BELOW-THE-HOOK LIFTING DEVICE
Engineering Note Cover Page

Lifting Device Numbers:

FNAL Site No/ _____ (If applicable) Div. Specific No. 141 (If applicable) Asset No. _____ (If applicable)

ASME B30.20 Group: (check one)
- [x] 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: NuMI Water Skid Inst Fixture

Device was (check all applicable)
- [ ] Purchased from a Commercial Lifting Device Manufacturer. Mfg Name _____
- [x] Designed and Built at Fermilab
- [ ] Designed by Fermilab and Built by a Vendor. Assy drawing number 8875.117-MD-427375
- [ ] Provided by a User or other Laboratory
- [ ] Other: Describe _____

Engineering Note Prepared by D. Pushka Date 8 Jan 2004

Engineering Note Reviewed by A. Lee Date 1-12-2004

Lifting Device Data:

Capacity 4000 #

Fixture Weight 300 #

Service: [x] 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 use

Rated Load Test by FNAL (if applicable) Date 1/12/04 Load 5000 #

[ ] Check if Load Test was by Vendor and attach the certificate

Satisfactory Load Test Witnessed by: John Voirin

Signature (of Load Test Witness) [signature] 01/9/40

Notes or Special Information: Used for Target, Horn 1, Horn 2, Decay U.S., Decay D.S., Absorber Rad, Absorber Intermediate, & Minos LCW Skids. - Two lifting fixtures have been built.

NuMI WATER SKID INSTALLATION FIXTURE WAS SIZED FOR 2500# CAPACITY. ACTUAL WEIGHT OF SKIDS IS 3000 TO 4000#. AS MEASURED IN NEW MUON.

THESE CALCULATIONS ARE TO SHOW THE EXISTING DESIGN IS GOOD FOR THE HIGHER WEIGHTS.

BOLTS:

1/2-13 BOLTS ATTACH FIXTURE TO SKID. ASSUME LOAD IS EQUALLY SHARED BY EIGHT BOLTS.

$$P = \frac{4000\ \#}{8\ \text{BOLTS}} = 500\ \#. \quad \text{SINGLE SHEAR}$$

$$\tau = \frac{P}{A} = \frac{500\ \#}{\frac{\pi}{4}(0.5^2)} = 2546\ \text{psi}$$

ALLOWABLE STRESS FOR CLASS 2 (CHEAP) BOLTS IS $\frac{F_y}{3} = \frac{45{,}000\ \text{psi}}{3} = 15{,}000\ \text{psi}$

ACTUAL STRESS < ALLOWABLE STRESS ∴ OK

VERTICAL CHANNELS:

C4 × 7.25 CHANNEL IS USED TO CARRY LOAD IN TENSION.

$A = 2.13\ in^2$

$\sigma_{ALLOW} = \frac{F_y}{3} = \frac{36{,}000\ psi}{3} = 12{,}000\ psi$

ASSUME 100% OF LOAD IS ON 1 CHANNEL:

$\sigma_{ACTUAL} = \frac{4000\ \#}{2.13\ in^2} = 1877\ psi$

$\sigma_{ACTUAL} < \sigma_{ALLOWABLE}$ ∴ OK

ASSUME 100% OF LOAD IS ON 2 BOLTS @ TOP OF CHANNEL, 2 @ 1/2-13 SCREWS

$A = (2)\frac{\pi}{4}(.5^2) = 0.39\ in^2$

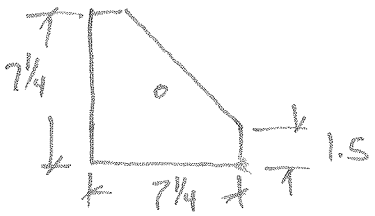
$\sigma = \frac{P}{A} = \frac{4000\ \#}{0.39} = 10{,}185\ psi$

$\sigma_{ALLOW} = \frac{F_y}{3} = \frac{45{,}000}{3} = 15{,}000\ psi$

$\sigma_{ACTUAL} < \sigma_{ALLOWABLE}$ ∴ OK

SKID LIFTING FIXTURE	7 JAN 2004	D. PARKER

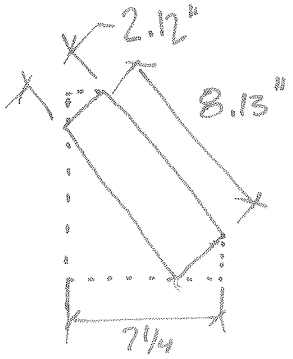
LIFTING PLATE:



3/4" THICK A36

$$\sigma_{ALLOWABLE} = \frac{F_y}{3} = \frac{36{,}000\ psi}{3} = 12{,}000\ Psi$$

CONSIDER AS A BEAM:



