5022TA

BELOW-THE-HOOK LIFTING DEVICE
Engineering Note Cover Page

Lifting Device Numbers:

FNAL Site No/ _____ Div. Specific No. HD-ENG-04-037 Asset No. _____

If applicable | If applicable | 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 ABSORBER CORE LIFTING FIXT.

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 _____
- [ ] Provided by a User or other Laboratory
- [ ] Other: Describe _____

Engineering Note Prepared by E. M. VILLEGAS Date 2/24/04

Engineering Note Reviewed by Tompkins Date 4/20/04

Lifting Device Data:

Capacity 12,000 #

Fixture Weight 752 #

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 _____

Rated Load Test by FNAL (if applicable) Date 6/11/04 Load 15,000 #

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

Satisfactory Load Test Witnessed by: DAVE ERICKSON, ERNIE VILLEGAS

Signature (of Load Test Witness) Dave Erickson, Ernest M. Villegas

Notes or Special Information:

* FIXTURE WILL ONLY BE USED TO TRANSPORT & PLACE CORE MODULES IN ABSORBER ONCE.

NuMi Task 114

Fermilab

Particle Physics Division
Mechanical Department Engineering Note

Number: MD-ENG-04-037 Date: 2/24/04

Project Internal Reference:

Project: NUMI

Title: ABSOLBER COLE LIFTING FIXT.

Author(s): E.M. VILLEGAS

Reviewer(s): [signature] 4/20/04

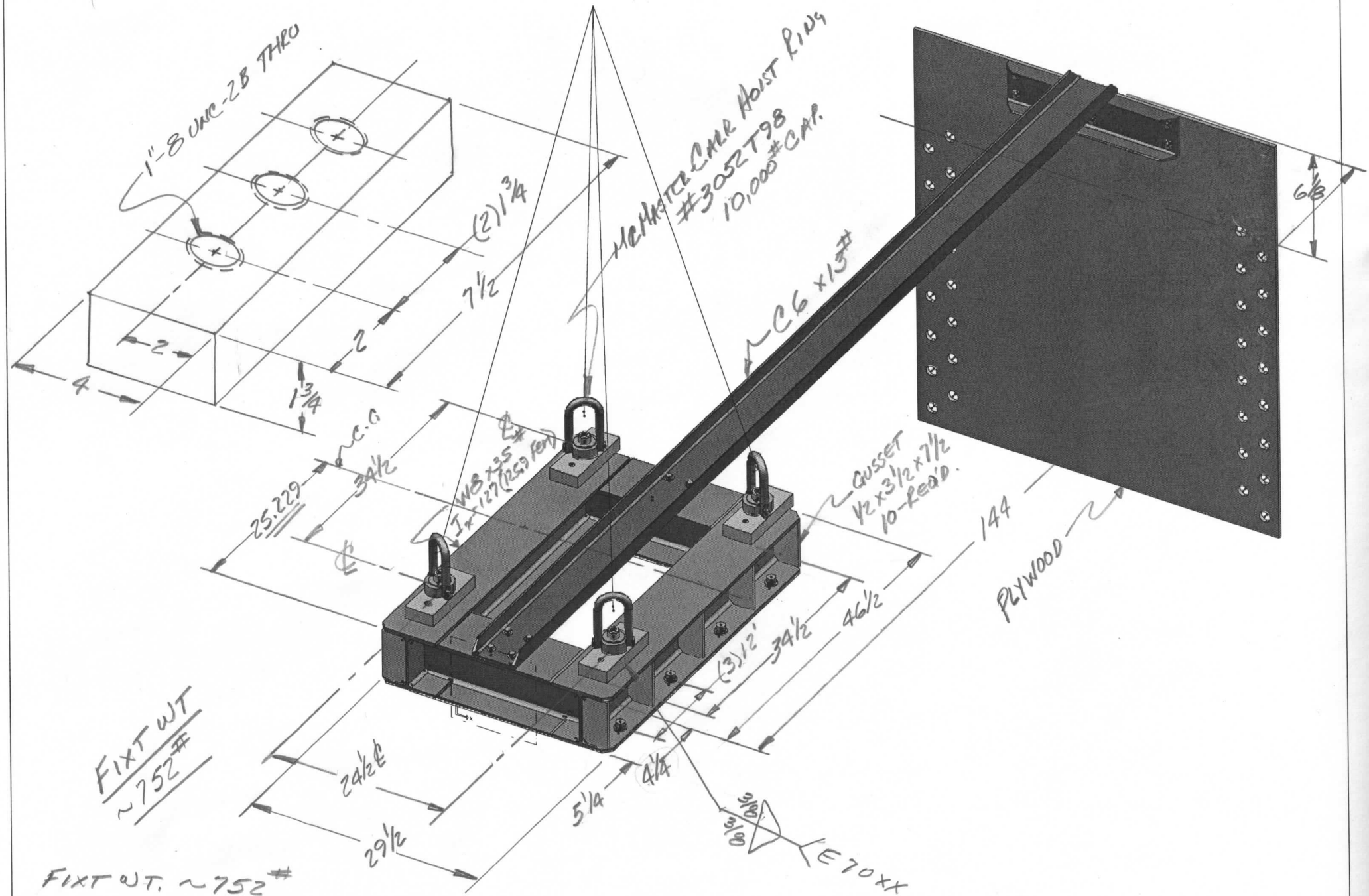
Key Words:

Abstract Summary:

Applicable Codes: BELOW THE HOOK LIFTING DEVICES
ASME B30.20 — 1993

NOTE:
LOAD TESTED 6/11/04
TEST LOAD 125% OF 12000# = 15,000#
WITNESS BY: DAVE ERICKSON
WOJCIECH BLASZYCISKI
ERNIE VILLEGAS

FAX # 5796



FIXT WT
~752#

FIXT WT. ~752#

FIXT LIFTING CAP. 12,000#

Pg # 1

Plotted by villegas on 14-Apr-04 , File: generic.pff

FERMILAB
ENGINEERING NOTE

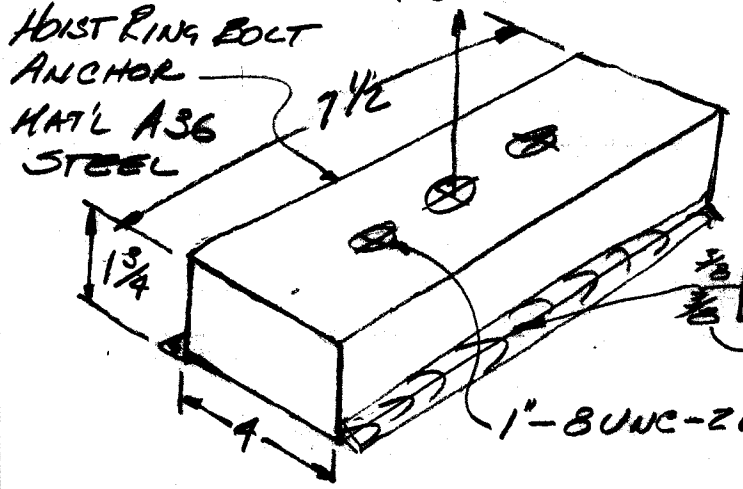
SECTION	PROJECT	SERIAL-CATEGORY	PAGE
			2

SUBJECT: CHECK INTEGRITY OF WELD & TAPPED HOLES ON HOIST RING ANCHOR BLOCK

NAME: E.M. Dillon

DATE: 3/22/09 REVISION DATE:

$P_a = \frac{13 \times 10^3}{2} = 6.5 \times 10^3 \#$



ASSUME TWO (2) HOIST RINGS SUPPORT 752 # FIXT. PLUS 12,036 # CORE FOR A TOTAL OF 12,788 # SAY $13.0 \times 10^3 \#$

3/8 E70XX

MIN. BASE ON MATERIAL THICKNESS

1"-8 UNC-2B TAP THRU

DESIGN FORCE ON FILLET WELD (#/IN)

$f_w = \frac{P_a}{l_w}$ $P_a = 6.5 \times 10^3 \#$ $l_w = 15"$

$= 433 \#/IN$

ALLOWABLE FORCE ON FILLET WELD (#/IN)

