

Segment of Head To be Stayed (Front Tube Sheet)

$$d = \frac{80t}{\sqrt{P}}$$

$$t = .5$$

$$P = 170$$

$$d = \frac{80 \times .5}{\sqrt{170}}$$

$$d = \frac{40}{13.038}$$

$$d = 3.068 \rightarrow \text{Use } 3.000''$$

$$A = \frac{4(H-d-2)^2}{3} \times \sqrt{\frac{2R}{(H-2)}} - .608$$

$$H = 12.5$$

$$d = 3.0$$

$$R = 20.125$$

$$A = \frac{4(12.5-3-2)^2}{3} \times \sqrt{\frac{2 \times 20.125}{(12.5-2)}} - .608$$

$$A = \frac{4 \times (7.5)^2}{3} \times \sqrt{\frac{40.25}{10.5}} - .608$$

$$A = \frac{4 \times 56.25}{3} \times \sqrt{3.833} - .608$$

$$A = 75 \times \sqrt{3.225}$$

$$A = 75 \times 1.796$$

$$A = 134.7 - \text{Dry pipe Ring} = A = 134.7 - 63.617$$

$$A = 71.083$$

6 stays @ 24.75 = 148.5" supported.

Plate t using 17,500 stress value

$$t = 4 \sqrt{\frac{P}{SC}}$$

$$t = 4 \sqrt{\frac{170}{17500 \times 2.1}}$$

$$t = 4 \sqrt{.0046}$$

$$t = 4 \times .068$$

$$t = .272$$

Staybolt a - FRA

Required Area

$$\frac{\text{Load}}{S} =$$

$$\frac{2722}{7500}$$

$$= .362 + .027 = .389 \frac{\text{FRA}}{\text{Required}}$$

.548 Actual

(LORAPPER)

$$P = \frac{StE}{R-O}$$

$$P = \frac{17500 \times .5 \times .8}{20.125}$$

$$P = 347.826 \text{ psi}$$

$$FS = 4 = (TS \div 4) = 17500$$

$$E = .8$$

BARREL

$$P = \frac{2SE(t-c)}{D-2y(t-c)}$$

$$P = \frac{2 \times 17500 \times .8 \times (.5 - .125)}{40.25 - 2 \times .4 \times (.5 - .125)}$$

$$P = \frac{2 \times 17500 \times .8 \times .375}{40.25 - 2 \times .4 \times .375}$$

$$P = \frac{10500}{39.95}$$

$$P = 262.828 \text{ psi}$$

$$FS = 4 = (TS \div 4) = 17500$$

$$E = .8 - \text{Actual} = 1$$

$$SA 36 - S = 16,600 @ 450^\circ F$$

PG 46/49
PFT 26

Stray bolt Cross Sectional Minimum Area

$$A_R = \frac{\text{Load}}{\text{All. Stress}} = \frac{P \times P}{S}$$

$$A_R = \frac{4^2 \times 170}{16,600}$$

$$A_R = \frac{16 \times 170}{16,600}$$

$$A_R = \frac{2720}{16,600}$$

$$A_R = .164 \quad (.16335)$$

Plus tell tale area (.027)

$$A_R = .191$$

.191 = $\frac{1}{2}$ " diameter Required

Actual bolt diameter will be 1"

$$\text{Actual bolt effective AREA} = .7854 - .027 = .7584$$

$$\text{Diameter at root of } 12 \text{ TPI / } \sqrt{\text{thread}} = D - (P \times 1.732) = d$$

$$1 - (.083 \times 1.732) = d$$

$$.856 = d$$

$$.575 = a$$

Min ACTUAL AREA minus AREA of TELL TALE

$$= .575 - .027 = .548 \text{ ACTUAL}$$

External loadings have been considered and found to be acceptable.

$$\text{Boiler Volume } \frac{183225.181 \text{ cu. in.}}{1728} = 106.033 \text{ cu ft}$$
$$106.033 \times 62.5 = 6627.068 \text{ pounds.}$$

Structural loading consists of the boiler being supported at both ends in a vertical plane. Loadings do not infringe on pressure retaining stresses.