$l = 8.13"$

$b = 3/4"$

$d = 2.12"$

$$I = \frac{1}{12} d b^3 = \frac{1}{12} \cdot 2.12 \cdot (3/4)^3$$

$$= 0.0746\ in^4$$

$$M = \frac{Pl}{4}\ ;\quad \sigma = \frac{My}{I}\ ;\quad y = 3/8"$$

$$\sigma = \frac{Pl}{4} \cdot \frac{3/8\ in}{0.0746\ in^4} = P \cdot 8.13\ in \cdot \frac{1}{4} \cdot \frac{3}{8}\ in \cdot \frac{1}{0.0746\ in^4}$$

$$\sigma = P \cdot 10.217 \quad (psi)$$

IF LOAD IS EQUALLY DISTRIBUTED, $P = \frac{4000\#}{4\ LEGS} = 1000\#$

$$\sigma_{ACTUAL} = (1000\#)(10.217\ in^{-2}) = 10{,}216\ psi$$

$$\sigma_{ACTUAL} < \sigma_{ALLOWABLE} \therefore OK$$

	7 JAN 2004	D. PUSHKA

LIFTING SLINGS:

SKID WILL BE LIFTED WITH 4 SLINGS. NYLON SLINGS DO STRETCH A BIT, THEREFORE THE LOAD WILL BE DIVIDED BY THE FOUR SLINGS AND NOT JUST 2 AS POSTULATED BY ED LAVALLIE'S NOTE.

AN INSPECTION OF THE SKIDS SHOW THAT THE C.G. IS NEAR THE GEOMETRIC CENTER OF THE SKID, SO IT IS REASONABLE TO ASSUME THE LOAD IS EQUALLY SHARED BY THE FOUR LIFTING POINTS.

	7 JAN 2004	D. PUSHKA

EYE BOLTS:

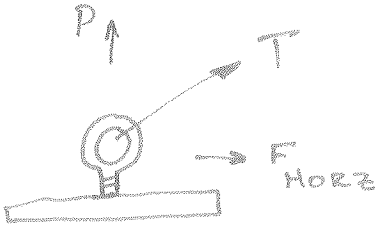
LIFTING PLATES ARE LIFTED VIA 1/2-13 EYE-BOLTS.

ALLOWABLE
CATALOG CAPACITY OF FORGED EYE BOLTS, 1/2-13 IS 2500# IN THE VERTICAL

EVEN IF THE VERTICAL LOAD WAS TAKEN BY ONLY 2 EYE BOLTS, $P = \frac{4000}{2} = 2000\#$ THE LOAD WOULD BE LESS THAN THE ALLOWABLE CAPACITY

∴ OK

ASSUME 45° ∠ ON SLINGS

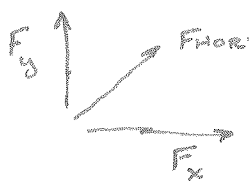


$$T = \frac{P}{\cos 45} = \frac{P}{.707}$$

$$P = \frac{4000\ \#/\text{SKID}}{4\ \text{BOLTS/SKID}} = 1000\#\ \text{PER EYEBOLT}$$

$$T = \frac{P}{\sin 45} = \frac{1000\#}{.707} = 1,414\#$$

$F_{HORZ} = 1000\#$



$F_x = F_y = 707\#$

∴ COMPRESSION IN THE C5 x 6.7 CHANNELS IS 707#

SIDE CHANNELS:

COMPRESSION = 707 #

C5 × 6.7 — $A = 1.97\ in^2$, $r_{x-x} = 1.95$, $r_{y-y} = 0.493$

$\therefore$ COMPRESSIVE STRESS = $\frac{P}{A} = \frac{707\ \#}{1.97\ in} = 358\ psi$

ALLOWABLE STRESS:

length = 60 inches

$K = 2.0$

$C_c = \sqrt{\frac{2\pi^2 E}{F_y}} = \sqrt{\frac{2\pi^2 \times 29 \times 10^6}{36{,}000}} = 126.09\ in$

$Kl/r = \frac{(2.0)(60)}{1.95} = 61.5$

$= \frac{(2.0)(60)}{.493} = 243.4$ ← DRIVES

$Kl/r > C_c \therefore F_a = \frac{12\pi^2 E}{23(Kl/r)^2}$

$= \frac{12 \cdot \pi^2 \cdot 29{,}000{,}000}{23 \cdot (2.0 \cdot 60/.493)^2}$

$= 2520\ psi$

ACTUAL STRESS (358 psi) < ALLOWABLE STRESS (2520 psi)

$\therefore$ OK

8 Jan 2004 | D. Pushka

Welds btw Lifting Plate & Channels

Load = 1000 #

Weld Material has a 70,000 psi Yield. ∴ Allowable stress = $\frac{70{,}000}{3}$ = 23,000 psi = F_v

1/4" Fillet Welds are used.

