Medium Mass Boilers

Maxim
Power VT

What is a Medium Mass Boiler?

- Sufficient Mass (Boiler water capacity) to act as a built in buffer tank.
- Sufficient Mass to handle varying system design flows without use of a primary-secondary piping configuration.
- Sufficient Mass to allow for “flow through” boiler piping design.
- Able to handle low return temperature (Power VT) and Varying Flow’s (Maxim & Power VT)

ADVANTAGES OF MEDIUM MASS HYDRONIC BOILERS

- SIMPLIFIED PIPING DESIGN AND INSTALLATION
- LESS PARTS AND COMPONENTS (pumps, valves) TO DESIGN, PURCHASE, INSTALL, MAINTENANCE AND REPLACE OVER TIME
- INTEGRATION INTO VARIOUS PIPING SCHEMES (variable speed pumping) WITH NO FIELD ISSUES
- STORED MASS TO CREATE BUFFER BETWEEN BOILER AND SYSTEM
- INSTANTANEOUS RESPONSE TO HEAT LOAD WHEN REQUIRED
- SMALL FOOTPRINT DESIGN
- DESIGNED EFFICIENCIES RANGING FROM NON-CONDENSING DESIGNS TO FULL CONDENSING
- STAGE FIRING, MODULATION AVAILABLE IF DESIRED
- PROVEN EQUIPMENT DESIGN OVER TIME
- INCREASED FLEXIBILITY WITH REGARDS TO OVERALL BUILDING AND SYSTEM INTEGRATION

What is a Low Mass Boiler?

- Less than 20 Gallon Capacity of Boiler Water
- Small Footprint
- Lightweight-Typically Copper Fin Construction
- Needs Primary-Secondary Piping for Hydronic Applications
- Unable to handle varying flows piped through boiler

ADVANTAGES OF LOW MASS HYDRONIC BOILERS

- INSTANTANEOUS RESPONSE TO HEAT LOAD WHEN REQUIRED
- SMALL FOOTPRINT DESIGN
- DESIGNED EFFICIENCIES RANGING FROM NON-CONDENSING DESIGNS TO FULL CONDENSING
- STAGE FIRING, MODULATION AVAILABLE IF DESIRED
- SOMETIMES LESS COSTLY ON INITIAL PURCHASE
- LIGHTER WEIGHT DESIGN

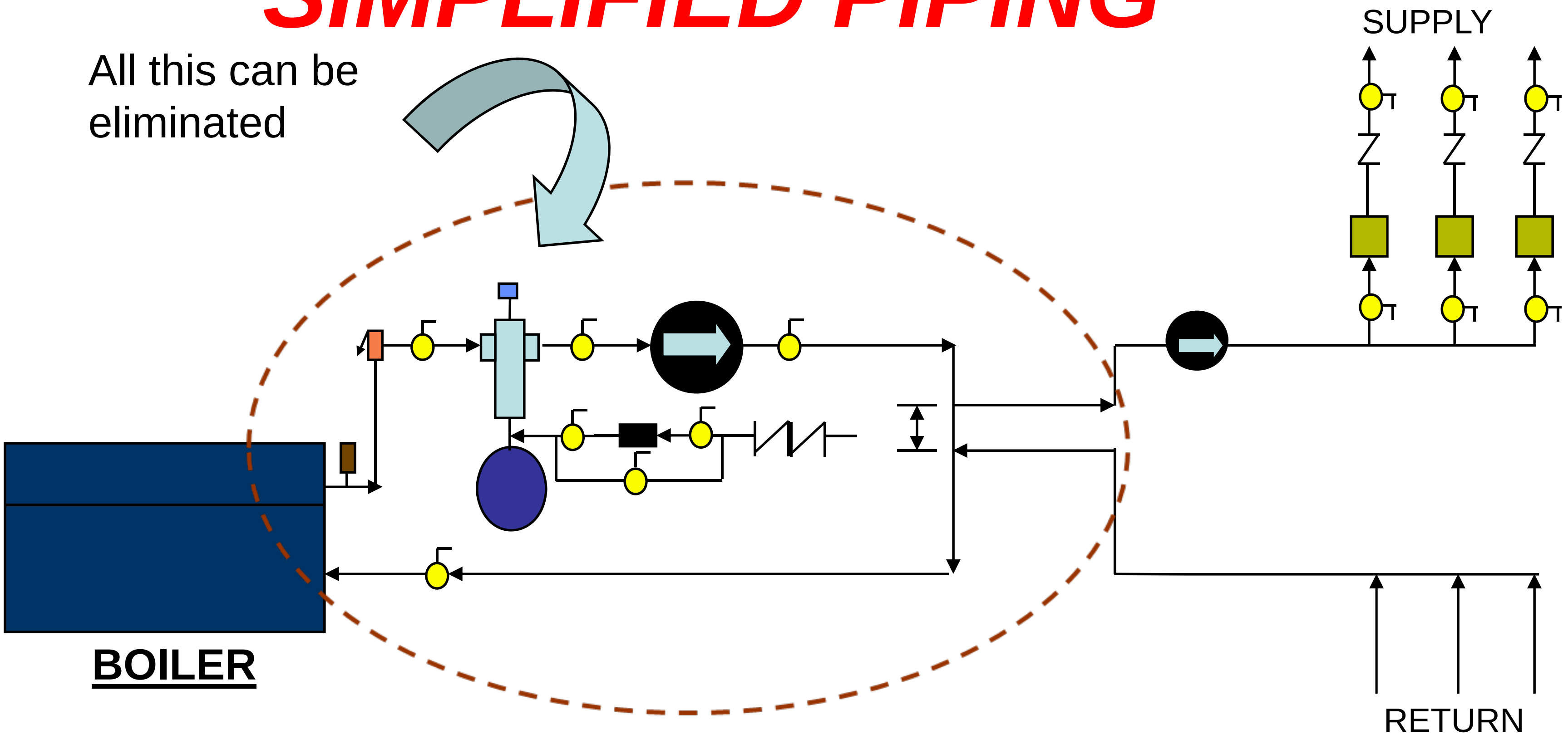
MEDIUM MASS
"A *Forgiving* Design"

