SA#2 81

NOV 08 1994

ENGINEERING DATA TRANSMITTAL

1. EDT 157684

2. To: (Receiving Organization)	3. From: (Originating Organization)	4. Related EDT No.:
Cesium Return Program	Cesium Return Program	N/A
5. Proj./Prog./Dept./Div.:	**6. Cog. Engr.:**	**7. Purchase Order No.:**
Cesium Return Program	P. T. Saueressig	N/A
8. Originator Remarks: Transmittal and release of the supporting document which compiles the documentation for fiscal year 1995 annual BUSS cask SARP testing and inspections.		**9. Equip./Component No.:** N/A
		10. System/Bldg./Facility: N/A
11. Receiver Remarks: Comments have been incorporated		**12. Major Assm. Dwg. No.:** N/A
		13. Permit/Permit Application No.: N/A
		14. Required Response Date: November 10, 1994

15. DATA TRANSMITTED

(A) Item No.	(B) Document/Drawing No.	(C) Sheet No.	(D) Rev. No.	(E) Title or Description of Data Transmitted	(F) Approval Designator	(G) Reason for Transmittal	(H) Originator Disposition	(I) Receiver Disposition
1	WHC-SD-WM-TI-672	-	0	Documentation for Fiscal Year 1995 Annual BUSS Cask SARP Testing and Inspections.	N/A	1,2	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)	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	(J) Name	(K) Signature	(L) Date	(M) MSIN	(G) Reason	(H) Disp.
1,2	1	Cog.Eng. (P.T. Saueressig)	Paul J Saueressig	11/2/94	S6-65	Central Files			L8-04	3	
1,2	1	Cog. Mgr. (E.D. Robbins)		11/2/94	S6-65	O.S.T.I. (2)			L807	3	
		QA	N/A								
		Safety	N/A								
		Env.	N/A								
1,2	1	Packaging and Safety Eng (W. A. McCormick)		11/4/94							

18.	19.	20.	21. DOE APPROVAL (if required) Ctrl. No.
Paul J Saueressig 11/2/94 Signature of EDT Originator Date	Paul J Saueressig 11/2/94 Authorized Representative for Receiving Organization Date	11-2-94 Cognizant Manager Date	[] Approved [] Approved w/comments [] Disapproved w/comments

RELEASE AUTHORIZATION

Document Number:	WHC-SD-WM-TI-672, REV 0
Document Title:	Documentation for Fiscal Year 1995 Annual BUSS Cask SARP Testing and Inspections
Release Date:	11/7/94

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

APPROVED FOR PUBLIC RELEASE

WHC Information Release Administration Specialist:

Kara M. Broz — November 7, 1994

SUPPORTING DOCUMENT	1. Total Pages 184

2. Title	3. Number	4. Rev No.
Documentation for Fiscal Year 1995 Annual BUSS Cask SARP Testing and Inspections.	WHC-SD-WM-TI-672	0

5. Key Words

Benificial Uses Shipping System (BUSS) Cask, Safety Analysis Report for Packaging (SARP), Hydrostatic and Dye Penetrant.

APPROVED FOR PUBLIC RELEASE

KMB 11/7/94

6. Author

Name: P. T. Saueressig

Paul T Saueressig 11/2/94
Signature

Organization/Charge Code 16800/KB5B2

7. Abstract

The purpose of this report is to compile the data generated during the Fiscal Year (FY) 1995 annual tests and inspections performed on the Beneficial Uses Shipping System (BUSS) cask. FY 1995 testing was performed because the first of several FY 1994 tests expired on October 26, 1994. In addition to compiling the generated data, this report will verify that the testing criteria identified in section 8.2 of the BUSS Cask Safety Analysis Report for Packaging (SARP), were met.

Section 8.2 "Maintenance and Periodic Inspection Program" of the BUSS Cask SARP (Ref. 4.1) requires that the following tests and inspections be performed on an annual basis:

- Hydrostatic pressure test
- Helium leak test
- Dye penetrant test on the trunnions and lift lugs
- Torque test on all permanent bolts
- Impact limiter inspection and weight test

The results of the FY 1995 annual testing of the BUSS Cask met the SARP criteria defined in section 8.2 of the BUSS cask SARP.

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9. Impact Level N/A

10. RELEASE STAMP

OFFICIAL RELEASE BY WHC DATE NOV 08 1994 STA #2 (18)

MASTER

Table of Contents

List of Tables

1.0 Introduction

The purpose of this report is to compile the data generated during the Fiscal Year (FY) 1995 annual tests and inspections performed on the Beneficial Uses Shipping System (BUSS) cask. The BUSS Cask Model R-1 is a type B shipping container used for shipment of radioactive cesium-137 and strontium-90 capsules to Waste Encapsulation and Storage Facility (WESF). The primary purpose of the BUSS Cask is to provide shielding and confinement as well as impact, puncture, and thermal protection for the capsules under both normal and accident conditions.

Section 8.2 "Maintenance and Periodic Inspection Program" of the BUSS Cask SARP (Ref. 4.1) requires that the following tests and inspections be performed on an annual basis:

2.1 Hydrostatic pressure test
2.2 Helium leak test
2.3 Dye penetrant test on the trunnions and lift lugs
2.4 Torque test on all permanent bolts
2.5 Impact limiter inspection and weight test

Testing for FY 1995 was initiated on October 12, 1994 to meet the above requirements for annual testing because the previous years (FY 1994) annual testing was initiated on October 26, 1993. This maintains the testing requirements identified in the BUSS cask SARP and Certificate of Compliance.

In addition to compiling the generated data, this report will verify that the testing criteria identified in section 8.2 of the BUSS Cask Safety Analysis Report for Packaging (SARP), Reference 4.1, was met.

2.0 Discussion/Summary

To meet the requirements of BUSS cask annual testing and inspections Preventative Maintenance (PM) procedures, operating procedures and Component Based Recall System (CBRS) data sheets were approved and are listed in Table 1, "Test Documentation":

Table 1: Test Documentation

BUSS Cask Test Documentation	
Test or Inspection	Documentation
2.1 Hydrostatic Test	Operating Procedure EO-140-021: "Perform Annual Test of BUSS Cask"
2.2 Helium Leak Test	Component Based Recall System (CBRS) Data Sheet: Loop Number T0001 Operating Procedure EO-140-021: "Perform Annual Test of BUSS Cask"
2.3 Dye Penetrant of Trunnions and Lift Lugs	(CBRS) Data Sheet: Loop Number T0001
2.4 Bolt Torque Test	PM 2C23027: "BUSS Cask Torque Test"
2.5 Impact Limiter Inspection and Weight Test	PM 2C23026: "BUSS Cask Impact Limiter Inspection"

Table 2, "Periodic Inspection Data", lists the test or inspection, the frequency the test must be performed, the FY 1995 completion period, and the next due date. All testing was performed by Westinghouse Hanford Company (WHC) personnel.

Table 2: Periodic Inspection Data

BUSS Cask Periodic Inspection and Testing			
Test or Inspection	Frequency	Completion Period	FY 1996 Due Date
2.1 Hydrostatic test	Annual	October 18, 1994	October 1995
2.2 Helium leak test	Annual	October 20, 1994	October 1995
2.3 Dye penetrant of trunnions and lift lugs	Annual	October 20, 1994	October 1995
2.4 Bolt torque test	Annual	October 12-21, 1994	October 1995
2.5 Impact limiter inspection and weight test	Annual	October 12-13, 1994	October 1995

2.1 Hydrostatic Testing

The BUSS Cask hydrostatic testing was completed on October 18, 1994. Appendix A contains the data from the work package which consists of the calibration data sheet, operating procedure and completed data sheets for EO-140-021 "Perform Annual Test of BUSS Cask".

SARP Requirements: There shall be no visible leakage. In addition, the criteria was used from Section 8.1.3 of the initial testing of the cask: There shall be no pressure decrease greater than 0.5 psig.

Test Results: The cask cavity was pressurized for 30 minutes. The lid, upper port and lower port seal areas were observed periodically through out the 30 minute period with no indications of any visible leakage. The results of this test met the SARP criteria.

A pressure gauge was installed on the hydrostatic test fixture and was used to monitor the pressure for hydrostatic testing of the BUSS cask. A second pressure gauge was installed on the hydrostatic test pump to monitor the test pump pressure during testing. The valve was shut which isolated the cask and hydrostatic test fixture from the hydrostatic test pump. The hydrostatic test fixture pressure gauge indicated a pressure increase during the 30 minute test period of 1.7 psig. The hydrostatic test pump pressure indicated the pressure was bleeding from the hydrostatic test pump and decrease below 70 psig during the 30 minute test period. Therefore, the hydrostatic test pump did not contribute to the pressure increase. The testing was performed outside and the pressure rise is attributed to the solar and ambient temperature fluxuation during the 30 minute test period. The results of this test met the additional criteria that no pressure decrease greater than 0.5 psig was observed.

2.2 Helium Leak Testing

The helium leak testing was completed on October 20, 1994. Appendix B contains the data from the work package which consists of the Non-Destructive Examination (NDE) Leak Test Procedure and Test Report.

SARP Requirements: The cask assembly shall have a leak rate of less than 1.0×10^{-5} atm-cc/sec.

Test Results: The containment boundary, lid seal, upper port cover, and lower port cover were tested and no detectable leaks were found within the sensitivity of the leak detector (2.7×10^{-10} atm-cc/sec). The results of this test met the SARP criteria.

2.3 Dye Penetrant of Trunnions and Lift Lugs

The dye penetrant test of the trunnions and lift lugs was completed on October 20, 1994. Appendix C contains the data from the work package which consists of the NDE Penetrant Procedure, Test Report and the Sandia National Laboratories (SNL) inspection criteria from the BUSS cask maintenance manual.

SARP Requirements: There shall be no cracks detected on the trunnions or lift lugs.

Test Results: No cracks were detected by dye penetrant inspection of the trunnions or lift lugs. The results of this test met the SARP requirements.

2.4 Bolt Torque Test

The bolt torque testing was initiated on October 12, 1994 and completed on October 21, 1994. Appendix D includes the work package and PM procedure which lists the permanent bolts and the torquing requirements based on the bolt design values.

SARP Requirements: All permanent bolts shall be torqued to their design values.

Test Results: The permanent bolts were removed and inspected. Difficulty was encountered during the removal of a bolt from the sixteen hole basket handle and a bolt from the bottom key on the cask body. One of the four bolts on the basket handle was sheared during removal. A drill press was used to remove the bolt and insert. A new insert and bolt was obtained from spare parts and installed. The bolt from the bottom key way could not be removed and required the use of an impact driver to loosen the bolt. New bolts were obtained from spare parts and installed in the bottom cask body key.

The remaining permanent bolts were inspected for damage, lubricated, re-installed and torqued to their design values. Quality Control (QC) verified the calibration of the torque wrenches and witness the final torquing sequences. Torque paint was applied to the trunnion, lift lug and trailer to skid bolts in order to determine if bolts movement occurs during the shipping campaign. The results of this test met the SARP requirements.

2.5 Impact Limiter Inspection and Weight Test

The impact limiter inspection and weight test was completed on October 13, 1994. Appendix E contains the work package and the PM procedure which inspects and weighs the BUSS cask impact limiters.

SARP Requirements: The impact limiters shall pass a visual inspection and the weight of each limiter shall not change from its original value more than -1% or +3% of the foam weight.

Test Results: Minor damage was found during the visual inspection which consisted of galling on the upper impact limiter impact ring. The impact ring is located on the interior of the impact limiter and contacts the lid bolts during placement of the upper impact limiter on the cask. The galling was removed and the impact ring bolts were tightened. The results of this inspection met the SARP criteria

Impact limiter S48929-001 weighed 3025 lbs, which is 0.63% more than its original weight of 3006 lbs. Impact limiter S48929-002 weighed 3015 lbs, which is 0.70% more than its original weight of 2994 lbs. The results of this testing met the SARP criteria.

3.0 Conclusion

The results of the FY 1995 annual testing of the BUSS Cask met the SARP criteria defined in section 8.2 of the BUSS cask SARP (Ref 4.1).

4.0 References

4.1 SAND83-0698 TTC-0430, Rev. 4, May 1993, Beneficial Uses Shipping System (BUSS) Cask Safety Analysis Report for Packaging (SARP), D.R. Bronowski et. all, Sandia National Laboratories.

Appendix A: Hydrostatic Test Data

New Request Num 10265
1. Document Number 2B-94-01022 W
2. Work Item Title MAINTE.SUPPORT ANNUAL TESTING BUSS CASK

3. System C99R *BUSSCASK*

4. Components

Component Number	Name
N/A	

Temporary Number	Name
USA-9511-B-U	BUSS CASK

5. Location

Facility 2C *WESF*
Bldg/Rm 225B Other BUSS CASK Other NDE

6. Associated Components

Component Number	Name
N/A	

		Date	Organization
7. Originator Name	CRAWFORD,RE	08/11/94	16700
Telephone No.	372/0070 MSIN S6-51		

8. Charge Code ~~KBP02~~ KB5B2 JG 10-4-94

9. Work Item Description

MAINTENANCE SUPPORT FOR ANNUAL TESTING OF BUSS CASK.
MES-010-005X CBRS MID INTERVAL DATA SHEET.

	Signature	Date
10. Operations Review	K.G Burton	10-3-94

11. Priority 2
12. Phase Designator P4 *4TH QUARTER (JULY 1-SEPT 30)*
13. Correct Maint. Assessment Y
14. Personnel Safety Related Y
15. Mode N/A

APPROVAL DESIGNATOR
NA

16. Resolution/Retest

MAINTENANCE TO SUPPORT ANNUAL HYDROSTATIC TESTING OF THE BUSS CASK ACCORDING TO OPERATING PROCEDURE EO-140-021, "PERFORM ANNUAL TESTING OF BUSS CASK".

NOTE: HYDROSTATIC TESTING MUST BE PERFORMED PRIOR TO HELIUM MASS SPEC.

MAINTENANCE TO SUPPORT ANNUAL TESTING FOR THE BUSS CASK FOR PROCEDURES # NDT-LT-6000 REV 3 AND NDT-PT-4000 REV 2. THE PROCEDURES ARE FOR HELIUM MASS SPECTROSCOPY OF THE BUSS CASK AND

New Request Num 10265
1. Document Number 2B-94-01022/W
2. Work Item Title MAINTE.SUPPORT ANNUAL TESTING BUSS CASK

DYE PENETRANT OF THE LIFT LUGS AND TRUNNIONS. THIS WILL BE DOCUMENTED WITH COMPONENT BASED RECALL SYSTEM LOOP NUMBER T0001 JOB CARD.

INCLUDED IN THE ANNUAL TESTING ARE THE FOLLOWING PMS:

2C23026, BUSS CASK IMPACT LIMITER ANNUAL INSPECTION (2B-94-00989)
2C23027, BUSS CASK TORQUE TEST (2B-94-00954)
2C23041, TRANSPORTATION SKID INSPECTION (2B-94-00953)
2C24010, BUSS CASK LEAK TEST FITTING MAINTENANCE (2B-94-00957)
2C24011, QUICK DISCONNECT VALVE MAINTENANCE (2B-94-00988)

THE PMS LISTED ABOVE CAN BE DONE IN CONJUNCTION WITH THE HYDROSTATIC TESTING AND/OR HELIUM MASS SPEC. OF THE CASK.

NOTE: MILLWRIGHTS WILL BE REQUIRED TO REMOVE THE TRUNNIONS AND LIFT LUGS FOR THE ABOVE NONDESTRUCTIVE EVALUATION. THIS WILL BE PERFORMED WITH INSTALLATION OF GUIDE PINS FOR REMOVAL OF THE TRUNNIONS.

MAINTENANCE TO BE SCHEDULED THROUGH OPERATIONS TO SUPPORT NDE EXAMINERS.

COORDINATION OF THE ANNUAL TESTING WILL BE PERFORMED BY THE PIC WITH ASSISTANCE FROM THE COGNIZANT ENGINEER.

17. PIC STEEL,MD
18. PIC Org. MAINTENANCE

	Signature	Date
19. Resolution By	CRAWFORD,RE	08/11/94

20. Plant Forces Work Review Required N Number

21. Resources Required

Res Code	Description	No.	Est Hrs	Act Hrs
23	MILLWRIGHT	02	08	32
24	PIPEFITTER	01	16	24
54	HEALTH PHYSICS TECHNICIANS	01	04	0
04	NUCLEAR OPERATOR	01	08	16
32	CRANE OPERATOR	01	08	8
QC	QUALITY CONTROL	01	08	12
NDE	NON-DESTRUCTIVE ENGINEERING	02	16	24

	Signature	Date
22. Cognizant Engineer	Carl T Swanson	10/3/94
23. Cognizant Manager	Edward D Kh	10-3-94

24. Reference Documents Type

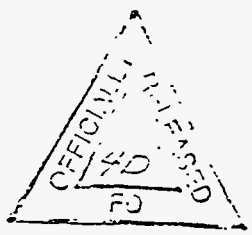
New Request Num 10265
1. Document Number 2B-94-01022/W
2. Work Item Title MAINTE.SUPPORT ANNUAL TESTING BUSS CASK

NDT-PT-4000 REV 2	PROC
NDT-PT-6000 REV 3	PROC
~~2C23026~~	~~PM~~ SOF 10/11/94
~~2C23027~~	~~PM~~
~~2C23041~~	~~PM~~
~~2C24010~~	~~PM~~
~~2C24011~~	~~PM~~
EO-140-021	PROC

25. Field Work Complete Signature [signature] Date 10/25/94

PERFORM ANNUAL TEST OF BUSS CASK

TABLE OF CONTENTS



LIST OF FIGURES

1.0 SYSTEM DESCRIPTION

This procedure provides instructions for performing the annual test of the Beneficial Uses Shipping System (BUSS) Cask containment boundary and port and lid seals.

The tests are performed on an annual basis or before returning the cask to service if it has not been used in more than one year.

2.0 PRECAUTIONS AND LIMITATIONS

2.1 General Safety Requirements

- Procedure compliance is mandatory. If the conditions or normal operations deviate from ethe prescribed steps within this procedure or steps cannot be performed as written, then ensure the system is placed in a stable configuration and notify management.
- Operation of the 25-ton bridge (byproducts) crane must comply with the requirements specified within the Hanford Site Hoisting and Rigging Manual, DOE-RL-92-36.
- Health Physics Technicians (HPTs) will release entire cask for testing prior to initiation of this procedure.

2.2 Applicable Safety Documents

The following safety documents apply to all work performed under this procedure:

DOE-RL-92-36, Hanford Site Hoisting and Rigging Manual.

WHC-CM-1-6, Radiological Control Manual.

WHC-CM-4-3, Industrial Safety Manual, Volumes 1 and 3.

SAND83-0698 TTC-0430, Beneficial Uses Shipping System (BUSS) Cask Safety Analysis Report for Packaging (SARP).

3.0 PREREQUISITE ACTIONS

3.1 Prestart Conditions for Testing BUSS Cask

3.1.1 The BUSS Cask has been moved to the crane pad where the testing will be performed. The cask is empty and disassembled and situated such that testing can be performed.

3.1.2 Personnel involved in leak testing the cask should be thoroughly familiar with helium mass spectrometer leak detection systems and with the standards and practices defined in ANSI N14.5.

3.1.3 Pressure monitoring equipment has been calibrated.

3.1.4 A clean, well-lighted work-surface is available.

3.2 Tools and Supplies

- BUSS Cask
- New Port and Lid Seal Assemblies with Helicoflex Seal Components
- Hydrostatic Plumbing Assembly (Part No. R35032-100)
- Port Leak Test Plumbing Assembly (Part No. R32035-200)
- Port Valve Tool (Part No. SS94921)
- Port Test Cover (Part No. S94924)
- Vacuum Pump
- Water Vapor Trapping System (If Needed)
- Manual or Power-operated Hydraulic Pump
- Compressed Air Supply
- 0 to 100 psig Pressure Gage, 1 psig increments
- 0 to 1000 Torr Pressure Transducer
- Apparatus for Lifting and Suspending BUSS Cask Lid
- 3/32-in. Allen Wrench and Drive Socket
- 3/16-in. Allen Wrench and Drive Socket
- 3/4-in. Allen Wrench and Drive Socket
- 12 Point, 1-5/8 Socket
- Appropriately-Sized Torque Wrenches, Allen Wrenches and Hex Drivers
- Small Screwdriver
- Lint-free Wipes
- Alcohol
- Apiezon L Grease or equivalent High Vacuum Grease
- Neolube No.1 Lubricant
- Nylon Sling (If Needed)
- Wooden Lid Stand

4.0 PROCEDURE

4.1 Install New Helicoflex Seals on Port Covers

NOTE - HPT survey and release is required prior to removal of port covers.

NOTE - This section is performed for both port covers (upper and lower). However, it will not be performed for the lower port at the same time as for the upper port. A seal assembly will be required to be prepared a second time for the upper port cover, as per section 4.5 step 2 of this procedure. Sections 4.1 and 4.2 of this procedure will be done in its entirety by the millwrights unless otherwise specified.

