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		Date December 22, 1994
Project Title/Work Order Analysis of The Flexible Receiver Lifting Yoke and Blast Shield Assembly (Tank 241SY101) (N2B2K)		EDT No. 608387
		ECN No. NA

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5. Proj./Prog./Dept./Div.: N2B2K	6. Cog. Engr.: G. A. Ritter	7. Purchase Order No.: NA
8. Originator Remarks: Approval/Release		9. Equip./Component No.: NA
		10. System/Bldg./Facility: NA
11. Receiver Remarks:		12. Major Assm. Dwg. No.: H-2-83687, Rev. 1
		13. Permit/Permit Application No.: NA
		14. Required Response Date: NA

15. DATA TRANSMITTED					(F)	(G)	(H)	(I)
(A) Item No.	(B) Document/Drawing No.	(C) Sheet No.	(D) Rev. No.	(E) Title or Description of Data Transmitted	Impact Level	Reason for Trans- mittal	Orig- inator Dispo- sition	Receiv- er Dispo- sition
1.	WHC-SD-WM-DA-160	NA	0	Analysis of the Flexible Receiver Lifting Yoke and Blast Shield Assembly (Tank 241SY101)	SQ	1,4	1	

16. Impact Level (F)			Reason for Transmittal (G)		Disposition (H) & (I)	
1, 2, 3, or 4 (see MRP 5.43)			1. Approval 2. Release 3. Information	4. Review 5. Post-Review 6. Dist. (Receipt Acknow. Required)	1. Approved 2. Approved w/comment 3. Disapproved w/comment	4. Reviewed no/comment 5. Reviewed w/comment 6. Receipt acknowledged

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1	/	Indep. Review J. S. Burgess	<i>J.S. Burgess</i>	2/22/95	H5-53						
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18. F. H. Huang <i>F.H. Huang</i> Signature of EDT Originator Date 12-21-94	19. G. A. Ritter <i>G.A. Ritter</i> Authorized Representative for Receiving Organization Date 1/6/95	20. C. E. Hanson <i>C.E. Hanson</i> H. Toffler Cognizant/Project Engineer's Manager Date 2/24/95	21. DOE APPROVAL (if required) Ltr. No. ☐ Approved ☐ Approved w/comments ☐ Disapproved w/comments
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RELEASE AUTHORIZATION

Document Number: WHC-SD-WM-DA-160, REV 0

Document Title: Analysis of the Flexible Receiver Lifting Yoke and Blast Shield Assembly (Tank 241SY101)

Release Date: 2/28/95

**This document was reviewed following the
procedures described in WHC-CM-3-4 and is:**

APPROVED FOR PUBLIC RELEASE

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Kara M. Broz

February 28, 1995

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SUPPORTING DOCUMENT		1. Total Pages 25
2. Title Analysis of the Flexible Receiver Lifting Yoke and Blast Shield Assembly (Tank 241SY101)		3. Number WHC-SD-WM-DA-160
4. Rev No. 0		
5. Key Words Analysis, Bending, Lifting Lug, Tear-out Weld, Shear. <div style="text-align: center;"> APPROVED FOR PUBLIC RELEASE </div> <i>KMB 2/29/95</i>		6. Author Name: F. H. Huang <i>F. H. Huang</i> Signature Organization/Charge Code 8D430/N2B2K
7. Abstract <p>The analysis of the lifting yoke and blast shield assembly considers the bending stress, weld strength, and resistance of the lug hole to tear out. The bending stress of the lifting lugs is evaluated to ensure that they meet the requirements of the American Institute for Steel Construction (AISC 1989). Also considered in the calculations is the capability of the thick lugs to withstand the weight of the pump together with that of the container and strongback during rotation to the horizontal position.</p>		
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9. Impact Level SQ		

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Analysis of the Flexible Receiver Lifting Yoke
and Blast Shield Assembly (Tank 241SY101)

December 1994

PREPARED BY: *F. H. Huang* Date 12-21-94
F. H. Huang, Principal Scientist
Materials Engineering