- **Medium mass design provides up to 25,000 BTU's stored heat immediately to satisfy demand (in lieu of 300' of 3" pipe)**
- **Rapid change in flow rate does not affect boiler – boiler loop piping system not required to dissipate heat after demand has ceased**
- **<u>No flow </u>required through boiler**

Why Do Power Medium Mass Boilers Solve System Integration Problems

1. MEDIUM TO HIGH EFFICIENCY 83% - 93%
2. CONDENSING DESIGN (POWER VT) MAXIMIZES EFFICIENCY
3. LOW RETURN WATER TEMPERATURE CAPABILITIES
4. FLEXIBILITY WITH REGARDS TO FLOW RATES AND REQUIRES NO MIMIMUM FLOW
5. MEDIUM MASS DESIGN ALLOWS INSTANTANEOUS RESPONSE TO HEAT LOAD WITHOUT SHORT CYCLING
6. STAGE FIRING ALLOWS 3:1 TURNDOWN
7. VENT RUNS AMONG THE INDUSTRY LONGEST (POWER VT) AND DIRECT VENT CAPABILITIES
8. TRUE BOILER CONSTRUCTION

SIMPLIFIED PIPING



PRIMARY / SECONDARY PIPING NOT NEEDED

POWER VT

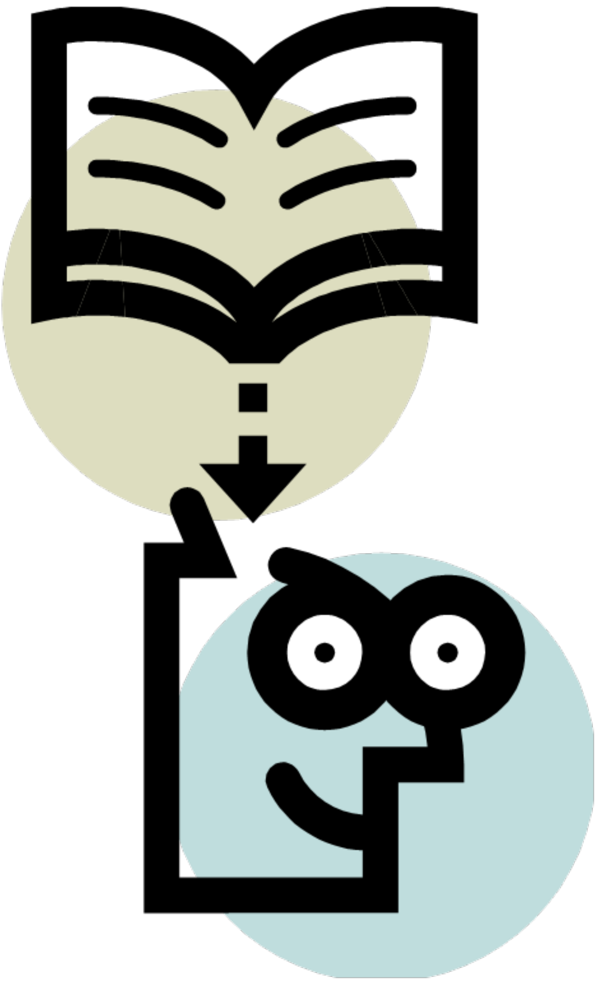
- 400 – 1000 mbh input
- 125 and 250 gallon designs
- Footprint design allows installation into standard mechanical rooms
- Full condensing design --- 94% efficiency-

