

LIFTING DEVICE

DEVICE NAME: Collider Detector End Wall Hadron Module Lifting
Fixture

ENGINEERING NOTE NUMBER: 53

APPLICABLE STANDARD: ANSI/ASME B30.20 - 1985

RATED LOAD: 6 Ton

TEST LOAD: 7.5 Ton

TEST LOAD PERCENT: 125%

LAST LOAD TEST DATE: 8/18/92

COLOR: Yellow

STRESS CALCULATIONS:

Done by: Chad Korte

Date: 5-4-92

Reviewed by: JOHN PAWLAK

Date: 11/13/92

REMARKS:

IDENTIFICATION:

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



September 15, 1992

To: John Grimson
From: John Pawlak
Subject: Collider Detector End Wall Hadron Module Lifting Fixture

John,

I've reviewed the lifting fixture engineering note. It meets my approval. Please note the following:

- 1) The cover sheet needs a manufacture date.
- 2) The cover sheet should probably have the fixture ID number (51) listed in the now empty space for the property number.
- 3) ANSI B30.20 states that the fixture should have the lifter weight, if over 100 LB, marked on the fixture.
- 4) ANSI B30.20 also states that "a lifter shall be designed to withstand the forces imposed by its rated load, with a minimum design factor 3, based on yield strength, for load bearing structural components." Chad consistently multiplied the yields by 0.6 to calculate allowables, a design factor of 1.6. He should really have multiplied by 0.33. I believe, however, that the computed stresses are still less than the new allowables:

Stress	Actual [psi]	Allowable [psi]
Upper Right Plate Tear Out	1,404	12,000
Upper Right Plate Bearing	4,087	12,000
Upper Left Plate Tear Out	1,734	12,000
Upper Left Plate Bearing	5,046	12,000
Lower Right Point Stress	213	12,000
Lower Left Point Stress	185	12,000
Right Plate Bending Stress	9,245	12,000
Left Plate Bending Stress	1,513	12,000
Center Beam Bending Stress	2,346	15,300

Below-the-Hook Lifting Device Engineering Note

Prepared By Chad Korte Date 5-4-92 Div/Sect RD/CDF
 Reviewed By JOHN PAWLAK Date 9-15-92 Div/Sect RD/CDF
 Div/Dept Head By John Casper Date 11/16/92 Div/Sect RD/CDF

I. Identification and Verification of Compliance

Fill in the Fermilab Engineering Conformance Label Information below;
 This below-the-hook lifting device conforms to Engineering
 Standard ????

Lifting Device Title Collider Detector End Wall Hadron Module Lifting Fixture
 Lifting Device Drawing Number 2563.2-MD-134437
 Rated Maximum Load 6 Tons
 Designer/Manufacturer FERMILAB
 Date Manufactured _____
 Proof Test Load 7.5 Tons Date 8/18/92

Director's signature (or designee) if lifting device requires an
 exception to the provisions of this standard. _____

II. Description of the Lifting Device

Laboratory location code CDF
 Laboratory property number _____

Is a testing procedure necessary for the safe proof testing of this
 lifting device? No

If yes, supply the written procedure with this Engineering Note.

Is an operating procedure necessary for safe operation of this lifting
 device? No

If yes, supply the written procedure with this Engineering Note.

Welding Information

Has the lifting device been fabricated in a Fermilab Shop? _____

If yes, append a copy of the welding shop statement of welder
 qualifications.

Amendment No.:

Reviewed By:

Date:



SUBJECT

Collider Detector End wall Hadron
Module Lifting Fixture

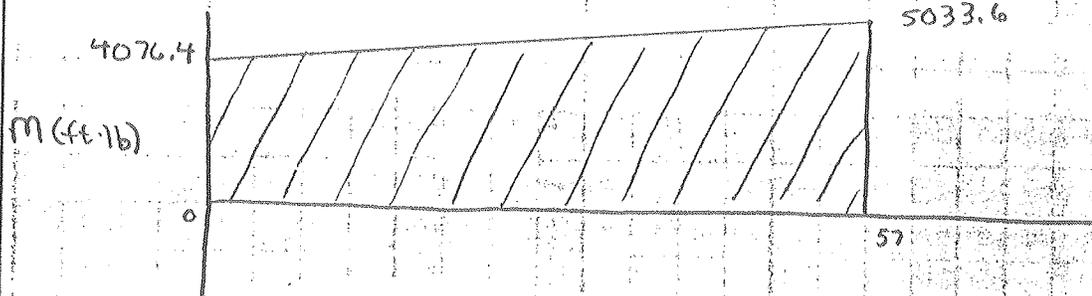
NAME

Chad Korte

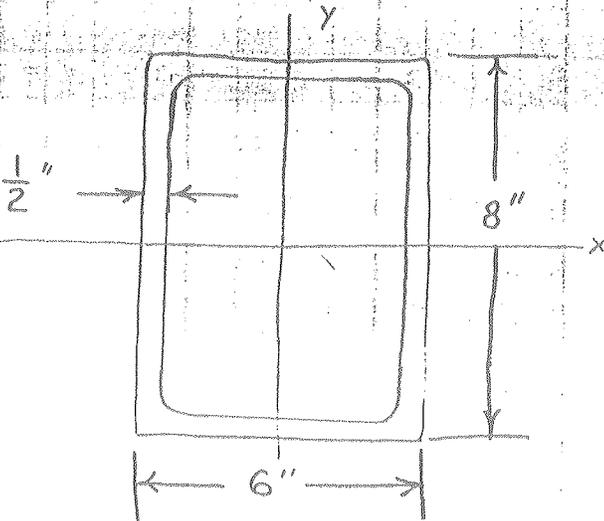
DATE

5-4-92

REVISION DATE



Tubing



$$A = 12.4 \text{ in}^2$$

$$I_x = 103 \text{ in}^4$$

$$w_t = 42.05 \text{ lb/ft}$$

F. Bending Stress at Center Beam

$$M_{\max} = 5033.6 \text{ ft}\cdot\text{lb}$$

$$\sigma = \frac{MC}{I} = \frac{(5033.6 \text{ ft}\cdot\text{lb}) (12 \frac{1}{2} \text{ ft}) (4 \text{ in})}{103 \text{ in}^4}$$

$$\sigma = 2345.76 \text{ psi}$$

$$\sigma_{\text{allow}} = 27.6 \text{ ksi}$$

$$\sigma_{\text{allow}} = 46 \text{ ksi} \cdot 0.33 = 15.3 \text{ ksi}$$

STILL O.K.



SUBJECT

Collider Detector End Wall Hadron
Module Lifting Fixture

NAME

Chad Korte

DATE

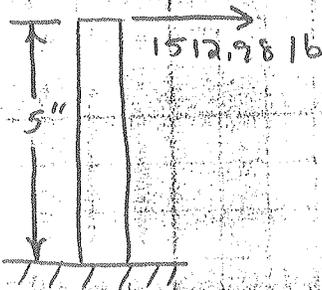
5-4-92

REVISION DATE

Left Plate

$$F_A = 5884.76 \text{ lb}$$

$$F_L = 5884.76 (\cos 72.73) (\cos 30) = 1512.98 \text{ lb}$$



$$I = \frac{1}{12} (3 \text{ in}) (1 \text{ in})^3 = \frac{3}{12} \text{ in}^4$$

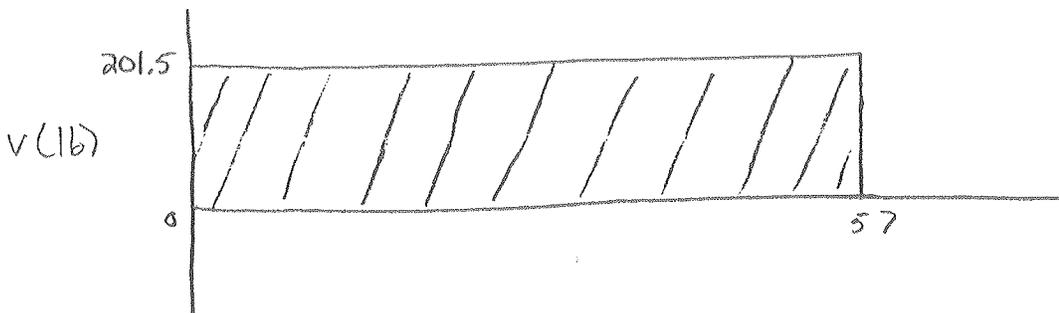
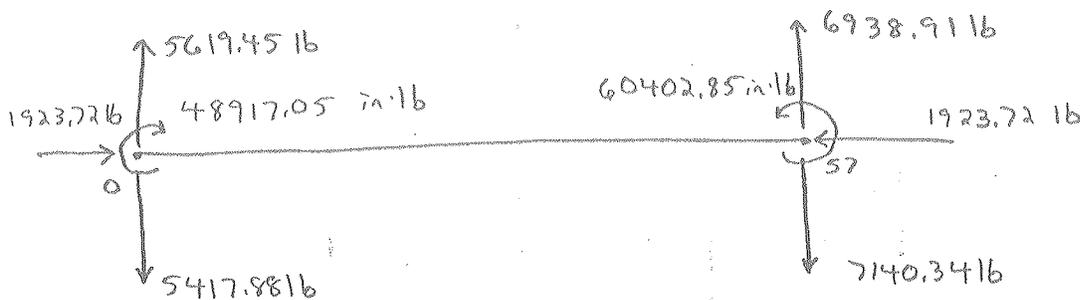
$$C = \frac{1}{2} \text{ in}$$

