

LIFTING DEVICE

DEVICE NAME: CMS PANEL LIFTING BAR

ENGINEERING NOTE NUMBER: 88

DRAWING NUMBER: ATTACHED

APPLICABLE STANDARD: B30-20 BELOW-THE-HOOK LIFTING DEVICES

RATED LOAD: 130 lbs

TEST LOAD: 130 lbs x 1.25 = 162.50 lbs

TEST LOAD PERCENT: 125%

LAST LOAD TEST DATE: _____

COLOR: ALUMINUM

STRESS CALCULATIONS:

Done by: JIM KILMER

Date: 11/20/97

Reviewed by: Bob Wands

Date: 11/26/97

REMARKS:

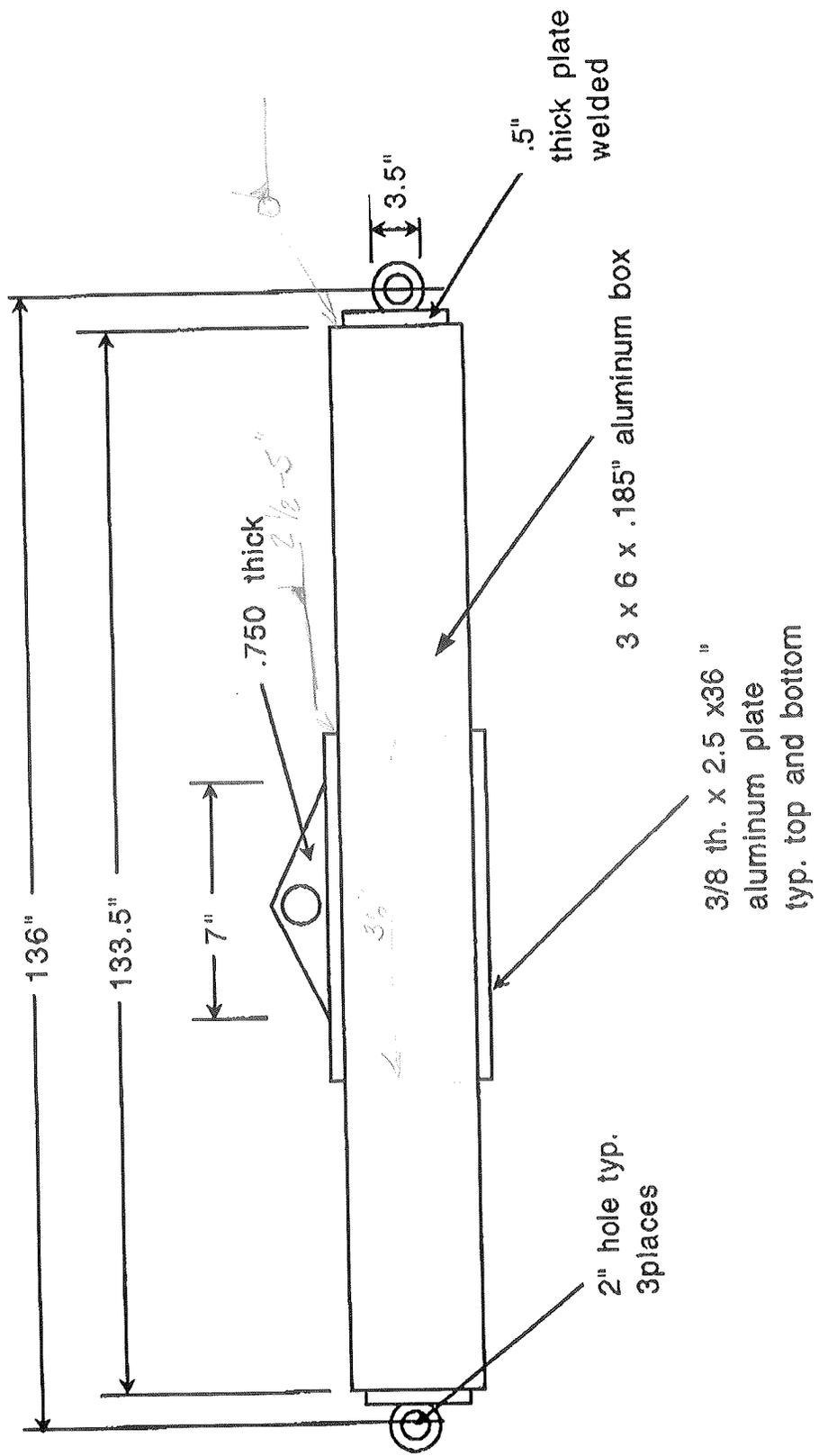
IDENTIFICATION:

Engineering Note Number & Rated Load Must be Clearly Marked On a Conspicuous Surface.