REVIEWED BY: *J. S. Burgess* Date 12/22/94
J. S. Burgess, Engineer
Equipment Stress Analysis

APPROVED BY: *R. B. Pan* Date 12/23/94
R. B. Pan, Manager
Equipment Stress Analysis

Westinghouse Hanford Company
Hanford Operations and Engineering Contractor
for the
U. S. Department of Energy

DESIGN VERIFICATION METHOD

The need for design verification has been reviewed with the method selected as indicated below:

<u> X </u>	Independent Review
<u> </u>	Alternate Calculations
<u> </u>	Qualification Testing
<u> </u>	Formal Design Review

R. B. Pan
Cognizant/~~P~~roject/Design Manager

SD # WHC-SD-WM-DA-160

ECN # NA

DWG(S) # NA

TYPICAL CHECKLIST FOR INDEPENDENT REVIEW

Document Reviewed WHC-SD-WM-DA-160

Author F. H. Huang

Yes No N/A

☒	☐	☐	Problem completely defined.
☒	☐	☐	Necessary assumptions explicitly stated and supported.
☐	☐	☒	Computer codes and data files documented.
☒	☐	☐	Data used in calculations explicitly stated in document.
☒	☐	☐	Data checked for consistency with original source information as applicable.
☐	☐	☒	Mathematical derivations checked including dimensional consistency of results.
☐	☐	☒	Models appropriate and used within range of validity or use outside range of established validity justified.
☒	☐	☐	Hand calculations checked for errors.
☐	☐	☒	Code run streams correct and consistent with analysis documentation.
☐	☐	☒	Code output consistent with input and with results reported in analysis documentation.
☒	☐	☐	Acceptability limits on analytical results applicable and supported. Limits checked against sources.
☒	☐	☐	Safety margins consistent with good engineering practices.
☒	☐	☐	Conclusions consistent with analytical results and applicable limits.
☒	☐	☐	Results and conclusions address all points required in the problem statement.

MANDATORY Software QA Log Number N/A

J. S. Burgess *J. S. Burgess*
Reviewer

12/22/94
Date

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Analysis of the Flexible Receiver Lifting Yoke and Blast Shield Assembly (Tank 241SY101)

1.0 INTRODUCTION

The flexible receiver is used to maintain primary tank confinement and minimize waste spillage during equipment removal from tank risers through pump pits. To remove the mixer pump, a crane is used to lift the lifting yoke (WHC 1994a) that is connected to the mixer pump. Before the pump is lifted, a bag assembly with a blast shield (WHC 1994b) is lowered over the lifting yoke and the mixer pump onto the load distribution frame by the crane. During set up for pump removal, the lifting yoke will be stabilized vertically by a yoke brace (WHC 1994c) while the crane is disconnected from the yoke and connected to the bag assembly. Each of the two components has four handling lugs for lifting. After the mixer pump is pulled from the 241SY101 waste tank, it will be inserted into a vertical container supported by a hydraulic strongback.

The disposal container then is lowered slowly to the horizontal position for transport. During the lowering of the container with the pump, the lifting yoke remains attached to the crane. A safety chain runs under the pump and is attached to two thick lugs of the yoke. The safety chain prevents the yoke from bumping the flange of the container. The analysis is to ensure that the lifting lugs have adequate strength.

This supporting document reports on the structural analysis of the equipment based on requirements for safety class 3 (DOE-RL 1993a), the *Manual of Steel Construction* (AISC 1989), and the *Hanford Hoisting and Rigging Manual* (DOE-RL 1993b).

2.0 SUMMARY

The analysis of the lifting yoke and blast shield assembly considers the bending stress, weld strength, and resistance of the lug hole to tear out. The bending stress of the lifting lugs is evaluated to ensure that they meet the requirements of the American Institute for Steel Construction (AISC 1989). Also considered in the calculations is the capability of the thick lugs to withstand the weight of the pump together with that of the container and strongback during rotation to the horizontal position.