$F_w = \sin 45^\circ w F_v$ where $w = .375$ LEG SIZE

$= 5,303 \#/IN > f_w$

$F_v = \frac{60 \times 10^3}{3}$

$= 20 \times 10^3$ psi, ALLOWABLE STRESS ON FILLET BASED ON E70XX

DETERMINE 1"-8 TAP HOLE STRESSES @ LOAD P

FOR A36 STEEL: $F_b = F_v = \frac{36 \times 10^3}{3} = 12 \times 10^3$ psi ALLOWED

$P = P_x + P_a$ where $P_x = 10 \times 10^3 \#$ (GIVEN FROM McMASTER-CARR HOIST RING #3052T98)

$= 16.5 \times 10^3 \#$ $P_a = 6.5 \times 10^3 \#$

TAPPED HOLE THREAD BEARING & SHEAR STRESS

$f_b = \frac{3P}{\pi m D_p b^2}$

$= \frac{8.1 \times 10^3}{12 \times 10^3}$

$f_v = \frac{P}{\pi m D_r b}$

$= 4.0 \times 10^3$ psi $< F_v$

FROM FED. STD. SCREW STANDARDS WE GET: $D_p = .9188$, $D_r = 1.000$, $L = .06766$, $b = .1094$

FOR 1 1/2" ENGAGEMENT GIVES $m = 12$ TEETH

FERMILAB
ENGINEERING NOTE

SECTION	PROJECT	SERIAL-CATEGORY	PAGE
			3

SUBJECT: CHECK INTEGRITY OF LIFTING TAPPED HOLES ON ALUM. CORE BLOCKS

NAME: E. M. Villegas

DATE: 5/23/09 | REVISION DATE:

3/4-10UNC-2B TAPPED HOLE THREAD BENDING & SHEAR STRESS

FOR ALUM. 6061-T6: $F_b = F_v = \frac{35 \times 10^3}{3} = 11.7 \times 10^3 \text{ psi}$ ALLOWED

$$f_b = \frac{3Pl}{\pi n D_p b^2}$$

$$= 986 \text{ psi} < F_b$$

$$f_v = \frac{P}{\pi n D_r b}$$

$$= 485 \text{ psi} < F_v$$

FROM FEDERAL SCREW STANDARDS

$D_p = .6850$

$D_r = .7500$

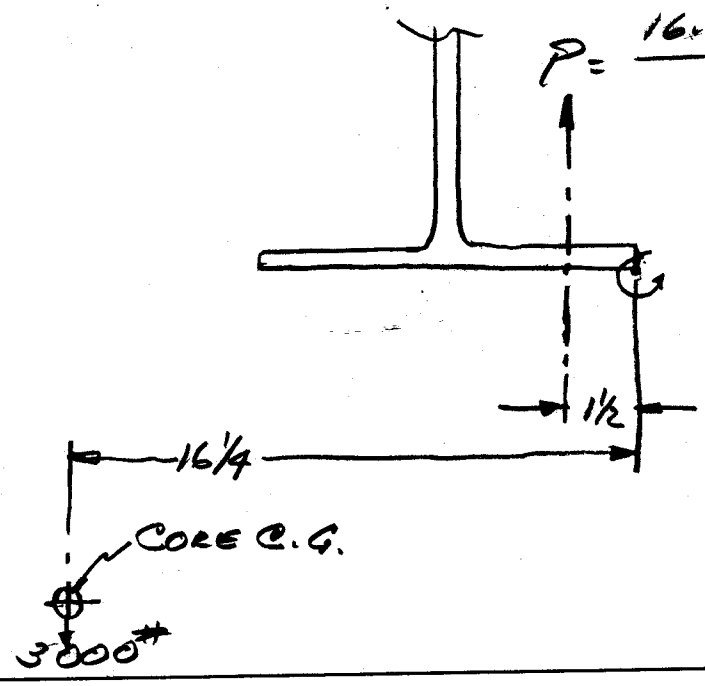
$l = .05413$

$b = .0875$

$n = 1.5 \times 10$
$= 15$ (1½" ENGAGEMENT)

$P = 1500^{\#}$ (HALF THE WT. OF ONE CORE BLK.)

