For a/b = results : α = β =

$\sigma = \dfrac{\beta \times q \times b^2}{t^2}$ $y = \dfrac{-\alpha \times q \times b^4}{E \times t^3}$	σ = ———— = y = ———— =	kg/cm² cm

COVER section 3

a =
b =
t =

σ_{max} = kg/cm²

$y_{max} = \dfrac{b}{}$ = cm

For a/b = results : α = β =

$\sigma = \dfrac{\times q \times b^2}{t^2}$ $y = \dfrac{\times q \times b^4}{\times t^3}$	σ = ———— = y = ———— =	kg/cm² cm

NOT APPLICABLE

VI. LIFTING LUG.

ASSUME SIMPLE, TOP WELDED LIFTING LUG (MUCH LESS FAVOURABLE THAN ACTUAL SITUATION):

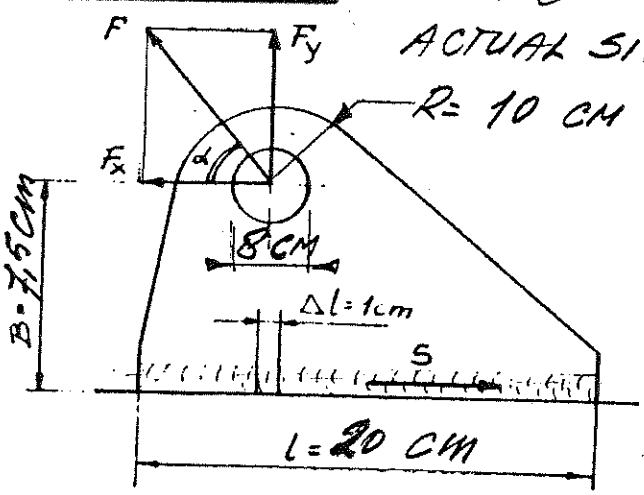
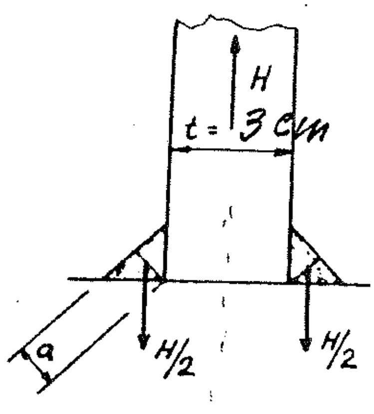


Fig. 12



a_{min} = 0,8 cm.

Fig. 13

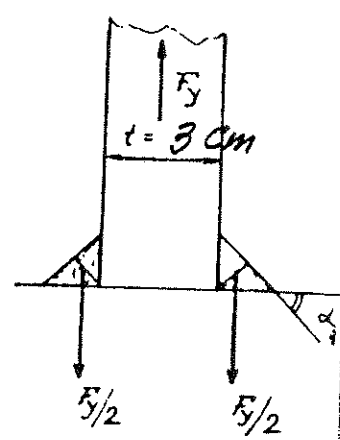


Fig. 14

NOTATIONS:

t, l, B	- Dimensions of lifting lug (see fig 12, 13, 14)
a	- Dimension of weld
α	- Angle of lifting rope (chain) with horizontal
c	- Factor depending on weld angle α (c=0,85 for 45°)
F_x	- Horizontal component of total load
F_y	- Vertical component of total load
H	- Vertical reaction due to F_x
S	- Horizontal reaction due to F_x
M_B	- Bending moment
σ_b	- Bending stress
σ_e'	- Weld stress due to F_x
τ	- Weld stress due to S
τ_e''	- Weld stress due to F_y
σ_e	- Total equivalent weld stress
W	- Modulus of resistance
A	- Weld area (A= a x l)

