

SPREADER BAR

I.D. N^o 25

COLOR OF BAR :

WHITE

LOAD CAPACITY PAINTED
ON BAR 10 TONS.

DATE CAP. & I.D. N^o PAINTED
ON BAR _____

DATE OF LAST LOAD
TEST. 11-18-88

TEST LOAD WEIGHT 12.9 TONS

TEST LOAD % 129%

STRESS CALCULATIONS:

DONE BY J. WESTERN

J. WESTERN

DATE

11-17-88

REMARKS :

DWG. NO. 9210.300-MD-272462

FERMILAB

MECHANICAL DEPARTMENT - MS#221
WILSON HALL 13TH FLOOR - EXT: 4568

NOVEMBER 21, 1988

TO: *DISTRIBUTION*
FROM: *JEFFREY L. WESTERN J/W*
SUBJECT: E740 D0 C.H. BATHTUB LIFTING FIXTURES LOAD TEST

ON FRIDAY NOVEMBER 18, 1988 BOB SCHERR AND MYSELF WITNESSED THE 125% LOAD TEST OF SPREADER BAR #24 AND #25. PHOTOS WERE TAKEN AND ARE ON FILE WITH THE CALCULATIONS.

SPREADER BAR #24

RATED LOAD 5 TONS
TEST LOAD 6.45 TONS (129%)

SPREADER BAR #25

RATED LOAD 10 TONS
TEST LOAD 12.9 TONS (129%)

WITNESS SIGNATURES

BOB SCHERR (SAFETY ENGINEER) *R. Scherr*

JEFF WESTERN (PROJECT ENGINEER) *J. L. Western*

DISTRIBUTION:

JACK LINDBERG
BOB SCHERR
BOB McCARTHY
NORM BOSZEK
SPREADER BAR CALCULATION FILE

* TS 8x6x1/2 w/ 1 1/2 x 6" B # 1/2 x 6 BITTON I = 336 in⁴
SEE DWG. 9210,300-MD-272462 S = $\frac{336}{5.7} = 58.95$ in³
ITEM 4



$$M = PL/4 = 25,800(72.75) = 469,238 \text{ IN-LB}$$

$$F_{br} = M/S = 469,238/58.95 = 7,960 \text{ PSI}$$

$$F_{br} = 12,000 \text{ P&S}$$

* THIS IS A REWORKED SPREADER BAR
SEE CALCULATIONS WHICH FOLLOW:

W8x31

SEE DWG 9210,300-MD-272462
ITEM 5



$$M = PL/4 = \frac{12,000(43.75)}{4} = 141,094 \text{ IN-LB}$$

$$F_{br} = M/S = 141,094/27.5 = 5,131 \text{ PSI}$$

$$F_{br} = \frac{12 \times 10^3}{L^2/K^2} = \frac{12000}{43.75(2.30)} = 110 \text{ USE } 12,000 \text{ P&S}$$