3.0 DISCUSSION

The structural calculations are based on the following allowable stresses: 12,000 lbf/in² for bending, tension, and bearing; 7,200 lbf/in² for shear; 7,200 lbf/in² on effective area for welds. According to the *Hanford Site Hoisting and Rigging Manual* (DOE-RL 1993b), the allowable stresses except allowable shearing stress are one-third of yield strength.

3.1 Lugs for Lifting the Yoke

Four $\frac{1}{2}$ -in.-thick lugs are welded on the $1\frac{1}{2}$ - by 6-in. flat bar of the yoke. The location of the handling lugs is symmetrical to the center of gravity of the yoke when the yoke is lifted horizontally. The calculations check the bending stress of the lugs when lifting without the use of spreader beams. Also considered in the analysis is the lifting load capacity of the lugs in terms of tension, shear, bearing, and tear-out resistance (see Appendix A).

3.2 Lugs for Securing the Yoke

The total weight of the container and the pump is approximately 80,000 lb; the strongback weighs 30,000 lb. The lugs are designed on the basis of the reaction acting on the safety chain and the lugs from the total weight of container, pump, and strongback. The lugs are full-penetration welded to the yoke bar. Because the safety chain will bend the lugs inward, the analysis checks the bending of the lugs. Calculations show that the bending stress of a lug $1\frac{1}{2}$ -in thick is acceptable (see Appendix A).

3.3 Lug for Lifting the Blast Shield Assembly

The weight of each component of the blast shield assembly is estimated from drawing H-2-821387 (WHC 1994b). Although there are four lifting lugs, the analysis assumes that only two lugs share the total weight of the assembly. The assembly shall be lifted by a 52-in. by 28-in. spreader bar with four 15-ft-long cables. Because the dimensions of the spreader bar is close to those of the assembly, the spreader bar lifts the lug of the assembly nearly vertically. The thickness of the lug and the edge distance of the hole in the lug are checked to ensure adequate strength. The calculations appear in Appendix B.

4.0 CONCLUSION

The calculations in Appendices A and B show that the $\frac{1}{2}$ -in.-thick lugs are qualified to carry the weight of the lifting yoke or the blast shield assembly. Also, the calculations determine that the $1\frac{1}{2}$ -in.-thick lug is structurally adequate to secure the container, pump and strong-back during rotation from 90° to the horizontal position.

5.0 REFERENCES

AISC 1989, *Manual of Steel Construction*, Ninth edition, American Institute for Steel Construction, Chicago, Illinois.

- DOE-RL 1993a, *Standard Arch-Civil Design Criteria, Design Loads for Facilities*, Hanford Plant Standard SDC-4.1, Rev. 12, U.S. Department of Energy-Richland Field Office, Richland, Washington.
- DOE-RL 1993b, *Hanford Site Hoisting and Rigging Manual*, DOE-RL-92-36, U.S. Department of Energy Richland Field Office, Richland, Washington.
- WHC 1994a, *Mixer Pump Assembly Lifting Yoke*, drawing H-2-83687, Rev. 1, Westinghouse Hanford Company, Richland, Washington.
- WHC 1994b, *HMT-Flexible Receiver Blast Shield Assembly*, drawing H-2-821387, Rev. 0, Westinghouse Hanford Company, Richland, Washington.
- WHC 1994c, *Structural Analysis: Flexible Receiver Yoke Brace for the 241SY101 Mixer Pump*, WHC-SD-WM-DA-157, Rev. 0, Westinghouse Hanford Company, Richland, Washington.