TOTAL LIFT WEIGHT (SEE SHEET 16) : 14.000 KG
NUMBER OF LIFTING LUGS : 4 PCS
SAFETY FACTOR : 2

$\therefore F_y = \frac{2 \times 14.000}{4} = 7000$ KG

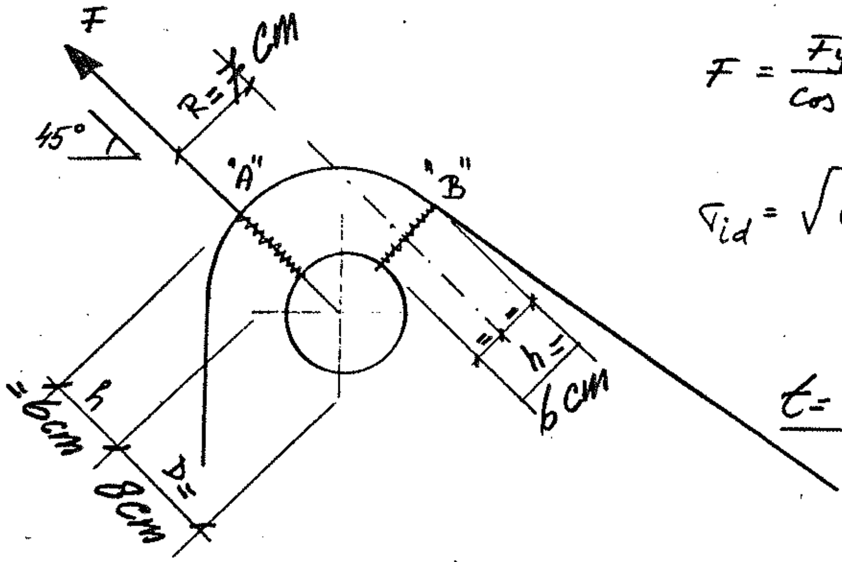
1. Weld stress due to horizontal component		
$F_x = F_y \frac{\cos\alpha}{\sin\alpha}$	$F_x = 7000 \times \frac{\cos 45°}{\sin 45°} = 7.000$	kg
$M_B = F_x \cdot B$	$M_B = 7000 \times 7,5 = 52.500$	kg.cm
$W = 1/6 . t . l^2$	$W = 1/6 \times 3 \times 20^2 = 200$	cm^3
$\sigma_b = \frac{M_b}{W}$	$\sigma_b = \frac{52500}{200} = 263$	kg/cm^2

17.

Take $\Delta l = 1cm$

$H = t.1cm.\sigma_b$ $S = F_x / 2$ Weld stress $\sigma'_e = \frac{H/2}{c.a.1cm}$ $\tau = \frac{S}{A} = \frac{S}{a.l}$	$H = 3 \times 1 \times 263 = 789$ $S = \frac{7000}{2} = 3500$ $\sigma'_e = \frac{789/2}{0{,}85 \times 0{,}8 \times 1} = 580$ $\tau = \frac{3500}{0{,}8 \times 20} = 219$	kgf kgf kg/cm^2 kg/cm^2
2. Weld stress due to vertical component $\sigma''_e = \frac{F_y/2}{c.a.l.}$	$\sigma''_e = \frac{7000/2}{0{,}85 \times 0{,}8 \times 20} = 258$	kg/cm^2
Total equivalent weld stress $\sigma_e = \sqrt{(\sigma'_e + \sigma''_e)^2 + 1{,}8\tau^2}$	$\sigma_e = \sqrt{(580+258)^2 + (1{,}8 \times 219^2)} = 888$	kg/cm^2
$\sigma_e = 888$ is smaller than the allowable stress $\sigma = 1600$, so okay.		kg/cm^2

CHECK ON STRESS AROUND LIFTING EYE:



$$F = \frac{F_y}{\cos 45^\circ} = \frac{7000}{\cos 45^\circ} = 9898\ kg$$

$$\sigma_{id} = \sqrt{(\sigma_T + \sigma_B)^2 + 3\tau^2}$$

$t = 3\ cm$

STRESS AT SECTION "A"

TENSION : $\sigma_T = \frac{0{,}459\ F}{t \times h} = \frac{0{,}459 \times 9898}{3 \times 6} = 253\ kg/cm^2$

BENDING : $\sigma_B = \frac{0{,}909\ F \cdot R}{t \times h^2} = \frac{0{,}909 \times 9898 \times 7}{3 \times 6^2} = 584\ kg/cm^2$

SHEAR : $\tau = \frac{0{,}5\ F}{t \times h} = \frac{0{,}5 \times 9898}{3 \times 6} = 275\ kg/cm^2$

$$\sigma_{id} = \sqrt{(253 + 584)^2 + (3 \times 275^2)} = 963\ kg/cm^2$$

< 1600, SO OK.

STRESS AT SECTION "B"

TENSION : $\sigma_T = \frac{0{,}5\ F}{t \cdot h} = \frac{0{,}5 \times 9898}{3 \times 6} = 275\ kg/cm^2$

BENDING : $\sigma_B = \frac{0{,}6636\ F \cdot R}{t \cdot h^2} = \frac{0{,}6636 \times 9898 \times 7}{3 \times 6^2} = 426\ kg/cm^2$

SHEAR : $\tau = \frac{0{,}459\ F}{t \cdot h} = \frac{0{,}459 \times 9898}{3 \times 6} = 253\ kg/cm^2$

$$\sigma_{id} = \sqrt{(275 + 426)^2 + (3 \times 253^2)} = 827\ kg/cm^2$$

< 1600, SO OK.