

**EXAMPLE PROBLEMS**

1. **PROBLEM:** It is desired to heat up 10,000 pounds of sugar to 160°F. Assume initial temperature to be 60°F and heat losses to be 25%.

A. How much heat is required for this job if a one hour heat up time is used?

B. How much heat is required for this job if a twenty minute heat up time is used?

$$\begin{aligned} \text{SOLUTION A.: } Q &= W \times \text{S.H.} \times \text{T.R.} \quad (\text{Determine S.H. from G.E. Table 2}) \\ &= 10,000 \times .30 \times 100 \\ &= 300,000 \text{ B.T.U.} \end{aligned}$$

$$\begin{aligned} \text{Total } Q &= 300,000 + 75,000 \\ &= 375,000 \text{ B.T.U.} \end{aligned}$$

$$\begin{aligned} \text{SOLUTION B.: } Q &= W \times \text{S.H.} \times \text{T.R.} \\ &= 10,000 \times .30 \times 100 \times 3 \\ &= 900,000 \text{ B.T.U.} \end{aligned}$$

$$\begin{aligned} \text{Total } Q &= 900,000 + 225,000 \\ &= 1,125,000 \text{ B.T.U.} \end{aligned}$$

2. **PROBLEM:** What is the total heat of steam at 100 P.S.I. and what volume does it occupy?

**SOLUTION:** 1. From G.E. Table 3, Read for 100 P.S.I.  
2. Total Heat Content = 1189.7 B.T.U./Pound.  
3. It occupies 3.882 Cu. Ft./Lb.

3. **PROBLEM:** Assume a Unit operates at 100 P.S.I. and requires 10 H.P.; what size steam and return line should be run if it is located 100 Ft. from the boiler?

**SOLUTION:** 1. Determine the Pounds of Steam required.  
 $10 \times 34.5 = 345$  Pounds of Steam per Hour.  
2. Select Steam Line Size from 100 P.S.I. Table 5.  
Note: For High Pressure Piping, use 2 P.S.I. Drop/100 Ft.  
Read 440 Pounds from Table, therefore 1-1/4" Line required.  
3. Select Return Line Size  
Read 419 Pounds from Table; under 100 PSI High Pressure Return Column.  
Therefore, 3/4" Line required.

4. **PROBLEM:** If 1/8 P.S.I. Gas Pressure is available at the inlet to a 20 H.P. Boiler, would this be sufficient pressure?

**SOLUTION:** 1. From Specifications, we know 7 to 14" W.C. is required.  
2. To convert P.S.I. to Inches W.C., refer to G.E. Table 1.  
3.  $\text{P.S.I.} \times 27.684 = \text{Inches Water Column.}$   
 $1/8 \times 27.684 = 3.46$  Inches Water Column.  
4. Pressure is not sufficient.

5. **PROBLEM:** What Size Gas Line should be run for a 9.5 H.P. Boiler if line is 75 Feet long with 5 ells?

**SOLUTION:**

1. From Spec 398 BTU or CFH is required at rating.
2. Use G.E. Table 6, Table No. 22-D, Low Pressure Table with .5" W.C. Drop.
3. Number of Elbows is not a factor in new Tables, in regards to length.
4. Refer to the closest column larger than actual length, in this case refer to the 80 ft. column.
5. For 80 Feet Pipe, a 1" Gas Line will handle only 222 CFH.  
Therefore, a 1-1/4" Line would be required; it could handle up to 456 CFH.
6. For Multiple Outlet Systems, refer to U.P.C.

6. **PROBLEM:** How Many 3/32" Orifices should be used to exhaust 9.5 H.P. into a Steam Room if pressure in steam line is 10 P.S.I.?

**SOLUTION:**

1. From G.E. Table 7, for 10 P.S.I. and 3/32" Orifice Read .3 H.P./Orifice.
2. Therefore -  $\frac{9.5 \text{ H.P.}}{.3 \text{ H.P./Orifice}} = 31.6 = 32$  Orifices

7. **PROBLEM:** Determine the area of Combustion Openings required for a 50 H.P. Boiler. The Boiler Room is 30 x 20 x 12' High and adjacent to an outside wall on Ground Level. The Owner would like to use Metal Louvers. Describe where the Openings should be.

**SOLUTION:** Refer to General and Basic Installation Instructions V, Air Supply.

1. In order for the Room to be judged unconfined, it must have a volume of 50 Cubic Feet per 1,000 BTUH Input or larger.  
Required Volume =  $2,100,000/1000 \times 50$   
= 105,000 Cubic Ft.  
Actual Volume =  $30 \times 20 \times 12$   
= 7,200 Cubic Ft.  
Room is confined.
2. Two Openings required.
3. The Combined Opening Area should be 1/2 Sq. In. per 1,000 BTUH Input.  
 $2,100,000/1000 \times .5 = 1,050$  Sq. In.
4. Account for Louvers with 60% Free Area.  
 $1,050 \text{ Sq. In.} / .6 = 1,750$  Sq. In.  
Total Wall Opening Size = 1,750 Sq. In.
5. One Half of this or 875 Sq. In. shall be within 12" of the Ceiling and one-half of this (875 Sq. In.) should be within 12" of the Floor.