Appendix A
Calculations for Lifting Yoke

DESIGN CALCULATION

WHC-SD-WM-DA-160
REV. 0

(1) Drawing H-2-83687, Rev. 1 (2) Doc. No. _____
(4) Building _____ (5) Rev. _____ (6) PAGE A-2 OF A-8
(7) Subject HMT- Flexible Receiver Lifting Yoke Assembly
(8) Originator Fit Huang, Lick Design Date 6-8-94
(9) Checker Sh Burgess Date 7/7/94

(10) C.G. OF LIFTING YOKE

WEIGHTS.

$$A = \frac{1}{2} \left[\frac{\pi}{4} (6^2 - (2\frac{1}{16})^2) \right] \times 1 \\ \times 4 \times 0.284 \\ = 14.2 \#$$

All Ys from bottom

$$Y_A = 3 \times 0.5756 \\ = 1.73"$$

$$B = \left[4.5 \times 1 \times 6 \times 2 - \frac{\pi}{4} (2\frac{1}{16})^2 \right] \\ \times 2 \times 0.284 \\ = 28.8 \#$$

$$Y_B = 3.98"$$

$$C = (1.5 \times 6 + 1 \times 2 \times 2) \times \\ (14 \times 12 - 4.5) \times 2 \times \\ 0.284 \\ = 1207.3 \#$$

$$Y_C = (14 \times 12 - 4.5) / 2 + 4.5 + 3 \\ = 89.25"$$

$$3' - 10\frac{3}{4}" = 46.75"$$

$$D = [2 \times 9 \times 46.75 + 1.5 \times 6 \times 46.75 \times 2 + \\ (1.5 \times 6 + 1 \times 2) (9 + 1.5 + 1.5) \times 2] \times 0.284 \\ = (841.5 + 841.5 + 2.60) \times 0.284 = 552 \#$$

DESIGN CALCULATION

WHC-SD-WM-DA-160
REV. 0

(1) Drawing H-2-83687, Rev. 1 (2) Doc. No. _____
 (4) Building _____ (5) Rev. _____
 (7) Subject HMT-Flexible Receiver Lifting Yoke Assembly
 (8) Originator FH Huang Date 6-8-94
 (9) Checker SB Burgess Date 7/7/94

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(10)

$$Y_D = (9 + 1.5 \times 2) / 2 + 14 \times 12 + 3$$

$$= 177"$$

$$E = (9 \times 23) / 2 \times 2 \times 0.284$$

$$= 59 \#$$

$$Y_E = 9 + 1.5 \times 2 + 14 \times 12 + 3 + 4$$

$$= 187"$$

C.G From bottom

$$\bar{Y} (14.2 + 28.8 + 1207.3 + 552 + 59)$$

$$= 14.2 \times 1.73 + 28.8 \times 3.98 + 1207.3 \times 89.25$$

$$+ 552 \times 177 + 59 \times 187$$

$$= 216627.7$$

$$\bar{Y} = \frac{216627.7}{1861.3} = 116.4" \quad (9' - 8\frac{3}{8}")$$

A-3

DESIGN CALCULATION

WHC-SD-WM-DA-160
REV. 0

(1) Drawing H-2-83687, Rev. 1 (2) Doc. No. _____
(4) Building _____ (5) Rev. _____
(7) Subject LUG of Lifting Yoke Assembly
(8) Originator FH Huang SHF Date 6-14-94
(9) Checker JB Date 7/14/94

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(10)

HANDLING LUGS OF LIFTING YOKE ASSEMBLY

Assume the $(2000 \times 1.5) \approx 3000$ lb lifting yoke assembly is supported by 2 lugs, 1500 lb per lug.
The cable is 60° tilt.
Loads on x, y, z directions

$$F_z = 3000/2$$

$$= 1500 \#$$

$$F_x = 1500 / \tan 60^\circ \times$$

$$\frac{46.75}{\sqrt{46.75^2 + 54^2}}$$

$$= 866 \times \frac{46.75}{71.43}$$

$$= 566 \#$$

$$F_y = .866 \times \frac{54}{71.43} = 656 \#$$

1. Bending stresses

$$\sigma_x = \frac{F_x \times 2.25}{3 \times t^2 / 6}$$

$$= \frac{2547}{t^2} \text{ psi}$$

$$\sigma_y = \frac{F_y \times 2.25}{\frac{t \times 3^2}{6}}$$

$$= \frac{983}{t} \text{ psi}$$

$$\sigma_z = \frac{F_z}{3t} = \frac{500}{t} \text{ psi}$$

A-4

DESIGN CALCULATION

WHC-SD-WM-DA-160

REV. 0

(1) Drawing H-2-83687, Rev. 1 (2) Doc. No. _____

(4) Building _____ (5) Rev. _____

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(7) Subject LOG of Lifting Yoke Assembly(8) Originator PH Huang DAEADate 6-14-94(9) Checker Sh. BurgessDate 7/7/94

