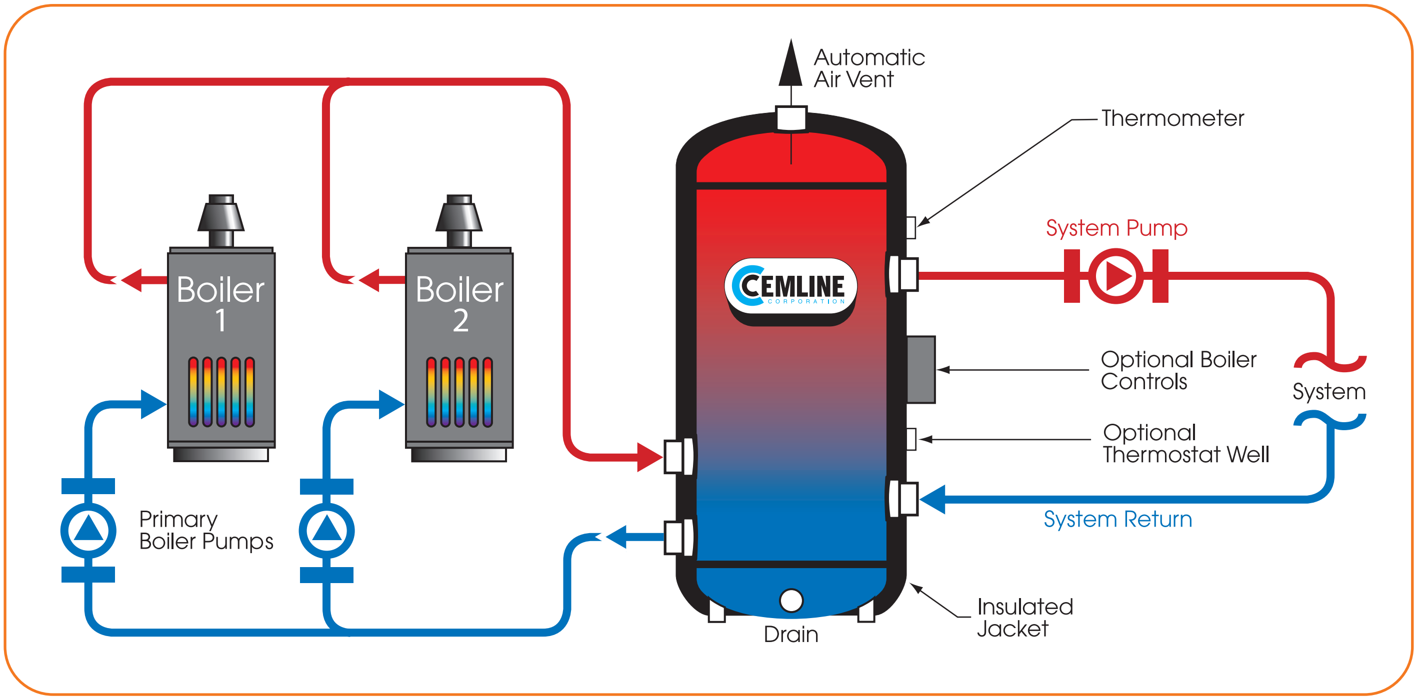
# SEB Series

# System Efficiency Buffer Tank
## Cemline Primary/Secondary Buffer Tank, Air Separator

- *Improves Efficiency of the Heating System*
- *Eliminates the Need for an Air Separator*
- *Primary/Secondary Hydraulic Separator*




### Cemline primary/secondary buffer tanks improve system efficiency by preventing the problem of short cycling boiler(s).

Low water content boilers operating at low loads will short cycle leading to sooting, premature component failure, and nuisance shut downs. If the boiler is allowed to fire for a minimum of several minutes the full efficiency of the boiler can be achieved preventing sooting, premature component failure, and nuisance shut downs.