ASSUME ONLY ONE BOLT SUPPORTS $3000^{\#}$ WT. OF ONE CORE BLOCK.



$$P = \frac{16.25 \times 3000}{1.5} = 32,500^{\#}$$

$f_b = 21.4 \times 10^3 \text{ psi}$

$f_v = 10.5 \times 10^3 \text{ psi}$

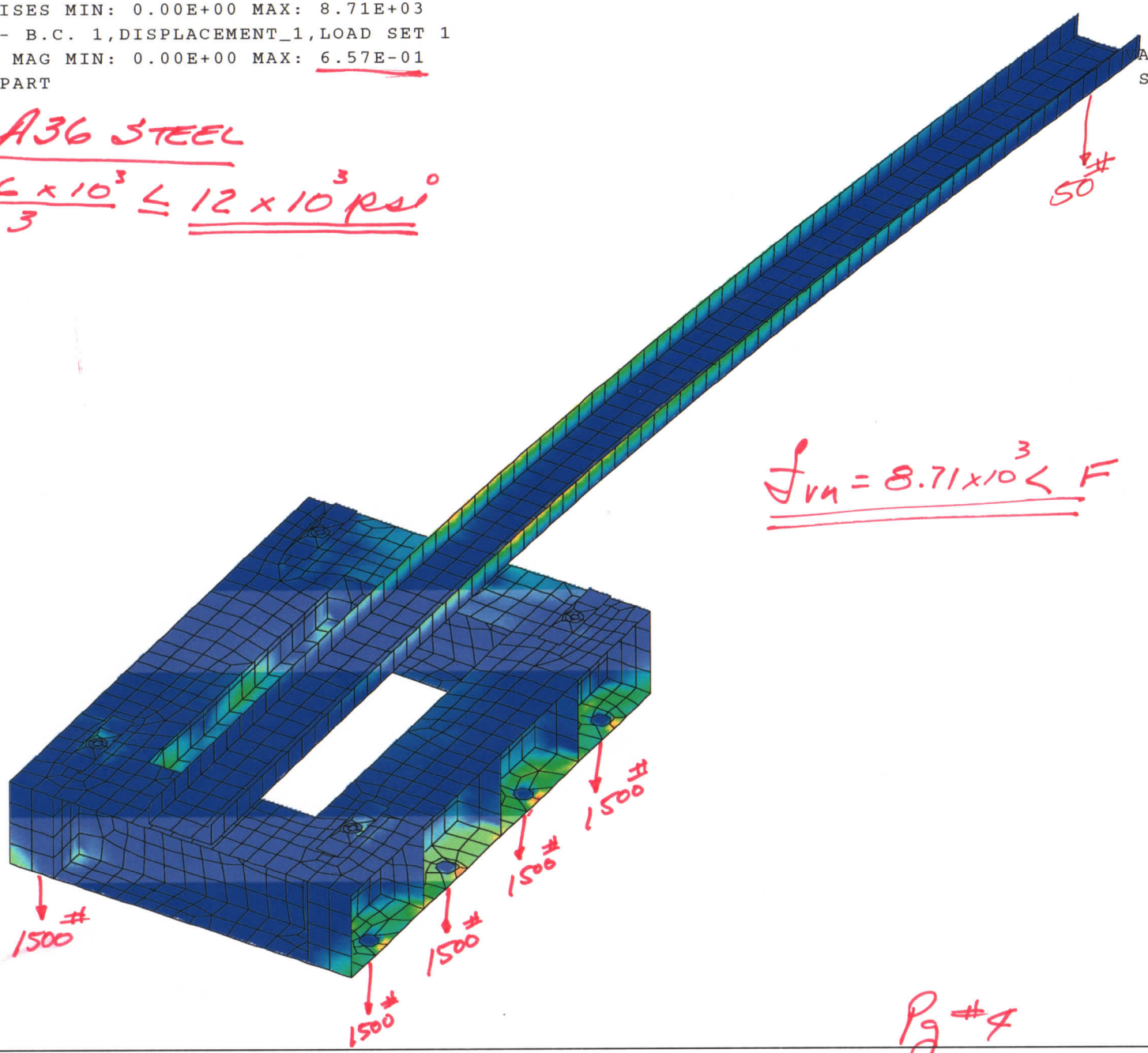
ALTHOUGH THE STRESSES ABOVE ARE HIGHER THAN THE STANDARD ALLOWS, THEY ARE STILL NOT HIGHER THAN THE THE YIELD OF THE MAT'L.

