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Design Considerations Part 1

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Welcome to WMS Design Considerations Part 1

What will be covered

Myths of today

Working with existing radiation for Conventional Boilers

Working with existing radiation for Condensing Boilers

Rules of Thumb

Expansion tanks sizing a bit more

Circulator anatomy a deeper understanding

Understanding Glycol

Low Loss Headers

The Myth's of Today

- All Systems must run on 160 °F to 180 °F whether it is 45 °F out or -20°F
- Outdoor reset doesn't work on a Cast Iron Boiler!
- Outdoor reset isn't worth installing on a Condensing Boiler
- A condensing Boiler is 95% efficient if it is running between 160 °F and 180 °F

Connected Load for Radiators

CHAPTER 1 - STEAM

Capacity Basis: 70°F Room Temperature 20°F Temperature Drop												
Sq. Ft. Radiation												
Temp.	215°	200°	190°	180°	170°	160°	150°	140°	130°	120°	110°	
BTU	240	210	190	170	150	130	110	90	70	50	30	
Pipe Size	MBH											
1/2"	17	71	81	90	100	113	131	155	189	243	340	567
3/4"	39	163	186	205	229	260	300	355	433	557	780	1300
1"	71	296	338	374	418	473	546	646	789	1014	1420	2367
1-1/4"	160	667	762	842	914	1067	1231	1455	1778	2286	3200	5333
1-1/2"	240	1000	1143	1263	1412	1600	1846	2182	2667	3429	4800	8000
2"	450	1875	2143	2368	2647	3000	3462	4091	5000	6429	9000	15,000

Use chart to determine BTU load on radiation converted from steam to H.W.

NOTE: Heat loss of building will determine BTU load on system piping.
Divide sq. ft. of installed radiation into heat loss = BTU load per sq. ft.

Count all the sections add them up and multiply them by 150 BTU Per Sq. Ft

CHAPTER 5

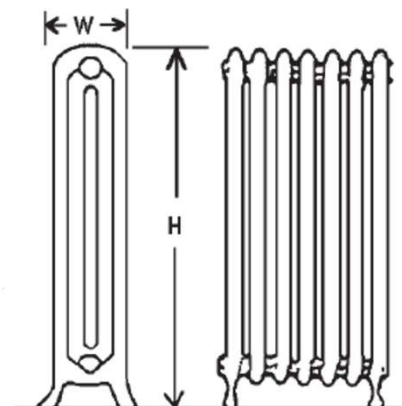
INSTALLED RADIATION: DETERMINING HEAT LOAD

SIZING OBSOLETE RADIATION - CAST IRON RADIATORS

The output of a radiator is measured in square feet of radiation. To determine the number of square feet of radiation in a radiator:

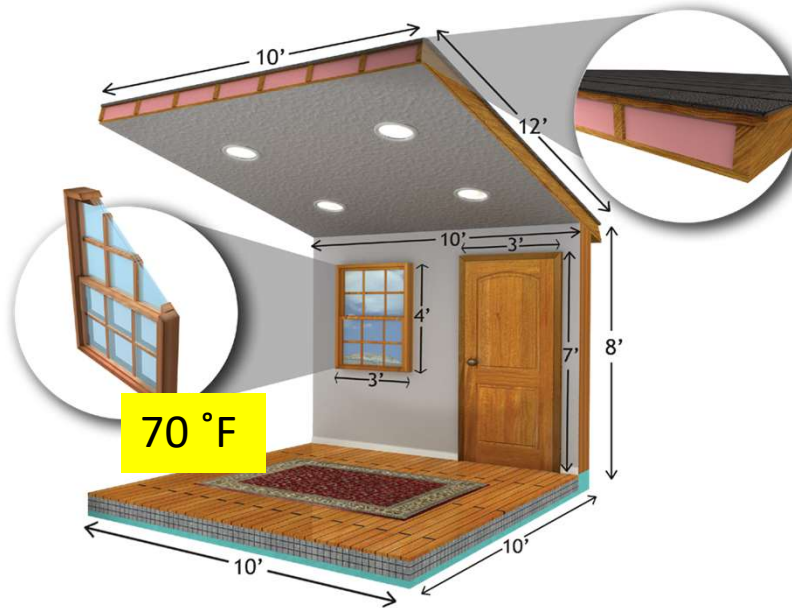
1. Measure the height of the radiator.
2. Count the number of columns in a section.
3. Count the number of sections.
4. Multiply the total number of sections by the number of square feet per section as shown in the following tables:

Column Type Radiators



Sq. Ft. Radiation per Section					
Height (inches)	4-1/2" W One Column	7-1/2" W Two Column	9" W Three Column	11-1/2" W Four Column	13" W Five Column
13	—	—	—	—	3
16	—	—	—	—	3-3/4
18	—	—	2-1/4	3	4-1/4
20	1-1/2	2	—	—	5
22	—	—	3	4	—
23	1-2/3	2-1/3	—	—	—
26	2	2-2/3	3-3/4	5	—
32	2-1/2	3-1/3	4-1/2	6-1/2	—
38	3	4	5	8	—
45	—	5	6	10	—

Where does it all begin?



We calculate the heat load at design conditions

In Up-State NY we have roughly 2600 hrs. of heating season.

Design conditions represent roughly 5% of that time roughly 130 hrs.

We need to design around those hrs. to meet the customers expectations of comfort.

Roughly 80% of that 2600 hrs. we are at or below 50% of design load conditions.

Cast Iron or Steel Boilers have a return water limit of 140 °F, condensing boilers it is more like 40 °F

Does that mean condensing boilers are for every application?

How The Water Moves

Circulators in Parallel Double the GPM at the same Ft of head



Circulators in Series Double the Ft of head at the same GPM



Under Minimal Load Conditions the same amount of water will flow into the Heating source
If the flow of the system is reduced due to satisfied Zones more of the water will recirculate back to the heat source and some will go to the system to meet the load.