  Most effective use of fuel dollars spent
- Direct vent capabilities with category IV venting material
- Inverse combustion design
- Integration with low temperatures systems, idea for “reset” and “setback” conditions
- Integration into systems where water flow is variable --- no minimum flow requirements

MAXIM BOILER

- 400 – 1400 mbh input
- 125 and 250 gallon designs
- Dual Fuel Capability (Gas/Oil)
- Footprint design allows installation into standard mechanical rooms
- Non-condensing design --- Mid efficiency 83% Cost Effective alternative in modular design
- Integration with low temperatures systems, ideal for “reset” and “setback” conditions
- Integration into systems where water flow is variable --- no minimum flow requirements

LET'S APPLY THE PRODUCTS…….



FRONT END LOADING

- FRONT-END LOADING involves combining multiple heating boilers of different thermal efficiencies to match the operating boiler equipment to the btu/h load requirement of a system.

- The benefit of using a front-end loaded system will be realized when non-condensing and condensing efficiency equipment are combined into one Hydronic heating system.

DEFINE THE SYSTEM REQUIREMENTS

Maximum design BTU load (output)_________

Minimum design BTU load ___________________

Fuel Type________ Code Approval ___________

Type of Hydronic System

Heat Only	**Heat w/ domestic Hot Water**
AC Re-heat	**AC Re-heat w/ domestic Hot Water**
Snow Melt	**Other**

Boiler Water Temperatures

Max________ Min___________

Temperature Mapping

- http://www.worldclimate.com/
- http://www.climatequest.com/

Definitions

Average Temperature
The monthly mean of the daily (24 hour) temperature.

Average Maximum Temperature
The monthly mean of the maximum daily temperature.