Boiler systems are sized to heat the building on the coldest days. When the outside temperature is above minimum outside design conditions the boiler may only require a short period of firing to warm the building causing short cycling of the boiler. Installing a Primary/ Secondary buffer tank prevents this short cycling. Many boiler manufactures do not recommend firing the boiler(s) more than 6 cycles per hour.

### Cemline primary/secondary buffer tanks remove air from the heating system, thus eliminating a separate air separator.

Boiler systems require a low velocity area in the system to allow entrained air to be separated from the boiler water. A Primary/ Secondary Buffer tank will have extremely low velocity and is used as the air separator, thus eliminating the need for a separate air separator.

### Cemline primary/secondary buffer tanks act as a hydraulic separator by separating the primary and secondary sides of the boiler system.

The primary/secondary hydraulic separator allows for variable volume systems to operate with the modern boiler as instructed in ASHRAE 90.1.

Cemline Primary/Secondary buffer tanks come complete with insulated jackets (R-12.5) with Velcro closures for simple field installation.

Cemline Primary/Secondary buffer tanks have a well to accept Building automation system or customer supplied temperature sensors. As an option a factory supplied digital electronic thermostat can be supplied to cycle the boilers on call for heat. This digital electronic thermostat has a LCD temperature display and can be easily field programmed for a minimum of 2°F and maximum of 30°F temperature differences.

# Operation of the Primary/Secondary Buffer Tanks

The boiler(s) will have a pump to provide constant flow rate between the Primary/Secondary buffer tank and the boiler. The top of the Primary/Secondary buffer tank is domed and an automatic air vent is installed in the top of the crown of the dome. There is a secondary building system pump, which circulates hot water from the Primary/Secondary buffer tank to the system and returns the system water to the Primary/Secondary buffer tank. Typically the maximum tank temperature is 180°F. A digital thermostat can be programmed to allow the Primary/Secondary buffer tank temperature to drop 5 to 10 degrees before calling for the primary boiler pump to start and for boiler(s) to fire. When the temperature of the Primary/Secondary buffer tank temperature reaches 180°F the boiler stops firing and the primary boiler pump stops. The secondary pump continues to run to provide heating water to the building.

## Product Benefits

- Improves efficiency of the Heating System
- Eliminates the need for an Air Separator
- Primary/Secondary Hydraulic Separator

## Standard Equipment

- ASME Pressure Vessel – rated 125 psig @ 400°F built to ASME Section VIII, Division I
- Air Vent – Reduces air accumulation in the system.
- Insulated Jacket – Foam R-12.5 field installed insulation with removable jacket
- Thermometer – Temperature in the buffer tank displayed

## Optional Equipment

- Digital Electronic Field Programmable Thermostat
- Extra openings
- Inlet/Outlet Diverting Baffle(s)
- Stainless steel vessel

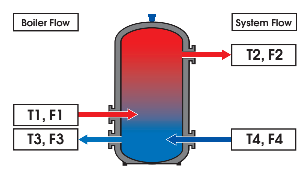
# How to Calculate Required SEB Tank

***Step 1: Determine the flow system characteristics.***

Primary/secondary systems can have varying flow characteristics depending on how the system is designed and how it operates.

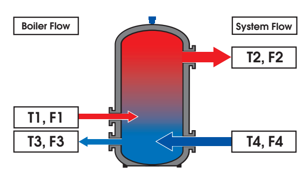
**System Type 1:** System Flow equals Boiler Flow. (No Buffer Tank Required). The distribution flow and the boiler flow are equal. This is the least common occurrence.

**Boiler Flow = System Flow**



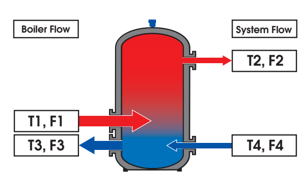

**System Type 2:** System Flow greater than Boiler Flow. (No Buffer Tank Required). The system flow is greater than the boiler flow. The greater system flow creates a situation where the temperature to the system piping is blended and less than the temperature from the boiler.