$P = A \cdot F_v = 0.707 * 1/4" * l * F_v$

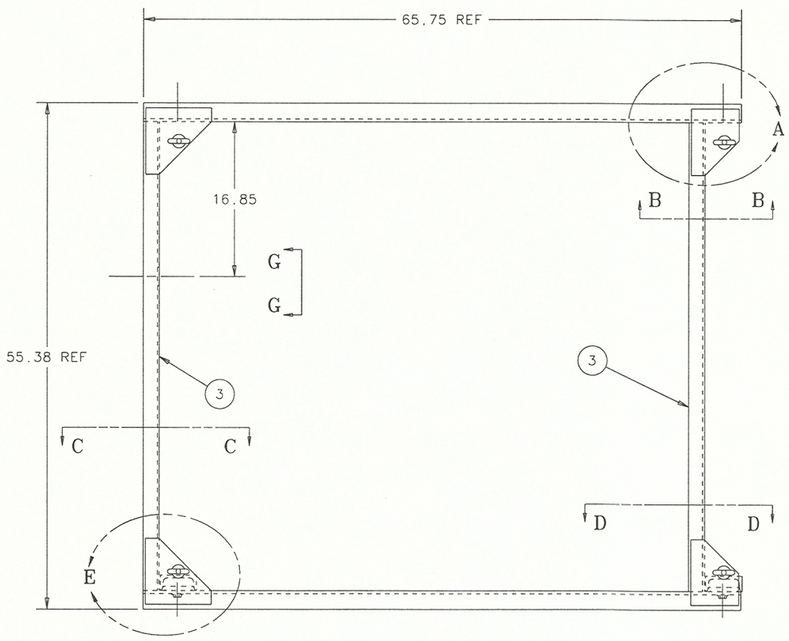
$1000\# = 0.707 * 1/4" * l * 23{,}000$

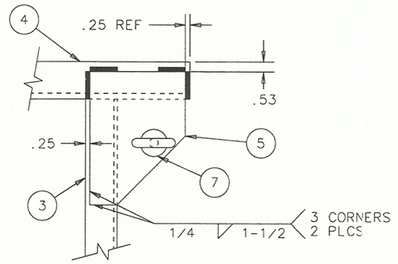
$\therefore l_{min} = \frac{1000}{.707 * 1/4" * 23{,}000} = 0.246$ in