[1] Place the port cover on a clean, well-lighted work surface with the seal facing up.

NOTE - The port cover, seal assembly and retention system are detailed in Figure 1.

[2] Use a 3/32-inch Allen wrench to loosen the three cap screws and secure the seal assembly to the port cover.

[3] While manually holding the seal assembly from sliding on the port cover, remove the screws and their accompanying seal retainers.

CAUTION

Exercise extreme care during the seal removal and replacement operations to prevent damaging the sealing surface of the port cover.

---

[4] Lift the seal assembly from the cover. IF the assembly should bind on the locating pins, THEN gently pry loose by using a small screwdriver at the outer circumference.

[5] Clean the seal surface with a lint-free cloth and alcohol.

[6] Inspect the mounting-hole threads (threaded inserts) for signs of wear, damage or looseness. IF any damage or looseness is found, THEN notify supervision and engineering.

[7] Remove the seal assembly from the stainless steel spacer.

NOTE - The metallic seal portion of is held in place by the elastomeric O-ring.

[a] Hold the assembly such that the thumbs are located on the replaceable seal assembly.

[b] Exert thumb pressure until the seal assembly pops loose from the spacer. See Figure 2.

4.1 Install New Helicoflex Seals on Port Covers (continued)

NOTE - Elastomeric O-rings have a limited shelf life. Administrative controls must be in place to insure that out-of-date O-rings are not used. Five years from date of manufacture (cure date) is the recommended maximum shelf-life.

[8] Record the expiration date of the elastomeric O-ring, as labeled on the packaging of the new seal, and request QC verification on the BUSS CASK HYDROSTATIC TEST DATA SHEET.

[9] Unpackage a new port seal assembly.

[a] Remove the elastomeric O-ring from the Helicoflex component and set aside.

[b] Visually inspect the outer surfaces of the copper jacket for dings or scratches. Do not use the seal if damaged. Request QC verification on the BUSS CASK HYDROSTATIC TEST DATA SHEET.

[c] Clean the Helicoflex seal using lint-free wipes dampened with alcohol.

[10] Lubricate the elastomeric O-ring with a small amount of vacuum grease.

[a] Wipe the O-ring to remove the excess grease.

[b] Reinstall the O-ring to the Helicoflex component.

[11] Install a new seal assembly in the spacer ring.

[a] Position one side of the seal assembly into the groove in the inside diameter of the spacer. See Figure 3.

[b] Use the thumb and forefinger of each hand to pinch around the assembly and seat the O-ring in the spacer groove.

[c] Feel around the full circumference of the O-ring on both sides of the assembly to assure that the O-ring is fully and evenly set.

NOTE - Any waviness between the exposed surface of the O-ring and the spacer indicates that the O-ring is not properly set in the spacer groove.

[d] Use thumb pressure on high spots to correct any misalignment.

[12] Clean the Helicoflex component of the assembly again, by using a lint-free wipe dampened with alcohol. Wipe following the arc of the seal. Avoid wetting the elastomeric seal with alcohol.

NOTE - Use of alcohol on the elastomeric
applied grease. This could adver
of the seal assembly when tested.

4.1 Install New Helicoflex Seals on Port Covers (continued)

[13] Orient the seal assembly above the cover so the countersunk features for the retainers are facing away from the cover.

[14] Carefully place the seal assembly onto the port cover, engaging the three locating pins.

[15] Hold the assembly in position and loosely install the three retainers and mounting screws.

[16] Continue to hold the seal assembly in place and progressively tighten the three attachment screws. Ensure that the seal is evenly drawn towards the cover and does not bind on the locating pins.

[17] Use an appropriate-size torque wrench and a 3/32-in. Allen drive socket to tighten the mounting screws to 12 in-lb.

4.2 Install New Helicoflex Seal on Cask Lid

NOTE - HPT survey and release is required prior to removal of lid.

WARNING

BE AWARE THE LID WEIGHS APPROXIMATELY 1500 LBS. TAKE APPROPRIATE SAFETY MEASURES TO PREVENT SWINGING OR DROPPING THE LID WHILE THE SEAL IS BEING REPLACED.

THE LID MAY BE INVERTED AND PLACED ON A SUITABLE WORK SURFACE BY FOLLOWING GOOD RIGGING PRACTICE. A NON-MARRING (i.e., NYLON) SLING MAY BE USED THROUGH A LID ATTACHMENT BOLT HOLE TO PERFORM THIS TASK. THE LID, SEAL ASSEMBLY AND RETENTION SYSTEM ARE DETAILED IN FIGURE 4.

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[1] Request the crane operator to place the lid on the wooden stand.

[2] Use a 3/16-inch Allen wrench to loosen the six cap screws attaching the seal assembly to the flange of the lid.

[3] While manually holding the seal in place (i.e. from sliding on or bumping against the lid), remove the screws and associated retainers. Place the screws and retainers where they will not become lost or damaged.

NOTE - This is a two-person operation.

4.2 Install New Helicoflex Seal on Cask Lid (continued)

CAUTION

Exercise extreme care while removing and replacing the seal to prevent damaging the sealing surface of the lid.

---

[4] Lift the seal assembly from the lid flange. IF the assembly should bind on the locating pins, THEN gently pry loose by using a small screwdriver at the outer circumference.

[5] Clean the seal surface with a lint-free cloth and alcohol.

[6] Inspect the six mounting-hole threads (threaded inserts) for signs of wear, damage or looseness. IF any damage or looseness is found, THEN notify supervision and engineering.

[7] Remove the seal assembly from the stainless-steel spacer. The metallic seal portion is held in place by the elastomeric O-ring.

[a] Hold the assembly so the thumbs are located on the replaceable seal assembly.

[b] Exert thumb pressure until the seal assembly pops loose from the spacer. See Figure 5.

NOTE - Elastomeric O-rings have a limited shelf life. Administrative controls must be in place to insure that out-of-date O-rings are not used. Five years from date of manufacture (cure date) is the recommended maximum shelf-life.

[8] Record the expiration date of the elastomeric O-ring, as labeled on the packaging of the new seal, and request QC verification on the BUSS CASK HYDROSTATIC TEST DATA SHEET.

[9] Unpackage a new lid seal assembly.

[a] Remove the elastomeric O-ring from the Helicoflex component and set aside.

[b] Visually inspect the outer surfaces of the copper jacket for dings or scratches. DO NOT use the seal if damaged. Request QC verification on the BUSS CASK HYDROSTATIC TEST DATA SHEET.

[c] Clean the Helicoflex seal using lint-free wipes dampened with alcohol.

[10] Lubricate the elastomeric O-ring with a grease, and wipe the O-ring with a lint excess grease.

[11] Reinstall the O-ring to the Helicoflex

4.2 Install New Helicoflex Seal on Cask Lid (continued)

[12] Install a new seal assembly in the spacer ring.

[a] Position one side of the seal assembly into the groove in the inside diameter of the spacer. See Figure 6.

[b] Use the thumb and forefinger of each hand to pinch around the assembly to seat the O-ring in the spacer groove.

[c] Feel around the full circumference of the O-ring on both sides of the assembly to assure that the O-ring is fully and evenly set.

NOTE - Any waviness between the exposed surface of the O-ring and the spacer indicates that the O-ring is not properly seated in the spacer groove.

[d] Use thumb pressure on high spots to correct any misalignment.

[12] Clean the Helicoflex component of the assembly again, by using a lint-free wipe dampened with alcohol. Wipe following the arc of the seal. Avoid wetting the elastomeric seal with alcohol.

NOTE - Use of alcohol on the elastomeric seal will remove the applied grease. This could adversely affect the performance of the seal assembly when tested.

[13] Orient the lid assembly above the lid flange such that the countersunk features for the retainers are facing away from the lid.

[14] Carefully place the seal assembly onto the lid flange, engaging the three locating pins.

[15] Hold the assembly in position and install the six retainers and mounting screws.

[16] Continue to hold the seal assembly in place and progressively tighten the mounting screws. Ensure that the seal is evenly drawn towards the cover and does not bind on the locating pins.

[17] Use an appropriate torque wrench and a 3/16-inch Allen drive socket to tighten the mounting screws to 100 in-lb.

4.3 Prepare Cask for Hydrostatic Test

NOTE - Figure 7 shows the hydrostatic test set-up.

[1] Record the date and cask serial number on the BUSS CASK HYDROSTATIC TEST DATA SHEET.

[2] Request the millwrights to install port cover in upper port.

[a] Install the port cover by centering over the upper port in the cask body, aligning the six mounting holes.

[b] Hold the cover from moving while installing the six mounting bolts and washers.

[c] Use an appropriate torque wrench and a 3/4-in. socket to incrementally tighten the bolts in a crossing pattern to 10, 30, and then 60 ft-lb.

[d] Torque the pattern again at 60 ft-lb.

[3] Fill the empty cask payload cavity with demineralized/deionized water to a level within the top and bottom of the upper port penetration.

NOTE - This water level will be at the approximate centerline of the penetration of the upper port into the cask interior and will be approximately 35 gals.

[4] Install the three lid guide pins.

[5] Completely extend the three lid jack screws by turning clockwise with a 3/4-in. socket wrench.

[6] Request the millwrights to lubricate the twelve lid bolts with Neolube No.1 lubricant. Ensure that a thin coating of lubricant is on the threads and bearing surface of the bolt heads. Allow to dry completely.

[7] Request the crane operator to use the 25 ton crane to install the lid.

[a] Place the lid on the cask, expelling the excess water.

[b] Install the lid bolts and tighten by hand.

[c] Remove the two lid leak-check fitting plugs.

CAUTION

Use only hand operations to install tightening with the jacking screws cask body and lid.

4.3 Prepare Cask for Hydrostatic Test (continued)

[8] Attach the hydrostatic plumbing assembly (part no. R35032-100) as shown in Figure 7 by inserting into the quick-connect valve until a snap is felt.

[9] Request a pipefitter to attach the flexible line to a water filled hydraulic pump (manual or power-operated). Record pump choice and 0-100 psig pressure gage type (installed to plumbing assembly), record calibration of gage, and request QC verification on the BUSS CASK HYDROSTATIC TEST DATA SHEET.

CAUTION

If a power-operated pump is used, a pressure release valve must be installed to protect against inadvertent overpressure.

---

[10] Request the millwrights to lower the lid using the jack screws.

[a] Use a 3/4-inch socket wrench to turn each jack screw one quarter turn counter-clockwise.

[b] Continue around the screw pattern until the indicator pins are flush with the top of the jack screw.

[11] Request the millwrights to remove the three lid guide pins.

[12] Request the millwrights to use an appropriate sized torque wrench and a 12 point, 1-5/8-inch socket, to torque the bolts initially to 50 ft-lbs in the following sequence:

1, 7, 4, 10, 2, 8, 5, 11, 3, 9, 6, 12

NOTE - The bolt numbers are marked on the lid surface adjacent to each bolt hole.

[a] Increase the lid bolt torque to 100 ft-lb, 200 ft-lb, 600 ft-lb, 800 ft-lb, 1000 ft-lb, and then a final torque of 1,250 ft-lb, following the above sequence at each torque increment.

[b] Make two additional passes at 1,250 ft-lb value repeating the above torquing pattern.

[13] Remove excess water out of the closure head/cask body groove and dry the cask exterior.

[14] Request pipefitters to apply air to one of the lid leak test fittings to force the water out of the leak test cavity.

4.4 Perform Hydrostatic Test

NOTE - The variance in pressure will be monitored during the 30-minute test within the sensitivity (1 psig) of the 0-100 psig pressure gage.

[1] Open the valves to the pump.

[2] Request pipefitters to operate the pump to slowly increase the pressure to 25, 50, then 70 psig.

[a] Stop after each increment and observe the cask, lid, upper port cover, and lower port quick-connect valve for signs of water leakage.

[b] If leakage is observed, depressurize the cask, removing the leaking component, and inspect the seal and sealing surfaces for damage or foreign matter.

[3] When the test pressure of 70 psig is reached, valve off the pump. Record the time on the BUSS CASK HYDROSTATIC TEST DATA SHEET.

[a] Allow the cask to set for a minimum period of two hours to allow the water temperature to stabilize.

[b] After a minimum of two hours, record the time and request QC verification on the BUSS CASK HYDROSTATIC TEST DATA SHEET.

[4] Open the valve to the pump, raise the test pressure to 75 (-0, +5) psig, and close the valve. Record the cavity pressure and start time on the BUSS CASK HYDROSTATIC TEST DATA SHEET. Request QC verification.

[5] Observe the pressure gage for 30 minutes. There should be no drop in pressure greater than 1/2 psig during that interval. A pressure drop indicates a leak. Observe the lid and ports for indications of leakage during the 30-minute test. Request QC verification on BUSS CASK HYDROSTATIC TEST DATA SHEET.

[6] Record the cavity pressure and time at the end of the test and any pressure decay on the BUSS CASK HYDROSTATIC TEST DATA SHEET. Request QC verification. If the pressure decreases and no exterior leakage is observed there are several possibilities:

- Air is trapped in the system
- The pump isolation valve is leaking
- Leakage is occurring between the metallic sealing element and the elastomeric sealing element but has not filled the test cavity enough to vent thro
- The test water was warmer its volume.

4.4 Perform Hydrostatic Test (continued)

[7] In the event of a failed test (i.e. pressure decay) without any visible indications of water leakage, the cask should be re-tested. Before re-testing:

- Check for test equipment line and/or valve leaks.
- Allow additional time for water temperature to come to equilibrium with that of the cask.

[8] IF water at a flange is observed, THEN remove the component, inspect the sealing surfaces, replace the seal with a new seal and re-test. A second failure, as indicated by the leakage, is cause for remedial action on the sealing components.

[9] Report a water leak at the lower port quick-connect valve to supervisor and engineering.

[10] Record the final disposition of test and any comments on the BUSS CASK HYDROSTATIC TEST DATA SHEET.

4.5 Prepare Cask for Leak Testing

[1] Drain the cask of water with the following steps:

[a] Close the valve on the hydrostatic test fixture.

[b] Disconnect the hydrostatic test fixture from the hydrostatic pump.

[c] Attach the hydrostatic test fixture to a hose routed to a drain to Tank-100.

[d] Remove the upper port cover by removing the six bolts holding it in place.

[e] Open the valve on the hydrostatic test fixture to drain the cask to the Tank-100 drain.

NOTE - Allow the cask cavity to completely drain prior installing upper port cover and vacuum drying cask. This may be accomplished by air flow through the upper port, cavity and out the lower port.

[2] Request millwrights to prepare upper port seal per section 4.1 of this procedure.

[3] Request millwrights to install the upper port cover per section 4.3 step 2 of this procedure.

4.5 Prepare Cask for Leak Testing (continued)

[4] Remove the hydrostatic test fixture from the lower port.

[a] Install the lower port leak test plumbing assembly with a vacuum gage/transducer capable of reading 1 torr.

[b] Connect vacuum pump to the lower port test fixture.

[5] Energize vacuum pump and vacuum dry the cask.

[a] When the vacuum pump torr indicator reads 5 torr or less, close the vacuum pump valves.

[b] Monitor the indicator for 15 minutes. IF the pressure rise does not exceed 2 torr at the end of 15 minutes, THEN the cask is considered dry. IF a pressure increase of more that 2 torr is observed, THEN check the system for leaks.

[6] Shut off vacuum pump and open vacuum pump valves. Allow system to reach atmospheric pressure.

[7] Disconnect vacuum pump from leak test plumbing assembly.

[8] Request NDE personnel to perform leak check according to leak test procedure NDT-LT-6000 (current revision).

[9] Request a copy of the test report generated from leak test procedure NDT-LT-6000 and sign BUSS CASK HYDROSTATIC TEST DATA SHEET. The leak test data sheets shall be maintained with the completed data sheets from this procedure.