(10)

The bending stress on the lug is

$$\sigma_t = \left[\left(\frac{2547}{t} \right)^2 + \left(\frac{983}{t} \right)^2 + \left(\frac{500}{t} \right)^2 \right]^{\frac{1}{2}} \text{ psi}$$

For $\frac{1}{2}$ " plate,

$$\sigma_t = \left[\left(\frac{2547}{0.5} \right)^2 + \left(\frac{983}{0.5} \right)^2 + \left(\frac{500}{0.5} \right)^2 \right]^{\frac{1}{2}} \text{ psi}$$

$$= 10,424 \text{ psi} < 12,000 \text{ psi} \quad \text{O.K.}$$

2. Lifting load capacity

Tension Failure

$$f_t = \frac{1500}{2 \times 0.5 \times 0.875} = 1,714 \text{ psi} < 12,000 \text{ psi} \quad \text{O.K.}$$

Shear Failure

$$\tau = \frac{1500}{2 \times 0.5 \times 0.875} = 1,714 \text{ psi} < 7,200 \text{ psi} \quad \text{O.K.}$$

Bearing Failure

$$f_b = \frac{1500}{0.5 \times 1.25} = 2,400 \text{ psi} < 12,000 \text{ psi} \quad \text{O.K.}$$

Tear-out Failure

$$P/A = \frac{1500}{0.5 \times 0.875}$$

$$= 3429 \text{ psi} < 12,000 \text{ psi} \quad \text{O.K.}$$

AISC

P_{all} Allowable load, based on D.T. Rider of Eng J. OF

DESIGN CALCULATION

WHC-SD-WM-DA-160

REV. 0

(1) Drawing H2-83687, Rev. 1 (2) Doc. No. _____

(4) Building _____ (5) Rev. _____

(7) Subject Lifting Yoke Assembly(8) Originator FH Huang JMDDate 6-24-94(9) Checker SE BurgessDate 7/7/94

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(10)

check allowable load, based on D.T. Ricker
of Eng. J of AISC

$$P_{all} = \frac{1.67(12000)(0.5)(1.5-1.25/2)^2}{1.25}$$

$$= 6,137 \text{ lb} > 1,500 \text{ lb} \quad \text{O.K.}$$

A-6

WHC-SD-WM-DA-160
REV. 0

WHC-SD-WM-DA-160
REV. 0

(1) Drawing _____ (2) Doc. No. _____
(4) Building _____ (5) Rev. _____
(7) Subject _____

PAGE A-7 OF A-8

(8) Originator FH Huang JHJ.

Date 6-17-94

(9) Checker P. Buzas

Date 7/7/84

(10)

check Lugs of the lifting Yoke during Lifting

Ears at C.G

$$\Sigma M_A: R[53 \times 12 + 3 + 194/\sqrt{2}]$$

$$= 78600(28 \times 12 + 1) + 30000(15 \times 12)$$

$$R = \frac{32674200}{705.5}$$

$$= 4.6314 \text{ eb}$$

$$P_V = 46314/2 = 23,15726$$

Load on the cable

$$P = 23157 \times \frac{(23.375 \pm 73.05^2)^{\frac{1}{2}}}{73.05}$$

$$= 2431.4 \text{ lb}$$

USE 13½ ton shackle (Crosby Forged part # 1018231)

A-A

A-7

DESIGN CALCULATION

WHC-SD-WM-DA-160
REV. 0

(1) Drawing H-2-83687, Rev. 1 (2) Doc. No. _____
(4) Building _____ (5) Rev. _____
(7) Subject Lifting Yoke Assembly
(8) Originator FH Huang JTWL Date 6-17-94
(9) Checker AS Burgess Date 7/2/94