Actual weld length used is $6 * 1\frac{1}{2}" = 9"$

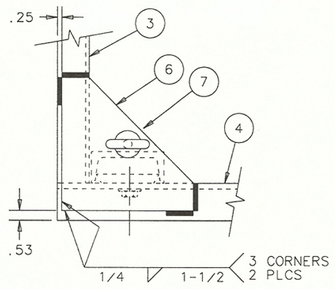
$9" > 0.246$ in ∴ OK

REV	DESCRIPTION	DRAWN	DATE
		APPROVED	DATE
A	1. ADDED .12 GAP	F. BROWNING	4-MAR-2003
	2. WAS 3.75		

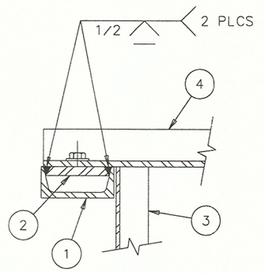




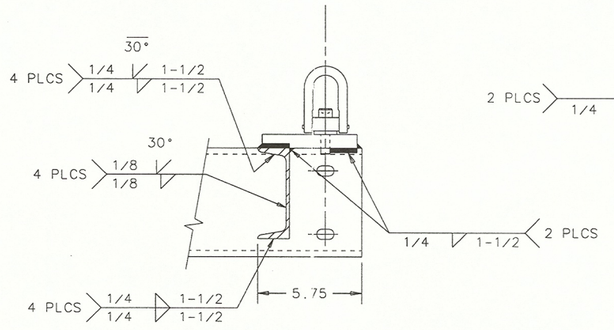
DETAIL A
SCALE: 1/4



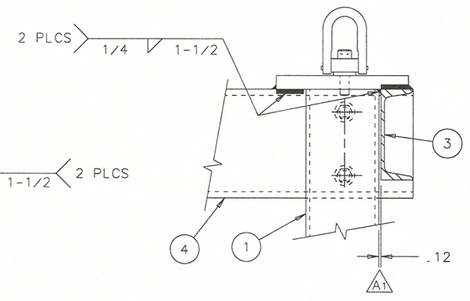
DETAIL E
SCALE: 1/4



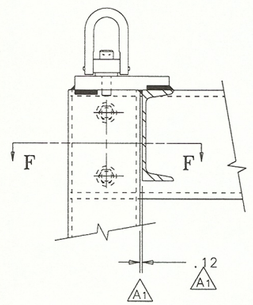
SECTION F-F
SCALE: 1/4



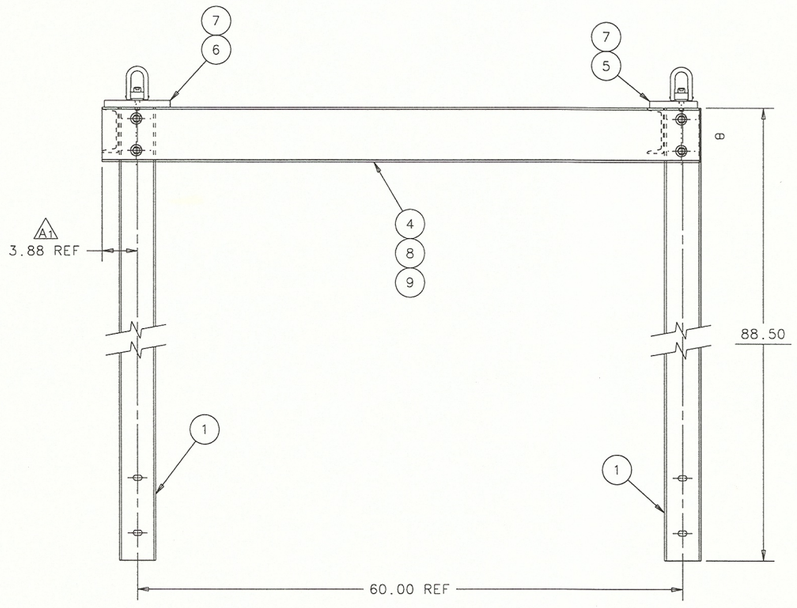
SECTION B-B
SCALE: 1/4

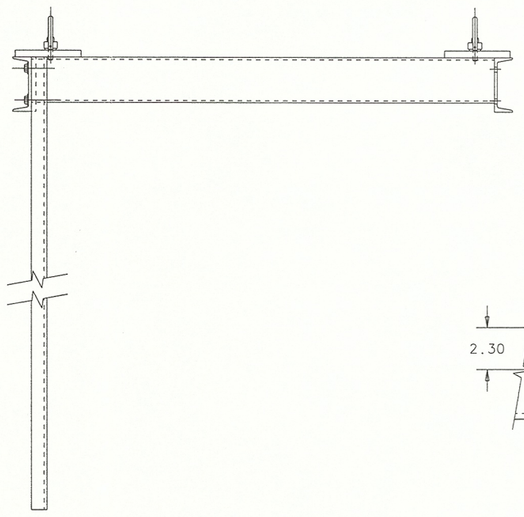


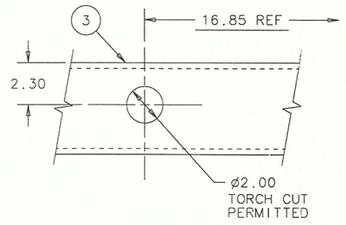
SECTION C-C
SCALE: 1/4



SECTION D-D
SCALE: 1/4







VIEW G-G
SCALE: 1/4

ITEM	PART NO.	DESCRIPTION OR SIZE	QTY.
9	COML	WASHER, FLAT 1/2 BOLT TYPE 18-8 SS	4
8	COML	BOLT, 1/2-13UNC X 1 LG HX. HD. TYPE 18-8 SS	4
7	COML	SWIVEL HOIST RING, 1/2"-13 UNC, 2,500# RATED LOAD, REID TOOL #SHR-23301	4
6	MB-427374	LIFTING PLATE "B"	2
5	MB-427373	LIFTING PLATE "A"	2
4	MC-427371	REAR CHANNEL - "A"	2
3	COML	CHANNEL, C5 x 6.7 x 51.32 LG. ASTM A36	2
2	MB-427372	MOUNTING PLATE	2
1	MC-427370	VERTICAL CHANNEL - "A"	2

PARTS LIST

UNLESS OTHERWISE SPECIFIED			ORIGINATOR	D.PUSHKA	02-DEC-2002
.XX	.XXX	ANGLES	DRAWN	D.FRIEND	02-DEC-2002
± .06	± ---	± ---	CHECKED	P.POLL	18-DEC-2002
			APPROVED	D.PUSHKA	18-DEC-2002

1. BREAK ALL SHARP EDGES .015 MAX.
2. DO NOT SCALE DRAWING.
3. DIMENSIONS BASED UPON ANSI Y14.5M-1982
4. MAX. ALL MACH. SURFACES 125

USED ON: ME-406249

MATERIAL: SEE PARTS LIST ABOVE

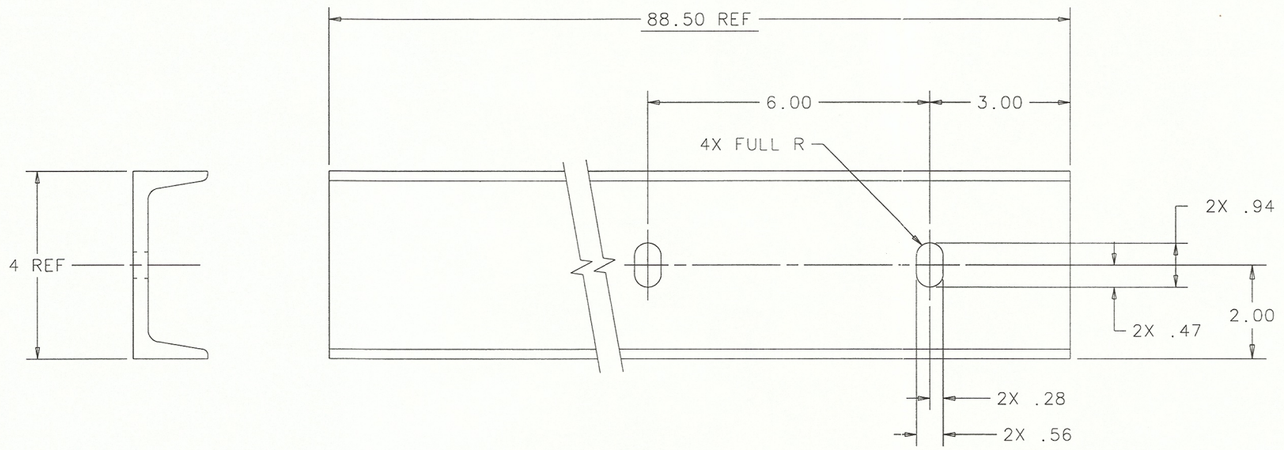
FERMI NATIONAL ACCELERATOR LABORATORY
UNITED STATES DEPARTMENT OF ENERGY