/cadwhs/server04/ms_villegas/TRANSPORT_FIXTURE.mf1

RESULTS: 2- B.C. 1,STRESS_2,LOAD SET 1
STRESS - VON MISES MIN: 0.00E+00 MAX: 8.71E+03
DEFORMATION: 1- B.C. 1,DISPLACEMENT_1,LOAD SET 1
DISPLACEMENT - MAG MIN: 0.00E+00 MAX: 6.57E-01
FRAME OF REF: PART

MAT'L: A36 STEEL

$F = \frac{36 \times 10^3}{3} \leq 12 \times 10^3 \text{ psi}$



VALUE OPTION:ACTUAL
SHELL SURFACE: TOP

8.71D+03
7.84D+03
6.97D+03
6.09D+03
5.22D+03
4.35D+03
3.48D+03
2.61D+03
1.74D+03
8.71D+02
0.00D+00

$f_{VM} = 8.71 \times 10^3 < F$

Pg #4

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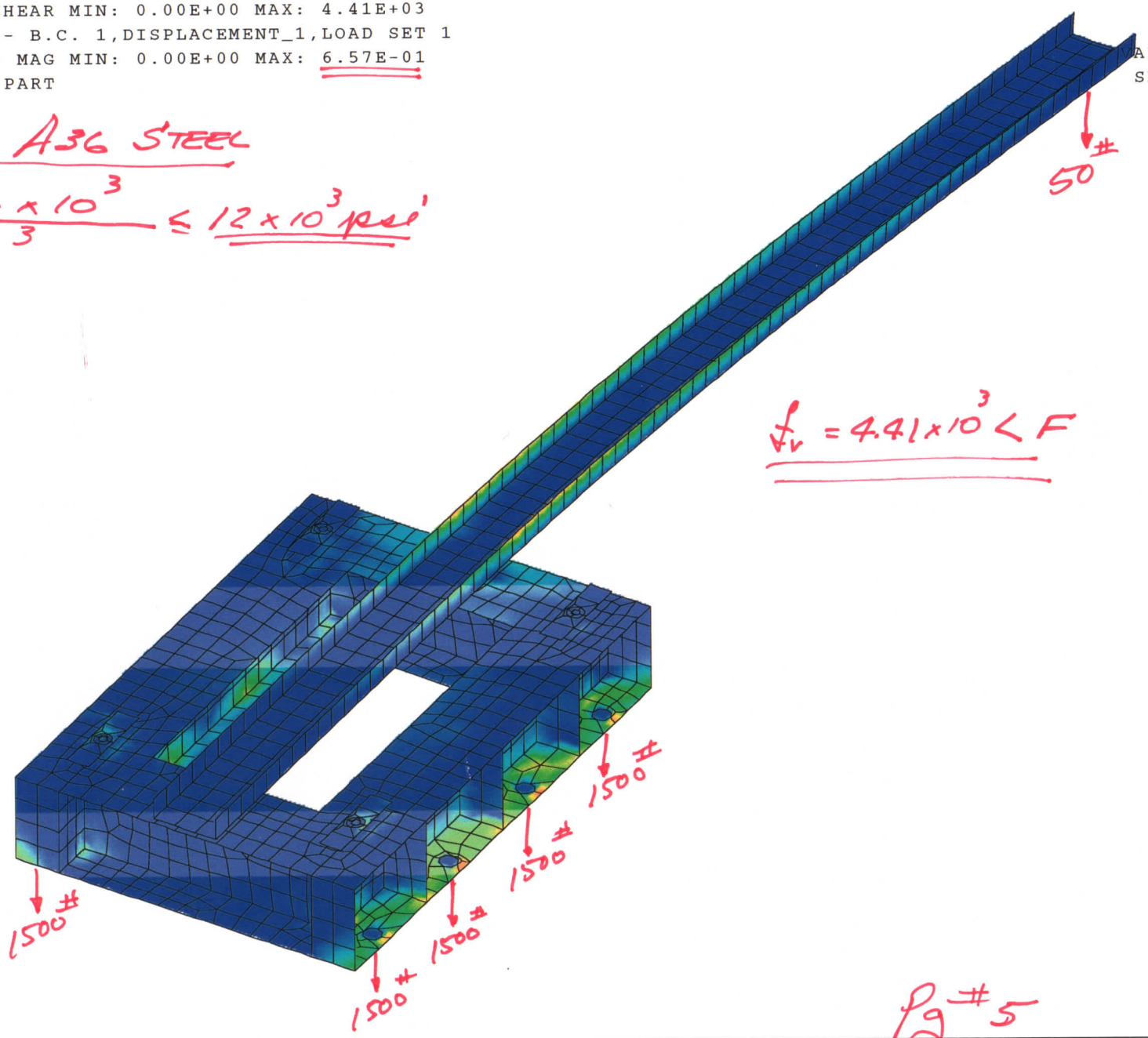
/cadwhs/server04/ms_villegas/TRANSPORT_FIXTURE.mf1