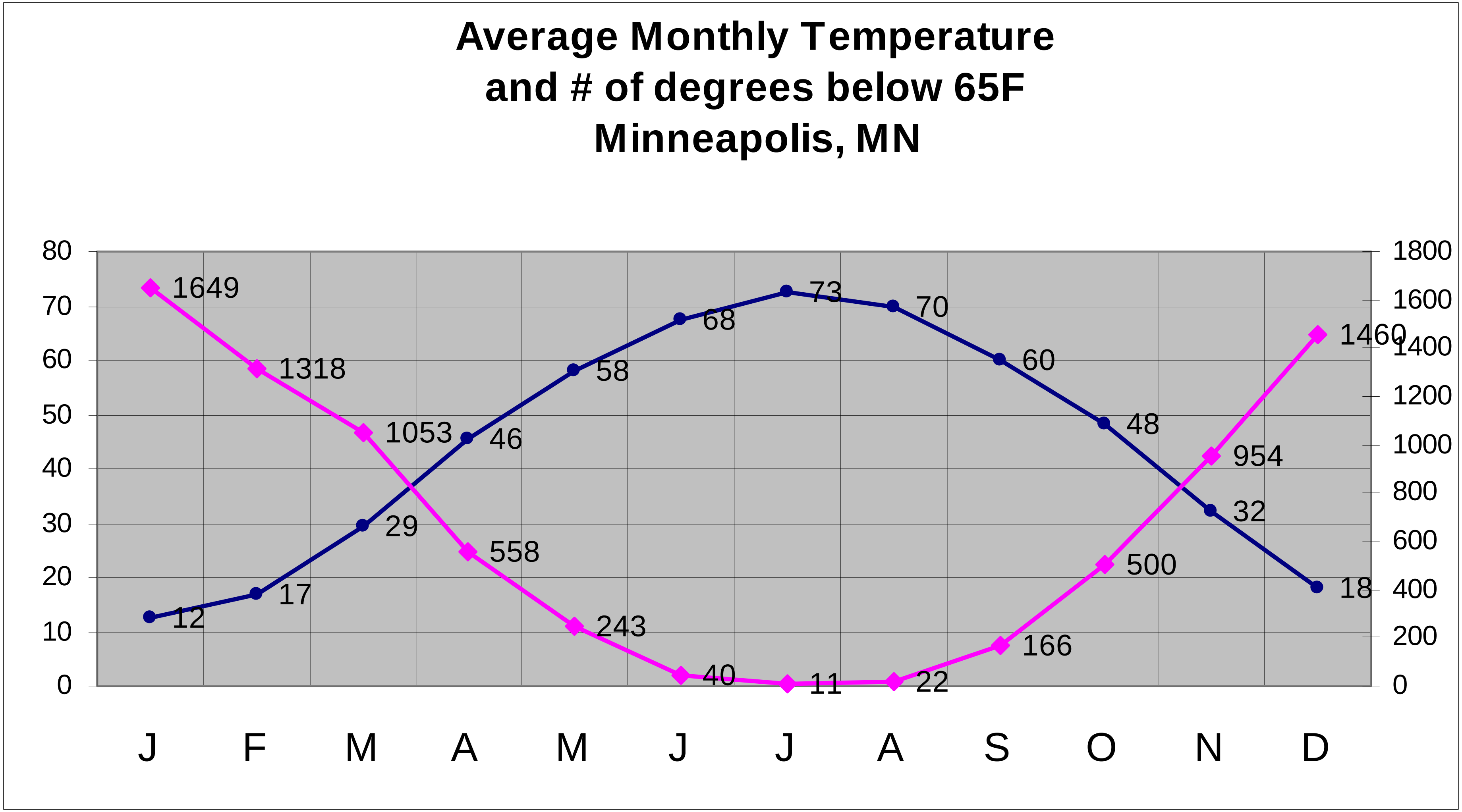
Average Minimum Temperature
The monthly mean of the minimum daily temperature.

Average Rainfall
This is the mean monthly precipitation, including rain, snow, hail etc.