PPD/MECHANICAL DEPARTMENT
NUMI; HORN #1 & 2 RAW SKID
LIFTING FIXTURE ASSEMBLY #2

SCALE	DRAWING NUMBER	SHEET	REV
1/8	8875.117-MD-427375	1 OF 1	A

CREATED WITH : Ideas9m3 | GROUP: PPD/MECHANICAL DEPARTMENT

REV	DESCRIPTION	DRAWN	DATE
		APPROVED	DATE
A	.56 WIDE X .94 LONG SLOTS WERE 9/16 DRILL	F. BROWNING	4 MAR-2003



UNLESS OTHERWISE SPECIFIED			ORIGINATOR	D.PUSHKA	25-NOV-2002
.XX	.XXX	ANGLES	DRAWN	D.FRIEND	25-NOV-2002
± .06	± ---	± ---	CHECKED	P.POLL	17-DEC-2002
1. BREAK ALL SHARP EDGES .015 MAX. 2. DO NOT SCALE DRAWING. 3. DIMENSIONS BASED UPON ANSI Y14.5M-1982 4. MAX. ALL MACH. SURFACES 125			APPROVED	D.PUSHKA	18-DEC-2002
			USED ON	MD-427375	
			MATERIAL	CHANNEL, C4 X 7.25 X 88.50 LG. ASTM A36 STEEL	

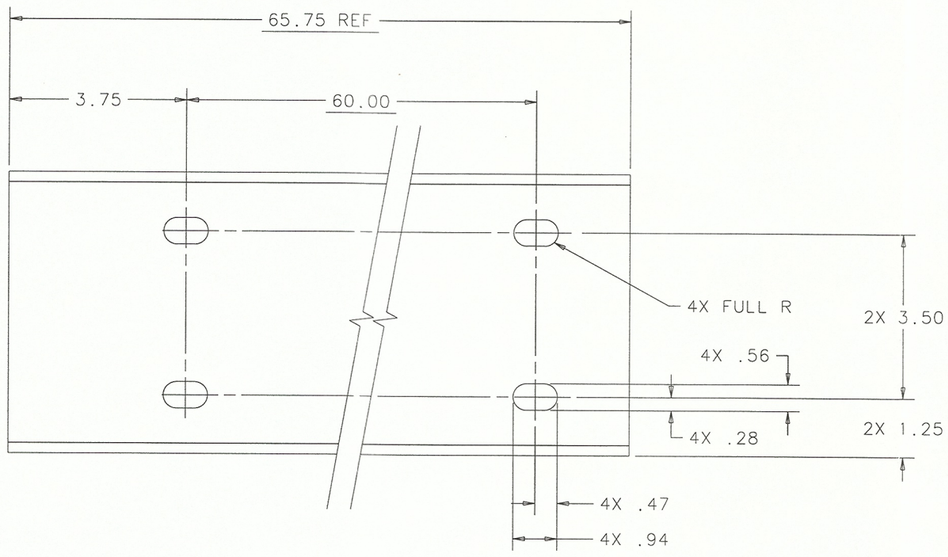
FERMI NATIONAL ACCELERATOR LABORATORY
UNITED STATES DEPARTMENT OF ENERGY

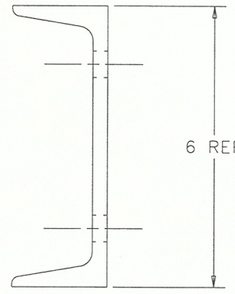
PPD/MECHANICAL DEPARTMENT NUMI; HORN #1 & 2 RAW SKIDS MOUNTING PLATE

SCALE	DRAWING NUMBER	SHEET	REV
1/2	8875.117-MC-427370	1 OF 1	A

CREATED WITH : Ideas9m3 | GROUP: PPD/MECHANICAL DEPARTMENT

REV	DESCRIPTION	DRAWN	DATE
		APPROVED	DATE
A	.56 WIDE X .94 LONG SLOTS WERE 9/16 DRILL	F. BROWNING	4-MAR-2003





UNLESS OTHERWISE SPECIFIED			ORIGINATOR	D.PUSHKA	25-NOV-2002
.XX	.XXX	ANGLES	DRAWN	D.FRIEND	25-NOV-2002
± .06	± ---	± ---	CHECKED	P.POLL	17-DEC-2002
			APPROVED	D.PUSHKA	18-DEC-2002

1. BREAK ALL SHARP EDGES .015 MAX.
2. DO NOT SCALE DRAWING.
3. DIMENSIONS BASED UPON ANSI Y14.5M-1982
4. MAX. ALL MACH. SURFACES 125