SPREADER BEAM ASSEMBLY 2

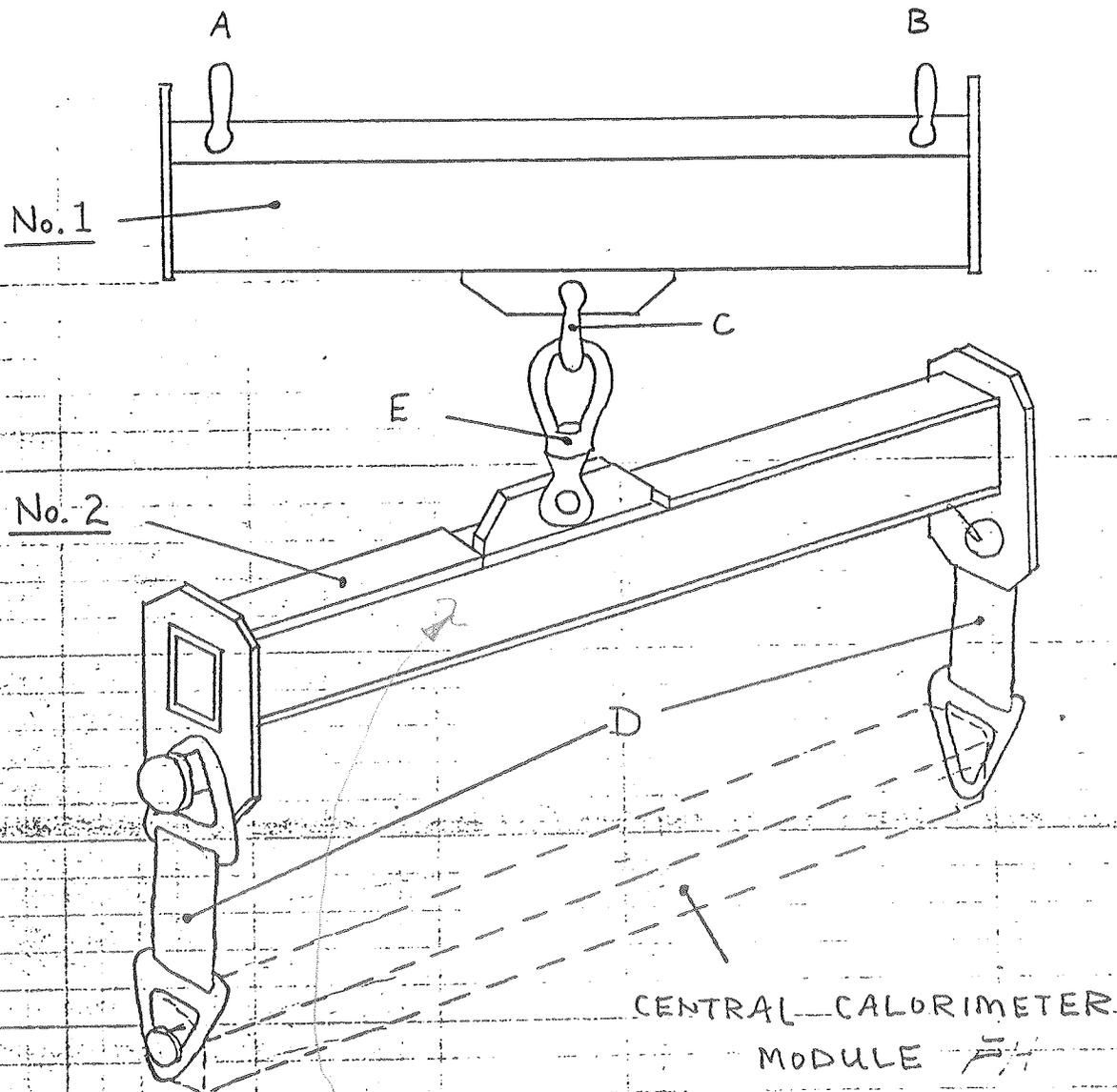
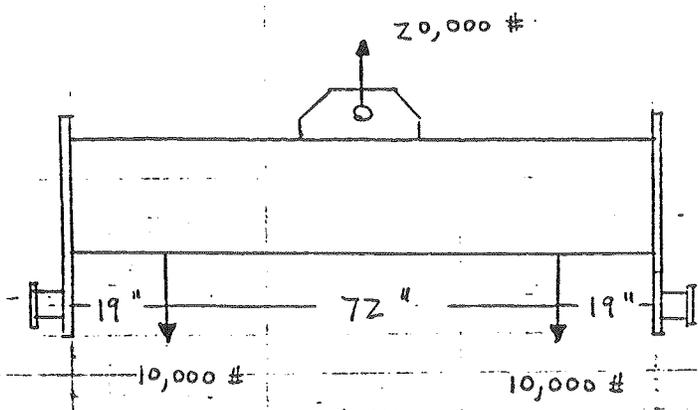
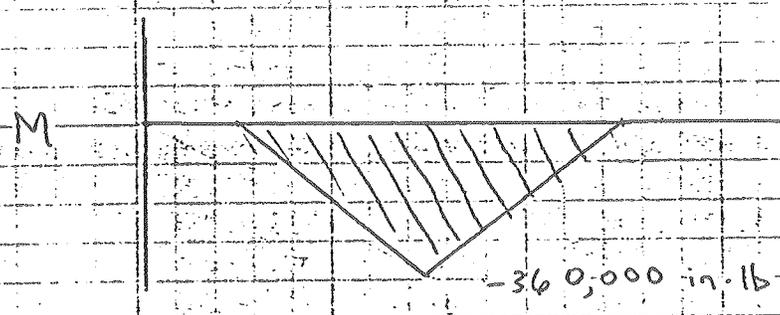
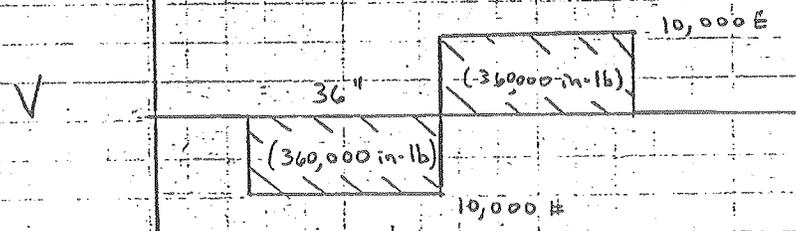