237/337

Dry Pipe

$$.023 \times 4 = .092$$

$$\text{wall } t \text{ is } .237 > .092$$

$$P = \frac{17300 \times t}{D} - 275$$

$$P = \frac{17300 \times .237}{4} - 275$$

$$P = \frac{4100.1}{4} - 275$$

$$P = 1025.025 - 275$$

$$L/D = 5$$

FRA

$$P = 750.025 \text{ psi}$$

Factor A = .0055

$$D/t = 16.878$$

$$P = \frac{4B}{3(D/t)}$$

PFT 51

Code

$$P = \frac{4 \times 8000}{3 \times 16.878}$$

$$P = \frac{32000}{50.634}$$

$$P = 631.986 \text{ psi}$$

Gusset Staying of Backhead

$$a = 9.5 \times .5$$

$$a = 4.75 \text{ in}^2$$

a = Cross sectional area
of gusset at 90°
on full section

4.75 in² exceeds the required CSA of a diagonal
or through stay.

Allowable A = total area of plate supported by a single brace
→ $A = 251.47 \text{ in}^2$

$$A = \frac{S a}{P} = \frac{9000 \times 4.75}{170} = \frac{40500}{170} = 251.47 \text{ in}^2$$

FRA Stress → $S = \frac{P \times A}{a} = \frac{170 \times 251.47}{4.75} = 8999.999 \text{ psi}$

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End Run

End Book

Start Book

Start Run

Front Tube Sheet Diagonal Pitch

$$\tau = \sqrt{\frac{P}{SC}}$$

$$\tau = 6 \sqrt{\frac{170}{17500 \times 2.2}}$$

$$\tau = 6 \sqrt{.0044}$$

$$\tau = 6 \times .066$$

$$\tau = .398$$

$1/4 = 1.227 (a)$ 6" pitch = 4987 psi bolt stress

$1/8 = .994 (a)$ " " = 6157 " " "