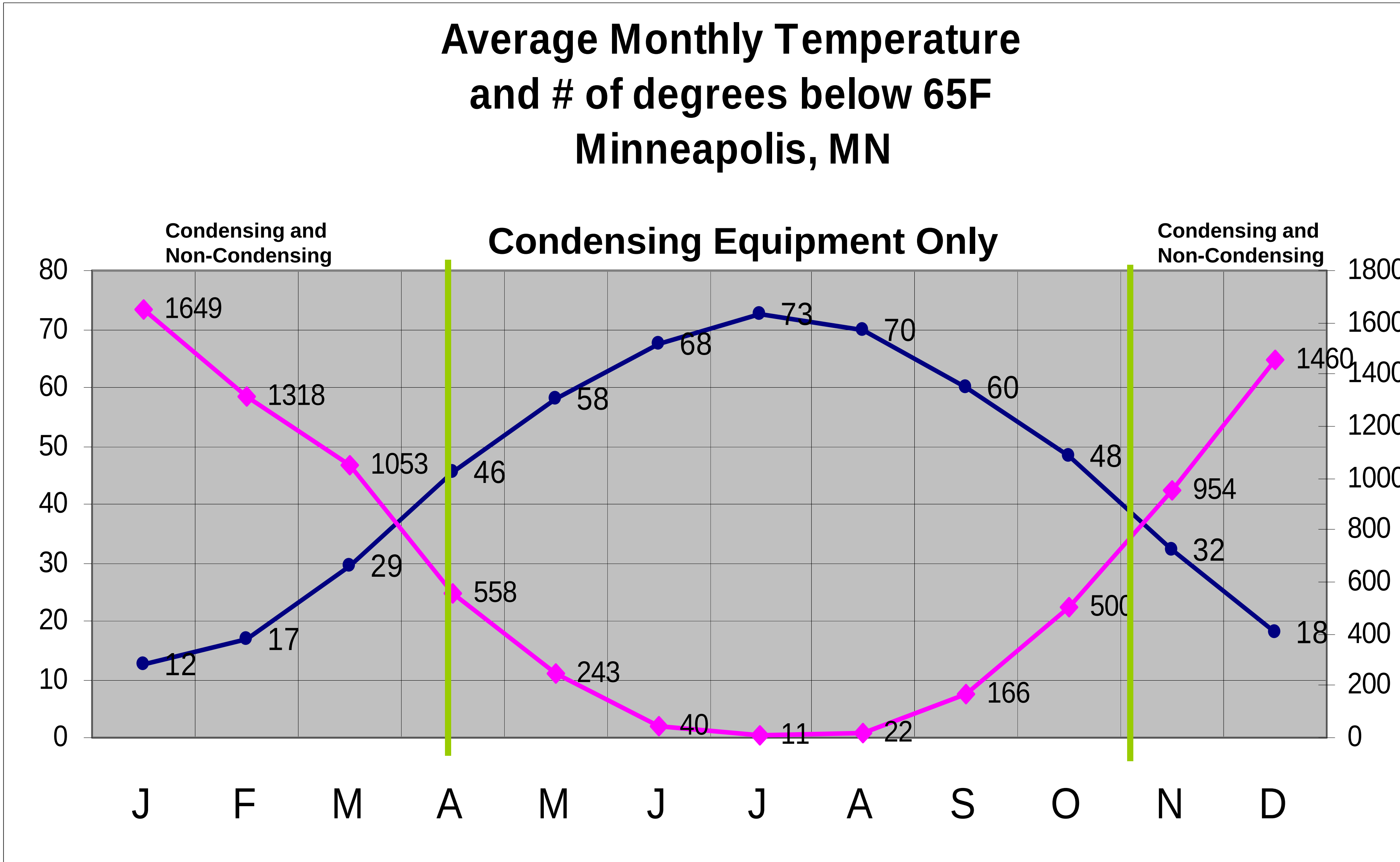
Heating Degree Days
The cumulative number of degrees in a month or year by which the mean temperature falls below 18.3°C/65°F.

