

MECHANICAL SUPPORT DEPARTMENT
ENGINEERING NOTE

NUMBER: MSD EN-2.0.0 - KTeV
(WBS number items 2.0.0)

DATE: 31 May 1995

TITLE: Design Note for the 4 ton capacity lifting fixture used for the G' block handling / installation.

AUTHOR(s): Dave Pushka

REVIEWER: RHLW 20 July 1995

KEY WORDS: Lifting Fixture, G' Blocks, Building Shielding

ABSTRACT/SUMMARY:

This design note contains the calculations required to size member used for the lifting fixture. Allowable stresses are based on those calculated from AISC 9th edition and from ASME B30.20 'Under-the-Hook Lifting Fixtures'. The most conservative of the two values calculated from each Code was used.

This fixture was designed, built and tested by people at Argonne National Laboratory specifically for handling the G' blocks (24'-0 long, 1'-0 wide by 2'-0 tall reinforced concrete shielding). These blocks were surplus by Argonne and acquired by FNAL for use in the KTeV building. The lifting fixture came with the concrete blocks.

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LIFTING DEVICE

DEVICE NAME: 6' BLOCK SPREADER BAR

ENGINEERING NOTE NUMBER: 79

DRAWING NUMBER: N/A

APPLICABLE STANDARD: ASME B30.20

AISC 9th ED ASD

RATED LOAD: 8000 #

TEST LOAD: 10,000 #

TEST LOAD PERCENT: 125%

LAST LOAD TEST DATE: 26 JAN. 1995

COLOR: ORANGE

STRESS CALCULATIONS:

Done by: DAVE PUSKRA

Date: 31 MAY '95

Reviewed by: RHILLO

Date: 7/20/95

REMARKS:

FIXTURE WAS BUILT BY ARGONNE & WAS PROVIDED WITH SURPLUS BLOCKS ACQUIRED FROM ARGONNE FOR KTEV.

IDENTIFICATION:

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



SUBJECT

AS BUILT OF 4 TON CAPACITY LIFTING FIXTURE
 BUILT & TESTED BY ARGONNE NAT. LAB.