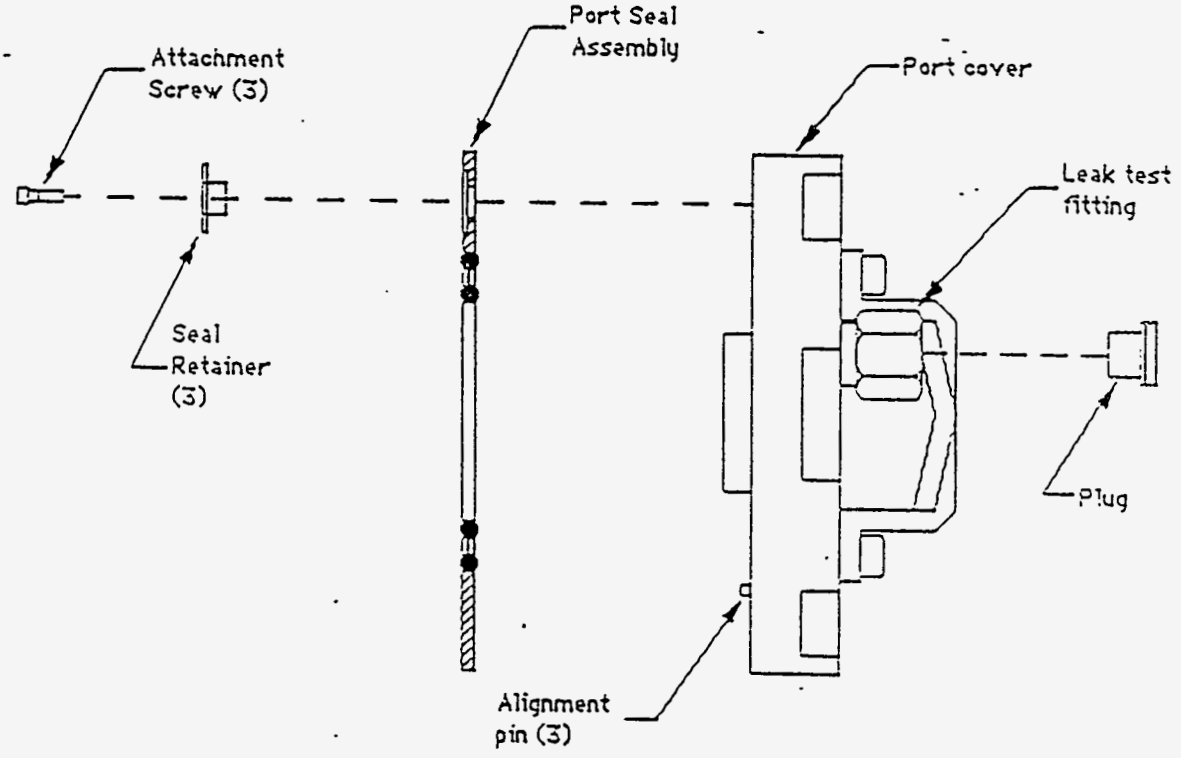

FIGURE 1 - PORT COVER AND SEAL DETAIL

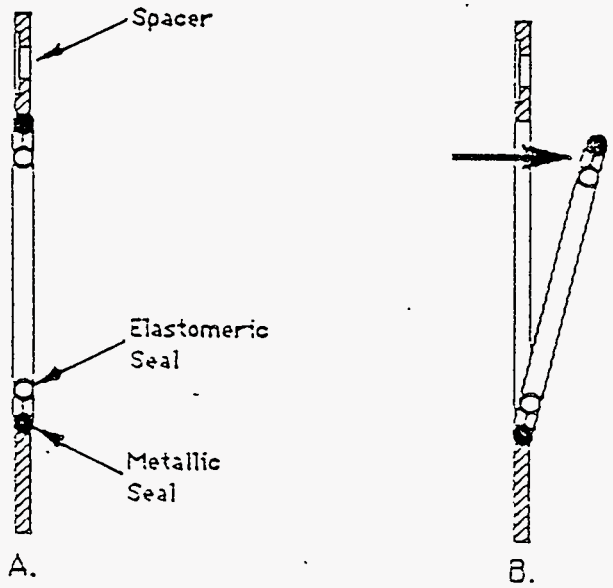

FIGURE 2 - PORT COVER HELICOFLEX SEAL REMOVAL

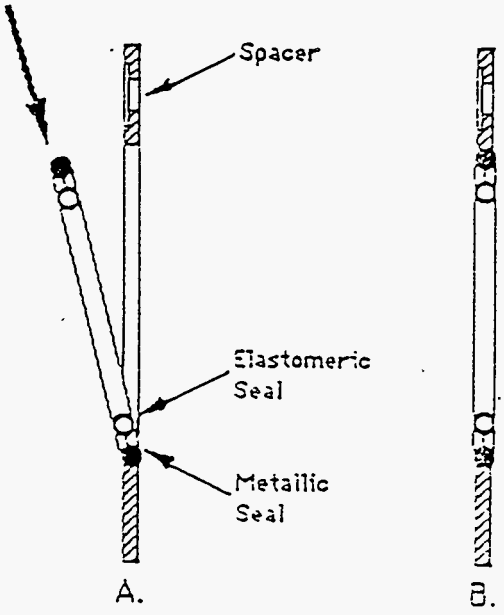

FIGURE 3 - PORT COVER HELICOFLEX SEAL REPLACEMENT

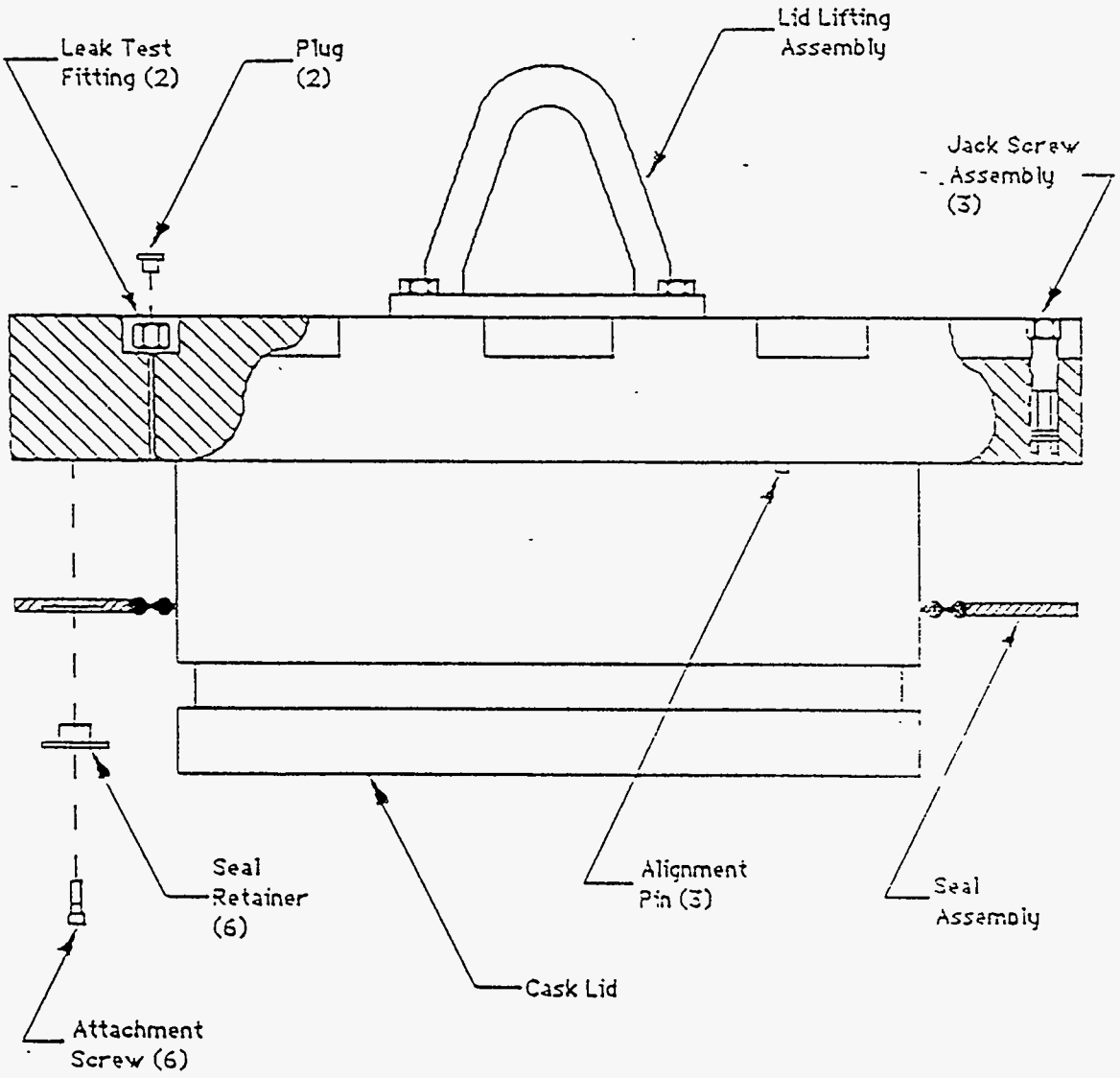

FIGURE 4 - LID AND SEAL DETAIL

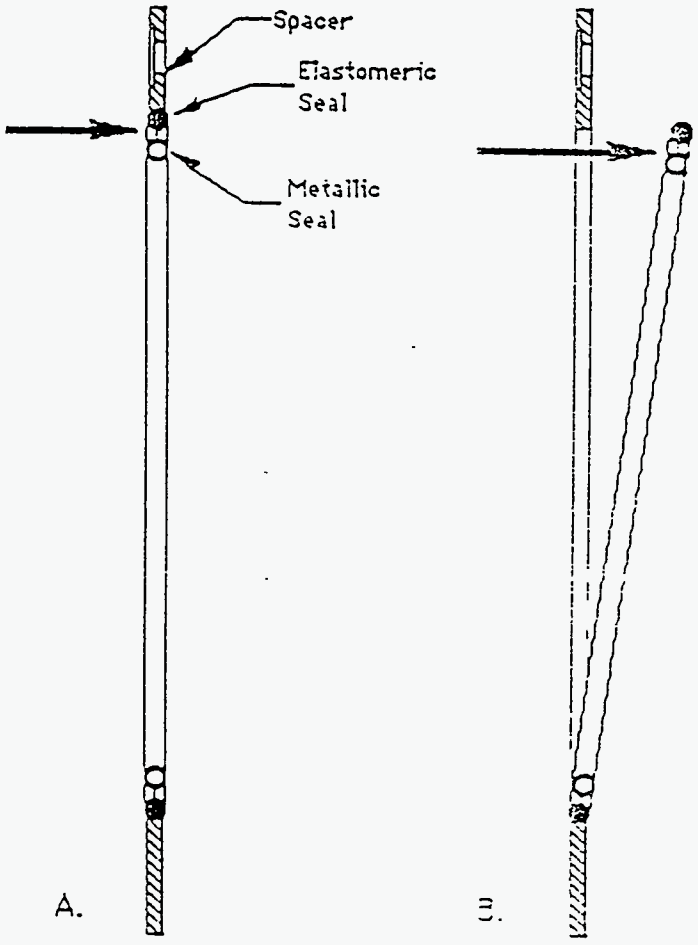

FIGURE 5 - LID HELICOFLEX SEAL REMOVAL

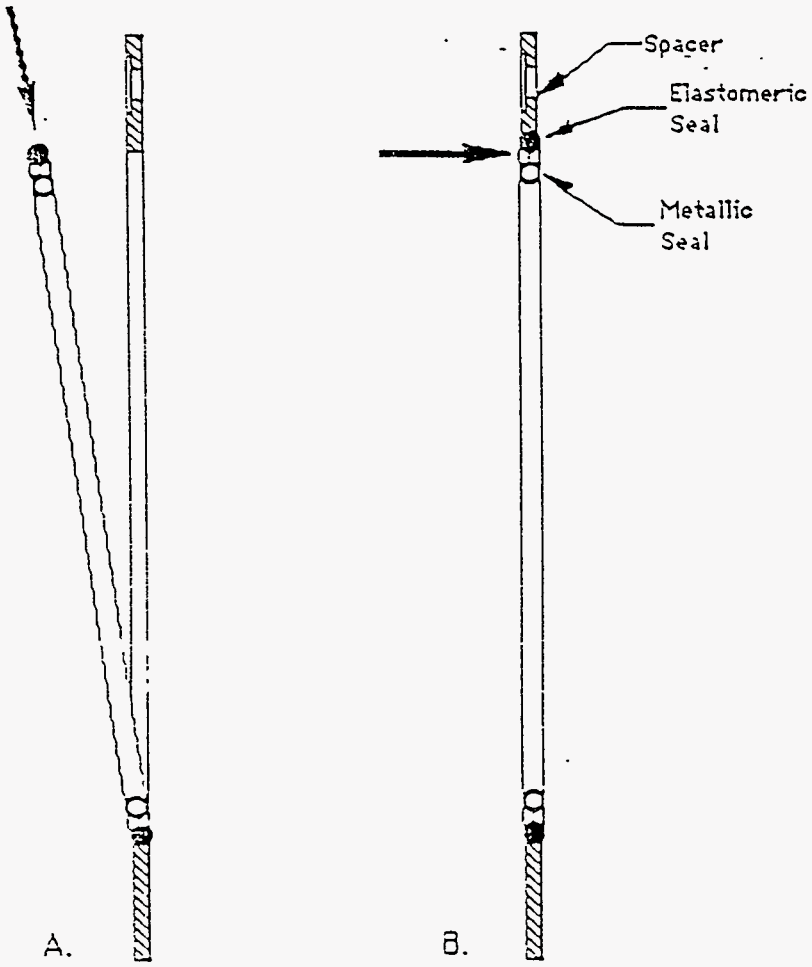

FIGURE 6 - LID HELICOFLEX SEAL REPLACEMENT

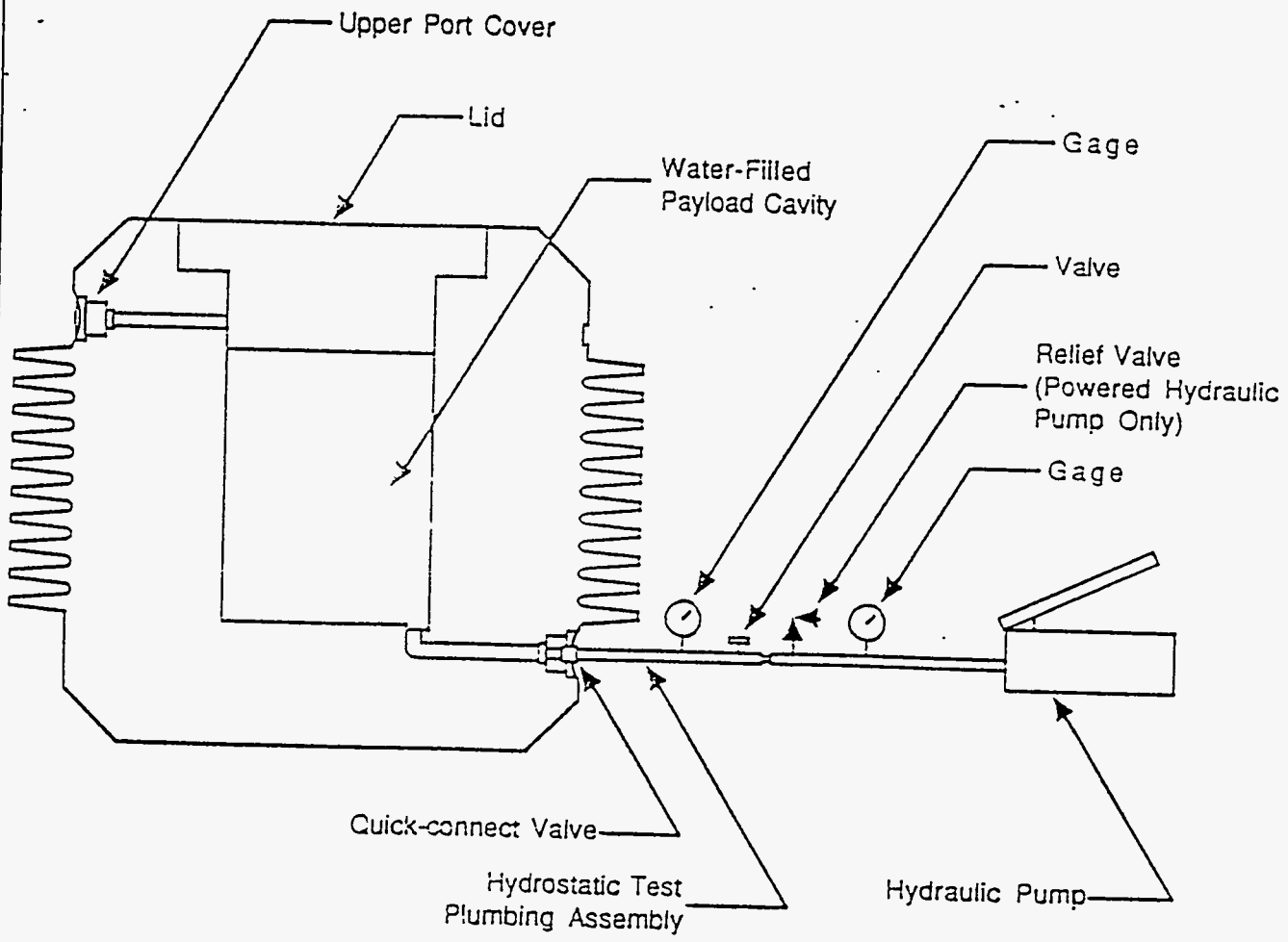

FIGURE 7 - HYDROSTATIC TEST CONFIGURATION

BUSS CASK HYDROSTATIC TEST DATA SHEET
(page 1 of 2)

4.1 Install New Helicoflex Seals on Port Covers

[8] Expiration date of upper port seal O-ring _____

QC verification _____ Date: _____

Expiration date of lower port seal O-ring _____

QC verification _____ Date: _____

[9] QC verify inspection of upper port seal _____ Date: _____

QC verify inspection of lower port seal _____ Date: _____

4.2 Install New Helicoflex Seal on Lid

[8] Expiration date of lid seal O-ring _____

QC verification _____ Date: _____

[9] QC verify inspection of lid seal _____ Date: _____

4.3 Prepare Cask for Hydrostatic Test

[1] Test date: _____ Cask Serial No. _____

[9] Hydro Pump Type: _____ Manual _____ Power Operated

Hydro Pump Mfg. _____ Model No. _____

Pressure Gage Mfg. _____ Serial No. _____

Cal Expiration Date _____ Gage Resolution _____

QC Verification _____ Date: _____

4.4 Perform Hydrostatic Test

[3] Time 70 psig reached and pump valved off _____

Time after cask is allowed to set (min 2 hrs) _____

QC verify cask has set 2 hrs _____ Date: _____

[4] Cavity Pressure _____ psig (minimum pressure is 75 psig)
(maximum pressure is 80 psig)

Test start time _____

QC verify start pressure and time ____

BUSS CASK HYDROSTATIC TEST DATA SHEET
(page 2 of 2)

[5] QC verify there is no visible leakage _____ Date: _____

[6] Test end time _____

Test pressure held for _____ minutes (minimum time is 30 mins)

Pressure decay _____

QC verify end time and pressure _____ Date: _____

[10] Final Disposition:

Acceptable _____ Unacceptable _____

Comments: _____

_____

_____

_____

_____

4.5 Prepare Cask for Leak Testing

[9] Copy of NDT-LT-6000 test report received:

Operations signature: _____ Date: _____

SAMPLE

PRE - JOB SAFETY MEETING

Job Description/Title:	Date:
Hydrostatic Testing BUSS Cask	10/17/94

MEETING TO BE HELD PRIOR TO START OF NONROUTINE ACTIVITY HAVING INHERENT HAZARD RISK

Items Discussed (as checked)

- [x] Approved Procedures/Plans
- [ ] Job Safety Analysis
- [ ] Hazardous Chemicals/Materials
- [ ] Facility Unique Hazards
- [ ] Lock, Tag or Bypass Involvement
- [x] HPT Coverage
- [ ] Informal Safety Review
- [ ] OSR/SAR Impacts
- [x] Communication
- [ ] Breathing Air Supply
- [ ] Alternate Air Supply
- [ ] Escape Routes
- [x] ALARA
- [x] Work Package # 2B-94-1044

Upper and lower port covers will be rebuilt for helium mass spec only.

PERMITS: _____

_____

_____

COMMENTS (use attachments as needed)

- Hydrostatic Testing
  - Lid prep, fill cask, install lid, pressurize cask drain cask, blow down cask, move cast to millwrights shop.

Meeting Chairman Signature: N/A Operations

N/A OSS

Paul Saueressig Other (Engineering)

ATTENDANCE ROSTER

Name	Payroll Number	Org. Code
1. Paul T Saueressig	80128	16800
2. M. J. Elwood	66174	16900
3. Ray Andrews	6C730	
4. J. W. Cummings	64287	16A10
5. [illegible]	8461	16900
6. [illegible]	64067	
7. [illegible]	8A252	
8. [illegible]	55569	
9. [illegible]	6A207	16A10
10. J R WALKER	85762	16A10
11. [illegible]	63534	16A10
12.		
13.		
14.		
15.		
16.		
17.		
19.		
20.		
21.		
22.		
23.		
24.		
25.		

PRE - JOB SAFETY MEETING

Job Description/Title:	Date:
BUSS Cask Annual Testing	10/18/94

MEETING TO BE HELD PRIOR TO START OF NONROUTINE ACTIVITY HAVING INHERENT HAZARD RISK

Items Discussed (as checked)

- [x] Approved Procedures/Plans
- [ ] Job Safety Analysis
- [ ] Hazardous Chemicals/Materials
- [ ] Facility Unique Hazards
- [ ] Lock, Tag or Bypass Involvement
- [ ] HPT Coverage
- [ ] Informal Safety Review
- [ ] OSR/SAR Impacts
- [x] Communication
- [ ] Breathing Air Supply
- [ ] Alternate Air Supply
- [ ] Escape Routes
- [ ] ALARA
- [x] Work Package # 2B-94-01022 2B-94-

PERMITS: _____

_____

_____

COMMENTS (use attachments as needed)

Torque Test PM
Blow down cask
Move cask to millwrights shop.
Rebuild upper port seal and install
Vacuum pump hook up

Remove trunnions and lift lugs.

Meeting Chairman Signature: _____ Operations

_____ OSS

Paul T Simmons Other (Engineering)

ATTENDANCE ROSTER

Name	Payroll Number	Org. Code
1. [illegible]	63918	16900
2. [illegible]	84300	16900
3. [illegible]	85697	16A10
4. [illegible]	85767	16A10
5. [illegible]	6B673	
6. [illegible]	95419	16F10
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BUSS CASK HYDROSTATIC TEST DATA SHEET
(page 1 of 2)

4.1 Install New Helicoflex Seals on Port Covers

[8] Expiration date of upper port seal O-ring 9-31-97

QC verification _____ Date: 10-18-94

Expiration date of lower port seal O-ring 9-31-97

QC verification _____ Date: 10-18-94

[9] QC verify inspection of upper port seal _____ Date: 10-18-94

QC verify inspection of lower port seal _____ Date: 10-18-94

4.2 Install New Helicoflex Seal on Lid

[8] Expiration date of lid seal O-ring 9-31-97

QC verification _____ Date: 10-18-94

[9] QC verify inspection of lid seal _____ Date: 10-18-94

4.3 Prepare Cask for Hydrostatic Test

[1] Test date: 10-18-94 Cask Serial No. USA/9511/B(U) DOE

[9] Hydro Pump Type: ✓ Manual _____ Power Operated

Hydro Pump Mfg. HENDERER Model No. 15

Pressure Gage Mfg. WIKA Serial No. 2R0263

Cal Expiration Date 9-95 Gage Resolution 1 PSI

QC Verification _____ Date: 10-18-94

4.4 Perform Hydrostatic Test

[3] Time 70 psig reached and pump valved off 1300

Time after cask is allowed to set (min 2 hrs) 1035 AM

QC verify cask has set 2 hrs _____ Date: 10-18-94

[4] Cavity Pressure 76 PSI psig (minimum pressure is 75 psig)
(maximum pressure is 80 psig)

Test start time 1300

QC verify start pressure and time _____ Date: 10-18-94

BUSS CASK HYDROSTATIC TEST DATA SHEET
(page 2 of 2)

[5] QC verify there is no visible leakage _____ Date: 10-18-94

[6] Test end time 1330

Test pressure held for 30 min minutes (minimum time is 30 mins)

Pressure decay 77.7

QC verify end time and pressure _____ Date: 10-18-94

[10] Final Disposition:

Acceptable X Unacceptable _____

Comments: The system was pumped up to 25, 50, 70 and 75 psig with no indication of leakage at lid, upper port and lower port seal areas. The pressure on the hydrostatic test fixture and pump was set at 76 psi. The hydrostatic test fixture pressure gauge raised to 77.7 psi but the pressure gauge on the hydrostatic test pump dropped to below 70 psi during the 30 minute test period. After the 30 minutes the valve between the two gauges was opened and the pressure was measured on both gauges to be 68 psi.