$$M = (5 \text{ in}) (1512.98 \text{ lb})$$

$$\sigma = \frac{M C}{I} = \frac{(7564.9 \text{ in}\cdot\text{lb}) (0.5 \text{ in})}{(0.25 \text{ in}^4)} = 15129.8 \text{ psi}$$

$$\sigma_{allow} = 21.6 \text{ ksi}$$

E. Shear and Bending Moment Diagrams for Center Beam





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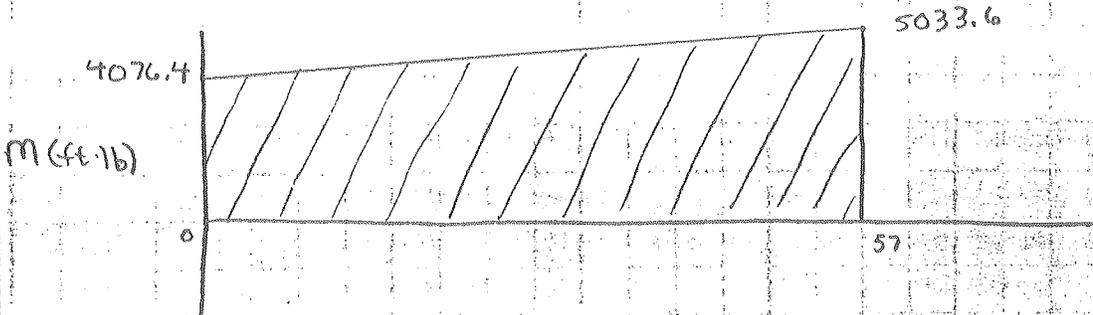
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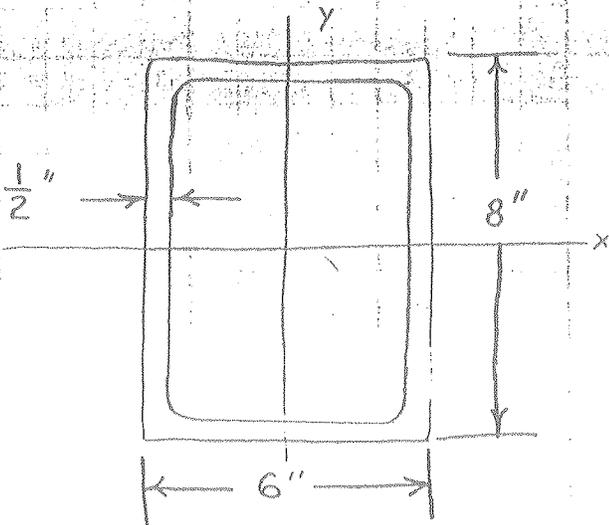
DATE