FIG. 2

SPREADER BEAM No. 2 (From FIG. 1)

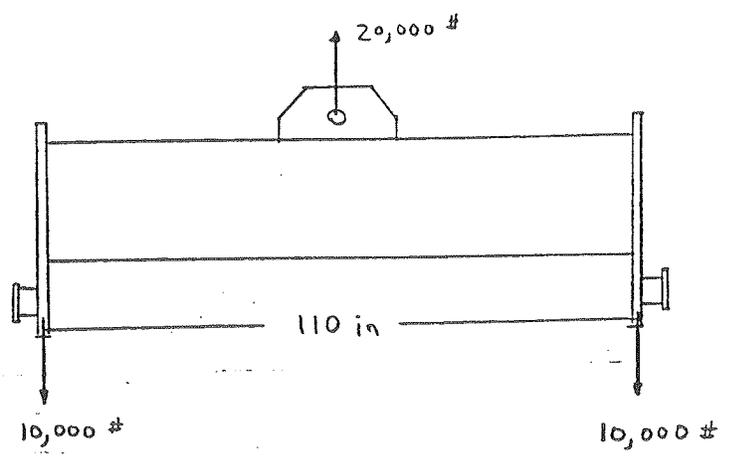


Find the maximum shear force and bending moment

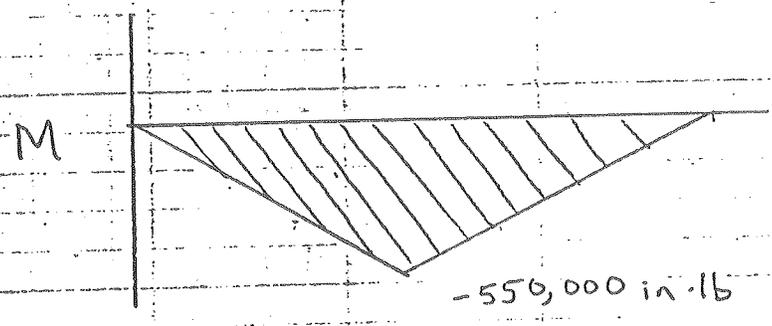
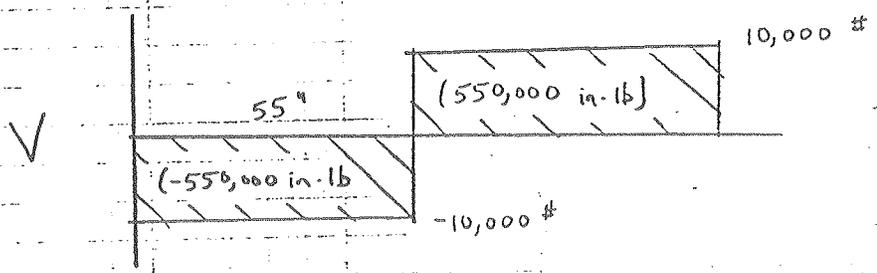


$V_{max} = 10,000 \text{ lbs.}$
$M_{max} = -36,000 \text{ in-lb}$

SPREADER BEAM NO. 2 (from FIG. 2)