RESULTS: 2- B.C. 1,STRESS_2,LOAD SET 1
STRESS - MAX SHEAR MIN: 0.00E+00 MAX: 4.41E+03
DEFORMATION: 1- B.C. 1,DISPLACEMENT_1,LOAD SET 1
DISPLACEMENT - MAG MIN: 0.00E+00 MAX: 6.57E-01
FRAME OF REF: PART

MAT'L: A36 STEEL

$F = \frac{36 \times 10^3}{3} \leq 12 \times 10^3 \text{ psi}$



ALUE OPTION:ACTUAL
SHELL SURFACE: TOP
4.41D+03
3.97D+03
3.53D+03
3.09D+03
2.65D+03
2.21D+03
1.77D+03
1.32D+03
8.83D+02
4.41D+02
0.00D+00

$f_v = 4.41 \times 10^3 < F$

Pg #5

Plotted by villegas on 14-Apr-04 , File: generic.pff

Pg #6

I-DEAS 9 m3: Simulation 14-Apr-04 15:59:05
/cadwhs/server04/ms_villegas/TRANSPORT_FIXTURE.mf1
CORE_FIXTURE

Group ID : None
Result Set : 2 - B.C. 1,STRESS_2,LOAD SET 1
Report Type : Contour Units : IN
Result Type : STRESS
Frame of Reference: Part Data Component: Von Mises
Surface Type : Top