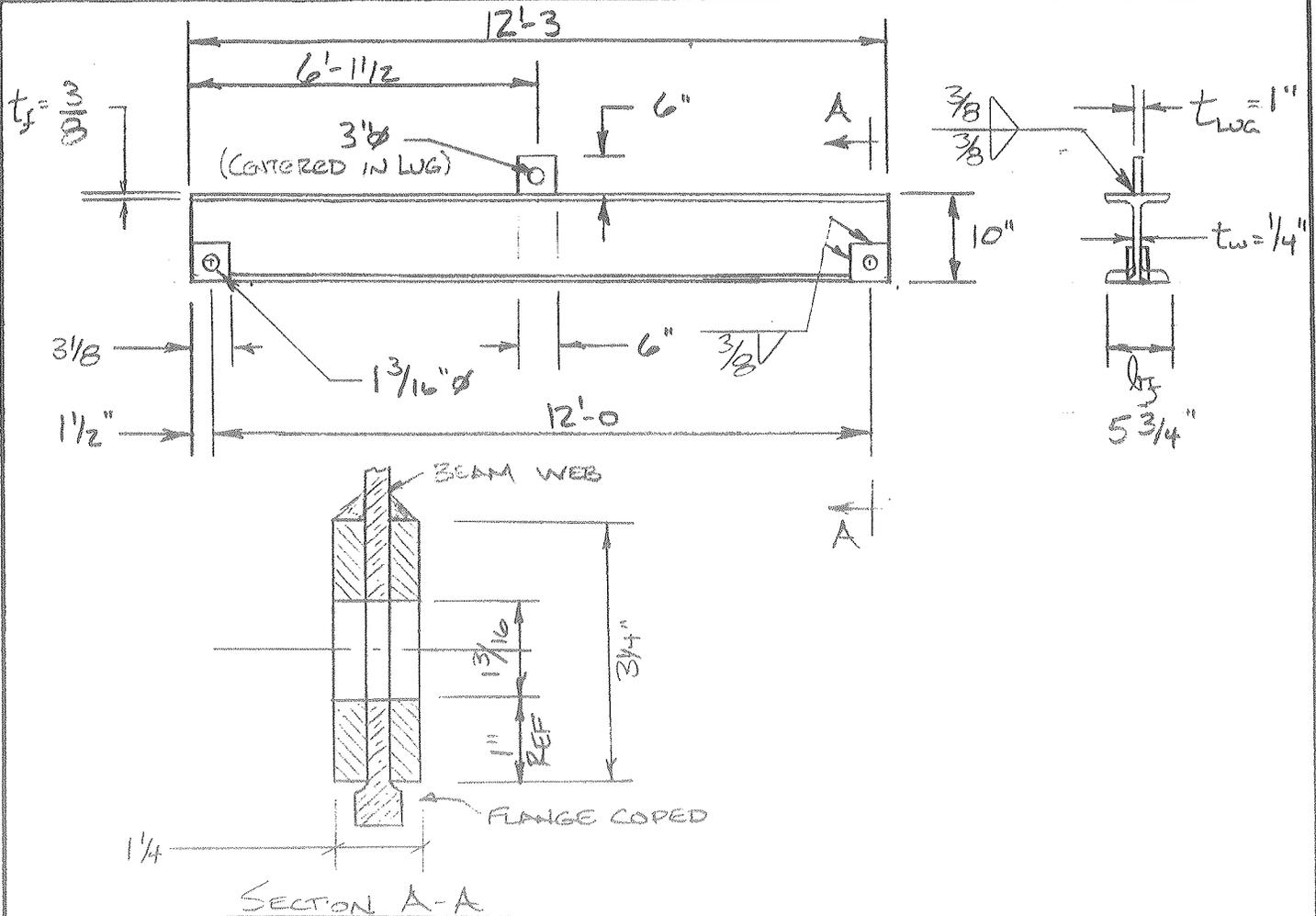
NAME

DAVE PUSKA

DATE

24 MAY '95

REVISION DATE



ASSUMPTIONS:

- 1) BEAM IS A36 MATERIAL (NOT 50 KSI MAT'L)
- 2) LUGS ARE MILD STEEL W/ 30 KSI F_y FIELD.
- 3) WELDS ARE E70XX MAT'L (70 KSI F_y FIELD).



SUBJECT

BEAM CAPACITY FOR 4 TON, ARGONNE BUILT
SPREADER BAR LIFTING FIXTURE

NAME

DAVE PISHKA

DATE

25 MAY '95

REVISION DATE

FROM AISI 5TH BEAM IS A W10x22, $t_w = 1/4$, $t_f = 3/8$, $d = 10 1/8$, $b_f = 5 3/4$
FROM THE ALLOWABLE MOMENTS TABLE, A W10x22 WITH
AN UNBRACED LENGTH HAS AN ALLOWABLE MOMENT OF 32.75 KIP-FT.

$$M = \frac{PL}{4} \quad \text{where } P = \text{TOTAL LOAD, } L = 144 \text{ IN}$$

$$\sigma = \frac{My}{I} = \frac{M}{S} \quad \text{where } S = 23.2 \text{ in}^3$$

$$\sigma_{\max} = \frac{F_y}{3} = \frac{36}{3} = 12 \text{ ksi} \quad \text{PER ASME B30.20}$$

$$M_{\max} = \sigma S = (12 \text{ ksi})(23.2 \text{ in}^3) = 278.4 \text{ KIP-IN}$$

$$P_{\max} = \frac{4M_{\max}}{L} = \frac{(4)(278.4)}{144 \text{ IN}} = 7.76 \text{ KIPS} = 7700 \#$$

$7700 \# > 8000 \# \therefore$ STRESS BASED CAPACITY EXCEEDS
THE 8000 # \therefore OK

CONSIDER AISI REQMTS.

$$M_{\max} = 32.75 \text{ KIP-FT} = \frac{PL}{4} \quad \therefore P_{\max} = \frac{(4)(32.75 \text{ KIP-FT})}{12 \text{ FT}} = 10.9 \text{ KIPS}$$

$10,900 \# > 8000 \# \therefore$ THE AISI ALLOWABLE MOMENT
BASED CAPACITY EXCEEDS THE
8000 # NUMBER \therefore OK.

SUMMARY - THE BEAM IS MORE THAN SUFFICIENT FOR
THE DESIGN CAPACITY.



SUBJECT

LUG STRING CALCULATIONS FOR 4 TON, ARGONNE BUILT
SPREADER BAR

NAME

DAVE POSHKA

DATE

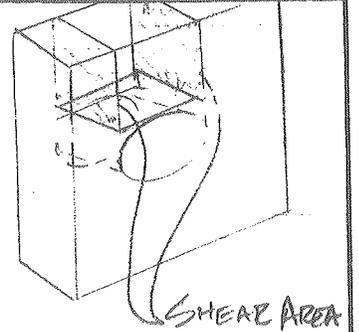
5/31/95

REVISION DATE

MAIN LUG -

$$\text{ASSUME } F_y = 30 \text{ ksi} \therefore \sigma_{\text{MAX}} = 10 \text{ ksi}$$

$$\text{SHEAR AREA} = 2(t_{\text{LUG}}) \left(\frac{6-3}{2} \right) = 3 \text{ in}^2$$



$$P_{\text{MAX SHEAR}} = \sigma_{\text{MAX}} A_{\text{SHEAR}} = (10 \text{ ksi})(3 \text{ in}^2) = 30,000 \# > 8 \text{ TONS} \therefore \text{OK}$$

$$\text{TENSILE AREA} = (t_{\text{LUG}})(6-3) = 3 \text{ in}^2$$

$$P_{\text{MAX TENSILE}} = \sigma_{\text{MAX}} A_{\text{TENSILE}} = (10 \text{ ksi})(3 \text{ in}^2) = 30,000 \# > 8 \text{ TONS} \therefore \text{OK}$$

