BELOW-THE-HOOK LIFTING DEVICE
Engineering Note Cover Page

Lifting Device Numbers: 115

FNAL Site No.: _____ if applicable Div. Specific No.: _____ if applicable Asset No. _____ if applicable

ASME B30.20 Group: (check one)
- ✓ Group I Structural and Mechanical Lifting Devices
- Group II Vacuum Lifting Devices
- Group III Magnets, Close Proximity Operated
- Group IV Magnets, Remote Operated

Device Name or Description: D∅ CFT lifting fixture

Device was: (check all applicable)
- Purchased from a Commercial Lifting Device Manufacturer
  - mfg. name: _____
- ✓ Designed and Built at Fermilab
- Designed by Fermilab and Built by a Vendor
  - Assy drawing number: _____
- Provided by a User or Other Laboratory
- Other. Describe: _____

Engineering Note Prepared by: John Krider - JCK Date: 6/19/00

Engineering Note Reviewed by: Brent Anderson Date: 7/13/00

Lifting Device Data:

Capacity: 700 lb

Fixture Weight: 340 lb

Service: (normal) heavy severe (refer to B30.20 for definitions)

Duty Cycle: _____ 8, 16 or 24 hour rating (applicable to groups III, and IV)

Inspections Frequency: Before each use

Rated Load Test by FNAL (if applicable): Date: 6/16/00 Load: 916 lb

Check if Load Test was by Vendor and attach the certificate.

Satisfactory Load Test Witnessed by: John Krider

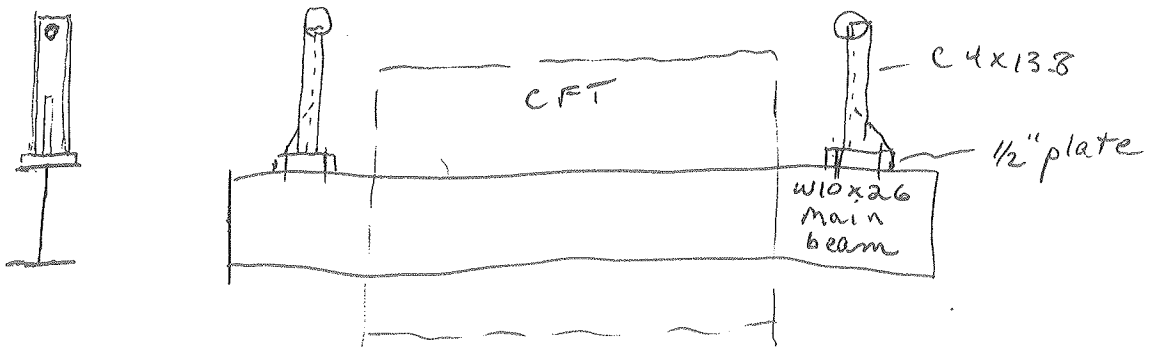
Signature (of Load Test Witness): J. C. Krider

Notes or Special Information:

Use a spreader bar with slings positioned to lift perpendicular to the top surface of the main beam. Avoid side loading of the channel brackets attached to the beam.

J. Krider
6-20-00

All components are structural steel.



total weight = fixture + load = 340 + 700 = 1040 lb

Stress in lifting channel (C4x13.8)

$$\sigma = \frac{1040\ lb/2}{2.5\ in^2} = \boxed{208\ lb/in^2}$$

Stress in weld at base of channel ($\frac{1}{4}$" fillet x 12" long)

$$\sigma \approx \frac{1040/2}{3\ in^2} = \boxed{173\ lb/in^2}$$

Stress in bolts and nuts in tension (two 1/2-13 bolts equally share approx 80% of load on each channel)

$$\sigma \approx \frac{\text{load/bolt}}{\text{effective cross section}} = \frac{(1040/4)\times 0.8}{0.142\ in^2} = \frac{208\ lb}{0.142\ in^2} = \boxed{1460\ lb/in^2}$$

Stress in main beam:

σ = stress due to its own weight + stress due to CFT

$$\approx \frac{(310\ lb)(120\ in)}{8\ (27\ in^2)} + \frac{(1040\ lb)(3\ in)}{27\ in^2} = 172 + 116 = \boxed{288\ lb/in^2}$$

All peak stresses are less than 10% of the allowable stresses for lifting fixtures.