4.5 Prepare Cask for Leak Testing

[9] Copy of NDT-LT-6000 test report received:

Operations signature: _____ Date: 10/25/94

Appendix A
Page 31
WHC-SD-WM-TI-672 Rev 0

CALIBRATION JOB CARD

AG NO: _____ CHG: __ LEVEL: ___ WORK AUTH: _____
OE CODE: _____ LOOP NO: _____ STATUS: ___ PROCEDURE: _____
TEM NAME: _____ REV: ___
YSTEM: _____ MFG: Precision / Sd. Instr. DOE-NUM: _____
AREA: 100K MODEL: _____ FREQ: ___
BLDG: 1717K PART-NO: _____ LAST CAL: 10/18/94
ROOM: Instr SERIAL-NO: K-93-0003 CAL DUE: 4/18/95
LOC: _____ RANGE-TOL: 0-100- EMS: _____
REVIOUS REMARKS: _____ EMSWA: _____
STD-LEVEL: _____
CAL-ORG: _____

TOLERANCE HISTORY: ___

WG: _____ CVI: ____

TECH. MANUALS: _____

TANDARDS REQUIRED/USED:

Stds Lab. ID #

QUIP: Hi5e TAG NO: 77E-31-04-023 CAL DUE DATE: 04/01/95

Note: This Test Equip → Traceable to Stds Lab 3717B

Wtendon

EVICE CALIBRATION:

TEP	SIGN OFF	INPUT	UNIT	AS-FOUND OUTPUT	AS-LEFT OUTPUT	UNIT	OUTPUT REQUIRED	TOL +/-
		0.0	DSC	0.0	0.0	DIT	0.0	1/2%
		25.0	"	25.0	25.0	"	25.0	"
		50.0	"	50.0	50.0	"	50.0	"
		75.0	"	75.0	75.0	"	75.0	"
		100.0	"	100.0	100.0	"	100.0	"
		100.0	"	100.0	100.0	"	100.0	"
		75.0	"	75.0	75.0	"	75.0	"
		50.0	"	50.0	50.0	"	50.0	"
		25.0	"	25.0	25.0	"	25.0	"
		0.0	"	0.0	0.0	"	0.0	"

S-FOUND OUT OF CAL YES __ NO ✓ AS-LEFT ADJUSTED YES __ NO ✓

EMARKS/EXCEPTIONS: _____ PROC REV REQD YES __ NO __

ERFORMED BY:

SIGNATURE	INIT	DATE	HOURS			
[signature]	WDA	10/18/95	1.0			✓ TE
		/ /				/ /
SIGNATURE	INIT	DATE	HOURS	SIGNATURE	INIT	DATE

J-5	CRAFT/RESOURCE USAGE LOG AND MAINTENANCE RECORD	1. Document Number 2B-94-01022/6

Date	Turnover, Problem Description, Action Taken	Name	Craft/ Resource Type	Hours
10/17/94	The pressure gauges on the hydrostatic ~~test~~ fixture and hydrostatic test pump were pegged. The gauges were removed and could not be recalibrated. Procedure EO-140-021 needs to be revised to monitor the pressure as the cask lid is being torqued to prevent reoccurance.			
10/18/94	Installed new calibrated pressure gauge on hydrostatic test fixture.			
~~10/18~~				
10/17 - 10/20	Replaced seals	Walkupchannam	23	24
10/17 - 10/20	Fixture support	Krumings	24	24

Summary by Craft/Resource Type

Craft/Resource Type	Total Hours	Craft/Resource Type	Total Hours

Appendix B: Helium Leak Test Data

New Request Num 10265
1. Document Number 2B-94-01024W
2. Work Item Title MAINTE.SUPPORT ANNUAL TESTING BUSS CASK

3. System C99R *BUSSCASK*

4. Components

Component Number	Name
N/A	

Temporary Number	Name
USA-9511-B-U	BUSS CASK

5. Location

Facility 2C *WESF*
Bldg/Rm 225B Other BUSS CASK Other NDE

6. Associated Components

Component Number	Name
N/A	

	Date	Organization
7. Originator Name CRAWFORD,RE	08/11/94	16700

Telephone No. 372/0070 MSIN S6-51

8. Charge Code ~~KBP02~~ KB5B2 J4 10-4-94

9. Work Item Description

MAINTENANCE SUPPORT FOR ANNUAL TESTING OF BUSS CASK.
MES-010-005X CBRS MID INTERVAL DATA SHEET.

	Signature	Date
10. Operations Review	K.A Burton 2	10-3-94

11. Priority
12. Phase Designator P4 *4TH QUARTER (JULY 1-SEPT 30)*
13. Correct Maint. Assessment Y
14. Personnel Safety Related Y
15. Mode N/A

APPROVAL DESIGNATOR
NA

16. Resolution/Retest

MAINTENANCE TO SUPPORT ANNUAL HYDROSTATIC TESTING OF THE BUSS CASK ACCORDING TO OPERATING PROCEDURE EO-140-021, "PERFORM ANNUAL TESTING OF BUSS CASK".

NOTE: HYDROSTATIC TESTING MUST BE PERFORMED PRIOR TO HELIUM MASS SPEC.

MAINTENANCE TO SUPPORT ANNUAL TESTING FOR THE BUSS CASK FOR PROCEDURES # NDT-LT-6000 REV 3 AND NDT-PT-4000 REV 2. THE PROCEDURES ARE FOR HELIUM MASS SPECTROSCOPY OF THE BUSS CASK AND

New Request Num 10265
1. Document Number 2B-94-01022/W
2. Work Item Title MAINTE.SUPPORT ANNUAL TESTING BUSS CASK

DYE PENETRANT OF THE LIFT LUGS AND TRUNNIONS. THIS WILL BE DOCUMENTED WITH COMPONENT BASED RECALL SYSTEM LOOP NUMBER T0001 JOB CARD.

INCLUDED IN THE ANNUAL TESTING ARE THE FOLLOWING PMS:

2C23026, BUSS CASK IMPACT LIMITER ANNUAL INSPECTION (2B-94-00989)
2C23027, BUSS CASK TORQUE TEST (2B-94-00954)
2C23041, TRANSPORTATION SKID INSPECTION (2B-94-00953)
2C24010, BUSS CASK LEAK TEST FITTING MAINTENANCE (2B-94-00957)
2C24011, QUICK DISCONNECT VALVE MAINTENANCE (2B-94-00988)

THE PMS LISTED ABOVE CAN BE DONE IN CONJUNCTION WITH THE HYDROSTATIC TESTING AND/OR HELIUM MASS SPEC. OF THE CASK.

NOTE: MILLWRIGHTS WILL BE REQUIRED TO REMOVE THE TRUNNIONS AND LIFT LUGS FOR THE ABOVE NONDESTRUCTIVE EVALUATION. THIS WILL BE PERFORMED WITH INSTALLATION OF GUIDE PINS FOR REMOVAL OF THE TRUNNIONS.

MAINTENANCE TO BE SCHEDULED THROUGH OPERATIONS TO SUPPORT NDE EXAMINERS.

COORDINATION OF THE ANNUAL TESTING WILL BE PERFORMED BY THE PIC WITH ASSISTANCE FROM THE COGNIZANT ENGINEER.

17. PIC STEEL,MD
18. PIC Org. MAINTENANCE

	Signature	Date
19. Resolution By	CRAWFORD,RE	08/11/94

20. Plant Forces Work Review Required N Number

21. Resources Required

Res Code	Description	No.	Est Hrs	Act Hrs
23	MILLWRIGHT	02	08	32
24	PIPEFITTER	01	16	24
54	HEALTH PHYSICS TECHNICIANS	01	04	0
04	NUCLEAR OPERATOR	01	08	16
32	CRANE OPERATOR	01	08	8
QC	QUALITY CONTROL	01	08	12
NDE	NON-DESTRUCTIVE ENGINEERING	02	16	24

	Signature	Date
22. Cognizant Engineer	[signature]	10/3/94
23. Cognizant Manager	[signature]	10-3-94

24. Reference Documents Type

New Request Num 10265
1. Document Number 2B-94-0102/W
2. Work Item Title MAINTE.SUPPORT ANNUAL TESTING BUSS CASK

NDT-PT-4000 REV 2	PROC
NDT-PT-6000 REV 3	PROC
~~2C23026~~	~~PM~~
~~2C23027~~	~~PM~~
~~2C23041~~	~~PM~~
~~2C24010~~	~~PM~~
~~2C24011~~	~~PM~~
EO-140-021	PROC

SQ 10/11/94

25. Field Work Complete Signature MD Date 10/25/94

PROCEDURE REVIEW AND APPROVAL

UNCONTROLLED

I have reviewed and approved the Nondestructive Examination Procedure NDT-LT-6000 revision 3 for conformance to the ASME Boiler and Pressure Vessel Code, 1992 issue, A-92 Addenda.

Please place this sheet in WHC-CM-4-38, in front of the above mentioned procedure.

J. K. Keve
NDE Level III Leak Test Examiner

12-27-93
Date

J. C. Krogness, Manager
Nondestructive Examination

12-28-93
Date

TABLE OF CONTENTS

APPENDICES

LIST OF FIGURES

TITLE:

GENERAL LEAK TEST PROCEDURE

Approved by A. J. Fisher 12/29/93

A. J. Fisher, Manager
Quality Assurance

1.0 PURPOSE

This procedure establishes minimum requirements for the control of leak measurement and location for examination of components, piping systems, and vessels and is not intended to be used for hydrostatic or pneumatic (proof) testing.

2.0 SCOPE

This procedure has three basic parts, which are used in conjunction with one another for each examination. These parts consist of Request/ Instruction for Nondestructive Test Services (R/I) form; general requirements applicable to all leak testing techniques; and appendixes for specific requirements applicable to the various leak testing techniques.

3.0 GENERAL REQUIREMENTS

3.1 Referenced Documents

The specifically referenced content of documents referenced herein shall be considered part of this procedure.

3.2 Request/Instruction for Nondestructive Test Services

The following additional requirements shall be included, or directly referenced, in the R/I form and shall be considered as part of this procedure for the specific job requested.

- The acceptance criteria and method, or technique required
- The extent of examination required
- Test pressure
- Material, part, or weld identification for each object
- Gas type
- Any additional requirements.

3.3 Certification of Personnel

All WHC personnel performing leak examination for acceptance shall be certified in accordance with the requirements of WHC-CM-4-39, *Qualification and Certification of Nondestructive Examination Personnel*.

3.4 Administrative Requirements

Administrative controls specified in NDT-GA-2000, "General Administrative Procedure," shall apply to all work done in accordance with this procedure.

3.5 Deviation from Requirements

If it becomes necessary to deviate from the requirements contained in this procedure, a special technique shall be prepared and qualified (proven satisfactory for the referenced requirement) by actual demonstration. The qualified technique shall be approved by a Nondestructive Examination (NDE) Level III Leak Test (LT) Examiner before its use in an actual examination. The records documenting the technique qualification shall be retained and submitted to the Authorized Code Inspector for concurrence, where required. If the specified sensitivity and testing requirements are not achieved, the appropriate documentation shall be prepared in accordance with NDT-GA-2000.

3.6 Safety Related

3.6.1 Hazardous atmospheres

Great care shall be exercised when working with vessels and pipes or gas leakage from such equipment to avoid severe injury or death from oxygen-deficient, toxic, or explosive atmospheres. The guidance provided in the WHC-CM-4-3, *Industrial Safety Manual*, Volume 1, particularly Standard W-13, "Confined Space Entry," shall be fully utilized.

3.6.2 Compressed gases

Compressed gas cylinders shall be secured in the upright position. Before using, inspect valves, regulators, and other accessories to ensure safe operation. The guidance provided in WHC-CM-4-3, *Industrial Safety Manual*, Volume 1, Standard PS-2, "Compressed Gas Cylinders," shall be fully utilized.

3.6.3 Pressure relief valves

A pressure relief valve shall be installed in all pressure leak test systems for protection of personnel and equipment. This pressure relief valve shall be in addition to others normally furnished with gas cylinders and regulators. The pressure relief valve shall be actuated at a pressure value considerably less than that c
entire pressurized system (test article plus t

should normally be actuated at a pressure of approximately 10 percent greater than the required leak test pressure.

3.6.4 Prior pressurization

Articles with documented evidence of prior pressurization to at least one and one quarter the leak test pressure, or certified by the manufacturer for use at the leak test pressure, may be examined or used without further proof testing or investigation as noted on the R/I or as approved by the NDE Level III LT Examiner. Procedures for verifying safety of all other equipment shall be obtained from Industrial Safety and Fire Protection.

3.6.5 Handling

Lead, aluminum, carbon steel, and low melting point materials (such as cadmium and zinc) shall not contact stainless steel and/or nickel alloys being leak tested. Additional restrictions, as well as specific handling and cleanliness instructions, shall be specified in the R/I or documents directly referenced therein.

4.0 APPLICABLE TEST EQUIPMENT AND APPROVED MATERIALS

4.1 Pressure/Vacuum Gages

When components are to be subjected to pressure, one or more dial-indicating pressure measurement device(s) (or equal as determined by NDE Level II or III LT Examiner) shall be connected to the component, with one of the devices readily visible to the operator controlling the pressure throughout the pressurizing/vacuum and testing cycle, with the other dial-indicating device(s) being located at the component. When required, a recording-type gage may be substituted for one of the pressure-indicating devices.

4.1.1 Indicator range

Indicating gages should preferably have graduations over a range of about double the intended maximum pressure, but in no case shall the range be less than one and one half nor more than four times that pressure. When greater accuracy is required, quartz bourdon tube gages or liquid manometers may be used.

4.1.2 Calibration Requirements

All gages or other pressure measurement devices shall carry nonrepetitive Standards Laboratory identification numbers. Devices shall be calibrated against a certified standard deadweight tester, a calibrated master gage, or a mercury column and shall have been recalibrated during the last year, or as required by the referencing Ameri
Engineers (ASME), *ASME Boiler and Pressure Ve*

time a malfunction is suspected. Records of calibration shall be maintained in accordance with the calibration program requirements.

4.2 Sealant and Marking Materials

Sealant materials, including gaskets, will exhibit closed cellular structure so that a gas cannot flow through the material. Sealant and marking materials shall be certified in accordance with NDT-GA-2000.

4.3 Connections

Metal tubing and compression fittings should be used wherever possible (minimize use of plastic or rubber hose). Metal tubing and compression fittings shall be used if required by the Code or Standard referenced by the R/I.

5.0 EXAMINATION REQUIREMENTS

5.1 Precleaning

Before leak testing, the test surface shall be visually examined to ensure that the area is dry and free of contaminants that would prevent performance of a valid leak test. Precleaning or surface preparation, other than with a solvent, shall be the responsibility of the customer. The cleaning and drying process shall be compatible with the testing method such that leaks will not be plugged or masked and also to the satisfaction of the NDE Level II or III LT Examiner.

5.2 Visual Inspection

Before leak testing, visually inspect accessible external surfaces and fittings of the test object for gross leaks. Preliminary leak tests may also be employed to detect and eliminate gross leaks; however, this shall be done in a manner that will not invalidate the specified test.

5.3 Pressurization

Components that are to be pressure tested shall be pressurized as specified in the R/I or by the NDE Level III LT Examiner and shall not be tested at a pressure exceeding 25 percent of the design pressure.

5.4 Gases

When gases other than ordinary air are used, the concentration of the tracer gas shall be determined or estimated as required by the referencing Code section.

5.5 Post-Examination Cleaning

Following each examination, all examination materials shall be removed from the test surface. The application of protective coatings by NDE personnel shall be specified in the R/I or documents directly referenced therein.

6.0 RESULTS OF EXAMINATION

6.1 Acceptance Criteria

A certified Leak Test Examiner (NDE Level II or III) shall evaluate indications. The area under test is acceptable when the measured leak is less than the value specified in the R/I. Where the examination reveals an unacceptable leak rate from the object, NDE personnel shall record the condition and initiate the appropriate documentation as specified in NDT-GA-2000.

6.1.1 Reexamination

Rejected parts may be reexamined by another technique to pinpoint leaks. Repaired areas in the test item shall be cleaned and reexamined using the original test procedure or as required by the referencing ASME Code section.

7.0 RECORDS OF EXAMINATION

7.1 Special Techniques (specific)

When necessary, a special technique shall be prepared and either referenced by, attached to, or included as part of the examination report. Special techniques will be assigned an identification number associating it with the procedure with which it will be used. For example, NDT-LT-6001 identifies the first leak test special technique associated with the General Leak Test Procedure NDT-LT-6000.

7.2 Leak Test Procedure and Test Report

The Leak Test Procedure and Test Report (see Figure 1) shall be divided into two sections: the documentation of specific examination parameters, and the results of the examination. Gage(s) and temperature measuring device(s), if required, shall be identified by the Standards Laboratory number. This number allows access to the complete identification and calibration history of the device. The documentation of specific examination parameters shall contain, but not be limited to, the following information as applicable:

- Job number
- Customer and address

- Company
- Project or system name.
- Part description and identification
- Work package number/traveler number
- Acceptance criteria
- Associated nonconformance report numbers
- Test temperature and measuring devices
- Test pressure and barometric pressure
- Gas type and concentration
- Bubble solution manufacturer and batch number
- Gage(s) standards lab number, range, and calibration expiration date
- Type of equipment used for detecting and measuring leaks
- Standard leak and expiration date of calibration
- Soak times, pressure decay time, time duration of examination
- Response time and accumulation time
- Procedure number with appendix and revision number
- Special techniques and revision number
- Work Instruction and revision number
- Any applicable data (i.e., calculations)
- Examination results
- Location of leaks
- Sketch showing method or technique setup
- Date of examination
- Examiner's name and certification level
- Interpreter's name and certification level
- NDE Level III LT Examiner (or NDE Manager) review.

Locations on the report form that are not applicable to the specific examination shall be shown as N/A (not applicable).

7.3 Records Storage

The NDE examination reports that are either lifetime or nonpermanent quality assurance records shall be officially stored in the work package or traveler. When a copy of the NDE examination report is issued to the requestor or his representative, it shall be their responsibility to insert the report into the work package or traveler. For jobs with and without work packages or travelers, NDE will retain a courtesy copy for 5 years.

8.0 REFERENCES

American Society of Mechanical Engineers, *ASME Boiler and Pressure Vessel Code*, Section V, "Nondestructive Examination."

WHC-CM-4-3, Volume 1, *Industrial Safety Manual.*
PS-2, "Compressed Gas Cylinders."
W-13, "Confined Space Entry."

WHC-CM-4-38, *Nondestructive Examination Procedures*, NDT-GA-2000, "General Administrative Procedure."

WHC-CM-4-39, *Qualification and Certification of Nondestructive Examination Personnel.*

9.0 BIBLIOGRAPHY

WHC-CM-4-2, *Quality Assurance Manual.*

WHC-CM-4-28, *Quality Assurance Program Manual for ASME Code.*

Figure 1. Leak Test Procedure and Test Report.
(sheet 1 of 2) (A-6000-494)

Page 1 of _____

Westinghouse Hanford Company

NDE LEAK TEST PROCEDURE AND TEST REPORT
NON DESTRUCTIVE EXAMINATION
306 BLDG., 300 AREA - TEL. 376-5401

Job No.

Requestor | Company | Project/System/Work Package/Traveler No.