END LUGS -

$$\text{ASSUME } F_y = 30 \text{ ksi} \therefore \sigma_{\text{MAX}} = 10 \text{ ksi}$$

$$\text{SHEAR AREA} \approx (2)t(1") = (2)(1/4)(1") = 2.5 \text{ in}^2$$

$$P_{\text{MAX SHEAR}} = \sigma_{\text{MAX}} A_{\text{SHEAR}} = (10 \text{ ksi})(2.5 \text{ in}^2) = 25,000 \# > \frac{8 \text{ TONS}}{2}$$

$$\text{TENSILE AREA} \approx (3/4 - 13/16)(1/4) = 2.57 \text{ in}^2$$

$\therefore \text{OK}$

$$P_{\text{MAX TENSILE}} \approx \sigma_{\text{MAX}} A_{\text{TENSILE}} = (10 \text{ ksi})(2.57 \text{ in}^2) = 25,700 \# > \frac{8 \text{ TONS}}{2}$$

$\therefore \text{OK}$

SUMMARY - THE MAIN LUG AND THE END LUGS ARE MORE THAN SATISFACTORY FOR THE 16,000 LOAD ON THE 8000 # LOAD FOR THE END LUGS.



SUBJECT

LOG TO BEAM WELD SIZING.

NAME

DAJE PISHKA

DATE

31 MAR '95

REVISION DATE

MAIN LOG -

(2) LENGTHS OF $\frac{3}{8}$ " FILLET EACH 6" LONG.

$$P = A F_v = 0.707 w \times l \times F_v$$

$$F_v = \frac{1}{3} F_y \text{ OF THE BASE METAL} = \frac{1}{3} (30 \text{ ksi}) = 10 \text{ ksi}$$

OR

$$0.3 F_y \text{ OF THE WELD METAL} = (0.3) (70 \text{ ksi}) = 21 \text{ ksi}$$

$$\therefore \text{USE } F_v = 10 \text{ ksi}$$

$$P_{\text{MAX}} = (0.707) \left(\frac{3}{8}\right) (6") (2) (10 \text{ ksi}) = 31,800 \# > 16,000 \#$$

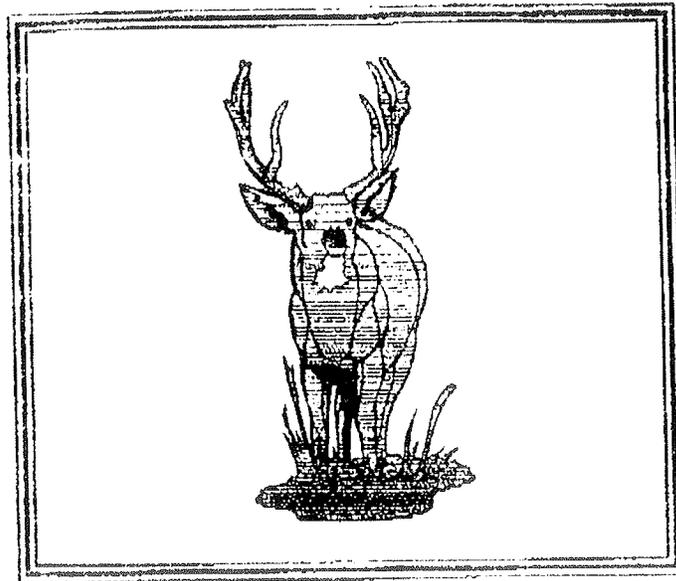
 \therefore MAIN LOG WELD IS SATISFACTORY

END LOGS -

(2) LENGTHS OF $\frac{3}{8}$ " FILLET, 1 @ $3\frac{1}{4}$ " LG & 1 @ $3\frac{1}{8}$ " LG.AS ABOVE, USE $F_v = 10 \text{ ksi}$

$$P_{\text{MAX}} = 2 (0.707) \left(\frac{3}{8}\right) \left(3\frac{1}{4} + 3\frac{1}{8}\right) (10 \text{ ksi}) = 33,800 \# > 8000 \#$$

 \therefore THE END LOGS ARE SATISFACTORY



RIGGING SERVICES FAX

TO: AL GUTHAKE FAX#: 840-4263

DATE: 5-22-95

FROM: FRANK SCHOEN, RIGGER FOREMAN
 ARGONNE NATIONAL LABORATORY
 9700 SO. CASS AVE. BLDG. 46
 ARGONNE IL. 60439

Transmitted herewith to you the following 1 page(s) not including the cover sheet. If any part is received poorly or missing, please call immediately.

Confirmation: (708) 252-7099

FAX: (708) 252-7514

ARGONNE
NATIONAL
LABORATORY

INTRA-LABORATORY MEMO

January 26, 1995

To: John Benkert
From: Frank Schoen
Subject: **Certification of Spreader Bar Bldg. 314**

Spreader Bar #314-001 was load tested with test weights totaling 10,000 lbs. This test was conducted by the following personnel:

Dave Smiley	PR# 46414
John Cozzie	PR# 46418
Roy Griparis	PR# 45168
Jesus Alvarez	PR# 45108

Spreader Bar #314-001 was subsequently marked with 8000 lb. cap. sign. This test was witnessed by Frank A. Schoen, Rigger foreman PFS/SS.

Thank you for your help in this matter