3	4"
4	3"	4	4"	4	5"	4	5"
5	3 1/2"	5	5"	5	6"	5	6"
6	3 1/2"	6	5"	6	6"	6	6"

LIT0136

L E G E N D

FULL PORT BALL VALVE	SYSTEM PUMP	SYSTEM RELIEF VALVE	TEE	ELBOW	UNION	EXPANSION TANK	CHECK VALVE	THERMOMETER



(TABLE F) – COMMON WATER MANIFOLD SIZE FOR MULTIPLE WATER HEATER INSTALLATION

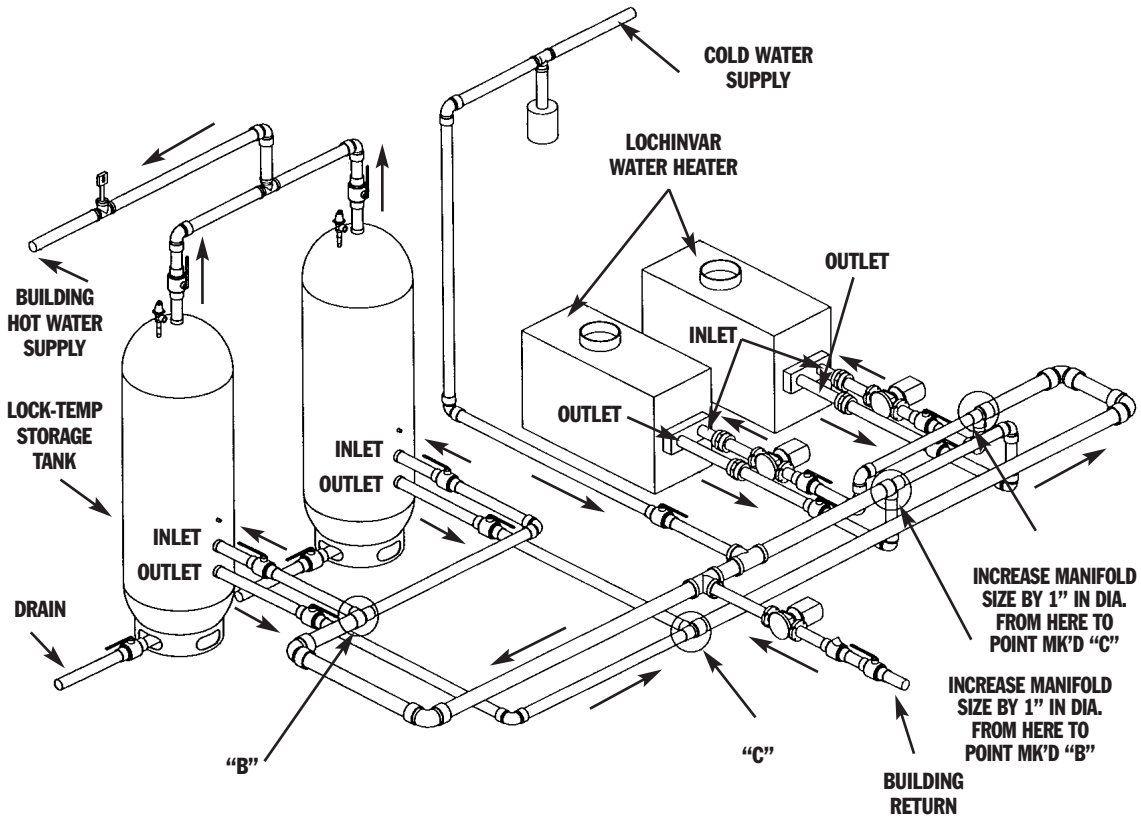
Pipe sizing chart provides minimum pipe size for common manifold piping to insure adequate flow.

