# **Boiler System Design to Installation**

## Phase I – Boiler System Design

Most problems occur when something unusual has been attempted, ignoring basic rules of thumb. A good design is the necessary starting and ending point in a complete boiler room implementation.

Each boiler room is unique. To achieve the proper design one must have a complete understanding of (i) the application objectives, (ii) the limitations of the boiler room, and (iii) all applicable building and boiler room codes. Qualified engineers and designers should be consulted prior to implementing any boiler system.

The Design Engineer is responsible for making it all work.

New systems involve defining and existing systems involve revising any or all of the following:

* Heating Demand
* Fuel Supply
* Make-up and Expansion Tank Requirements
* System Piping
* Combustion Air Needs
* Venting
* Controls

Proper design will ensure sufficient combustion air, correct boiler spacing, and a primary loop separate from the secondary/load loops which has its own correctly sized circulating pump.

### Rules of Thumb for Water Temperatures

* Space Heating: A rise of 20°F to 30°F is typical,
* Domestic Hot Water: A rise of 100°F is typical. The copper coil isolates the potable water from the higher temperature vessel water.
* Low Temperature: An intermediate rise of 50°F is typical. The copper coil isolates the potable water from the higher temperature vessel water.

## Phase II – Boiler System Sizing

Once the design engineer has analyzed the load, the necessary Btu requirement is determined. Modular boilers like those [Superior Boiler manufactures](https://superiorboiler.com/boilers/) can match virtually any load requirement while providing back-up for most contingencies.

When using our [Combination Boilers](https://superiorboiler.com/type/combination/), upsize the space heating load by 20-30 percent.

The only items needed to properly order a Superior Boiler from the factory is (i) the type of application, (ii) the direction of flow, (iii) the fuel type, and the (iv) the firing rate (including any special gas train/control requirements).

### Common System Problems

* Over-sizing that can lead to short-cycling.
* System loops that are improperly designed or sized.
* Inadequate combustion air and venting systems.
* Rumble with burners resulting from insufficient air, bad venting, or faulty gas train.

## Phase III – Boiler Room Piping

A separate [mains header](https://superiorboiler.com/type/equipment/mains/) should be connected to the building loop and the return/supply manifolds of the secondary piping.

The secondary manifolds are directional. If necessary, they can be reversed, but it is much easier to order the correct flow at the beginning.

If the application requires a Left to Right Flow (return water comes from the left and supply water goes out to the right) then each pump on each boiler will be mounted on the front, slightly left of center, with the supply (water supply to the main header) coming from the rear, slightly right of center.

Header flow for a space heating system is typically matched to the maximum combined flow of the secondary manifolds.

Remember, the pump on a Superior Boiler, which is mounted on the front, pushes the water through the vessel.

## Phase IV – Boiler System Installation

Because Superior Boilers are packaged vessels, installation only involves the following six simple steps:

1) Set the Boiler: Each boiler comes with adjustable legs to insure a level installation. Once the desired location is determined, adjust the leveling legs to plum the boiler.

2) Install the Burner: Once the burner is set in place and the locking screws are tightened, the next step is to install the gas piping and wiring. The gas train components are included with the burner and require installation at the job site. Detailed installation instructions are in the Burner Manual.

3) Connect the Burner: The burner involves connecting only a few wires for burner power and safety controls. After wires are connected, provide the proper gas pressure to the gas train.

4) Connect the Water Piping: The boiler’s circulator pump, located on the front, is the inlet to the boiler because it pushes the water through the vessel. The outlet, located on the back, is connected to the Primary Main. If the Mains were purchased from Superior Boiler then just cut the secondaries to length and sweat the fittings together.