MSIII | Bldg. | Area

Acceptance Std. | Section | Para. | Date | ☐ NA

Dwg. No. ☐ NA | HGR ☐ NA | Cleaning ☐ NA

UNCONTROLLED

TEST CONDITIONS

Temperature _____ Device ID _____ ☐ NA
Barometric Pressure _____ ☐ NA
Test Pressure _____ ☐ NA
Gas _____ ☐ NA
Concentration _____ ☐ NA
Other _____ ☐ NA
Bubble Solution _____ ☐ NA
Batch No. _____
Gage 1 584-31-04- _____ ☐ NA
Range _____
Calib. Exp. _____
Gage 2 584-31-04- _____ ☐ NA
Range _____
Calib. Exp. _____
Relief Valve _____ ☐ NA

TEST EQUIPMENT ☐ NA

Manufacturer _____
Mfgr. No. _____
Fine Range x 10 Atmcc/sec/Div ☐ NA
Std. No. 584-40 03- _____
Std. Leak x 10 Atmcc/sec
Calib. Exp. _____
Medium Range x 10 Atmcc/sec/Div ☐ NA
Std. No. 584-40 03- _____
Std. Leak x 10 Atmcc/sec
Calib. Exp. _____
Gross Range x 10 Atmcc/sec/Div ☐ NA
Std. No. 584-40 03- _____
Std. Leak x 10 Atmcc/sec
Calib. Exp. _____

WHC PROCEDURE NO ☐ NA

☐ NDT LT-6000 Rev. _____
Appendix _____ Rev _____
☐ Special Tech. No. _____

WORK INST. ☐ NA

☐ NDT LT-601 Rev. _____
☐ Other _____

SYSTEM SENSITIVITY

☐ Same as MSLD Calib. of:
Fine Range x 10 Atmcc/sec/Div
Med. Range x 10 Atmcc/sec/Div
Gross Range x 10 Atmcc/sec/Div

TEST TIME

He Response Time _____ ☐ NA
He Accum. Time _____ ☐ NA
Soak Time _____ ☐ NA

Weld No., Part No., or Serial No.	Acc.	Rej	He Bell Ind.	Comments

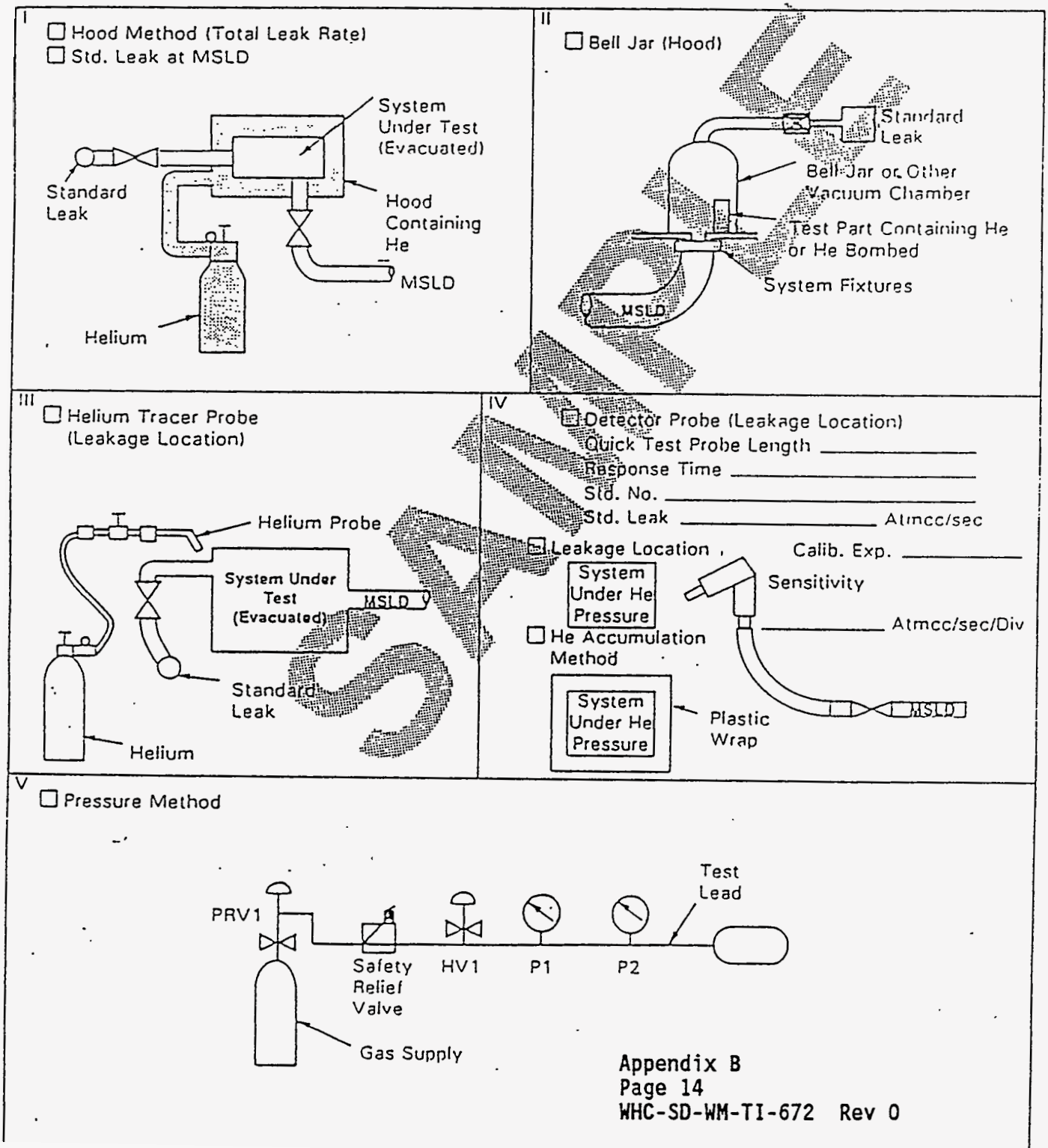
Technique Pre Approval ☐ NA | LT Level/Date

Technician | Level | Interpreted by | LT Level

Date of Examination | Date

Appendix B
Page 13
WHC-SD-WM-TI-672 Rev 0

Figure 1. Leak Test Procedure and Test Report.
(sheet 2 of 2) (A-6000-494)



APPENDIX A
HELIUM LEAK TEST TECHNIQUE

1.0 SCOPE

This appendix sets forth specific requirements for the helium leak test technique and shall be used in conjunction with the Request/Instruction for Nondestructive Test Services (R/I) form and NDT-LT-6000, "General Leak Test Procedure."

2.0 APPLICABLE TEST EQUIPMENT AND APPROVED MATERIALS

2.1 DETECTOR PROBE (SNIFFER, SAMPLING, OR QUICK-TEST)

Commercial probe with hose length less than 15 feet or a QUICK-TEST type probe with a hose length less than 100 feet.

2.2 TRACER (SPRAY) PROBE

Stainless steel hypodermic needle or a commercial helium nozzle.

2.3 HELIUM HOOD

The hood may be a plastic bag approximately one and one half times the volume of the test part.

2.4 STANDARD LEAKS

Leakage rates ranging from 10^{-10} to 10^{-2} std cm^3/s of helium in current calibration.

2.5 MASS SPECTROMETER

The helium leak detector is a Vacuum Instruments Corporation MD-180, or equal, as determined by the Nondestructive Examination (NDE) Level II or III Leak Test (LT) Examiner.

2.6 AUXILIARY EQUIPMENT

When necessary, constant voltage transformers, auxiliary pumping systems, manifolds, and gages may be used. Normally constant voltage transformers are not required for mass spectrometer leak detectors (MSLD) because of internally regulated power supplies. However, if the equipment becomes unstable, operates erratically, or sluggish because of line voltage variations, then either a different power source or a constant voltage transformer shall be used.

*This procedure has been completely rewritten. There are no revision bars indicated.

APPENDIX A
HELIUM LEAK TEST TECHNIQUE

2.7 HELIUM

U.S. Bureau of Mines high-purity grade or better.

3.0 SPECIFIC REQUIREMENTS

3.1 AUXILIARY TESTS

In addition to helium leak testing, it may be desirable to perform a bubble, sonic, or other gross leak test to find and plug larger leaks.

3.2 SURFACE CONDITION

Helium leak testing shall be performed before dye penetrant, hydrostatic, or gas-pressure-bubble tests, unless otherwise specified in the R/I.

3.3 CALIBRATION OF MASS SPECTROMETER LEAK DETECTOR

1. The equipment shall be turned on and allowed to warm up for the minimum time specified by the instrument manufacturer, or at least 30 minutes before calibrating the MSLD.

2. The MSLD shall be calibrated by the vacuum technique using a permeation-type standard leak that is attached directly to the MSLD inlet.

3. The standard leak shall be in the range of 1×10^{-7} to 1×10^{-10} atm cm^3/s.

4. Details of the setup and necessary adjustments shall be performed to the instrument manufacturer's operating manual.

5. The helium background (BG-1) shall be measured and the machine sensitivity shall be calculated by Equation 1.

NOTE: When operating on the Hanford reservation and the ambient temperature is between 65 degrees and 85 degrees Fahrenheit, atmosphere cubic centimeters per second (atm cm^3/s) will be equal to standard cubic centimeters per second (std cm^3/s). When operating outside of these parameters and standard cubic centimeters per second (std cm^3/s) is the nomenclature for the acceptance standard, then the leak rate shall be corrected to standard conditions (77 degrees Fahrenheit and 14.7 psia).

APPENDIX A
HELIUM LEAK TEST TECHNIQUE

Equation 1

$$\text{MSS (std cm}^3\text{/s/div)} = \frac{\text{CL (std cm}^3\text{/s)}}{\text{(MSI-1) - (BG-1)}}$$

Where: MSS = MSLD machine sensitivity

CL = Helium leak rate of the calibrated standard leak

MSI-1 = Leak rate meter reading attributable to helium from the standard leak plus background

BG-1 = Leak rate meter reading attributable to background, measured after MSI-1 is determined

div = Minor scale division

The MSLD is acceptable for use if the machine sensitivity is better than 1×10^{-9} std cm^3/s/div helium.

Calibration will be performed in accordance with this schedule:

- At the beginning and end of each 2-hour period of continuous operation.
- At the beginning and end of each operating period, if operation is not continuous.
- At any time the operator suspects the equipment is performing erratically.

If the MSLD has experienced a loss of sensitivity to less than 1×10^{-9} std cm^3/s/div, all examinations must be repeated since the time of the last satisfactory calibration.

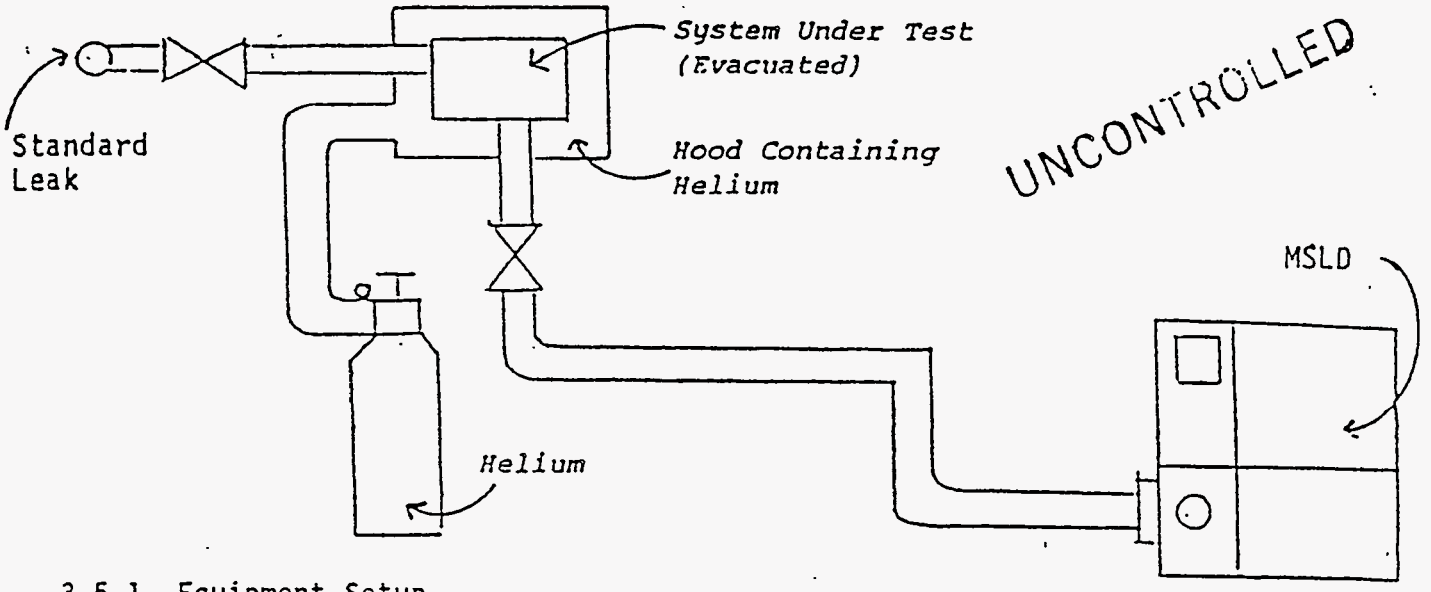
3.4 LEAK TEST METHODS

A NDE Level II or III LT Examiner will select one of the following techniques: hood technique, helium tracer probe, or helium detector probe.

APPENDIX A
HELIUM LEAK TEST TECHNIQUE

3.5 HOOD TECHNIQUE (TOTAL LEAK RATE)

Figure A-1. Hood Technique.



3.5.1 Equipment Setup

Connect test part to MSLD, as shown in Figure A-1. The calibrated leak standard and the MSLD shall be attached, where feasible, to the component as far apart as possible. Alternately, when the test part contains helium, the MSLD may be connected to a bell jar type device.

3.5.2 Evacuation

Evacuate the test part by operating the MSLD according to the manufacturer's written operating instructions.

3.5.3 Part Enclosure

Enclose the test part with any suitable envelope or container such as a plastic bag or hood.

3.5.4 Preliminary System Calibration

1. To determine the preliminary system calibration (PSC) and the helium response time, open the calibrated leak to the system.

2. After the measured leak rate becomes stable, record the reading as MSI-2.

APPENDIX A
HELIUM LEAK TEST TECHNIQUE

NOTE: The time difference between the helium application and a stable reading on the MSLD is the system response time.

3. Close the calibrated leak to allow the MSLD to stabilize, and record system background (BG-2).

4. Calculate the preliminary system calibration according to Equation 2, and record both the PSC and response time.

NOTE: The calibration shall be repeated when there is any change in the MSLD system setup (e.g., a change in the portion of helium bypassed to the auxiliary pump, if used, or any change in the calibrated leak).

Equation 2

$$PSC\ (\text{std cm}^3/\text{s/div}) = \frac{CL\ (\text{std cm}^3/\text{s})}{(MSI\text{-}2) - (BG\text{-}2)}$$

Where:
- PSC = Preliminary system calibration
- CL = Helium leak rate of the calibrated standard leak
- MSI-2 = Leak rate meter reading attributable to helium from the standard leak in the system, plus background of the system
- BG-2 = Leak rate meter reading attributable to background of the system, measured after MSI-2 is determined
- div = Minor scale division

3.5.5 Leakage Rate

To determine the system leakage rate, open the MSLD to the system and fill the hood with helium (ensure helium concentration is about 100 percent). Wait until the response time has elapsed (as determined in 3.5.4) or when the MSLD has stabilized, and record the meter reading (MSI-3).

APPENDIX A
HELIUM LEAK TEST TECHNIQUE

3.5.6 Actual System Calibration

Perform actual system calibration (ASC) by opening the calibrated leak into the system with helium still in the hood; after waiting a period of time equal to the response time, record MSLD reading (MSI-4). Calculate actual system sensitivity according to Equation 3, and record the ASC.

Equation 3

$$\text{ASC (std cm}^3\text{/s/div)} = \frac{\text{CL (std cm}^3\text{/s)}}{\text{(MSI-4) - (MSI-3)}}$$

Where: ASC = Actual system calibration

CL = Helium leak rate of the calibrated standard leak

MSI-4 = Total leak rate meter reading attributable to helium from leakage in the system, the standard leak, and background

MSI-3 = Leak rate meter reading attributable to leakage into the system, plus background

div = Minor scale division

If the ASC has decreased below the PSC by more than 35 percent, the cause shall be investigated and corrected. Then the component or system shall be retested.

3.5.7 Leakage Rate Calculation

Calculation of measured leak rate shall be according to Equation 4.

APPENDIX A
HELIUM LEAK TEST TECHNIQUE

Equation 4

$$\text{MLR (std cm}^3\text{/s)} = \frac{\text{ASC [(MSI-3) - (BG-2)] (100)}}{\text{\% helium}}$$

Where:

MLR = Measured leak rate of components

ASC = Actual system calibration as determined in (Equation 3)

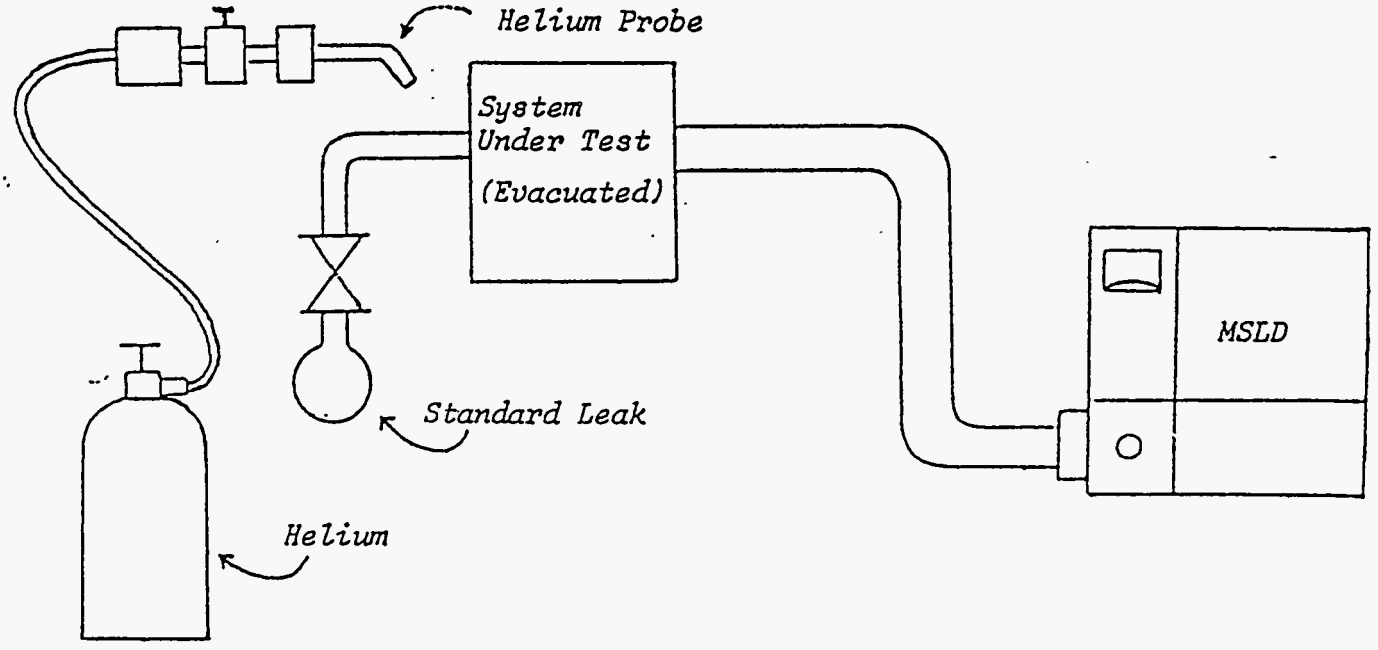
MSI-3 = Leak rate meter reading attributable to the real leak, plus background

BG-2 = Leak rate meter reading attributable to background of the system

% helium = Estimated helium concentration in hood

3.6 HELIUM TRACER PROBE (LEAKAGE LOCATION ONLY)

Figure A-2. Helium Tracer Probe Technique.



APPENDIX A
HELIUM LEAK TEST TECHNIQUE

3.6.1 Helium Tracer Probe Technique

Helium tracer probe technique shall not be used for acceptance testing unless approved before the test by the NDE Level III LT Examiner.

3.6.2 Equipment Setup

Connect the test part to the MSLD, as shown in Figure A-2.

3.6.3 Evacuation

Evacuate the test part.

3.6.4 Operation

When evacuated, operate the MSLD using manufacturers' written operating instructions.

3.6.5 Helium Regulation

Adjust the helium pressure regulator so that the tracer probe emits a fine stream of 100 percent helium.

ATTENTION: Special care shall be taken not to point the tracer probe at anyone. The needle or nozzle tip could become a projectile if propelled off the supply hose by an excessive burst of pressure.

3.6.6 System Calibration

When using the tracer probe for acceptance, a capillary standard leak shall be attached to the component as far as possible from the MSLD. The capillary standard leak shall remain open during system calibration. Evacuate the component with the MSLD, and calibrate the system by passing the previously adjusted helium supply within 1/4 inch of the capillary standard leak. Note the time required for the helium indication to appear and stabilize on the MSLD (response time).

3.6.7 Scanning

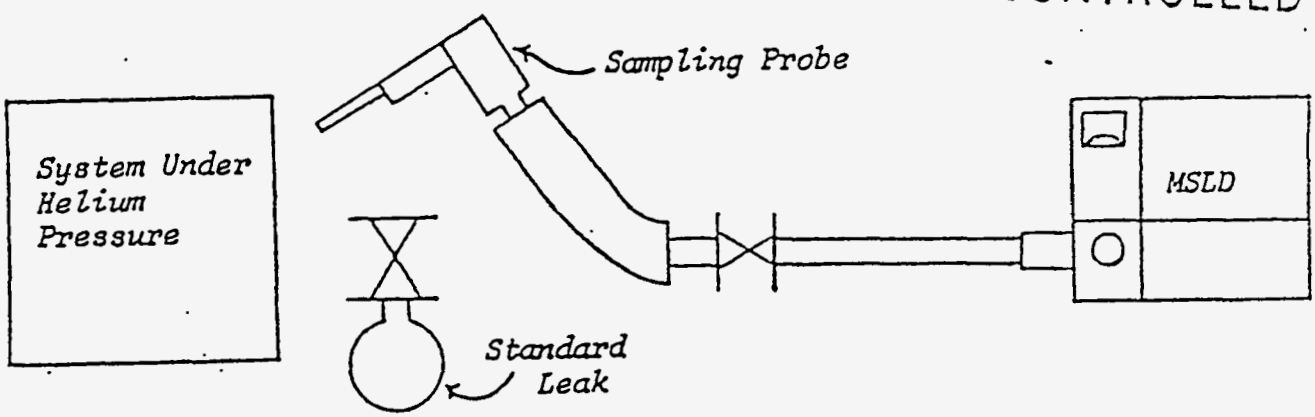
The scanning rate shall not exceed that which can detect a leakage rate of 1×10^{-5} std cm^3/s of helium flowing though the capillary standard leak into the test system. Slowly move the tracer probe within 1/4 inch along the exterior of the test part, always moving from the upper to the lower portion

APPENDIX A
HELIUM LEAK TEST TECHNIQUE

of the part. If the flow rate of the tracer probe is reduced, the system calibration shall be repeated to determine a new scanning rate. Monitor the leak rate meter and/or the speaker for indications of a leak, and record meter reading (MSI-3). Mark the locations of all leaks detected.