**Boiler Flow < System Flow**




**System Type 3:** System Flow less than Boiler Flow. (Buffer Tank Required). The system flow is less than the boiler flow. The greater boiler flow creates a situation where the temperature returning to the boiler is greater than the cold water returning from the system piping.

**Boiler Flow > System Flow**

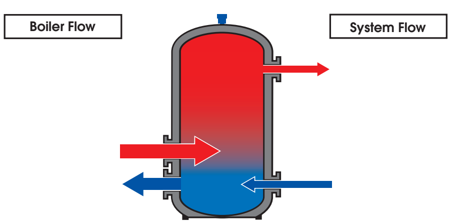


# How to Calculate Required SEB Tank (continued)

Automated sizing can be found on-line at www.cemline.com. Please visit www.cemline.com to size and print out specification and drawing of the unit required.

| | |
|---|---|
| *Step 2: What is the BTU/hr of the boiler?* | Q Boiler (BTU/H) |
| *Step 3: What is the minimum boiler output in BTU/hr?* | Q mBoiler = Q Boiler x Minimum Firing Rate<br>Boiler Minimum Firing Rate between 20-80%*<br>*Check with boiler manufacturer for recommended minimum firing rate. |
| *Step 4: What is the minimum rate of heat extraction from the tank in BTU/Hr.* | Q Load†<br>†Assume to be 0 if no load on the system or if the rate is unknown. |
| *Step 5: Enter the temperature drop within the tank.* | $\Delta$T (°F) (Typically, 10 °F, Range 5 to 25 °F) |
| *Step 6: Enter the cycle time the boiler should run.* | T (Minutes) (Range: 1—5 minutes)*<br>*Check with boiler manufacturer for recommended minimum run time. |
| *Step 7: Calculate the minimum buffer tank size required.* | $V\ (\text{Gallons}) = \dfrac{T \times (Q\ \text{mBoiler} - Q\ \text{Load})}{T \times 500^{\dagger}}$<br>†500 = 8.33#/gal x 60 min/hr |

## Example: Buffer Tank Sizing




Boiler Flow > System Flow

Step 1: System flow is less than boiler flow.

Step 2: What is the BTU/hr of the boiler?
1,000,000 BTU/hr

Step 3: Calculate the minimum boiler output in BTU/Hr.
The boiler has a minimum firing rate of 25%.
1,000,000 BTU/hr x 25% = 250,000 BTU/hr

Step 4: What is the minimum rate of heat extraction from the tank?
0 BTU/hr

Step 5: Temperature drop in the tank.
$\Delta T = 10\ °F$

Step 6: Cycle time on.
T = 2 minutes

Step 7: Minimum buffer tank volume required (V).

$$V\ (\text{Gallons}) = \frac{T \times (Q\ \text{mBoiler} - Q\ \text{Load})}{(\Delta T \times 500)}$$