FERMILAB

ENGINEERING NOTE

SECTION	PROJECT	SERIAL-CATEGORY	PAGE

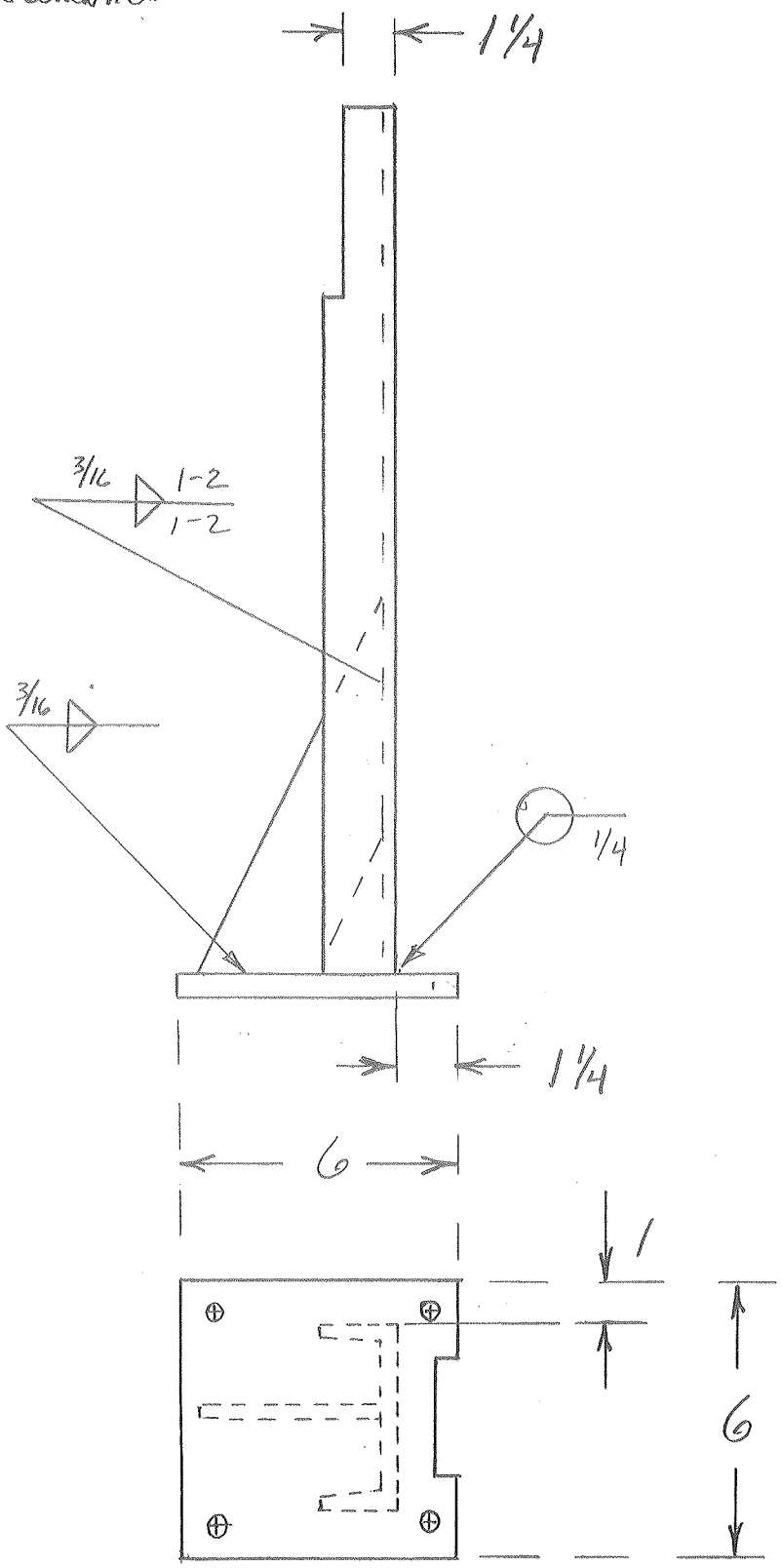
SUBJECT: DØ CFT installation
Lift bracket weldment

NAME: J. Krider

DATE: 6/9/00

REVISION DATE:

Materials: C4 column 18½" long - structural steel, any weight
↳ 13.8 lb/ft actually used
1/2 x 6x6 base plate
1/4 x 4x8 gusset (¼x2½ flat)
2 assemblies