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(10)

$$P_x = 23157 \times \frac{23.375}{73.05} = 7411 \text{ lb}$$

$$P_y = 23157 \times \cos 45^\circ \\ = 16372.6 \text{ lb}$$

$$P_z = 16372.6 \text{ lb.}$$

Bending Stressos on 1 1/2" Lug

$$\sigma_x = \frac{7411 \times (2.25 + 6)}{3 \times (1.5)^2 / 6} = 54,344 \text{ psi}$$

$$\sigma_y = \frac{16372.6 \times 2.25}{\frac{1.5 \times 3^2}{6}} = 16,372.6 \text{ psi}$$

$$\sigma_z = \frac{16372.6}{3 \times 1.5} = 3638.4 \text{ psi}$$

Resultant Stress

$$\sigma_r = \sqrt{54344^2 + 16372.6^2 + 3638.4^2} \\ = 56.9 \text{ ksi} < F_u = 58 \text{ ksi}$$

check tear-out stress

$$\frac{P}{A} = \frac{23157}{1.5 \times (1.5 - \frac{25}{32})} = 21.4 \text{ ksi}$$

Appendix B
Calculations for Blast Shield Assembly

(1) Drawing H-2-821387, Rev 0 (2) Doc. No. _____

(4) Building _____ (5) Rev. _____

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(7) Subject HMT-Flexible Receiver Blast Shield(8) Originator PH Huang Date 6-21-94(9) Checker JB Burgess Date 7/8/94

(10)

WEIGHT OF RECEIVER BLAST SHIELD

BASE ASSEMBLY

$$C3 \times 5.0 : 5.06 \text{ lb/ft}$$

$$\text{Angle } 1\frac{1}{2} \times 1\frac{1}{2} \times \frac{1}{4} : 2.34 \text{ lb/ft}$$

$$\begin{aligned} & [(4' - 7\frac{1}{8}") \times 2 + (3' - 8\frac{3}{4}") \times 2 + (1' - 4\frac{7}{8}") \times 4] \times 5\frac{1}{2} \\ & + (2' - 9\frac{5}{8}") \times 4 \times 2.34\frac{1}{2} = 116.8 \text{ lb} \end{aligned}$$

REF (14)

$$\frac{68 \times 3.1416 \times 2.34}{12} = 41.7 \text{ lb}$$

REF (13) Tubing $\frac{1}{2}" \phi 304L$ (sch. 5) $\rho = 0.538 \text{ lb/ft}$

$$\frac{68\pi \cdot (0.538)}{12} = 9.6 \text{ lb}$$

REF (6), (9), (10)

$$\begin{aligned} & (1\frac{1}{8} \times 2 \times 6 \times 8 + \frac{1}{2} \times 3 \times 10 \times 6 + \frac{1}{2} \times 3 \times 7.5 \times 4) \times 0.284 \\ & = 69 \text{ lb} \end{aligned}$$

REF (19), (11)

$$\begin{aligned} & (\frac{1}{2} \times 3 \times 10 \times 8 + \frac{1}{2} \times 3 \times 24 \times 4) \times 0.284 \\ & = 75 \text{ lb} \end{aligned}$$

REF (7), (8)

$$\begin{aligned} & [68 \times 3.1416 \times 5\frac{1}{2} \times \frac{3}{16} + (5 \times 12 + 8.875)(6 \times 12 + 9.875) \frac{3}{16}] \times \\ & 0.284 = 847.5 \text{ lb} \end{aligned}$$

B-2

(1) Drawing H-2-821387, Rev. 0 (2) Doc. No. _____ PAGE B-3 OF B-5
 (4) Building _____ (5) Rev. _____ (6) Job No. _____
 (7) Subject HMT-Flexible Receiver Blast Shield Assembly
 (8) Originator FH Huang Date _____
 (9) Checker JR. Benford Date 7/8/91