$$V = \frac{2 \times (250{,}000 - 0)}{(10 \times 500)}$$

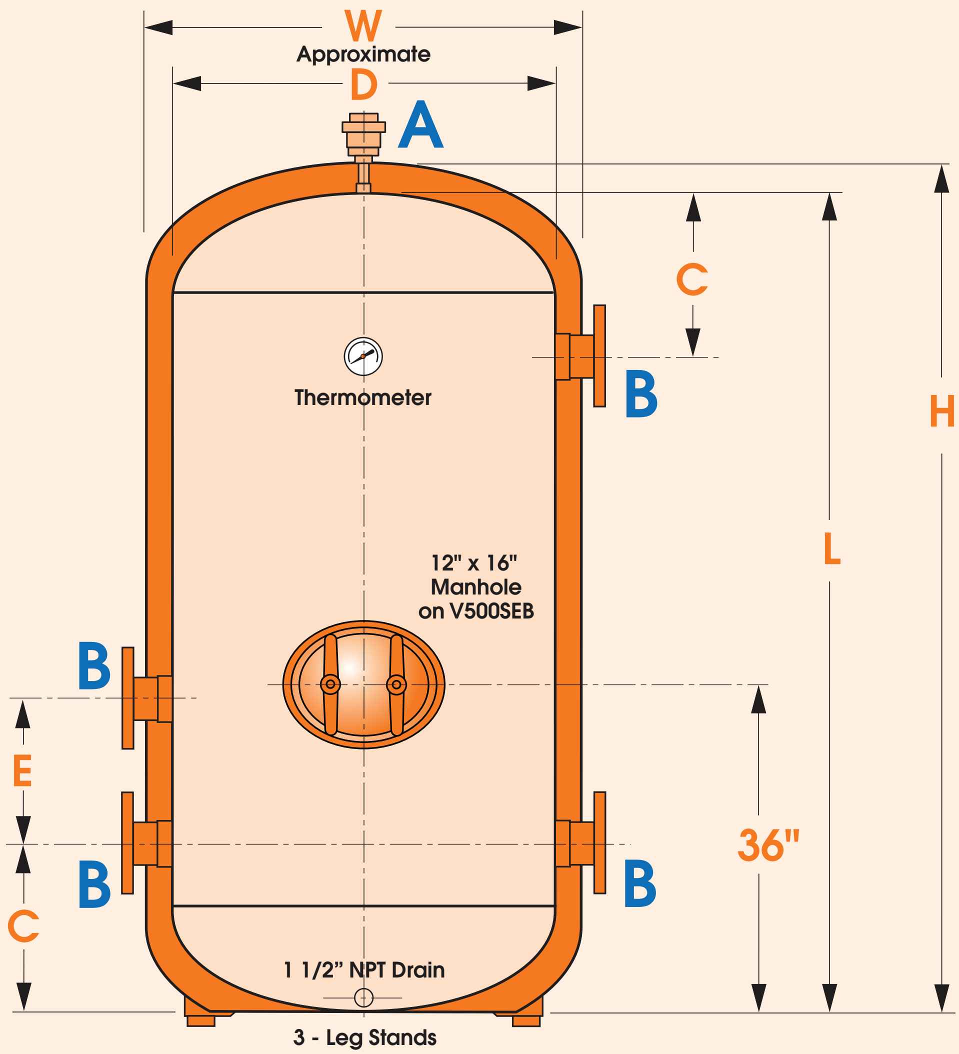
V = 100 gallons

Therefore, choose a V120SEB.

# SEB Series

CEMLINE® CORPORATION

## System Efficiency Buffer Tank- Submittal Drawing




| Model Number | Capacity Gallons | D | L | A | B | C | E | H | W |
|---|---|---|---|---|---|---|---|---|---|
| **V60SEB** | 60 | 18" | 61" | 3/4 Vent" | 2" NPT | 10" | 10" | 64 1/8" | 24 1/4" |
| **V120SEB** | 120 | 24" | 60" | 3/4 Vent" | 2 1/2" NPT | 12" | 12" | 63 1/8" | 30 1/4" |
| **V200SEB** | 200 | 30" | 72" | 3/4 Vent" | 3"-150# FLG | 14" | 14" | 75 1/8" | 36 1/4" |
| **V300SEB** | 300 | 36" | 72" | 3/4 Vent" | 4"-150# FLG | 16" | 16" | 75 1/8" | 42 1/4" |
| **V500SEB** | 500 | 42" | 90" | 3/4 Vent" | 6"-150# FLG | 18" | 24" | 93 1/8" | 48 1/4" |



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**CEMLINE CORPORATION**
P.O. BOX 55 CHESWICK, PENNSYLVANIA 15024
Phone: (724) 274-5430 FAX: (724) 274-5448
www.cemline.com