FERMILAB

ENGINEERING NOTE

SECTION	PROJECT	SERIAL-CATEGORY	PAGE

SUBJECT: DØ CFT installation
Lift bracket base plate

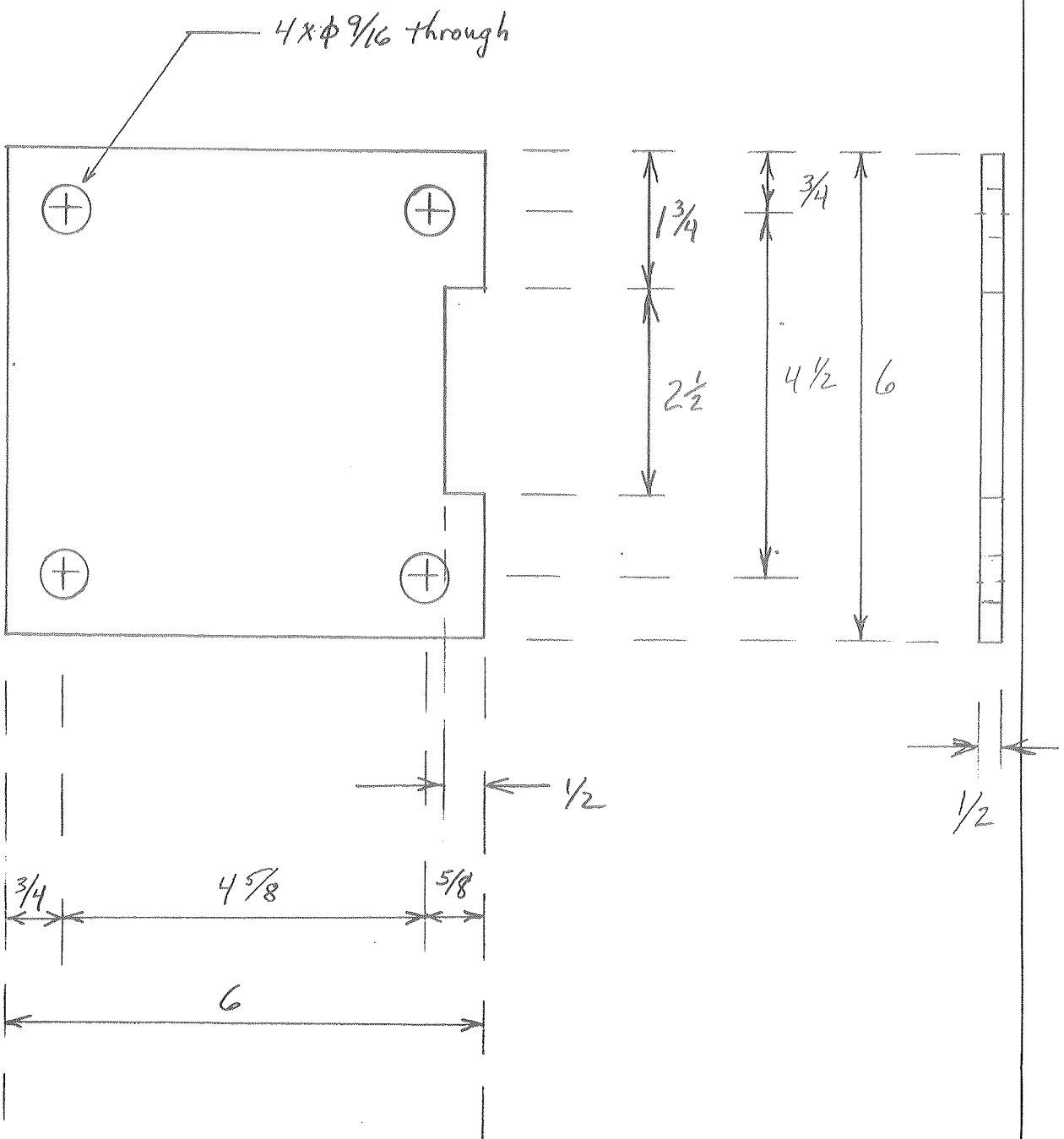
NAME: J. Krider

DATE: 6/9/00

REVISION DATE:

½ x 6 x 6 steel plate

2 pieces



Date: Mon, 10 Jul 2000 15:59:41 -0500 (CDT)
From: John Krider <krider@fnal.gov>
To: banderso@fnal.gov
Cc: krempetz@fnal.gov
Subject: Correction to CFT lifting fixture weld stress calculation

Brent,

The actual weld area at the base plate of the CFT lifting bracket column and gusset plate, as built with heavier gauge materials than originally requested, is:

(4+4+2.5+2+2.5+2 in)x(0.25 in)x(cos45deg) + (6.1 in)x(0.188 in)x(cos45deg)

= 3.82 sqin

So the average stress in the weld is:

(520 lb)/(3.82 sqin)

= 136 lb/sqin

Because of the geometry of the lifting fixture, the stress is not uniform at all points in the weld. The peak weld stress occurs along the web of the channel and is probably on the order of 20% higher than the average stress. Therefore, the peak stress is estimated to be 163 lb/sqin, still slightly less than the originally calculated value, and vastly below allowable weld stresses.

If you still have the original copy of the engineering note, you could just attach a copy of this email message amending it. Otherwise, let me know and I will send you the same documents by lab mail.

John