NUMBER OF UNITS	COMMON MANIFOLD SIZE (Min.)	NUMBER OF UNITS	COMMON MANIFOLD SIZE (Min.)	NUMBER OF UNITS	COMMON MANIFOLD SIZE (Min.)	NUMBER OF UNITS	COMMON MANIFOLD SIZE (Min.)
RW 90,000 thru 500,000		**CW 495,000 thru 745,000**		**CW 985,000 thru 2,065,000**		**CW 2,620,000 thru 3,080,000**	
1	1 1/2"	1	2"	1	2 1/2"	1	3"
2	2"	2	3"	2	4"	2	3 1/2"
3	2 1/2"	3	3 1/2"	3	4"	3	4"
4	3"	4	4"	4	5"	4	5"
5	3 1/2"	5	5"	5	6"	5	6"
6	3 1/2"	6	5"	6	6"	6	6"

LIT0138

L E G E N D

FULL PORT BALL VALVE	SYSTEM PUMP	SYSTEM RELIEF VALVE	TEE	ELBOW	UNION	EXPANSION TANK	CHECK VALVE	THERMOMETER	REDUCING TEE	REDUCING TEE



(TABLE F) – COMMON WATER MANIFOLD SIZE FOR MULTIPLE WATER HEATER INSTALLATION

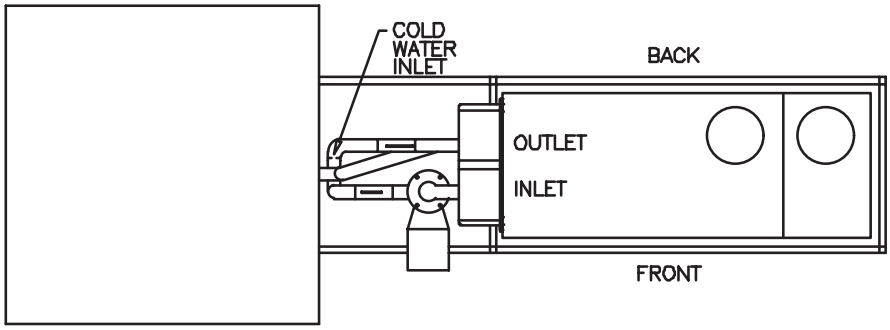
Pipe sizing chart provides minimum pipe size for common manifold piping to insure adequate flow.

NUMBER OF UNITS	COMMON MANIFOLD SIZE (Min.)	NUMBER OF UNITS	COMMON MANIFOLD SIZE (Min.)	NUMBER OF UNITS	COMMON MANIFOLD SIZE (Min.)	NUMBER OF UNITS	COMMON MANIFOLD SIZE (Min.)
RW 90,000 thru 500,000		**CW 495,000 thru 745,000**		**CW 985,000 thru 2,065,000**		**CW 2,620,000 thru 3,080,000**	
1	1 1/2"	1	2"	1	2 1/2"	1	3"
2	2"	2	3"	2	4"	2	3 1/2"
3	2 1/2"	3	3 1/2"	3	4"	3	4"
4	3"	4	4"	4	5"	4	5"
5	3 1/2"	5	5"	5	6"	5	6"
6	3 1/2"	6	5"	6	6"	6	6"

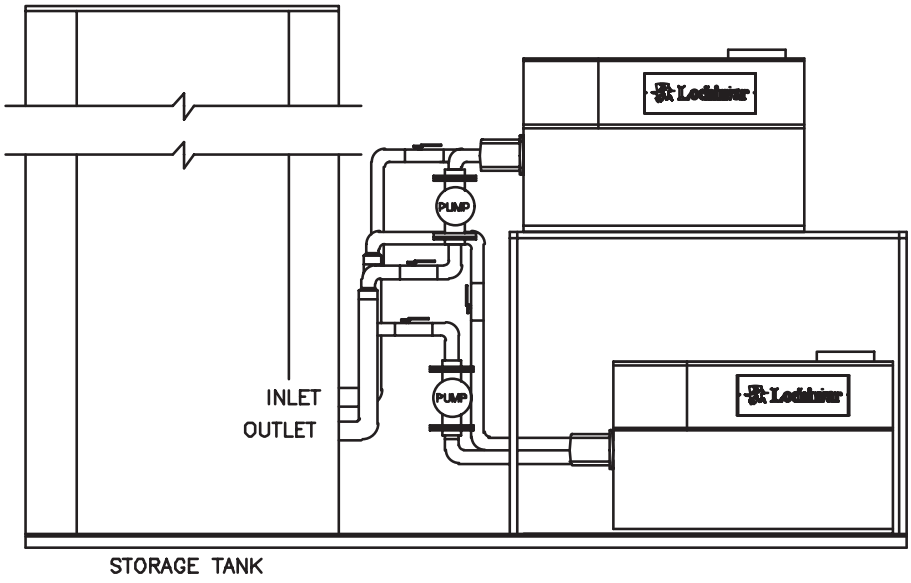
LIT0451

L E G E N D

FULL PORT BALL VALVE	SYSTEM PUMP	SYSTEM RELIEF VALVE	TEE	ELBOW	UNION	EXPANSION TANK	CHECK VALVE	THERMOMETER	REDUCING TEE	REDUCING TEE