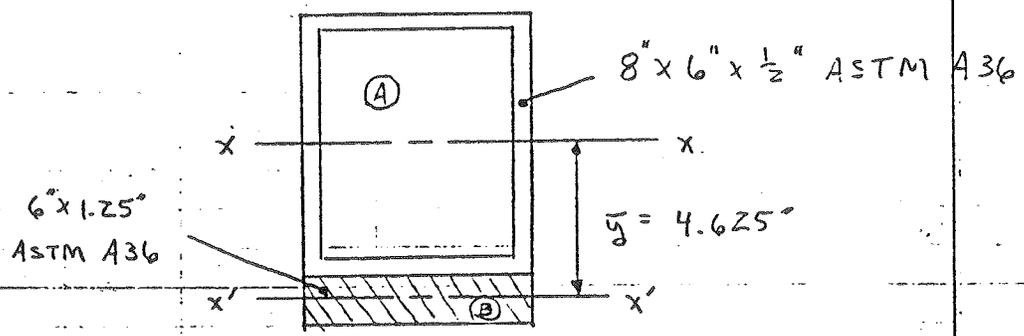


• Find the maximum shear force and bending moment



$V_{max} = 10,000 \text{ lbs.}$
$M_{max} = 550,000 \text{ in-lb}$

CROSS - SECTION



For (A) $I_{xx} = 103 \text{ in}^4$ (3)

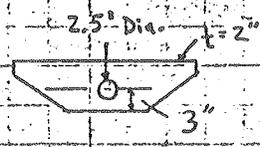
For (B) $I_{xx'} = \frac{1}{12}bh^3 + A\bar{y}^2 = \frac{1}{12}(6)(1.25)^3 + (6)(1.25)(4.625)^2 = 161.4 \text{ in}^4$

Total $I_{xx} = I_{xx(A)} + 2I_{xx'(B)} = 103 \text{ in}^4 + 161.4 = 264.4 \text{ in}^4$

Allowable stress in spreader beam: (Fig. 2 is the worst case)

$\sigma_{act} = \frac{M_{max} C}{I} = \frac{(550,000 \text{ in}\cdot\text{lb})(5 \text{ in})}{264.4 \text{ in}^4} = 10,401 \text{ psi}$

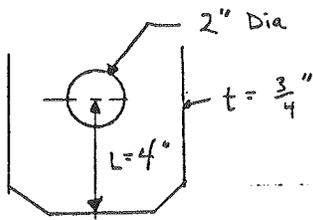
Pull-out shear and bearing stress in lifting lug (ASTM A36):



pull-out shear: $\tau_{act} = \frac{F}{2tL} = \frac{20,000 \text{ lb}}{2(2)(3)} = 1667 \text{ psi}$

bearing stress: $\sigma_{act} = \frac{F}{tD} = \frac{20,000 \text{ lb}}{(2)(2.5)} = 4000 \text{ psi}$

- Pull-out shear in flange (ASTM A36):

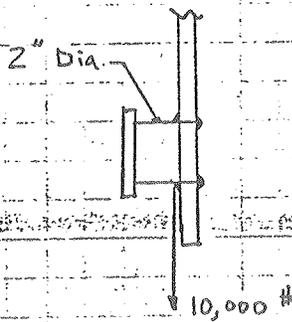


$$\tau_{act} = \frac{10,000 \#}{2 \left(\frac{3}{4}\right) (4)} = \boxed{1666 \text{ psi}}$$

- Bearing stress in flange hole:

$$\sigma_{act} = \frac{10,000 \#}{\left(\frac{3}{4}\right) (2 \text{ " Dia})} = \boxed{6667 \text{ psi}}$$

- shear stress on trunion (AISI 1018):



$$\sigma_{act} = \frac{F}{\frac{\pi D^2}{4}} = \frac{10,000 \# (4)}{\pi (2 \text{ "})^2} = \boxed{3183 \text{ psi}}$$

E740
C. H. BATHTUB

10 TON
LIFTING FIXTURE

JEFFREY L. WESTERN
NOV. 18, 1988

LOAD TEST

11-18-88

12.9 TONS (25,800#)