(10)

Latch Assembly and Stop

$$1\frac{1}{2} \times 3\frac{1}{4} \times 3\frac{7}{8} = 4.36 \text{ in}^3$$

$$(1 \times 12 + 5\frac{3}{16}) \frac{\pi}{4} (\frac{3}{8})^2 = 7.6 \text{ in}^2$$

$$[4\frac{1}{2} \times 1 \times \frac{1}{2} + \frac{\pi}{4} (\frac{9}{16})^2 \times 2] 2 = 5.5$$

$$W_L = (4.36 + 7.6 + 5.5) \times 4 \times 0.284 = 19.8 \text{ lb}$$

Latch Handle

$$[(\frac{7}{8})^2 - (\frac{7}{8} - 0.095)^2] (5 \times 12 + 14.25) \times 4 \times 0.284 = 13.3 \text{ lb}$$

Detector mount Assembly

$$\frac{\pi}{4} [(2\frac{3}{8})^2 - (2\frac{3}{8} - 0.24)^2] \times 5 +$$

$$3\frac{1}{4} \times 3\frac{1}{4} \times 2\frac{3}{16} + \frac{1}{16} \times 3\frac{1}{4} \times 4\frac{3}{8}$$

$$= 4.25 + 1.23 + 0.21 = 5.686 \text{ in}^3$$

$$W_t = 4(0.284 \times 5.686) = 6.5 \text{ lb}$$

$$\text{Bag w} = 250 \text{ lb}$$

Total weight

$$= 116.8 + 41.7 + 9.6 + 69 + 75 + 847.5$$

$$+ 19.8 + 13.3 + 6.5 + 250 = 1445 \text{ lb}$$

$$\text{S.F.} = 1.5$$

$$W_t = 1445 \text{ lb} \times 1.5 = 2174 \text{ lb}$$

DESIGN CALCULATION

WHC-SD-WM-DA-160
REV. 0

(1) Drawing H-2-821387, Rev. 0 (2) Doc. No. _____
 (4) Building _____ (5) Rev. _____ (6) _____
 (7) Subject HMT-Flexible Receiver Blast Shield
 (8) Originator SK Huang Date 12-21-94
 (9) Checker JS Brunner Date 12/22/94

PAGE B-4 OF B-5

(10)

Because of design change, additional weights include:
 (see drawing H-2-821386)

Collimator Assembly:

$$\text{plates: } 10 \times 10 \times 3 \times 4 = 1200 \text{ in}^3$$

$$\text{Backing plate: } \frac{1}{4} \times 8\frac{1}{4} \times 10\frac{3}{8} \times 2 = 42.8 \text{ in}^3$$

$$\text{Mounting BRKT: } \frac{3}{16} \times 8\frac{1}{8} \times 2 \times 8 = 24.4 \text{ in}^3$$

$$\text{Side plate: } \frac{3}{16} \times 8\frac{1}{8} \times 10 \times 4 = 60.9 \text{ in}^3$$

$$\text{Total weight } W_c = 1328 \times 0.284 = 377 \text{ lb.}$$

Cone:

$$W_n = \frac{\pi}{2} \left(65\frac{3}{8} + 60\frac{5}{8} \right) \times 11 \times 0.134 \times 0.284$$

$$= 82.8 \text{ lb}$$

Ring:

$$W_g = 64.5 \times \pi \times \frac{1}{4} \times 4.43 \times 0.284$$

$$= 63.7 \text{ lb}$$

Detector, Conduit and Junction box:

$$W_d = 320 \text{ lb.}$$

Total weight of Receiver Blast Shield

$$W_T = 1445 + 377 + 82.8 + 63.7 + 320$$

$$= 2,289 \text{ lb}$$

$$\text{With safety factor } W_T = 2,289 \times 1.5 = 3,433 \text{ lb}$$

B-4

(1) Drawing H-2-821387, Rev. 0 (2) Doc. No. _____
 (4) Building _____ (5) Rev. _____ (6) PAGE B-5 OF B-5
 (7) Subject HMT - Flexible Receiver Blast Shield
 (8) Originator Z. H. Huang Date 12-21-94
 (9) Checker [Signature] Date 12/22/94