3.7 DETECTOR PROBE (SNIFFER OR "QUICKTEST")

Figure A-3. Detector Probe Technique.



3.7.1 Part Pressurization

Pressurize the test part with helium as noted on the R/I or as approved by the NDE Level III LT Examiner. Allow the test part to soak for at least 30 minutes. The test is to be conducted in a draft-free enclosure or by shielding the probe with a rubber cone.

3.7.2 Concentration of Tracer Gas

The concentration of the helium tracer gas shall be a minimum of 10 percent by volume at the specified test pressure.

If helium concentration is less than 100 percent, then the standard leak shall be smaller than the acceptance criteria. Refer to Equation 5 to calculate the maximum size of the standard leak.

Equation 5

$$Q = (\text{acceptance criteria}) \left[\frac{\text{Actual helium concentration (\%)}}{100} \right]$$

Q = maximum leakage rate of the standard leak

APPENDIX A
HELIUM LEAK TEST TECHNIQUE

3.7.3 Response Time

The time required for a helium indication to appear and stabilize on the MSLD is the response time and shall be noted on the test report.

3.7.4 Scanning Rate Determination

The normal scanning rate shall be determined by passing the detector probe across the orifice of the standard leak, provided the helium concentration in the standard simulates the test article concentration. The tip of the probe shall be within 1/8 inch of the surface being scanned.

3.7.5 Scanning

Slowly scan all sealing surfaces with the detector probe as shown in Figure A-3 at the rate determined in 3.7.4. The examination scan should proceed from the lowest portion to higher portions of the system. The detector probe method is qualitative and is usually used to locate leaks.

3.7.6 Tubular Heat Exchanger

When testing tubular heat exchanger, the probe shall be inserted into each tube end and held for a time equal to the response time to check for cracks or splits in the tube walls. When desirable, all tube-to-tube sheet welds may be tested by the encapsulator method. If the encapsulator is used, the response time is determined by placing the encapsulator over the orifice on the capillary calibration leak standard and noting the time required for an indicated response.

1. Mark all leaks detected, and seal them temporarily while probing for additional leaks.

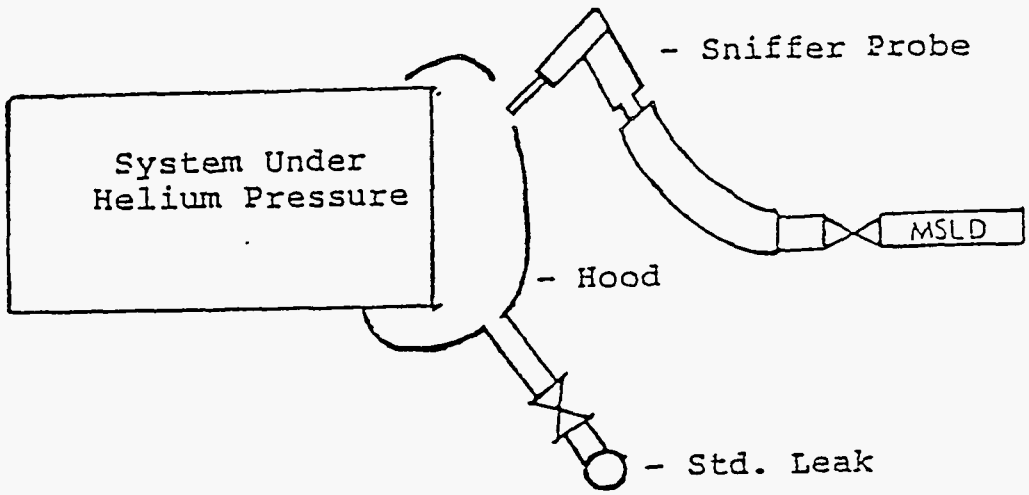
2. Record locations of all leaks detected.

3.7.7 Other Application

Quantitative measurements of leakage may be accomplished by using the detector probe and a hood accumulation technique. A hood (may be a plastic envelope or bag) is placed over the weld or zone to be leak tested. Helium leakage to the atmosphere, if any, is collected in the hood. A detector probe is used to detect the accumulation of helium in the hood as shown in Figure A-4.

APPENDIX A
HELIUM LEAK TEST TECHNIQUE

Figure A-4. Accumulation Technique.



3.7.7.1 Standard Leak. The capillary standard leak used to qualify this technique shall be within a factor of 10 of the acceptance criteria; i.e., 5 X 10^{-6} atm cm^3/s acceptance criteria, the standard leak shall be from 5 X 10^{-5} atm cm^3/s to 5 X 10^{-7} atm cm^3/s.

3.7.7.2 Accumulation Time. The accumulation time is determined by measuring the increase in helium concentration from a standard leak in a test hood at 5- to 10-minute intervals. The minimum accumulation time is determined when the helium concentration in the test hood reaches a level at least 200 divisions above the background signal. The detector probe background signal may vary slightly; therefore it is recommended the helium signal be significantly larger than the background signal.

3.7.7.3 Hood. The hood used during calibration and in determining the accumulation time shall be representative of the hood used to test the component or weld.

3.7.7.4 Calibration. Without helium in the system under test, the standard leak is opened to the hood and signal response MSI-6, and corresponding accumulation time is recorded.

Response of the detector probe to a standard leak shall be checked both before and after the examination. The sensitivity shall not decrease by more than 35 percent. If it does, the cause shall be investigated and corrected; then the component or system shall be r

APPENDIX A
HELIUM LEAK TEST TECHNIQUE

Equation 6

$$\text{MLR std } cm^3/s = \frac{(MSI\text{-}7) - (MSI\text{-}5) \quad (CL)\ (100)}{(MSI\text{-}6) - (MSI\text{-}5) \quad \%\ \text{helium}}$$

Where:

MLR = Measured leak rate of component

MSI-5 = Leak rate meter reading (divisions) attributable to helium in the atmosphere (background)

MSI-6 = Leak rate meter reading (divisions) attributable to the standard leak after accumulation time

MSI-7 = Leak rate meter reading (divisions) of helium leakage into hood after accumulation time

CL = Helium leak rate of standard leak

% helium = Estimated helium concentration in test part

1.0 SCOPE

This appendix sets forth specific requirements for the pressure change technique and shall be used in conjunction with the Request/Instruction for Nondestructive Test Services (R/I) form and NDT-LT-6000, "General Leak Test Procedure."

2.0 SPECIFIC REQUIREMENTS

2.1 REQUEST/INSTRUCTION FOR NONDESTRUCTIVE TEST SERVICES

The following additional requirements shall be included, or directly referenced, in the R/I.

- o Test gas, if other than air
- o If required, permission for evacuating the test article before introducing the test gas
- o Starting pressure
- o Special precautions
- o Acceptance criteria shall be specified by the R/I in terms of pressure change permitted over a prescribed time period.

2.2 TECHNIQUE SELECTION

Examination technique selection shall be tailored to the requirements of the measurement system and the test article being examined as determined by the Nondestructive Examination (NDE) Level II or III Leak Test (LT) Examiner.

2.3 TEST ARTICLE

The test article volume, rigidity, provision for, and likely consequences of evacuation or pressurization shall be considered before leak testing.

---

*This procedure has been completely rewritten. There are no revision bars indicated.

APPENDIX B
PRESSURE CHANGE TECHNIQUE

2.4 TEST PRESSURE

Components shall be examined at the pressure specified on the R/I or as approved by the NDE Level III LT Examiner. For a vacuum test, the pressure shall be at least 2 psi below atmospheric pressure or as required by the referencing American Society of Mechanical Engineers, ASME Boiler and Pressure Vessel Code section.

2.5 MEASUREMENT SYSTEM

The measurement system is defined as all components needed to measure a leakage rate from a test article. These components may be items such as tubing, valves, gages, instrumentation, and relief valves.

2.6 MEASUREMENT SYSTEM INSTRUMENTATION

Temperature measuring instrumentation and pressure gage(s) shall have an accuracy, resolution, sensitivity, and repeatability that is compatible with the acceptance criteria and shall be calibrated in accordance with NDT-GA-2000, "General Administrative Procedure."

2.7 MEASUREMENT SYSTEM CHECK

The measurement system shall be evaluated for leak tightness. The measurement system leakage rate, not including the test article, shall not exceed one-tenth of the specified acceptance leakage criteria.

2.8 PURGE

Measurement system lines shall be purged with the test gas, if other than air, before pressurizing the system or test article.

2.9 TEMPERATURE CHECK

Examination gas temperatures in the test article shall be measured before the start of the test and recorded at regular intervals of not more than 60 minutes during the examination.

2.10 OTHER ESSENTIAL VARIABLES

When compensation for atmospheric pressure and/or water vapor pressure variations is required, then measurements shall be made and recorded during the examination cycle at regular intervals of not more than 60 minutes.

APPENDIX B
PRESSURE CHANGE TECHNIQUE

2.11 SMALL SYSTEMS

For small systems such as gasket interspaces, at least 15 minutes shall elapse after completion of pressurization and before starting the test.

2.12 LARGE SYSTEMS

For systems larger than 10 cubic inches, the temperature of the trace gas shall have stabilized before starting the test.

3.0 EXAMINATION PROCEDURE

All inspection equipment shall be operated in accordance with the manufacturers' written operating instructions.

3.1 COMPENSATION FOR TEMPERATURE AND ATMOSPHERIC PRESSURE CHANGES

If temperature and/or atmospheric pressure changes occur during the examination, then the measured leak rate shall be mathematically corrected to account for such changes (refer to Equation 5).

4.0 RESULTS OF EXAMINATION

4.1 LEAK RATE CALCULATION (PRESSURE DROP)

For the conditions stated, the following formula may be applied.

Equation 1

$$Q = \frac{P_1V - P_2V}{t}$$

Q = Leak Rate (atm cm^3/s)

Where:
- P_1 = Pressure at start of examination (atmospheres)
- P_2 = Pressure at end of examination (atmospheres)
- V = Volume of system (cubic centimeters)
- t = Time duration of examination (seconds)

Assume:
1. Ideal gas
2. Viscous flow
3. No temperature change throughout examination
4. No change in barometric pr

APPENDIX B
PRESSURE CHANGE TECHNIQUE

4.2 EQUATION FOR COMPENSATION OF MEASUREMENT SYSTEM VOLUME

When the measurement system volume is significant compared to the test article volume, either the examination time shall be increased or the permissible pressure change shall be decreased to compensate for the influence of the measurement system volume.

Equation 2

$$t_{total} = t_{sp} [1 + (V_S/V_A)]$$

Where: t_{total} = Total examination time

t_{sp} = Specified examination time for test article

V_S = Volume of measurement system

V_A = Volume of test article

or

Equation 3

$$P_{total} = P_{sp} [1 + (V_S/V_A)]$$

Where: P_{total} = Total permitted pressure change

P_{sp} = Specified pressure change permitted for the test article alone

V_S = Volume of measurement system

V_A = Volume of test article

APPENDIX B
PRESSURE CHANGE TECHNIQUE

Table B-1. Sample Calculations.

Correction of pressure drop measurement for an increase in temperature and a drop in barometric pressure.

Equation:

$$Pa = Pm - P_1 \left(\frac{T_2}{T_1} - 1\right) + (P_{A_2} - P_{A_1})$$

Given:

Pa = Actual pressure change (absolute)

P_1 = Test pressure 5.0 psig argon (19.5 psia)

T_1 = 70°F (529°R) temperature at start of test (absolute)

T_2 = 80°F (539°R) temperature at end of test (absolute)

P_{A_1} = 29 inches of mercury (1 inch mercury = 0.5 psi)

P_{A_2} = 28 inches of mercury

Pm = -0.1 lb/in^2/30 minutes

Solution:

$$Pa = -0.1 - 19.5 \left(\frac{539}{529} - 1\right) + (14.0 - 14.5)$$

$$Pa = -0.1 - 0.37 - 0.5$$

$$Pa = -0.97 \text{ lb/in}^2\text{/30 minutes}$$

In this example, both the temperature and barometric pressure changes were significant.

APPENDIX C
BUBBLE TEST TECHNIQUE

1.0 SCOPE

This appendix sets forth specific requirements for the bubble test technique and shall be used in conjunction with the Request/ Instruction for Nondestructive Test Services (R/I) form and NDT-LT-6000, "General Leak Test Procedure."

2.0 DIRECT PRESSURE TECHNIQUE

2.1 TEST MATERIALS

2.1.1 Gases

Unless otherwise specified in the R/I, the test gas will normally be air. Inert gases, such as nitrogen, helium, or argon, may be used. When inert gases are used, safety aspects such as oxygen-deficient atmosphere shall be considered.

2.1.2 Bubble Solution

The bubble solution shall be specifically designed for leak detection. Ordinary household soaps or detergents are prohibited as substitutes for bubble testing solutions. The bubble solution shall produce a thin film capable of wetting and adhering to the area being tested. The bubbles formed by a leak shall not break rapidly because of air drying or low surface tension. Halogen and sulfur content of the bubble solution shall be less than 0.5 percent by weight.

2.1.3 Immersion Bath

Water or another compatible solution shall be used for the bath.

2.2 SPECIFIC REQUIREMENTS

2.2.1 Temperature

Surface temperature of the part shall not be below 40° Fahrenheit nor above 125° Fahrenheit throughout the examination. Where it is impractical to comply with the temperature limitations, a specific technique shall be prepared, demonstrated, and approved by a Nondestructive Examination (NDE) Level III Leak Test (LT) Examiner before the test. The bubble solution and the immersion bath shall be compatible with the temperature of the test conditions.

APPENDIX C
BUBBLE TEST TECHNIQUE

2.2.2 Other Considerations

Hydrostatic test shall not be made before bubble testing unless special drying procedures are approved by a NDE Level III LT Examiner.

2.2.3 Pressurization

The test pressure shall be specified on the R/I. Before examination the test pressure shall be held for a minimum of 15 minutes.

2.2.4 Application of Solution

The bubble-forming solution shall be applied to the surface to be tested by flowing the solution over the examination area. The number of bubbles produced in the solution by application should be minimized to reduce the problem of masking bubbles caused by leakage. In immersion testing, the area of interest shall be placed below the surface of the bath in an easily observable position.

2.2.5 Visual Examination

A direct visual examination shall be made by placing the eye within 24 inches (61 cm) of the surface to be examined and at an angle of not less than 30 degrees to the surface being examined. Mirrors may be used to improve angle of vision, and aids such as magnifying lens may be used to assist examinations. The specific part, component, pipe, vessel, or section thereof under immediate examination, shall be illuminated, if necessary, with flashlight or other auxiliary lighting to attain a minimum of 15 foot candles for general examination and a minimum of 50 foot candles for the detection or study of small anomalies.

2.2.6 Remote Visual

In some cases, remote visual examination may be substituted for direct examination. Remote visual examination may be by visual aids such as mirrors, telescopes, borescopes, fiber optics, cameras, or other suitable instruments. Visual aid shall have a resolution capability such that the 1/64-inch markings on a steel rule may be clearly distinguished.

2.2.7 Indication of Leakage

The presence of leakage on the surface of the component or weld is indicated by bubbles or foam produced by gas flowing through an orifice passage(s).

APPENDIX C
BUBBLE TEST TECHNIQUE

When leakage is observed, the leak(s) shall be marked. Depressurize the component or system and repair as required by the referencing American Society of Mechanical Engineers, ASME Boiler and Pressure Vessel Code section. As a minimum, the repair area(s) shall be retested by the bubble test method.

3.0 VACUUM BOX TECHNIQUE

3.1 SPECIFIC REQUIREMENTS

In addition to the following specific requirements, Section 2.0 of this appendix shall also apply.

3.1.1 Vacuum Box

A vacuum box of convenient size shall have a suitable gasket, valve(s), 0 to 15 psi or equivalent gage, and a window, which provides adequate lighting and viewing of the test surface.

3.1.2 Vacuum Source

Any convenient source may be used to create the required vacuum. The gage shall register at least 2 psi below atmospheric pressure or partial vacuum required by the referencing ASME Code section.

3.1.3 Vacuum Retention

The required partial vacuum (differential pressure) shall be maintained for at least 10 seconds during the examination.

3.1.4 Vacuum Box Overlap

A minimum overlap of 2 inches shall be used.

MES-010.005X CBRS Mid-Interval Data Sheet Page 1
Craft NON DESTRUCTIVE Funct Test
Facility WESF Data Sheet Sequence #: 2C*9408030004

Comp Id: USA 9511 B(U) Safe Appl: Regulatory-3 Due: 09/28/94
Loop: T0001 Bldg: 225B MFR: SANDIA NATIONAL LAB Last Done:
Seq: 1 Room: Model: R-1 Procedure: N/A
Sys #: C99R Locn: CRANE PAD Serial #:
Interval:12M DS Key: 053036|S Funct Code: 01 Recall Status: A
Function Desc: ANNUAL NDE TESTING OF THE BUSS CASK OSD #:
Dwg/Sht/Coord/Rev#: / / / Mel No.

NOTE: The BUSS cask is required to have annual NonDestructive Examination (NDE) testing performed according to Chapter 8, Section 8.1.4.1, 8.1.4.2 and 8.2 of the Safety Analysis Report for Packaging (SARP). The leak detector (Helium Mass Spectroscopy) must have a sensitivity of 5.0 x 10(-6) atm-cm(3)/sec.

1. Does the BUSS cask containment boundary meet the leak rate criteria of less than 1.0 x 10(-5) atm-cm(3)/sec? (Yes)/No/NA WDP 10/21/94

2. Does the lid seal meet the leak rate criteria of less than 1.0 x 10(-4) atm-cm(3)/sec? (Yes)/No/NA WDP 10/21/94

3. Does the upper port seal meet the leak rate criteria of less than 1.0 x 10(-4) atm-cm(3)/sec? (Yes)/No/NA WDP 10/21/94

4. Does the lower port seal meet the leak rate criteria of less than 1.0 x 10(-4) atm-cm(3)/sec? (Yes)/No/NA WDP 10/21/94

5. Does the sum of the leak rates for the lid, upper and lower port meet the leak rate criteria of less than 1.0 x 10(-4) atm-cm(3)/sec? (Yes)/No/NA WDP 10/21/94

6. Do the lift lugs meet the criteria of no detectable cracks using dye penetrant? (Yes)/No/NA [illegible] 10/20/94

7. Do the trunnions meet the criteria of no detectable cracks using dye penetrant? (Yes)/No/NA [illegible] 10/20/94

8. Restore BUSS cask to shipping configuration. [signature]

HPT SURVEYED [signature] 10/17/94 Please Circle: (Accept or) Reject
Signature Date

Reason _____

Previous Reason:

Instructions: PERFORM ANNUAL NON-DESTRUCTIVE EVALUATION (NDE) OF THE BUSS CASK PER NDT-LT6000 AND NDT-[illegible]

Revision Required (Y)(N) Procedure _____ Data Sheet _____

Technician Bill Purdy 10/21/94 Hours 32.00 Manager Jim Krogness 10/21/94
Work Order # 28794-01022

Westinghouse Hanford Company

NDE LEAK TEST PROCEDURE AND TEST REPORT

NON DESTRUCTIVE EXAMINATION
306 BLDG., 300 AREA - TEL. 376-5401

Job No. 94-204

Requestor	Company	Project/System/Work Package/Traveler No.
PAUL T SAUERESSIG	WHC	BUSS CASK ANNUAL TESTING
		2B-94-01022/P

MSIN	Bldg.	Area
6-65	225B	200E

KB5B2

Acceptance Std.	Section	Para.	Date	NA	Dwg. No.	NA	NCR	NA	Cleaning	NA
Sum of Seals (Lid, upper, & Lower Ports) must be Less Than 1.0 x 10-4 Atmcc/sec. Containment Boundry Less Than 1.0 X 10-5 Atmcc/sec.				☐	SAND92-0967 SECT. 7	☐		☒		☒

TEST CONDITIONS

Temperature AMB	Device ID	☒ NA
Barometric Pressure AMB		☐ NA
Test Pressure 14.7 PSIA.		☐ NA
Gas HELIUM		☐ NA
Concentration ~ 100%		☐ NA
Other		☒ NA
Bubble Solution		☒ NA
Batch No.		
Gage 1 584-31-04- 006		☐ NA
Range 0-30 PSIA		
Calib. Exp. 6/2/95		
Gage 2 584-31-04-		☒ NA
Range		
Calib. Exp.		
Relief Valve		☒ NA

TEST EQUIPMENT ☐ NA

Manufacturer L.H. UL-100 PLUS		
Ident. No. WC-48869		
Fine Range 2.1 x 10^{-11}	Atmcc/sec/Div	☐ NA
Std. No. 584-40-03- 017		
Std. Leak 1.7 x 10^{-8}	Atmcc/sec	
Calib. Exp. 7/6/95		
Medium Range x 10	Atmcc/sec/Div	☒ NA
Std. No. 584-40-03-		
Std. Leak x 10	Atmcc/sec	
Calib. Exp.		
Gross Range x 10	Atmcc/sec/Div	☒ NA
Std. No. 584-40-03-		
Std. Leak x 10	Atmcc/sec	
Calib. Exp.		

