

I. According to „Bauvorschriften für Landdampfkessel“

1. The spherical portion.

$$s = D \cdot y \cdot \frac{p}{200 \cdot \frac{K_2}{x}} + C_1 + C_2 + C_3$$

$$s = 2000 \cdot 0,55 \cdot \frac{7}{200 \cdot \frac{36}{4,5}} + 3 + 2 + 2 = 12 \text{ mm}$$

$$D = 2000 \text{ mm.}$$

$$y = 0,55$$

$$p = 7 \text{ Atm.}$$

$$K_2 = 36 \text{ Kg/mm}^2$$

$$x = 4,5$$

$$C_1 = 3 \text{ mm}$$

$$C_2 = 2 \text{ mm.}$$

$$C_3 = 2 \text{ mm.}$$

2. The conical portion.

$$s = \frac{p \cdot d}{2400} \cdot \left(1 + \sqrt{1 + \frac{a \cdot l}{p \cdot (l + d)}} \right) + 2 \text{ mm}$$

$$s = \frac{7 \cdot 2100}{2400} \cdot \left(1 + \sqrt{1 + \frac{45 \cdot 700}{7 \cdot (700 + 2100)}} \right) + 2 \text{ mm} = 18 \text{ mm.}$$

$$p = 7 \text{ Atm}$$

$$d = 2100 \text{ mm}$$

$$a = 45$$

$$l = 700 \text{ mm.}$$

3. The stiffening ring.

Total vertical load on the fire box:

$$P_v = \frac{D^2 \cdot T_0}{4} \cdot p = \frac{240^2 \cdot T_0}{4} \cdot 7 = 316 000 \text{ Kg.}$$

Total horizontal load at the stiffening ring:

$$P_h = P_v \cdot \sin \alpha = 316 000 \cdot 0,425 = 144 000 \text{ Kg.}$$

Load sustained by the ring:

$$P = \frac{P_h}{2} = \frac{144 000}{2} = 72 000 \text{ Kg.}$$

Areas sustaining this load:

$$\begin{aligned} \text{a) Flanged edge of fire box: } (13 - 2,3) \cdot 1,8 &= 19,2 \text{ cm}^2 \\ \text{b) Ring (welded, strength 0,65): } 14 \cdot 5 \cdot 0,65 &= 45,5 \text{ cm}^2 \\ \text{c) Shell plate: } (14 - 2,3) \cdot 1,6 &= 18,7 \text{ cm}^2 \\ \text{Total} &= 83,4 \text{ cm}^2 \end{aligned}$$

$$\text{The tension of the material: } \frac{72 000}{83,4} = 862 \text{ Kg} < 900 \text{ Kg/cm}^2$$

II. According to Lloyds Rules.

1. The spherical portion.

$$WP = \frac{275 \times (t-1)}{R}$$

$$WP = \frac{275 \times (21-1)}{40} = 137,5 \text{ Lb}$$

$$t = 17 \text{ mm} = \frac{21}{32}''$$

$$R = 1000 \text{ mm} = 40''$$

2. The conical portion.

$$\text{a) } WP = \frac{C \times (t-1)^2}{(L + 24) \times D}$$

$$WP = \frac{1450 \times (21-1)^2}{(27 + 24) \times 83} = 137 \text{ Lb.}$$

$$C = 1450$$

$$L = 700 \text{ mm} = 27''$$

$$D = 2100 \text{ mm} = 83''$$

$$\text{b) } WP = \frac{C_1}{D} \times [10 \times (t-1) - L]$$

$$WP = \frac{50}{83} \times [10 \times (21-1) - 27] = 104 \text{ Lb}$$

$$C_1 = 50$$

3. The stiffening ring.

$$WP = \frac{4 \cdot 2 \left[t_1 \times (L_1 - a) + t_2 \times L_2 \times 7 + t_3 \times (L_2 - a) \right] \times 5 \times 2240}{D^2 \times T_0 \times t_g \times a \times C}$$

t_1 = thickness of fire box	$\frac{21}{32}''$ 0,655"
t_2 = " " " ring	2"
t_3 = " " " shell plate	$\frac{5}{8}''$ 0,63"
L_1 = width of flanged edge of fire box	5"
L_2 = " " " ring	$5\frac{1}{2}''$ 5,5"
T = strength of the weld (ring)	$\frac{50}{100}$
S = minimum tensile strength of the material:	26
D = Greatest diameter of the fire box	95"
α = The angle formed by the conical surface and the vertical	23° by 23° 0,425
d = diameter of rivet hole	$2\frac{3}{32}''$ 0,9"
C = margin of security	4

$$WP = \frac{4 \times 2 \left[0,655 \times (5 - 0,9) + \frac{2 \times 5 \times 50}{100} + 0,63 \times (5,5 - 0,9) \right] \times 26 \times 2240}{95^2 \times T_0 \times 0,25 \times 4} =$$

$$106 \text{ Lb}$$

ELK.
7/3/34

W.D.H.

A.P. Möller Byggenummer 52.

Dato	Order. No.	Modtager	Udst. Amt. Gauge	Pos.	Stk.	Genstand	Mater.	Model.
2. 3. 34		A/S SMITH, MYGIND & HÜTTEMEIER				Fire box for a 2500mm Vertical-Boiler		39905.
Tegn.	qder.	System S.M.K.H. 7 Atm.						
Kalk.								
Kontr.								

Maasstok = 1:15.

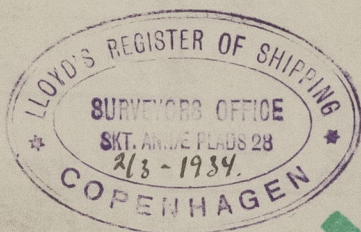
W464-0215.2

Vinc box

for vertical derrick bails
being built by Messrs.

J. B. Smith, Huggind & Hüttenmeier
and intended for

Odense Staalhilsverft's Yard No 52.



M/S NORA MERSE of Copenhagen
Cfr. Reg. No 9423



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Foundation

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