(10)

CAPACITY OF LUG

= 1,700 lb/lug for 4 Lugs

Check Lug - Tensile tearing

$$A = (1.5 - \frac{1.5}{2}) \frac{1}{2}$$

$$= 0.375 \text{ in}^2$$

$$\frac{P}{A} = \frac{1700}{0.375}$$

$$= 4.5 \text{ ksi} < 12 \text{ ksi OK}$$

Tear-out allowable load

$$P = \frac{1.67 (12000) (0.5) (0.75)^2}{1.5}$$

$$= 3,758 \text{ lb}$$

$$S.F. = \frac{3758}{1700} = 2.21 \text{ OK}$$

The calculations are conservative
with bushing $\frac{1}{16}'' \phi$ used in lug hole

Lug weld strength

$$A_w = (3 + 0.5) \times 2 = 7 \text{ in}$$

$$f_u = \frac{1700}{7 \times \frac{1}{4}} = 972 \text{ psi} < 7,200 \text{ psi OK}$$

Appendix C
Drawings

				REF	124825
U.S. DEPARTMENT OF ENERGY					
Richland Operations Office					
Westinghouse Hanford Company					
MIXER PUMP ASSEMBLY					
LIFTING YOKE					
DATE	BLANK TAG	POUSE NO	SNOW NO	PART	
F	241-SY	1001	H-2	83687 1	
TAG SHOWN

SECTION

SCALE: 1/4 SIZE

FOR REFERENCE ONLY

FOR GENERAL NOTES SEE SHEET 1

										124825 U.S. DEPARTMENT OF ENERGY Richland Operations Office Westinghouse Hanford Company	
										MIXER PUMP ASSEMBLY LIFTING YOKE	
										SIZE F 241-SY 1001 DWP NO H-2-83687 REV 1	
										SCALE SHOWN NEXT 2 OF 2

1 BLAST SHIELD ASSEMBLY
SCALE: 1/8

PARTS/MATERIAL LIST									
QTY REQD				PART/DASH NUMBER	NOMENCLATURE/DESCRIPTION	MATERIAL/REFERENCE	SHEET	ITEM NO.	
-040	-030	-020	-010						
			X	-010	FLEXIBLE RECEIVER ASSEMBLY		1	1	
		X		-020	CONTAINMENT BAG ASSEMBLY	H-2-821391		2	
	X			-030	BLAST SHIELD ASSEMBLY	H-2-821387		3	
X				-040	GAMMA DETECTOR ASSEMBLY	H-2-824280		4	

BAG weight ≈ 175 lb + 0/-10 lb.

WHC-SD-WM-DA-160
REV. 0

PAGE C-4 OF C-4

GENERAL NOTES: (UNLESS OTHERWISE SPECIFIED)

- 1 IDENTIFY ASSEMBLY WITH DRAWING NUMBER, PART NUMBER AND REVISION NUMBER PER HS-BS-0015 TYPE 2. USE 1/2 INCH HIGH CHARACTERS. LOCATE APPROX. WHERE SHOWN.
- 2 CONTAINMENT BAG (ITEM 2) FOLDED IN APPROX. 4" FOLDS TO COMPRESS ONTO THE BLAST SHIELD (ITEM 3).
- 3 ALIGN ITEM 2 AND 3 ALONG HARDPOINT INDICATORS AT ASSEMBLY.

TITLE REFERENCE NEXT USED ON H-2-821392				REVISIONS CADFILE BB21386A				CADCODE GDS.5.0.ACD2:12.0.SS				U.S. DEPARTMENT OF ENERGY DOE Field Office, Portland Westinghouse Hanford Company FLEXIBLE RECEIVER ASSEMBLY HYDROGEN MITIGATION PROJECT F 241-SY 4750 H-2-821386 0 1/8 XXXXX			
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