5-4-92

REVISION DATE



Tubing



$$A = 12.4 \text{ in}^2$$

$$I_x = 103 \text{ in}^4$$

$$w_t = 42.05 \text{ lb/ft}$$

F. Bending Stress at Center Beam

$$M_{max} = 5033.6 \text{ ft}\cdot\text{lb}$$

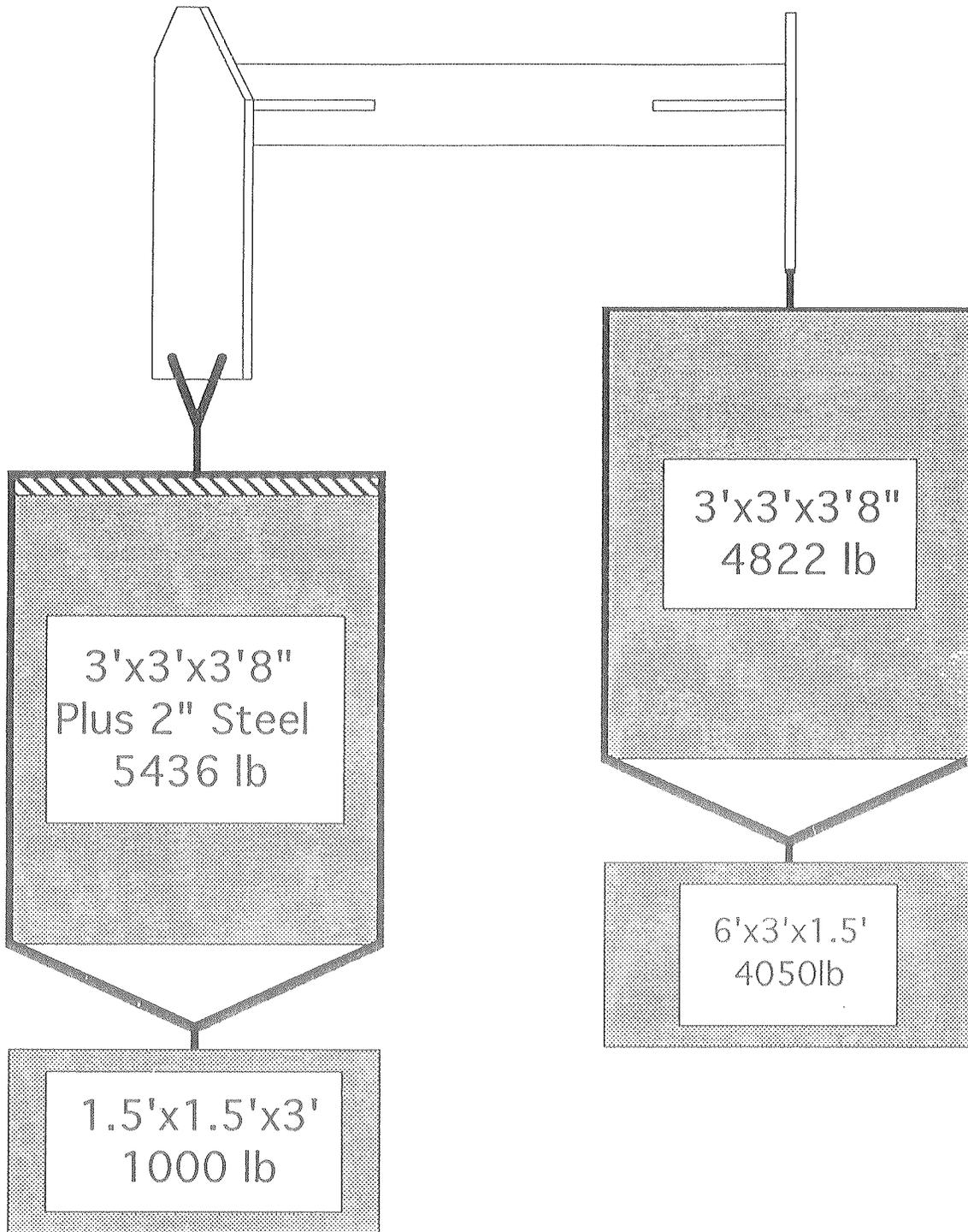
$$\sigma = \frac{Mc}{I} = \frac{(5033.6 \text{ ft}\cdot\text{lb}) (12 \frac{1}{2} \text{ ft}) (4 \text{ in})}{103 \text{ in}^4}$$

$$\sigma = 2345.76 \text{ psi}$$

$$\sigma_{allow} = 27.6 \text{ ksi}$$

$$\sigma_{allow} = 46 \text{ ksi} \times 0.33 = 15.3 \text{ ksi}$$

STILL OK



Total Weight = 15,308 lb
 127.5% of Rated Load

DRAWN BY CHAD KORTE		DATE 5/11/92
APPROVED BY		DATE
 FERMI NATIONAL ACCELERATOR LABORATORY UNITED STATES DEPARTMENT OF ENERGY		
END WALL HADRON MODULE LIFTING FIIXTURE LOAD TEST		
SCALE REF	DRAWING NO.	REV A