USED ON: MD-427375

MATERIAL: CHANNEL C6 X 10.5 X 65.75 LG. ASTM A36 STEEL

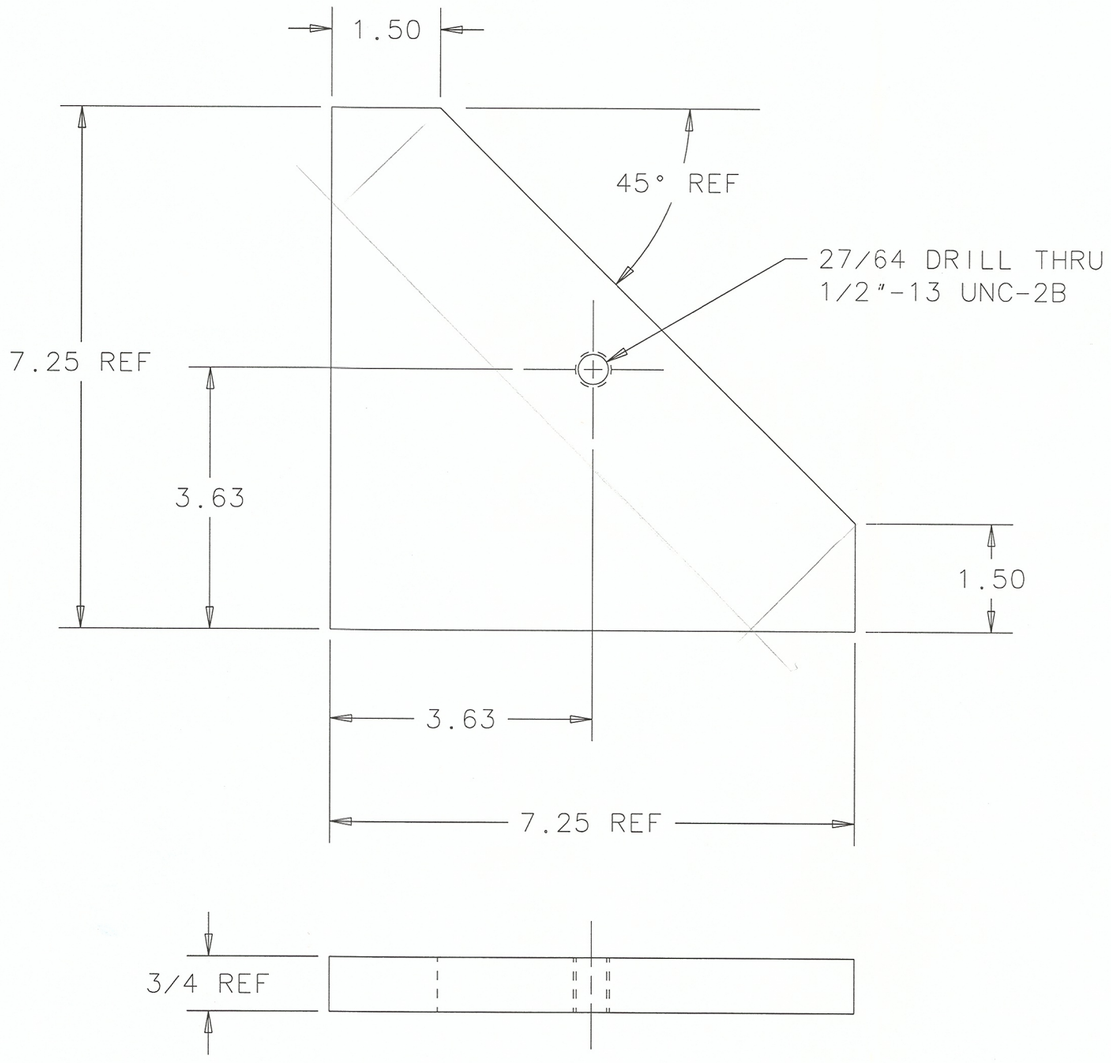
FERMI NATIONAL ACCELERATOR LABORATORY
UNITED STATES DEPARTMENT OF ENERGY

PPD/MECHANICAL DEPARTMENT NUMI; HORN #1 & 2 RAW SKIDS MOUNTING PLATE

SCALE	DRAWING NUMBER	SHEET	REV
1/2	8875.117-MC-427371	1 OF 1	A

CREATED WITH : Ideas9m3 | GROUP: PPD/MECHANICAL DEPARTMENT

REV	DESCRIPTION	DRAWN	DATE
		APPROVED	DATE



UNLESS OTHERWISE SPECIFIED			ORIGINATOR	D.PUSHKA	18-NOV-2002
.XX	.XXX	ANGLES	DRAWN	D.FRIEND	18-NOV-2002
± .03	± ---	± 1°	CHECKED	P.POLL	17-DEC-2002
			APPROVED	D.PUSHKA	18-DEC-2002

1. BREAK ALL SHARP EDGES .015 MAX.
2. DO NOT SCALE DRAWING.
3. DIMENSIONS BASED UPON ANSI Y14.5M-1982
4. ALL DIMENSIONS ARE INCHES
5. MAX. ALL MACH. SURFACES 125

USED ON: MD-427375

MATERIAL: PLATE 3/4" X 7.25 X 7.25 ASTM A36

FERMI NATIONAL ACCELERATOR LABORATORY
UNITED STATES DEPARTMENT OF ENERGY

PPD/MECHANICAL DEPARTMENT NUMI; HORN #1 & 2 RAW SKID LIFTING PLATE "B"