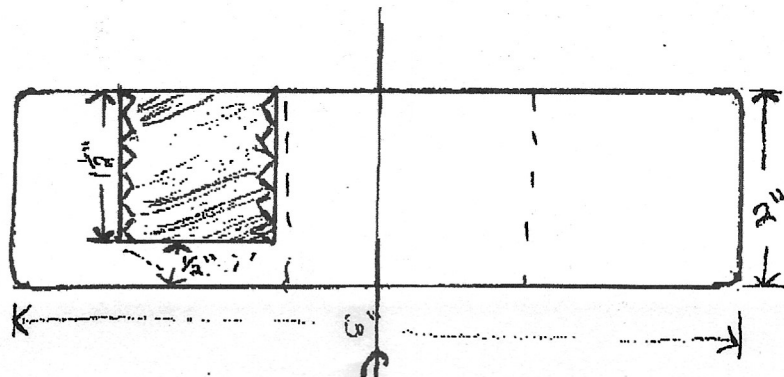
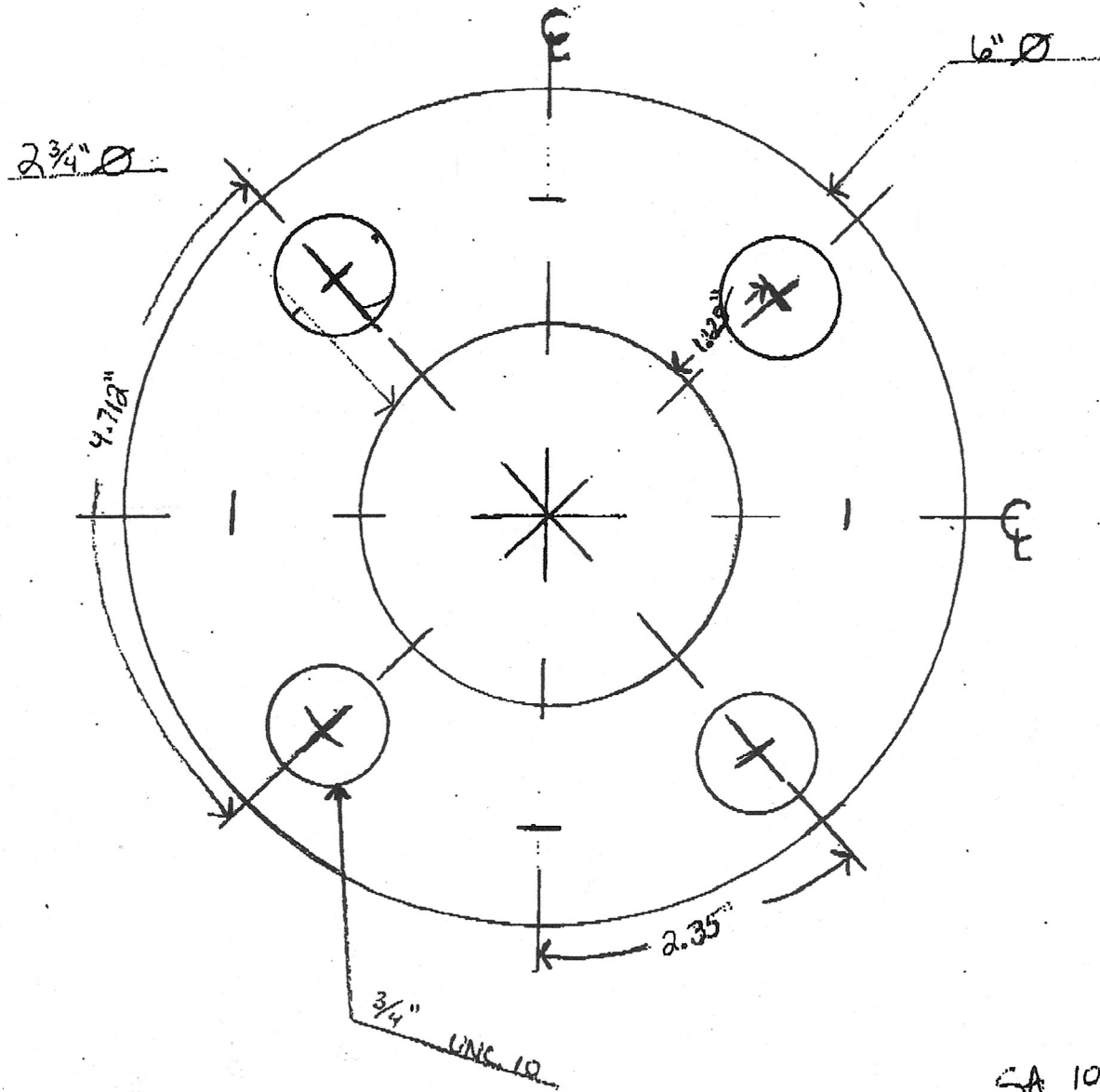
$$A = \frac{wh}{l} = \frac{.7854 \times 24}{13} = 1.047 \quad \text{Use } 1/4 \text{ round}$$

Wall Baker Bolt Flanges

Blake Gadbury

421-8603

WASATCH
RAILROAD
CONTRACTORS




SA 105


3 Ea

Drawing by
Blake Gadbury

In Regards to Job # 001-1, NB # 7 P-2 Documentation
Under the name of Wemco, Certificate # 37,567
expiring May 28, 2011 Was Misplaced And is
Completed here within that timeframe.

 1-23-12

Hydro/Stamping occurred on March 03, 2009

 FI NB5657A/CO-075
01/23/2012