ENGINEERING NOTE

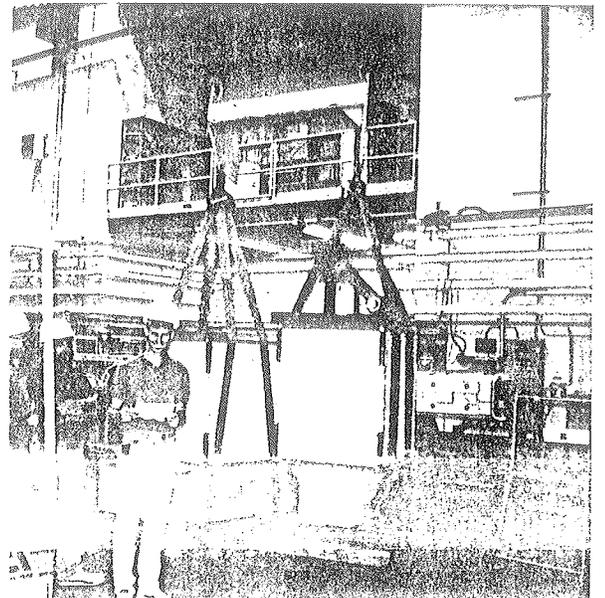
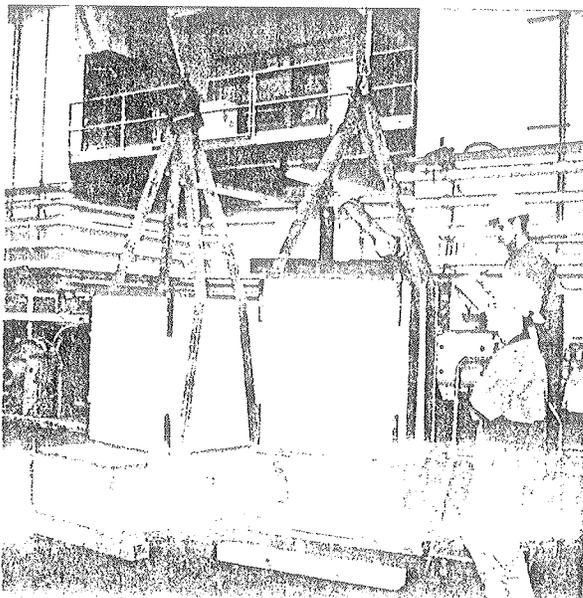
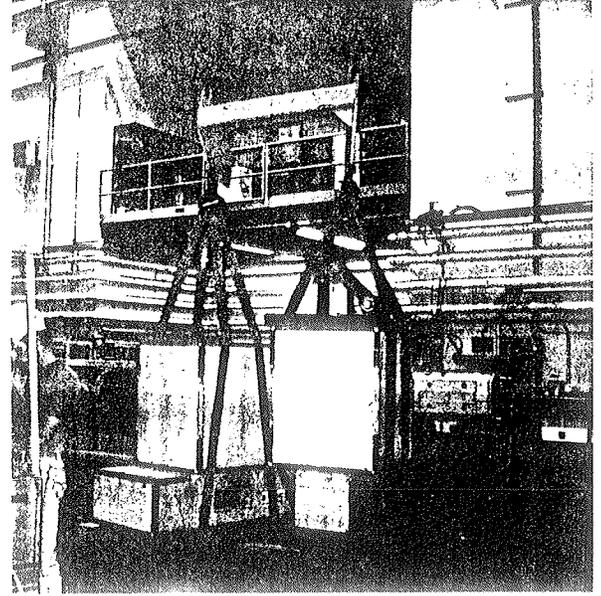
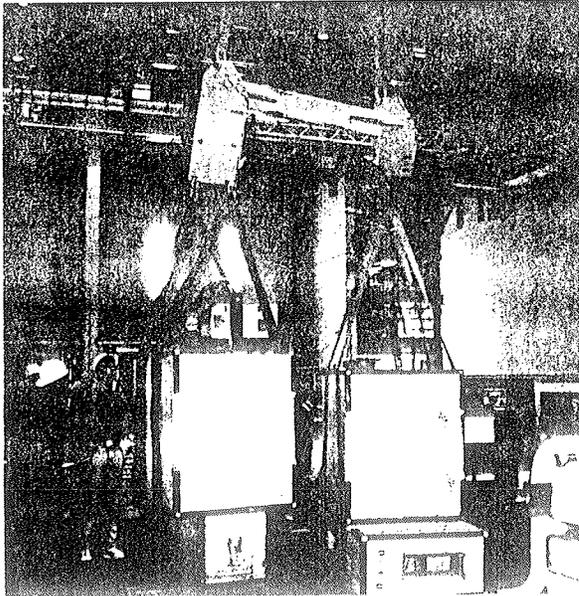
SUBJECT

NAME

DATE

8/18/92

REV. NO. / DATE



11/11/92

