

- Mushulu:

Donkey Boils

acchamm

Heating Surfaces.

$$105 \text{ tubes } 2" \text{ dia} \times 5'-0" = \frac{6.28 \times 105 \times 60}{144} = 22.5$$

$$\text{Lower tube plate } 42.75 - 1 = 41.75 = \frac{1369}{379.7} = \frac{1040}{144} = 7.2$$

$$\text{Furnace } 21" \times \text{Arc } 742\frac{3}{4} = \frac{134.3 \times 21}{144} = 19.8$$

Total

$$\underline{49.2}$$

Plate Surface. Area  $42\frac{3}{4} = \frac{1435}{144} = \underline{10.59 \text{ feet}}$

Tube Circumferential  $\frac{D-a}{p} \times 100 = \frac{2\frac{1}{4} - \frac{3}{4}}{2\frac{1}{4}} \times 100 = \underline{66.6}$

$$\frac{100(S_2 \times a \times \pi \times C)}{S_1 \times p \times L} = \frac{100(23 \times .44 \times 1 \times 1)}{26 \times 2.25 \times .375} = \underline{46.1}$$

Long Seam

$$\underline{K_1} \quad \frac{100(p-a)}{p} = \frac{100(7.75)}{7} = \underline{89.3} \text{ use this}$$

$$\underline{K_2} \quad \frac{100(S_2 \times a \times \pi \times C)}{S_1 \times p \times L} = \frac{100(23 \times .44 \times 5 \times 1.875)}{26 \times 7 \times .375} = \underline{138}$$

If using only 4 rivets for double shear constant

$$\frac{4}{5} \times 138 = \underline{110}$$



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+ 1 rivet

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Combined

$$\frac{100(p-d)}{p} + \frac{100(S_2 \times a \times c)}{S_1 \times p \times t}$$

$$\frac{100(7-1.5)}{7} + \frac{100(23 \times .44 \times 1.7)}{26 \times 7 \times .375} = \underline{103.7}$$

Working Each row separately

1<sup>st</sup> row  $\frac{100(p-d)}{p} = \frac{100(7-7.5)}{7} = 89.3$  use this

2<sup>nd</sup> row  $\frac{100(7-1.5)}{7} = 78.5$

3<sup>rd</sup> row  $78.5$

Sub:

1<sup>st</sup> row  $\frac{100(.44 \times 1)}{7 \times .375} = 16.5$

2<sup>nd</sup> row  $\frac{100(.44 \times 2)}{7 \times .375} = 33$

3<sup>rd</sup> row  $do$   $33$



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Value of Each row.

No 1. 89.3.

- 2  $78.5 + 16.5 = 95.$

- 3  $78.5 + 16.5 + 33 = 128.$

Rivet Section  $16.5 + 33 + 33 = \underline{82.5.}$

Boiler Shell.

$$HP = \frac{(t-2) \times S \times J}{C \times D} = \frac{(12-2) \times 26 \times 89.3}{2.75 \times 47.25} = \underline{178 \text{ lbs}}$$

Furnace Plate.

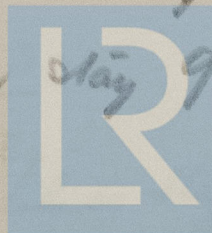
$$HP = \frac{C(t-1)^2}{(L+24)D} = \frac{1300 \times 121}{(9+24)42.75} = \underline{111.5 \text{ lbs.}}$$

2nd rule.

$$HP = \frac{S}{D} [10(t-1) - L] =$$

$$= \frac{45}{42.75} [10(11) - 9] = \underline{106.05 \text{ lbs}}$$

Note Stays are fitted  $7 \times 7$  which is in excess of  
14 times plate thickness - Length taken from  
main ring rivet to lower stay 9'



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End plate

$$HP = \frac{(t-1)^2 \times C}{A^2 + L^2} =$$

$$HP = \frac{(14-1)^2 \times 50}{A^2 + L^2}$$

$$100 = \frac{13^2 \times 50}{a^2 + L^2}$$

$$100(a^2 + L^2) = 13^2 \times 50$$

$$a^2 + L^2 = \frac{13^2 \times 50}{100} = \underline{84.5}$$

Value of  $a^2 + L^2$  for 100 lbs HP = 84.5

The only system of staying is by tubes, which are 2" External dia, and .12 thick.

There are 105 tubes Expanded & headed over at each end. The pitch of tubes is  $4\frac{1}{2} \times 3$  at inner row.

$$HP = \frac{(t-1)^2 \times C}{A^2 + L^2}$$

$$100 = \frac{13^2 \times C}{4.5^2 + 3^2}$$

$$100 = \frac{169C}{20.25 + 9}$$

$$100 \times 29.25 = 169C$$

$$C = \frac{100 \times 29.25}{169} = \underline{17.3}$$

Value of C Considering plain tubes as stays 17.3

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