Cooling Degree Days
The cumulative number of degrees in a month or year by which the mean temperature is above 18.3°C/65°F.

TEMPERATURE TRACKING



The Front End Control Zone



Control System

Stand-alone Boiler(s)

Multiple Boilers with Master Boiler Controller

EMS______ Manufacturer / Model_________

I/O Reset______ Temperature ratio_________

Required Output interfaces (status/louvers, etc)

Required Input interfaces i.e.: 4-20mil

Set Back Considerations

- **Night**
- **Weekends**
- **Holiday**

- **Temperature reduction planned**
- **Time to return to operating temperature**
- **Flow rates - low load and return to temp**

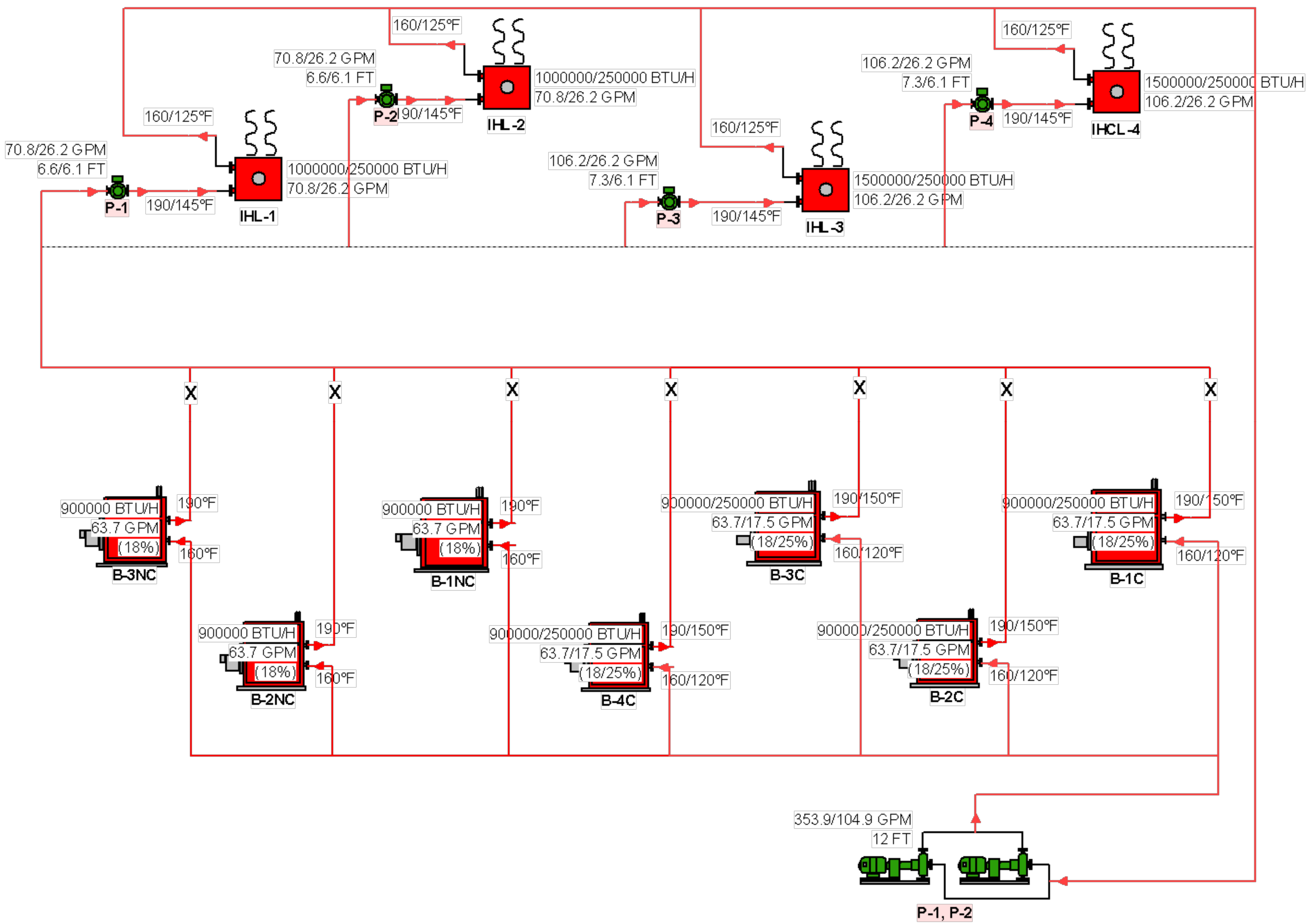
VENTING

Vent Categorization Chart

	Natural Draft "non-positive"	Presurized Draft "positive"
Non Condensing	I	III
Condensing	II	IV

1. **Vertical Flue – room air**
2. **Vertical Flue – direct inlet air horizontal**
3. **Vertical Flue – direct inlet air- vertical**
4. **Sidewall vent – room air**
5. **Sidewall vent – direct inlet air horizontal**
6. **Sidewall vent – direct inlet air vertical**

FULL FLOW
FRONT END LOADED BOILER SYSTEM



TYPICAL DORM BUILDING

- **6.0 mbh total heat load requirement**
- **70% of the time --- 3.0 mbh (or less) can handle the heat load**
- **30% (remaining time) --- heat load varies between 3.0 and 6.0 mbh**
- **Installation most likely will be comprised of 6.0 – 8.0 mbh (to allow for redundancy)**
- **Facility owner desires highest operating efficiency possible**
- **Facility owner desires lowest initial cost as possible**
- **Facility owner desires low maintenance over the life of the equipment**
- **There is a low temperature loop (setback) that we must deal with**
- **Engineer desires to vary circulating pump operation to maximize efficiency of circulating pumps**
- **Which Boiler(s) do you design around?**

FRONT END LOADED SYSTEM

3.0 MBH of POWER VT BOILERS HANDLE FRONT END

Most efficient equipment operates 70%+ of heating season

2.8 MBH of MAXIM BOILERS HANDLE BACK END

Cost effective method of maximizing boiler performance

WHY DOES "FRONT END LOADING" FIT THE APPLICATION

1. **Owner does not pay for total system of highest efficiency product but still receives a similar payback over the life of the system**
2. **Modular system may allow for less total BTU's be designed into the system and still achieve system redundancy that is desired**
3. **Majority of the time (70%+) system operates at high efficiency**
4. **Remainder of the time system operates at upper end of mid to high efficiency so cost savings is not sacrificed**
5. **Owner does not ever sacrifice heating capacity, even if a boiler goes down system is still able to operate at high % of load requirement**
6. **System installation is simple, piping schematic takes into account condensing/non-condensing equipment so life expectancy is increased and maximizing of condensing process is taken advantage of**
7. **Piping schematic and controls can also take advantage of varying flow rates allowing integration with desired pump scheme**
8. **Maintenance of equipment is simplistic even when taking into consideration the different types of boilers that may be integrated**