WHC PROCEDURE NO. ☐ NA

☒ NDT-LT-6000 Rev. 3	
Appendix A	Rev. 2
☐ Special Tecn. No.	

WORK INST. ☒ NA

☐ NDT-LT-601 Rev.	
☐ Other	

SYSTEM SENSITIVITY 584-40-03-015 6.2 X 10-5 1-27-95

☐ Same as MSLD Calib. or:		
Fine Range 2.7 x 10^{-10}	Atmcc/sec/Div	
Med. Range N/A x 10	Atmcc/sec/Div	
Gross Range N/A x 10	Atmcc/sec/Div	

TEST TIME

He Response Time 10 SEC.	☐ NA
He Accum. Time	☒ NA
Soak Time	☒ NA

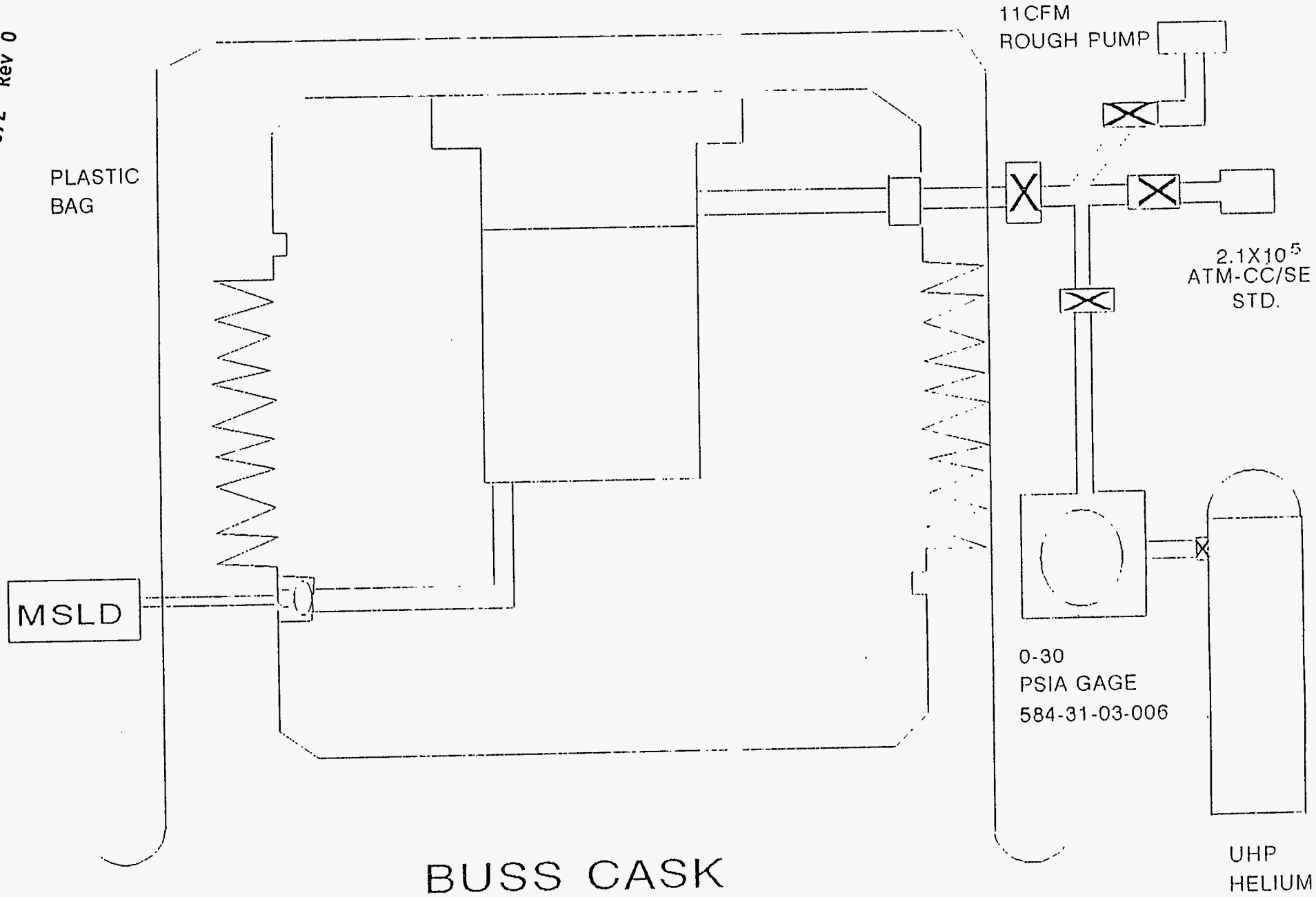
Weld No., Part No., or Serial No	Acc.	Rej.	No Rel. Ind.	Comments
CONTAINMENT BOUNDRY	X		X	NO DETECTABLE LEAKS FOUND
LID SEAL TEST	X		X	NO DETECTABLE LEAKS FOUND
UPPER PORT COVER	X		X	NO DETECTABLE LEAKS FOUND
LOWER PORT COVER	X		X	NO DETECTABLE LEAKS FOUND
				SEE ATTACHED FOR METHOD SET-UP

Appendix B
Page 36
WHC-SD-WM-TI-672 Rev 0

Technique Pre Approval ☒ NA

LT Level/Date

Technician	Level	Interpreted by	LT Level II	Reviewed by
W. D. Purdy WD PURDY	II	W. D Purdy WD PURDY	II	J. L. Krogness
Date of Examination		**Date**		**Date**
10-19 Thru 10-20-94		10-19 Thru 10-20-94		10-24-94

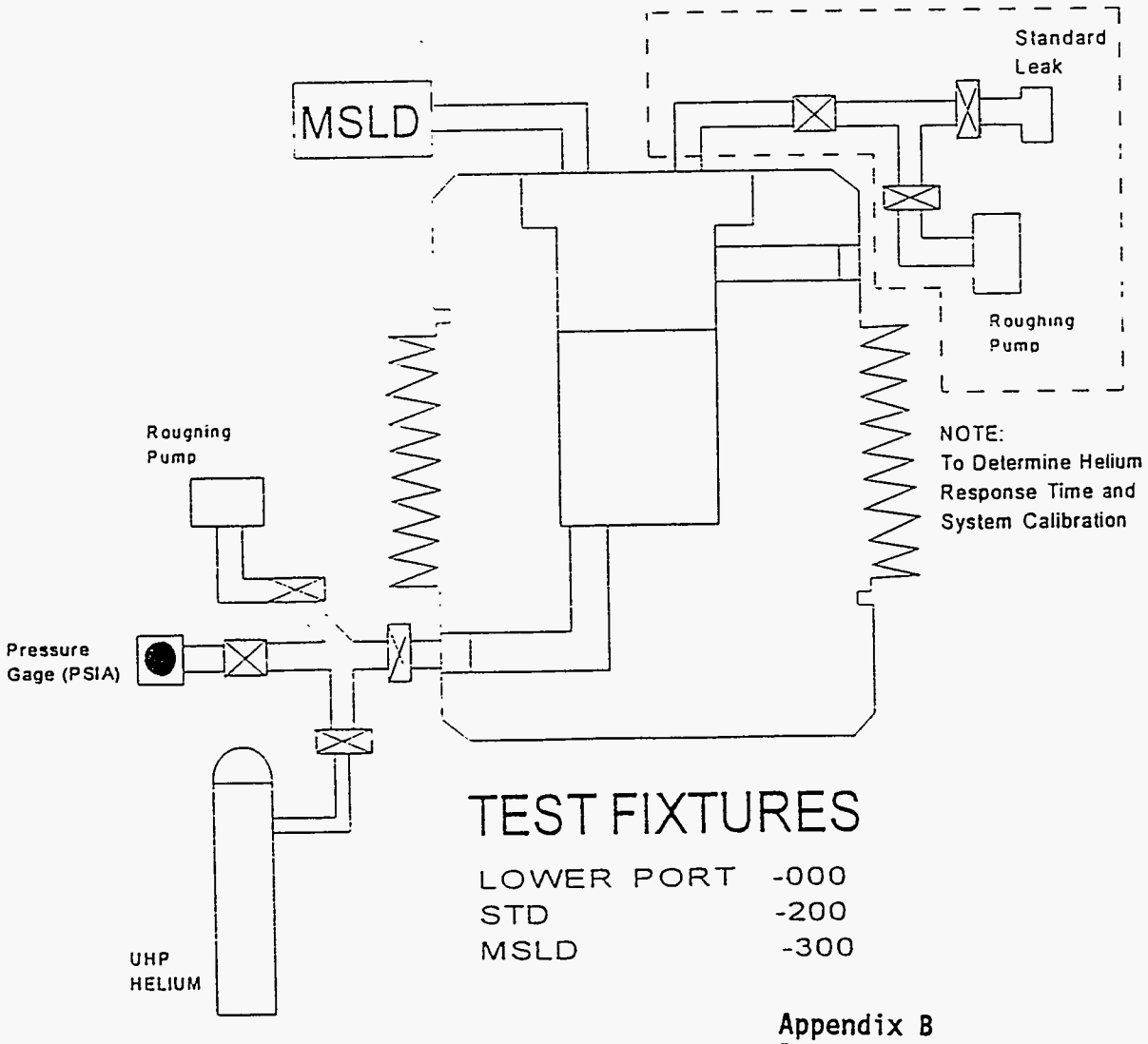


BUSS CASK

CONTAINMENT BOUNDRY TEST
(EVACUATED CAVITY)

ATTACHMENT 1

Containment Lid Seal

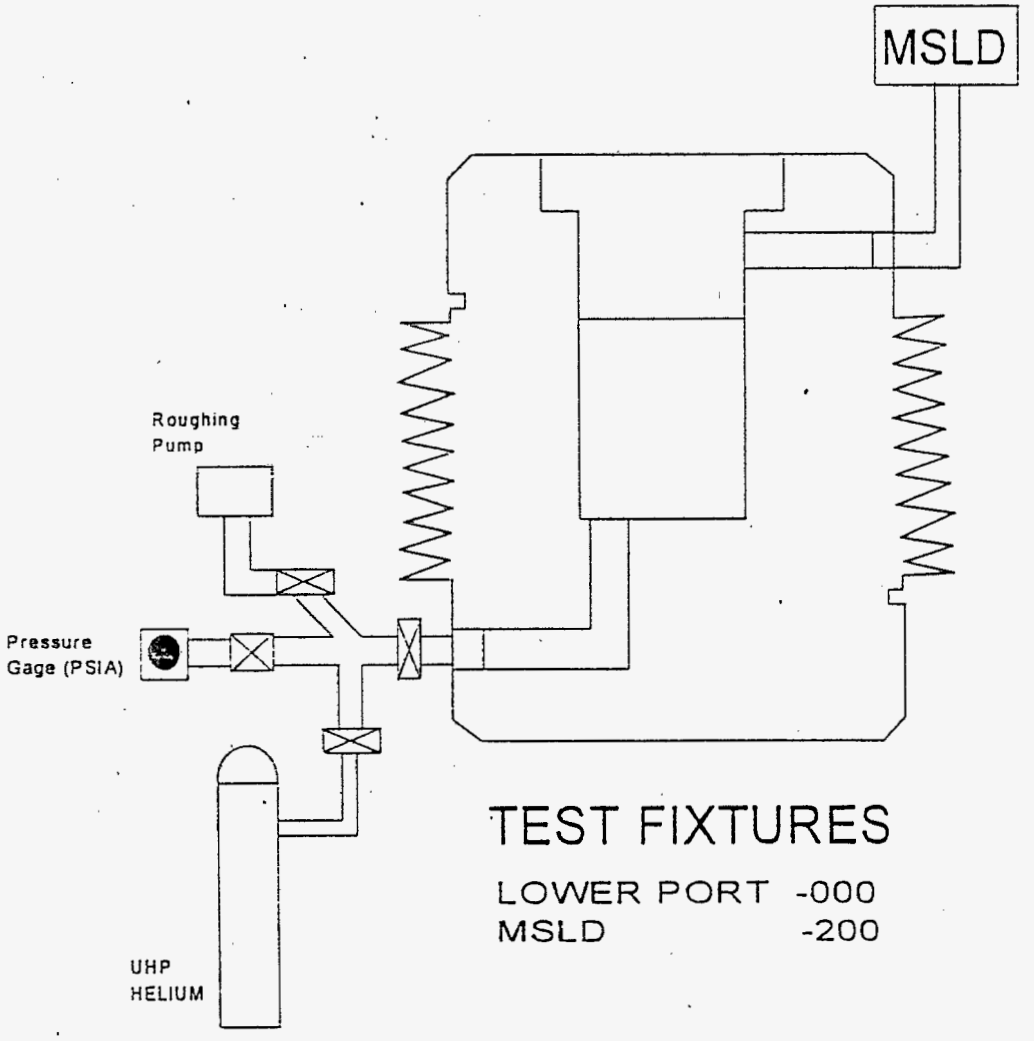


TEST FIXTURES

LOWER PORT	-000
STD	-200
MSLD	-300

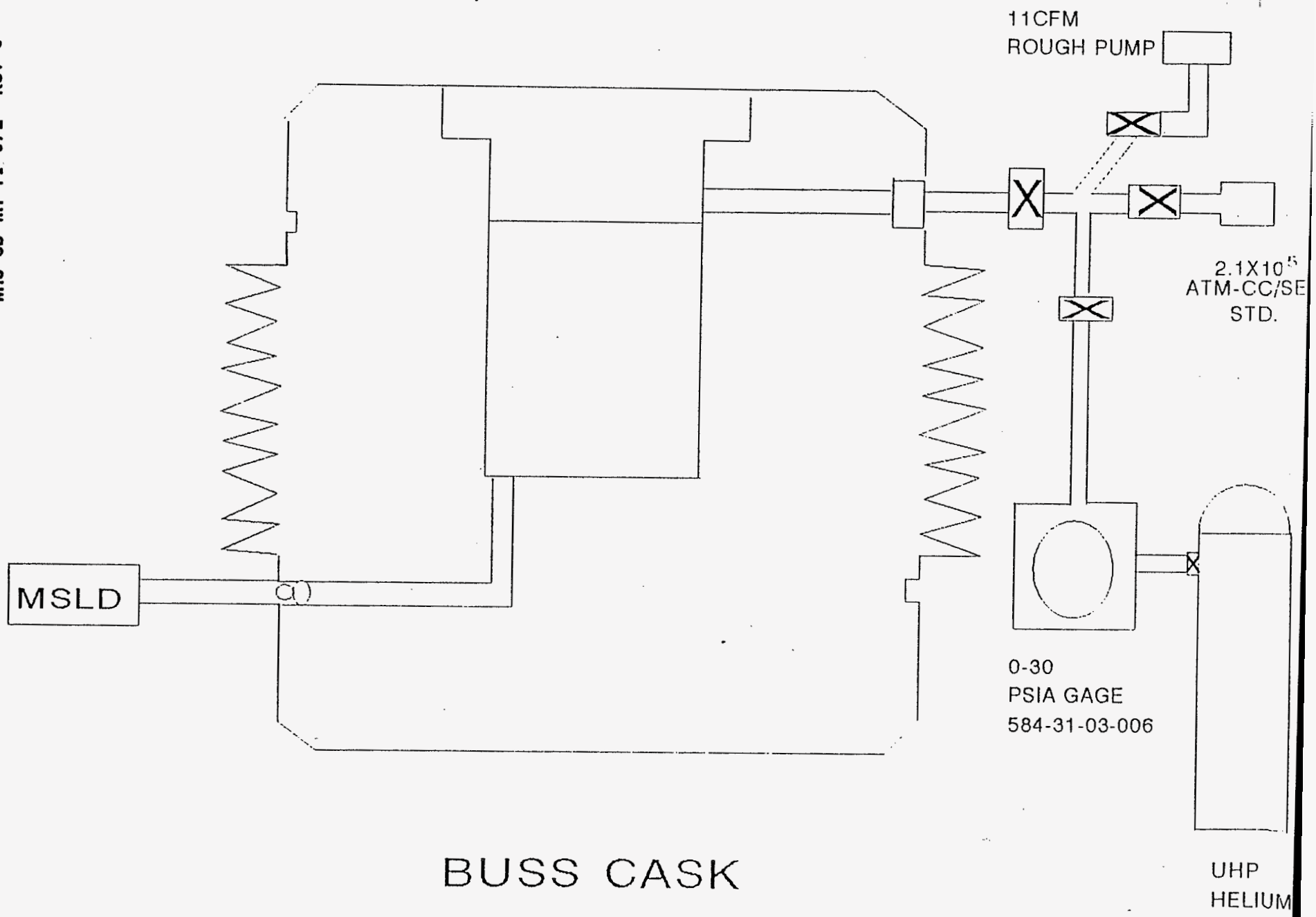
ATTACHMENT 2

Upper Port Seal



TEST FIXTURES

LOWER PORT -000
MSLD -200



BUSS CASK

LOWER PORT SEAL (HELIUM BACKFILLED)

Appendix C: Dye Penetrant of Trunnions and Lift Lugs Data

New Request Num 10265
1. Document Number 2B-94-01024 W
2. Work Item Title MAINTE.SUPPORT ANNUAL TESTING BUSS CASK

3. System C99R *BUSSCASK*

4. Components

Component Number	Name
N/A	

Temporary Number	Name
USA-9511-B-U	BUSS CASK

5. Location

Facility 2C *WESF*
Bldg/Rm 225B Other BUSS CASK Other NDE

6. Associated Components

Component Number	Name
N/A	

		Date	Organization
7. Originator Name	CRAWFORD,RE	08/11/94	16700
Telephone No.	372/0070 MSIN S6-51		

8. Charge Code ~~KBP02~~ KB5B2 JY 10-4-94

9. Work Item Description

MAINTENANCE SUPPORT FOR ANNUAL TESTING OF BUSS CASK.
MES-010-005X CBRS MID INTERVAL DATA SHEET.

	Signature	Date
10. Operations Review	L.C. Burton	10-3-94

11. Priority 2
12. Phase Designator P4 *4TH QUARTER (JULY 1-SEPT 30)*
13. Correct Maint. Assessment Y
14. Personnel Safety Related Y
15. Mode N/A

APPROVAL DESIGNATOR
NA

16. Resolution/Retest

MAINTENANCE TO SUPPORT ANNUAL HYDROSTATIC TESTING OF THE BUSS CASK ACCORDING TO OPERATING PROCEDURE EO-140-021, "PERFORM ANNUAL TESTING OF BUSS CASK".

NOTE: HYDROSTATIC TESTING MUST BE PERFORMED PRIOR TO HELIUM MASS SPEC.

MAINTENANCE TO SUPPORT ANNUAL TESTING FOR THE BUSS CASK FOR PROCEDURES # NDT-LT-6000 REV 3 AND NDT-PT-4000 REV 2. THE PROCEDURES ARE FOR HELIUM MASS SPECTROSCOPY OF THE BUSS CASK AND

New Request Num 10265
1. Document Number 2B-94-01022, W
2. Work Item Title MAINTE.SUPPORT ANNUAL TESTING BUSS CASK

DYE PENETRANT OF THE LIFT LUGS AND TRUNNIONS. THIS WILL BE DOCUMENTED WITH COMPONENT BASED RECALL SYSTEM LOOP NUMBER T0001 JOB CARD.

INCLUDED IN THE ANNUAL TESTING ARE THE FOLLOWING PMS:

2C23026, BUSS CASK IMPACT LIMITER ANNUAL INSPECTION (2B-94-00989)
2C23027, BUSS CASK TORQUE TEST (2B-94-00954)
2C23041, TRANSPORTATION SKID INSPECTION (2B-94-00953)
2C24010, BUSS CASK LEAK TEST FITTING MAINTENANCE (2B-94-00957)
2C24011, QUICK DISCONNECT VALVE MAINTENANCE (2B-94-00988)

THE PMS LISTED ABOVE CAN BE DONE IN CONJUNCTION WITH THE HYDROSTATIC TESTING AND/OR HELIUM MASS SPEC. OF THE CASK.

NOTE: MILLWRIGHTS WILL BE REQUIRED TO REMOVE THE TRUNNIONS AND LIFT LUGS FOR THE ABOVE NONDESTRUCTIVE EVALUATION. THIS WILL BE PERFORMED WITH INSTALLATION OF GUIDE PINS FOR REMOVAL OF THE TRUNNIONS.

MAINTENANCE TO BE SCHEDULED THROUGH OPERATIONS TO SUPPORT NDE EXAMINERS.

