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43 ENGINEERING DATA TRANSMITTAL

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FMEF/19110	Greg Dixson	NA
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1	HNF-SD-FM-TA-004	-	0	Structural Analysis of Hatch Cover Plates on Fuels and Materials Examination Facility High Bay Mezzanine	S	1	1	1

16. KEY

Approval Designator (F)	Reason for Transmittal (G)	Disposition (H) & (I)
E, S, Q, D or N/A (see WHC-CM-3-5, Sec.12.7) S	1. Approval 4. Review 2. Release 5. Post-Review 3. Information 6. Dist. (Receipt Acknow. Required)	1. Approved 4. Reviewed no/comment 2. Approved w/comment 5. Reviewed w/comment 3. Disapproved w/comment 6. Receipt acknowledged

17. SIGNATURE/DISTRIBUTION
(See Approval Designator for required signatures)

(G) Reason	(H) Disp.	(J) Name (K) Signature (L) Date (M) MSIN	(G) Reason	(H) Disp.	(J) Name (K) Signature (L) Date (M) MSIN
1	1	Design Authority G. E. DIXSON 5-27-97	3	4	K. L. BENNETT
1	1	Design Agent G. E. DIXSON 5-27-97			
1	1	Cog.Eng. R. D. LIPP 5/29/97			
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18.	19.	20.	21. DOE APPROVAL (if required)
G. E. DIXSON 5-27-97 Signature of EDT Originator — Date	R. D. LIPP 5/29/97 Authorized Representative for Receiving Organization — Date	E. J. BITTEN 5/28/97 FOR E.J. BITTEN Design Authority/ Cognizant Manager — PER TELECON Date	Ctrl. No. N/A [ ] Approved [ ] Approved w/comments [ ] Disapproved w/comments

5-29-97

Structural Analysis of Hatch Cover Plates on Fuels and Materials Examination Facility High Bay Mezzanine

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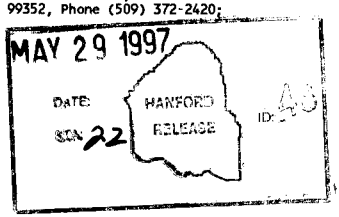
Key Words: FMEF, Cover, Plate, Analysis

Abstract: This supporting document and it's attached calculations verify that the circular hatch cover plates on the FMEF 42' level mezzanine are strong enough to support the weight of one of the Idaho National Engineering Laboratory Light Duty Utility Arm trailer rear wheels.



Release Approval Date Release Stamp

Approved for Public Release

STRUCTURAL ANALYSIS OF HATCH COVER PLATES ON FUELS AND MATERIALS EXAMINATION FACILITY HIGH BAY MEZZANINE

1.0 PURPOSE

In order to move the Idaho National Engineering Laboratory (INEL) Light Duty Utility Arm (LDUA) trailer into position for testing on the Fuels and Materials Examination Facility (FMEF) 42' level mezzanine one of the trailer's wheels will have to sit on a circular hatch cover fabricated from one-inch thick steel plate. The attached calculations verify that the hatch cover plate is strong enough to support the weight of the INEL LDUA trailer's wheel.

2.0 SUMMARY

The maximum load for a wheel on the hatch cover plate was assumed to be half of one-quarter of the total weight of the trailer or 2,700 pounds. This is conservative because the trailers center of gravity is near the front pair of wheels. The load was assumed to be distributed around an eight-inch diameter circle at the center of the plate and the plate's boundary was assumed to be simply supported. The computed peak stress of 6,200 psi is roughly one-sixth of the yield strength of structural steel (ASTM A36). Based on this the hatch cover plate is strong enough to support the INEL LDUA trailer wheel.

Battelle
Pacific Northwest Laboratories

0527 5/27/97

ENGINEERING WORKSHEET

Prepared By: John Friley | Date: 5/27/97 | Project: INEL LDUA

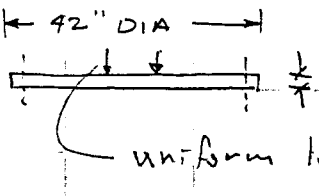
Title/Subject: SUPPORT PLATE STRESSES

Checked By: Chris Smith 5-27-97
CHRIS SMITH

PROBLEM STATEMENT: WHEN POSITIONING THE INEL LDUA ONE OF THE REAR WHEELS WILL REST ON A PLATE WHICH CURRENTLY DISPAYS A SIGN WHICH READS "NO LOAD". IT WAS REPORTED THAT THIS SIGN IS PRESENT BECAUSE (TO DATE) NO STRUCTURAL ANALYSIS HAS BEEN PERFORMED. THE MAXIMUM LOAD THAT WILL BE EXERTED ON THE STEEL PLATE IS 2700 POUNDS. THE PURPOSE OF THIS CALCULATION IS TO SHOW STRUCTURAL ADEQUACY OF THE PLATE TO CARRY THIS LOAD (WITH SUBSTANTIAL EXCESS CAPACITY)

THE FOLLOWING DATA IS AVAILABLE FOR THE PLATE:

1. DIAMETER (42")
2. MATERIAL (STEEL)
3. PLATE THICKNESS (1")
4. MATERIAL YIELD STRENGTH (36,000 PSI) -- PLATE WAS ASSUMED TO BE A36 STRUCTURAL STEEL
5. EDGE BOUNDARY CONDITIONS CONSIST OF A BOLT CIRCLE RESTING ON SUPPORTS (SEE SKETCH BELOW)



THE FOLLOWING CONSERVATIVE ASSUMPTIONS WERE MADE IN PERFORMING THE CALCULATIONS.

1. THE LOAD WAS ASSUMED TO BE DISTRIBUTED AROUND A "SMALL" 8" DIAMETER CIRCLE LOCATED IN THE CENTER OF THE PLATE. A CENTRAL LOAD WILL LIKELY GIVE HIGHER STRESSES THAN ONE LOCATED CLOSE TO A SUPPORTING EDGE.

2. THE BOUNDARY OF THE PLATE WAS ASSUMD TO BE SIMPLY SUPPORTED (THIS IS MUCH MORE CONSERVATIVE THAN THE CLAMPED CASE)

3. THE CALCULATION FORMULA WAS TAKEN FROM : TIMOSHENKO, THEORY OF PLATES AND SHELLS, MCGRAW HILL, 2ND EDITION, 1959, PAGE 62, TABLE 3. THIS FORMULA GIVES PEAK (FLEXURE) STRESS FOR CIRCULAR, SIMPLY SUPPORTED PLATES UNDER THE ASSUMED LOADING CONDITION. (COPIES OF THE FORMULA AND RELEVANT TABLE ARE ATTAHCED).

Battelle
Pacific Northwest Laboratories

ENGINEERING WORKSHEET

Prepared By: John Fridley | Date: 5/27/97 | Project: INEL LOUA

Title/Subject: Support Plate Stresses

Checked By: ~~Author~~ 5-27-97
CHRIS SMITH

THE PEAK STRESS WAS CALCULATED TO BE :

$$\sigma = \frac{2.34 \times 2700\ lb}{(1")^2}$$

$$\sigma = 6200\ psi$$

THE PEAK STRESS (6200 PSI) IS SUBSTANTIALLY BELOW THE ASSUMED YIELD STRENGTH OF 36000 PSI. THE FACTOR OF SAFETY BASED ON THE ASSUMED CONDITIONS IS ABOUT 36000/6200 OR ABOUT 6. IT IS THEREFORE JUDGED THAT THE PLATE HAS ADEQUATE STRUCTURAL CAPACITY TO SUPPORT THE REQUIRED LOAD.