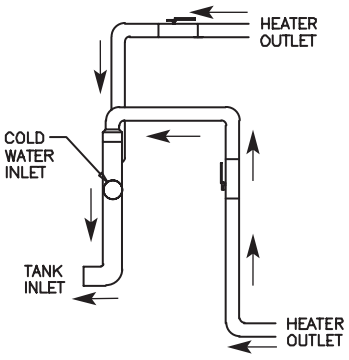


TOP VIEW

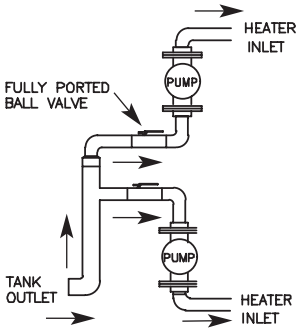


FRONT VIEW

Heater Model	Heater Inlet/ Outlet Size	Manifold Pipe Size
CW495-745	2"	3"
CW985-2065	2 1/2"	4"



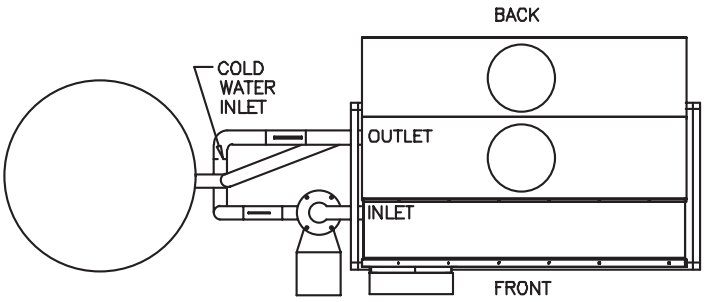
Tank Inlet View



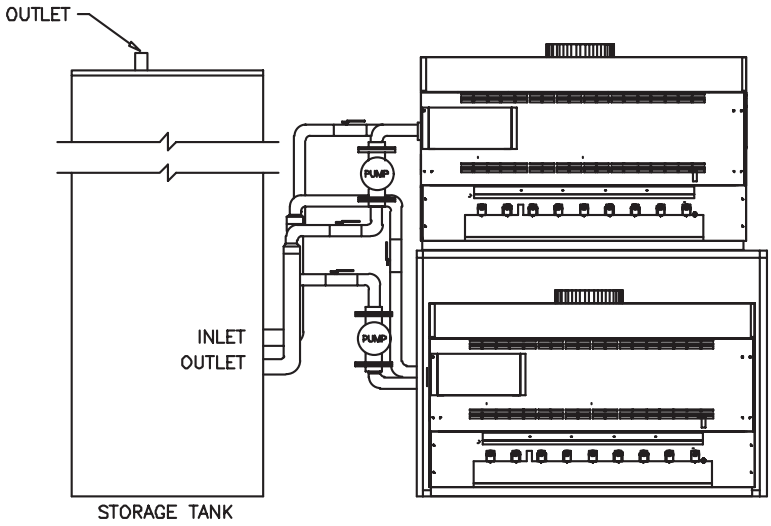
Tank Outlet View

CW Models

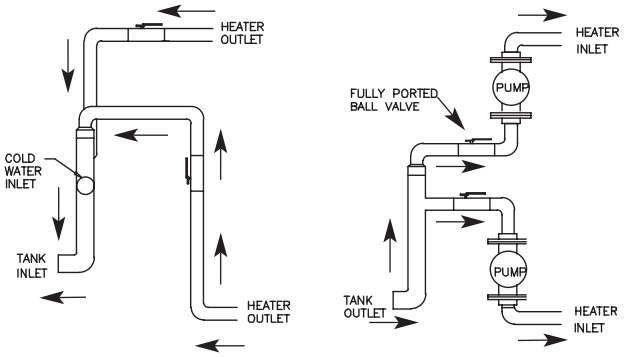
LIT0397



TOP VIEW



FRONT VIEW



Heater Model	Heater Inlet/ Outlet Size	Manifold Pipe Size
RW90-500	1 1/2"	3"

Tank Inlet View **Tank Outlet View**

RW Models

LIT0396

Notes

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