SCALE	DRAWING NUMBER	SHEET	REV
1/2	8875.117-MB-427374	1 OF 1	

CREATED WITH : Ideas9m3 | GROUP: PPD/MECHANICAL DEPARTMENT

BELOW-THE-HOOK LIFTING DEVICE
Engineering Note Cover Page

Lifting Device Numbers:

FNAL Site No/ ______________ (If applicable) Div. Specific No. 141 (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: Neutrino Horns #1 & #2 Raw Shield 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 8875.117-ME-406223
- [ ] Provided by a User or other Laboratory
- [ ] Other: Describe ______________

Engineering Note Prepared by Ed LaVallie Date 11/8/02

Engineering Note Reviewed by Ang Lee Date 5/16/03

Lifting Device Data:

Capacity 2500#

Fixture Weight 301#

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 ______________

Rated Load Test by FNAL (if applicable) Date ______________ Load ______________

[ ] Check if Load Test was by Vendor and attach the certificate

Satisfactory Load Test Witnessed by: ______________

Signature (of Load Test Witness) ______________

Notes or Special Information:

NUMI HORN #1 & HORN #2 RAW SKIDS LIFTING FIXTURE
SUPPORT FRAMES IDENTICAL FOR BOTH

SKID WELDMENT WEIGHT AS PER
DRAWING #8875.117-ME-406219

01.	Channel MC12 x 10.6# x 84" long = 74.2# x 2 pieces	= 148.40#
02.	Channel MC12 x 10.6# x 45" long = 37.75# x 2 pieces	= 75.50#
03.	Carbon Steel plate 48" x 84" x .25"	= 285.88#
04.	Channel C8 x 11.5# x 48" long = 46# x 2 pieces	= 92.00#
05.	Channel C4 x 5.4# x 88.5" long = 39.83# x 2 pieces	= 79.66#
06.	Channel C4 x 5.4# x 56" long	= 25.20#
07.	Channel C4 x 5.4# x 51.66" long	= 23.25#
08.	Channel C4 x 5.4# x 24" long	= 10.80#
09.	Unustrut channel P-1000 x 43.63 " long = 6.9# x 2 pieces	= 13.80#
10.	Stiffening Plate 11.42" x 4" x .5" = 6.4# x 2 pieces	= 12.80#
11.	Stiffening Plate 11.42" x 4" x .5" = 6.4# x 2 pieces	= 12.80#
12.	Lifting Plate 6" x 3.5" x .5" = 2.95# x 2 pieces	= 5.90#
13.	Channel C8 x 11.5# x 23" long = 22.04# x 2 pieces	= 44.08#

Total Weight = 835.00#

LIFTING FIXTURE WELDMENT WEIGHT AS PER
DRAWING # 8875-MD-406223

01.	Vertical Channel C4 x 5.4# x 88.5" = 39.83# x 2 pieces	= 79.66#
02.	Lifting Plate 5.43" x 4" x .5" = 3.05# x 4 pieces	= 12.20#
03.	Channel C6 x 10.5# x 65.75" long	= 57.53#
04.	Rear Channel C6 x 10.5# x 68.75 long	= 57.53#
05.	Channel C5 x 6.7# x 51.168" + 28.57# x 2 pieces	= 57.14#
06.	Corner Gusset eyebolt plate 7.5" sq. x .75" thick x .281= 8.36# x 4	= 33.44#

Total Weight = 301.00#

Skid and Lifting Fixture combined total weights joined together =1136.00#

Note:
The above listed weights and a solid model of the upper and lower assemblies were completed to find Center of Gravity of unloaded skid for purposes of presumed load testing. Each assembly half was neither symmetrical or balanced nor was the Center of Gravity of the joined assemblies below the pick point. Ultimately I planned to make a solid model of both halves loaded. Dave Pushka stopped me at this point a and after some conversation I recommended that perhaps this joined assembly should have multiple pick points to eliminate the need to find the CG as long as near center of lifting fixture, he agreed.

SURGE TANK

ASME Head 52# x 2 pieces		= 104#
Rolled Cylinder Plate 39" x 75.39" x .25"		= 207#
	Total Weight	= 311#

MOTOR/PUMP COMBINATION 158# each x 2

Total Weight	= 316#

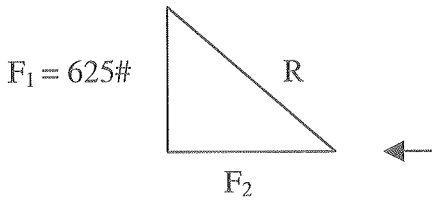
The major components on the cart are the Tank and Pumps which are located on diagonally opposite corners causing an initial weight balance of the Skid components not giving consideration to piping etc. Above listed major component weights cancel. Estimated dry weight including Skid and components is 2,500# as per drawing #8875.117-ME-406639, which indicates remainder of piping components weighs 737#.

After redesigning lifting fixture using tubular structural members and giving consideration to avoiding interferences with skid components, I was asked by Dave to investigate using as many pieces from the original design as was possible. The following states what could be used and commentary on loading.