HKOECHER
10-15-97

CMS PANEL LIFTING BAR

NOT TO SCALE



LIFTING BAR MARKED E 652, F BORCHARDING.
TO BE USED TO LIFT 65 LB. CMS PANEL

ALUMINUM ~~BAR~~ TUBING 3" x 6" x 3/16"
A = 3.14 in² I = 14.3 in⁴ S = 4.76 in³

DO NOT CONSIDER REINFORCING PLATES TOP & BOTTOM

BENDING MOMENT IN THE BEAM

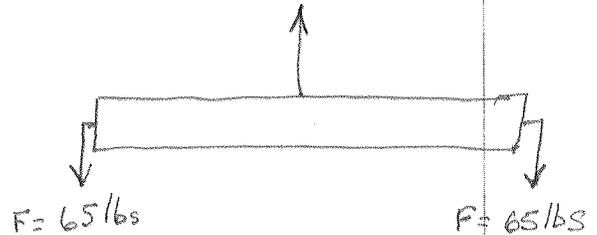
$$M_{MAX} = \frac{F L}{4} \text{ AT CENTER}$$

$$= \frac{(65 \text{ lbs}) (2 \text{ (136 in)})}{4}$$

$$= 4420 \text{ in/lbs}$$

$$\sigma = \frac{M}{S} = \frac{4420 \text{ in/lbs}}{4.76 \text{ in}^3}$$

$$= 928 \text{ lbs/in}^2$$



⇒ OK FOR STRESS ON 6061 ALUMINUM

deflection

$$= \frac{P L^3}{48 E I}$$

$$= \frac{(130 \text{ lbs}) (136 \text{ in})^3}{48 (10^7 \text{ PSI}) (14.3 \text{ in}^4)}$$

$$= 47 \text{ MILS} ~~\approx 0.047 \text{ in}~~$$

⇒ DEFLECTION IS OK.

CHECK WELDS. (ALL WELDS 6061-T6 ALUMINUM?)

1. FILLET WELD ON UPPER STIFFENER PLATE.

LENGTH OF WELD $\frac{1}{4}$ " = 36 X 2 SIDES X 50% COVERAGE = ~~36~~ 36"



$$h = .177 \text{ in} \quad \sigma = \frac{F}{A} = \frac{130 \text{ lbs}}{(.177 \text{ in})(36 \text{ in LONG})}$$

$$= 20 \text{ PSI} \quad \Rightarrow \text{OK}$$

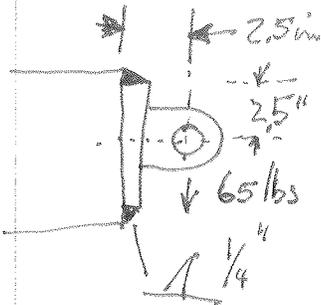
2. FILLET WELD ON LIFTING EYE AT TOP

LENGTH OF WELD = 2 X 7" = 14" OF $\frac{1}{4}$ " WELD $h = .177 \text{ in}$

$$\sigma = \frac{F}{A} = \frac{130 \text{ lbs}}{(.177 \text{ in})(14 \text{ in LONG})}$$

$$= 52.5 \text{ PSI} \quad \Rightarrow \text{OK}$$

3. WELD ON PLATE AT END OF THE BEAM. (WELDED ON ALL 4 SIDES OF PLATE)

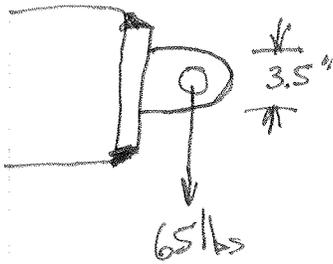


ASSUME SIDE WELDS DO NOT CONTRIBUTE
 THEN UPPER WELD IS IN TENSION AS FOLLOWS
 BENDING FORCE PUTS UPPER WELD IN TENSION
 IN SAME PROPORTION AS THE LOAD

$$\sigma = \frac{F}{A} = \frac{65 \text{ lbs}}{(.177 \text{ in})(2 \text{ in})}$$

$$= 183.6 \text{ PSI} \quad \Rightarrow \text{OK.}$$

4 WELD ON END LIFTING EYE

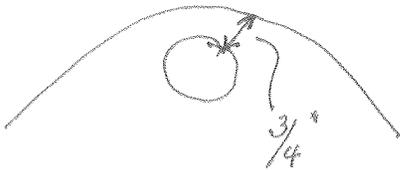


ASSUME UPPER $\frac{1}{2}$ OF WELD IN TENSION
 & LOWER $\frac{1}{2}$ IS IN COMPRESSION FROM
 BENDING MOMENT OF LOAD

$$\sigma = \frac{F}{A} = \frac{65 \text{ lbs}}{(.177 \text{ in}) \left(\frac{3.5 \text{ in}}{2} \times 2 \text{ SIDES} \right)}$$

$$= 105 \text{ PSI} \Rightarrow \text{OK}$$

WEB TEAROUT ON THE TOP LIFTING EYE.



THINNEST SECTION IS $\frac{3}{4}$ " \times $\frac{3}{4}$ " THICK
 AREA = $.5625 \text{ in}^2$

$$\sigma = \frac{F}{A} = \frac{130 \text{ lbs}}{.5625 \text{ in}^2}$$

$$\sigma = 231 \text{ PSI} \Rightarrow \text{OK.}$$