ALLOWED 12×10^3 psi | ALLOWED 12×10^3 psi

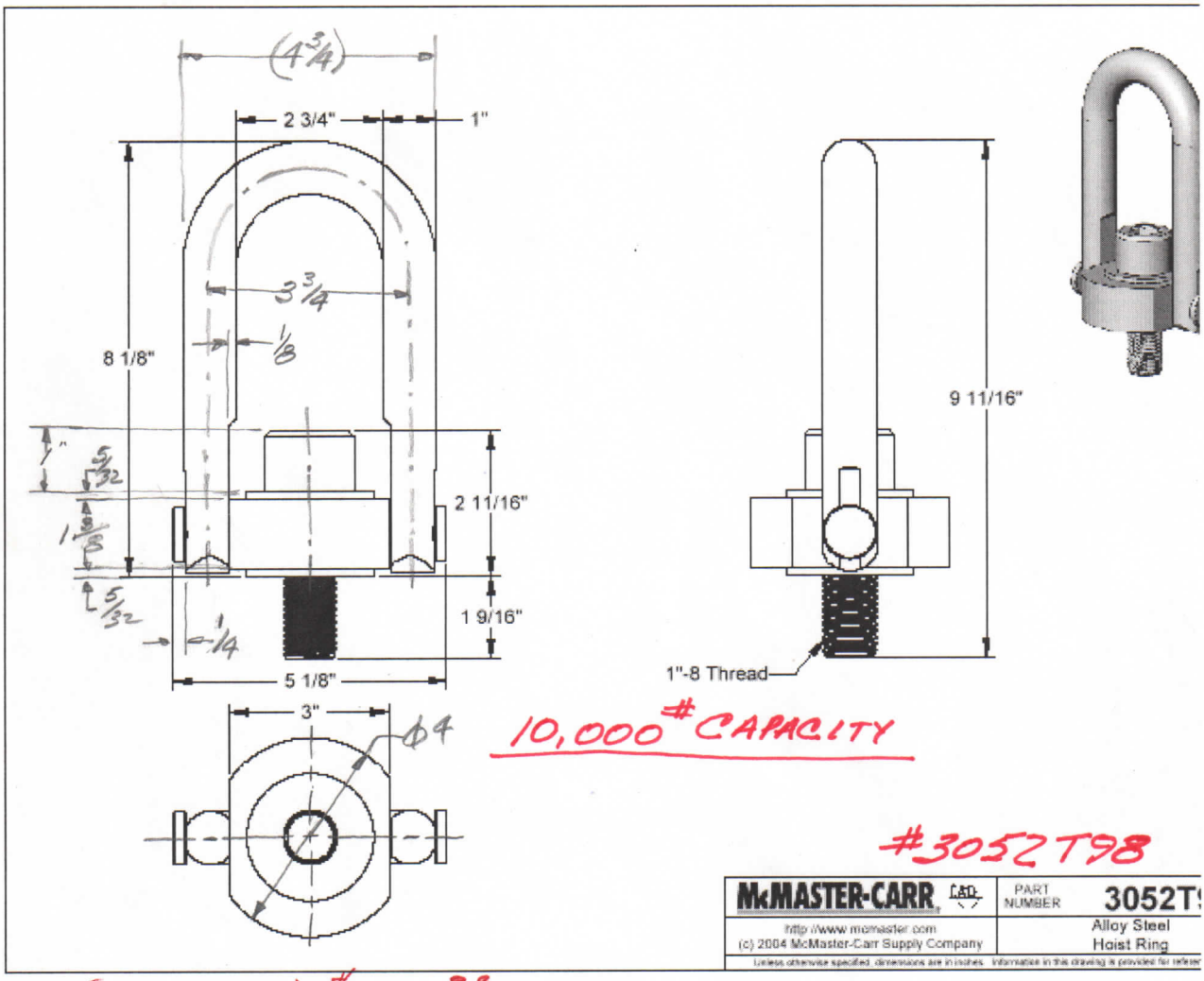
	Max Prin	Mid Prin	Min Prin	Max Shear	Von Mises
Maximum	2108 8.619E+03	171 2.222E+03	2637 3.019E+03	1983 4.415E+03	1983 8.706E+03
Minimum	678 -2.967E+03	418 -1.795E+03	677 -7.757E+03	18 0.000E+00	18 0.000E+00
Average	6.623E+02	-7.409E+00	-4.839E+02	6.099E+02	1.133E+03

Bill of Materials for

Name: CORE_TRANSPORT_FIXTURE
Type: ASSEMBLY
Part #: 431794
Version: 14
Revision:
Description:

Date: 15/04/2004

Qty	Name	Part #
2	SQUARE_WASHER_McMASTER-CARR#98099A036	COML
1	LIFT_SLING_HALF_CORE	COML
4	HOIST_RING_McMASTER-CARR#3052T98	COML
4	HOIST_RING_BAIL	COML
4	HOIST_RING_BASE	COML
8	HOIST_RING_PIN	COML
4	SOC_HD_SCR_1-8UNC-2Ax3_25LG	COML
4	SWIVEL_BOLT_ANCHORS	431801
1	W8x35x46_5_RH	431795
1	W8x35x46_5_LH	431796
2	W8x35x_X-MEMBER_W_HOLES .	431832
8	WASHER	COML
8	LOCK_WASHER_75_McMASTER-CARR#91101A100	COML
8	HEX_HD_SCR_75-10UNC-2Ax2_50LG	COML
1	C6x13x144	431797
1	C6x13x24	431800
1	PLYWOOD_TUBE_SUPPORT	431802
10	GUSSET	431803
14	1/2-13_HEX_HEADX2LG	COML
14	1/2_FLAT_WASHER	COML
14	1/2_HEX_NUT	COML



(QTY 1-4) $188.88

(QTY 5+) $166.88

MC 406704-7

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