Retained as many of lifting fixture components as possible going from single pick point to picking on all four corners. Items removed are 4" x 4" x 3/8" main lifting tube as well as two 1 ¼" x 1 ¼" x 3/16" cross tubes. Items retained are two C6 x 10.5# horizontal channels and two C4 x 7.25# vertical channels. Items added, two C5 x 6.7# channels which join C6 channels together and corner lifting plates.

Utilizing four pick points at corners, channel structural members are only seeing relatively small compression loads, 2500# total vertical load / 4 = 625# = F_1

C6 x 10.5# x 60"channel description, A = 3.09 in^2, I = 0.866, r = 0.529 in weak direction and an unsupported length of 60" with a pick angle of 60° to horizontal.



$R = F_1 / \sin\theta = 625 / \sin 60° = 722\#$

$F_2 = R * \cos\theta = 722 * \cos 60° = 361\#$, or 722# load on channel

Straight compressive load is 722# / 3.09 or 234 psi.

Slenderness ratio is Kl / r = 1*60 / 0.529 or 113.

AISC 1.5.1.3 Compression

$F_a = (1 - ((Kl/r)^2 / 2C_C^2) * F_y / 5/3 + (3(Kl/r) / 8) * C_C)) - ((Klr)^3 / 8C_C^3))$

$= (1 - (113^2 / 2 * 126^2)) * 36000 / 1.667 + 0.336 - 0.09$

$= 11254$ psi or

$F_a = F_y / 3$

$= 12000$ psi which ever is less

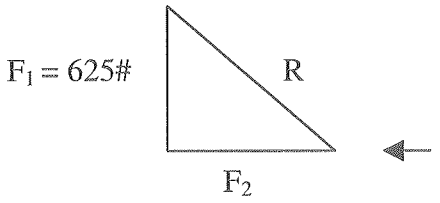
Where Kl/r of any unbraced section is less then $C_C = \sqrt{(2\pi^2 E) / F_y}$

$= \sqrt{(2 \pi^2 * 29000000) / 36000}$

$= 126.099$" greater then 113"

Utilizing same pick points as above

C5 x 6.7# x 51 5/16" channel description, A = 1.97 in^2, I = 0.479, r = 0.493 in weak direction and an unsupported length of 51" with a pick angle of 65.5° to horizontal.



$R = F_1 / \sin\theta = 625 / \sin 60° = 722\#$

$F_2 = R * \cos\theta = 722 * \cos 60° = 361\#$, or 722# load on channel

Straight compressive load is 722# / 1.97 or 367 psi.

Slenderness ratio is Kl / r = 1 * 52 / 0.493 or 105

AISC 1.5.1.3 Compression

$F_a = (1 - ((Kl/r)^2 / 2C_C^2) * F_y / 5/3 + (3(Kl/r) / 8 * C_C)) - ((Klr)^3 / 8C_C^3))*$

$= (1 - (105^2 / 2 * 126^2)) * 36000 / 1.667 + 0.313 - 0.072$

= 12321 psi or

$F_a = F_y / 3$

= 36000 / 3

=12000 psi which ever is less

Where Kl/r of any unbraced section is less then $C_C = \sqrt{ (2\pi^2 E) / F_y}$

$= \sqrt{ (2 \pi^2 * 29000000) / 36000}$

= 126.099" greater then 105"

Swivel hoist rings should be utilized, each having the capability to carry half the load or 2500#/2 = 1250#. Nearest larger capacity hoist ring capacity is 2500# and requires ½" tapped hole at four corners as specified on drawings. Safety factor of two above working load.

With a 2500# total load / 4 corners or 625# per corner, look at weld size and stresses joining the 5" and 6" channels. Maximum lineal inches of weld possible in the flange area joining two channels is 1.5" both sides of each flange * 2 flanges, or 6" * (.25 * sin 45) = 1.06 in^2 of weld, with the maximum web weld length being 4" both sides, or 8" * (.125 * sin 45) = .707 in^2. Stress in .25" and .125" welds are 625/1.06 = 590 psi and 625/0.707 = 884 psi respectively. E-70 fillet weld allowable of 11,200 psi, half of these welds are groove welds with an allowable of 15,800 psi.
Attachment of drilled/tapped lifting plates via welds to channels at corners. Top surface 3" weld at 3 corners of plate or 9" * (.25 * sin 45) = 1.59 in^2 of weld. Bottom surface in worst case allows for 3.5" weld or 3.5" * (.25" * sin 45) = 0.619 in^2 of weld. Stresses in welds are 625/1.59 = 353 psi and 625/ 0.619 = 1010 psi respectively. See attached drawing, all weld stresses are negligible.

Force on bolts joining upper lifting fixture to vertical channels of skid, 2500# total load/ 4 connections = 625# each connection / 2 bolts = 312.5 # load per bolt. P / A = 625# / (2 * (π * 0.4^2 / 4) = 2490 psi which is < Fv 17,500 psi allowable for A325 bolts or < Fv 10,000 psi for A307 bolts as per AISC allowable in shear. Fy for A-325 bolts is 92 ksi Fy for A307 bolts not listed. 1592 psi< 17,500 psi or 10,000 psi. Stresses are negligible.