COORDINATION OF THE ANNUAL TESTING WILL BE PERFORMED BY THE PIC WITH ASSISTANCE FROM THE COGNIZANT ENGINEER.

17. PIC STEEL,MD
18. PIC Org. MAINTENANCE

	Signature	Date
19. Resolution By	CRAWFORD,RE	08/11/94

20. Plant Forces Work Review Required N Number

21. Resources Required

Res Code	Description	No.	Est Hrs	Act Hrs
23	MILLWRIGHT	02	08	32
24	PIPEFITTER	01	16	24
54	HEALTH PHYSICS TECHNICIANS	01	04	0
04	NUCLEAR OPERATOR	01	08	16
32	CRANE OPERATOR	01	08	8
QC	QUALITY CONTROL	01	08	12
NDE	NON-DESTRUCTIVE ENGINEERING	02	16	24

	Signature	Date
22. Cognizant Engineer	Paul T Summerlin	10/3/94
23. Cognizant Manager	Edward D Wilson	10-3-94

24. Reference Documents Type

New Request Num 10265
1. Document Number 2B-94-0102/W
2. Work Item Title MAINTE.SUPPORT ANNUAL TESTING BUSS CASK

NDT-PT-4000 REV 2	PROC
NDT-PT-6000 REV 3	PROC
~~2C23026~~	~~PM~~
~~2C23027~~	~~PM~~
~~2C23041~~	~~PM~~
~~2C24010~~	~~PM~~
~~2C24011~~	~~PM~~
EO-140-021	PROC

SF 10/11/94

25. Field Work Complete Signature W&D Date 10/25/94

'estinghouse anford Company	NDE REQUEST\INSTRUCTION FOR NONDESTRUCTIVE TEST SERVICES Nondestructive Examination 306E Building, 300 Area, Phone No. 376-5402				
quester	MSIN	Bldg.	Area	Phone No.	Company
ul T. Saueressig	S6-65	225B	200E	2-0071	WHC

oject/System Identification	Work Package/Traveler No.
0 BUSS Cask Trailer Skid. 2.0 BUSS Cask Trunnions and Lift gs.	2B-94-00953 2B-94-01044 N/A
	Drawing No. N/A
isk Package No./Work Order No. 35B2	N/A N/A

ceptance

	Code/Specification	Section	Paragraph	Date
☒ NDE	SNL 9912119			
☐ Client				

pecial Instructions (handling requirements, allowed markings, etc.)

he skid must be removed from the trailer to access the outer bottom elds. The trunnions and lift lugs must be removed from the BUSS ask for evaluation of the welds.

NDE METHOD

- ☒ Penetrant (PT)
- ☐ Magnetic Particle (MT)
- ☐ Leak Testing (LT)
- ☐ Ultrasonic (UT)
- ☐ Radiography (RT)
- ☐ Eddy Current (ET)

afety/Radiological Conditions

he skid, trunnions and lift lugs will be release by Radiation ontrol Technicians (RTCs) prior to evaluation with dye penetration.

'art Location
225B

Part Information

Contact (PIC)
Paul T. Saueressig
Phone No.
2-0071
Bldg./Room
40410/H

Appendix C
Page 4
WHC-SD-WM-TI-672 Rev 0

RESERVED FOR NDE USE ONLY

Request Accepted By:	NDE Job No.

PROCEDURE REVIEW AND APPROVAL

UNCONTROLLED

I have reviewed and approved the Nondestructive Examination Procedure NDT-PT-4000 revision 2 for conformance to the ASME Boiler and Pressure Vessel Code, 1992 issue, A-92 Addenda.

Please place this sheet in WHC-CM-4-38, in front of the above mentioned procedure.

A. F. Pardini
NDE Level III Penetrant Examiner

12/28/93
Date

J. C. Krogness
J. C. Krogness, Manager
Nondestructive Examination

12-28-93
Date

TABLE OF CONTENTS

APPENDICES

LIST OF FIGURES

TITLE:

GENERAL LIQUID PENETRANT EXAMINATION PROCEDURE

Approved by A. J. Fisher 12/29/93

A. J. Fisher, Manager
Quality Assurance

1.0 PURPOSE

This procedure establishes the minimum requirements for the control of liquid penetrant examination of materials and assemblies.

2.0 SCOPE

This procedure shall be used in conjunction with NDT-GA-2000, "General Administrative Procedure," for the administration of liquid penetrant examinations at WHC.

3.0 DEFINITIONS

nonaqueous developer

A developer in which the developing powder is applied as a suspension in a quick-drying solvent.

penetration time

The time allowed, after penetrant has been applied to the test surface, for the penetrant to enter discontinuities.

post-emulsification

A penetrant removal technique employing a separate emulsifier applied over the surface penetrant to make it removable with water spray.

4.0 RESPONSIBILITIES

The Nondestructive Examination (NDE) group is responsible for maintaining this procedure current to the requirements of the American Society of Mechanical Engineers (ASME) Code and applicable WHC-controlled manuals.

5.0 GENERAL REQUIREMENTS

5.1 Relation to Other Documents

Documents referenced in this procedure shall be considered part of this procedure to the extent specifically referenced herein.

5.2 Certification of Personnel

All WHC personnel performing liquid penetrant examination for acceptance shall be certified in accordance with the requirements of WHC-CM-4-39, *Qualification and Certification of Nondestructive Examination Personnel*.

5.3 Procedure Qualification

Standard techniques (Appendices A and B) shall be qualified by demonstration to the satisfaction of the Authorized Inspector and the NDE Level III liquid penetrant examiner in the standard temperature range of 60 degrees Fahrenheit to 125 degrees Fahrenheit. This will be accomplished by using a comparator block as described in Appendix C. This will be done for each penetrant family used at WHC as a standard technique and documentation shall be in accordance with Appendix C and NDT-GA-2000.

5.4 Deviations from Requirements

If it becomes necessary to change the examination parameters outside of the limit of requirements contained in this procedure, a special technique shall be prepared and qualified by demonstration. Special technique qualification shall be approved by an NDE Level III liquid penetrant examiner before its use in an actual examination. The records documenting the technique qualification shall be retained and submitted to the Authorized Code Inspector for concurrence, where required. Where the specified sensitivity or the test requirements are not achieved, the appropriate documentation shall be prepared in accordance with NDT-GA-2000.

5.5 Special Instructions

5.5.1 Chemical and fire hazards

Toxic and/or flammable materials, for cleaning or examination, shall be used in accordance with the manufacturer's recommendations and applicable WHC safety and disposal requirements.

5.5.2 Handling and cleanliness considerations

Lead, aluminum, and carbon steel shall not contact stainless steel and high-nickel alloys being examined. Additional restrictions, as well as specific handling and cleanliness instructions,

Request/Instruction for Nondestructive Examination (R/I) or documents directly specified therein.

5.6 Applicable Test Equipment and Approved Material

5.6.1 Liquid penetrant comparators

Penetrant comparators as described in Appendix C shall be used to qualify penetrant examination techniques. (See Appendix C for manufacturing and qualification specifications.)

5.6.2 Materials

5.6.2.1 Liquid penetrant system materials

Penetrant examination materials shall be restricted to manufacturer designated families of materials. Control of contaminants in all penetrant and associated cleaning materials shall be as specified in NDT-GA-2000.

5.6.2.2 Cleaning solvents

Pre- and post-cleaning solvent shall be either reagent grade (or better) acetone, reagent grade (or better) alcohol, or penetrant family cleaner, unless otherwise specified in the R/I.

5.6.2.3 Masking/marking materials

Tapes and elastomers used as plugging or masking materials shall be compatible with the material under test. Marking materials shall be as specified in the R/I.

5.6.2.4 Cloth/paper

Cloth or paper towels used in penetrant examination shall be clean and lint free.

5.6.3 Support Equipment

5.6.3.1 Penetrant spraying equipment

Systems for spraying penetrants, other than spraying from commercially available pressurized containers, shall be equipped with filters placed on the upstream side near the air inlet to preclude contamination of the penetrant by oil, water, or dirt sediment that may have collected in the lines.

5.6.3.2 Warm water rinse equipment

Warm water rinses used in the fluorescent post-emulsified penetrant system shall not exceed 50 psi in pressure and 110 degrees Fahrenheit in temperature.

5.6.3.3 Ultraviolet light sources

High-intensity black lights (near ultraviolet) shall be used for illumination of fluorescent penetrant indications. The black lights shall be provided with suitable clean filters (Kopp[1] Number 41 or equivalent) and will pass near ultraviolet in the range between 330 nm and 390 nm but will filter out the short wavelength rays and most of the visible light.

5.6.3.4 Ultraviolet light meters

An ultraviolet sensitive light meter shall be used to determine the black light intensity in the area of interest on the component. Calibration shall be in accordance with NDT-GA-2000.

6.0 EXAMINATION REQUIREMENTS

6.1 Examination Prerequisites

6.1.1 Materials porosity

Liquid penetrant examination shall be limited to nonporous metallic, ceramic, glassy, or plastic materials unless a special technique is written and qualified for a porous material.

6.1.2 Surface temperature

The standard temperature range for liquid penetrant examination is from 60 degrees Fahrenheit to 125 degrees Fahrenheit. The surface to be examined and the penetrant material shall be maintained in this temperature range throughout the examination. If the penetrant examination is outside of this range, a special technique shall be prepared with penetrant and surface temperatures as follows.

1. Below 60 degrees Fahrenheit

   The surface to be examined and the penetrant material shall be the same temperature throughout the examination.

[1]Kopp - Trade name of Magnaflux Corporation.

2. Above 125 degrees Fahrenheit

There is no requirement that the penetrant material be maintained above room temperature.

6.1.3 Surface irregularities

Surface preparation by grinding, machining, or other methods may be necessary where surface irregularities could mask indications of unacceptable discontinuities. Surface blasting such as sand blasting, grit blasting, metal shot peening, or vapor blasting shall not be done on surfaces before performing liquid penetrant examinations.

6.1.4 Surface cleanliness

Before the liquid penetrant examination, the surface to be examined and all adjacent areas within at least 1 inch shall be dry and free of any dirt, grease, lint, scale, welding flux, weld spatter, oil, or other extraneous matter that could obscure surface openings or otherwise interfere with the examination.

6.1.5 Prevention of feature contamination

Small fabricated grooves or holes, which lead to areas from which it would be difficult to remove liquid penetrant materials, shall be plugged or masked before examination. The materials used for this purpose shall be as specified in paragraph 5.6.2.3. Where it is not possible to plug or mask these areas, customer agreement shall be obtained to permit residual penetrant materials and documented on the R/I via direct signature or per telecon.

6.2 Examination Set-up Considerations

6.2.1 Basic geometric considerations

The extent of coverage is as follows.

6.2.1.1 Welds

For all *ASME Boiler and Pressure Vessel Code*, Section III, welds, the entire length of the weld including the adjacent base metal for at least 1/2 inch on each side of the weld shall be examined. If this requirement is unattainable, a nonconformance report (NCR) shall be written before the examination to document the condition.

For all other welds, the entire length of the weld including the base metal region lying to either side of the weld to the limits of either the heat-affected zone or the span of one weld bead width, whichever is greater, shall be examined. Special conditions may warrant other coverage requirements. Such special considerations shall be noted on either the R/I or the Penetrant Procedure and Test

6.2.1.2 Materials

The examination shall encompass the surface area as requested on the R/I.

6.2.1.3 Multiple examinations

If each penetrant examination step cannot be completed within the prescribed time, because of the size of the surface to be examined, then the surface shall be examined in suitably sized increments. Sufficient overlap shall be done to ensure 100 percent coverage of the area requested.

6.2.2 Penetrant

Either color contrast solvent-removable or fluorescent post-emulsified penetrant systems may be employed. Other penetrant systems shall be employed only when specifically requested on the R/I and after consultation with, and approval by, an NDE Level III liquid penetrant examiner. A special technique shall be generated. Fluorescent penetrant examination shall not follow a color contrast penetrant examination. In either case, only those materials designated by the manufacturer as belonging to a single penetrant family shall be employed in any specific examination.

6.2.3 Pre-examination considerations

6.2.3.1 Prerequisites

A pre-examination visual inspection shall be made on the test object to determine if all examination prerequisites contained in paragraph 6.1 can be satisfied. If the prerequisites have not been met, the customer shall be informed of the condition, and examination shall be postponed until all examination prerequisites can be met.

6.2.3.2 Identification

Traceability shall be provided such that the examination report, the object, and the area examined can be identified with respect to each other at any time.

6.2.4 Post-examination considerations

6.2.4.1 Post-examination cleaning

Following each penetrant examination, all penetrant examination materials shall be completely cleaned from the test surface.

6.2.4.2 Application of protective coating

The application of protective coatings by NDE personnel shall be specified in the R/I and shall be limited to those for which NDE personnel have been trained.

6.3 Results of Examination

6.3.1 Evaluation of results

6.3.1.1 Interpretation of indications

The NDE certified liquid penetrant examiner (Level II or III) shall interpret indications and determine whether they represent relevant or nonrelevant indications in accordance with the applicable acceptance Code or Standard as noted on the R/I. Any indication which is believed to be nonrelevant shall be regarded as a defect and shall be re-examined to verify whether or not an actual defect is present. Surface conditioning may precede the re-examination.

6.3.1.2 Acceptance criteria

Acceptance criteria shall be specified in the R/I.

6.3.1.3 Rework/repair

Repaired areas shall be cleaned and re-examined using the same penetrant system that was used to locate the original defect.

6.3.2 Records of examination

6.3.2.1 Record contents

The record of examination shall be the Penetrant Procedure and Test Report, Figure 1. The report shall include the defining examination parameters and the results of the examination.

6.3.2.2 Report

The Penetrant Procedure and Test Report shall describe the documentation of specific examination parameters and the results of the examination.

The documentation of specific examination parameters shall contain the following information as a minimum.

- Job number
- Requester and address
- Project/system/work package/traveler
- Acceptance standard
- Drawing number
- Material

- NCR number
- Product or stage of manufacture
- WHC procedure and revision number
- Inspection area
- Penetrant material manufacturer, type, and batch number
- Special technique number
- Penetrant technique parameters
- Pre- and post-cleaning materials
- Technique pre-approval
- Examiner and certification level
- Interpreter(s) and certification level
- Date of examination
- Level III review and signature

The results of the examination shall contain the following information.

- Specific part identification
- Disposition
- Indications/Comments

Locations on the report form, which are not applicable to a particular examination, shall be shown as NA (not applicable).

6.3.2.3 Records storage

Records of examination shall be retained in accordance with NDT-GA-2000.

7.0 REFERENCES

All documents referenced below shall be maintained to the latest revision.

American Society of Mechanical Engineers, *ASME Boiler and Pressure Vessel Code.*

WHC-CM-4-38, *Nondestructive Examination Procedures*, NDT-GA-2000, "General Administrative Procedure."

WHC-CM-4-39, *Qualification and Certification of Nondestructive Examination Personnel.*

Figure 1. Penetrant Procedure and Test Report.
(BD-7320-043)

Westinghouse Hanford Company

NDE PENETRANT PROCEDURE AND TEST REPORT

NON DESTRUCTIVE EXAMINATION
306 BLDG., 300 AREA - TEL. 376 5401

Job No.

Requestor (client) | Company | Project/System/Work Package/Traveler No.

MSIN | Bldg. | Area

Acceptance Std. | Section | Para. | Date | ☐ NA | Dwg. No. | ☐ NA | Material | NCR | ☐ NA

PRODUCT OR STAGE OF MANUFACTURING

- ☐ As Cast
- ☐ As Forged
- ☐ As Machined
- ☐ As Assembled
- ☐ As Welded
- ☐ Weld Prep
- ☐ Root Pass
- ☐ Final
- ☐ Other _____
- ☐ Repair No. _____

WHC PROCEDURE NO

- ☐ NA
- ☐ NDT-PT-4000 Rev _____

Appendix _____ Rev _____

AREA TO BE INSPECTED

- ☐ Full Inspection: 100% of Area Requested
- ☐ Other (Explain Below)

MANUFACTURER

- ☐ Sherwin
- ☐ Magnaflux
- ☐ Other _____

DYE

- ☐ Color Contrast
- ☐ Fluorescent

Special PT Technique No.

- ☐ NA

CLEANING | Pre | Post

- Alcohol
- Cleaner/Remover
- Other

	Type	Batch No.	Time (min.)
Penetrant			
Cleaner ☐ NA			
Emulsifier ☐ NA			
Developer			

Developer Application

- ☐ Spray
- ☐ Dip
- ☐ Brush
- ☐ Powder

Light Level

- ☐ μW/cm²
- ☐ Foot Candles

Technique Pre Approval | Level/Date

- ☐ NA

Weld No., Part No., or Serial No.	Acc.	Rej.	No Rel. Ind.	Indications/Comments

Technician | PT Level | Interpreted by | PT Le

Date of Examination | Date of Examination

Appendix C
Page 15
WHC-SD-WM-TI-672 Rev 0

APPENDIX A
COLOR CONTRAST SOLVENT-REMOVABLE STANDARD TECHNIQUE

1.0 PURPOSE

This appendix defines the specific requirements for application and examination using the color contrast solvent-removable standard technique.

2.0 SCOPE

This appendix shall be used in conjunction with NDT-PT-4000, "General Liquid Penetrant Examination Procedure," and NDT-GA-2000, "General Administrative Procedure."

3.0 EXAMINATION REQUIREMENTS

3.1 PRE-CLEANING

The area to be examined shall be cleaned by dipping, spraying, swabbing or brushing before penetrant application. Ultrasonic cleaning is the recommended practice for items that have been previously penetrant inspected.

3.2 DRYING

Immediately following solvent pre-cleaning, the surface to be examined shall be thoroughly dried by normal evaporation or with forced hot air, provided the surface temperature is not raised above 125 degrees Fahrenheit. The surface to be examined shall be allowed a minimum of 5 minutes drying time, between the time when the last trace of cleaning solvent visually disappears and the application of penetrant, to allow complete evaporation of the cleaning solvent.

3.3 PENETRANT APPLICATION

The surface to be examined shall be thoroughly coated with penetrant by brushing, spraying, or dipping. Pools of penetrant should be prevented from forming on the object. The test surface shall be kept wetted for the minimum period of 10 minutes and not more than 1 hour. If the penetrant material should thicken, congeal, or dry, the test surface shall be completely rewetted with the penetrant and shall be kept thoroughly wetted for one additional penetration time.

APPENDIX A
COLOR CONTRAST SOLVENT-REMOVABLE STANDARD TECHNIQUE

3.4 EXCESS PENETRANT REMOVAL

After the penetration time has elapsed, the excess penetrant on the surface shall be removed with a lint-free cloth or absorbent paper, taking care to minimize removal of penetrant from discontinuities. Repeat the removal operation until most traces of penetrant have been removed. The remaining traces shall be removed by wiping the surface lightly with a cloth or absorbent paper moistened with the penetrant family cleaner/remover. Flushing the surface with solvent, following the application of the penetrant and before development, is prohibited.

3.5 DRYING

After excess penetrant removal, the surfaces shall be dried by normal evaporation for a minimum of 5 minutes and a maximum of 15 minutes.

3.6 DEVELOPING

Nonaqueous developer shall be applied as soon as practicable after drying. It shall be applied by spraying, except where safety or restricted access preclude it. The developer shall be thoroughly agitated before application and applied in the form of a light fog spray covering the examination surface in a thin even film. Under conditions of safety or restricted access, the developer may be applied by brushing, covering the surface in a thin film without excessive smearing of residual penetrant. It shall be up to the discretion of the examiner who will be interpreting the results as to whether brushing on developer is applicable.

In the event the developer is applied too heavily, or there is excessive coloration (background), the surface shall be re-examined beginning with pre-cleaning, Section 3.1.

3.7 EXAMINATION

The examination is to be conducted in a well-lighted area. The minimum illumination at the examination surface shall be 100 foot candles.

The surface under examination shall be observed during the application of developer and immediately following developer application to detect the nature of any indications which tend to bleed out profusely. Developing time for final interpretation begins immediately after the nonaqueous developer is dry. Final interpretation shall be made after allowing the penetrant to bleed out for 7 to 30 minutes. If bleed examination results, longer periods up to 1 hour are

APPENDIX B
FLUORESCENT POST-EMULSIFIED STANDARD TECHNIQUE

1.0 PURPOSE

This appendix defines the specific requirements for application and examination using the fluorescent post-emulsified standard technique.

2.0 SCOPE

This appendix shall be used in conjunction with NDT-PT-4000, "General Liquid Penetrant Examination Procedure," and NDT-GA-2000, "General Administrative Procedure."

3.0 EXAMINATION REQUIREMENTS

3.1 PRE-CLEANING

The area to be examined shall be cleaned by dipping, spraying, swabbing or brushing before penetrant application. Ultrasonic cleaning is the recommended practice for items that have been previously penetrant inspected.

3.2 DRYING

Immediately following solvent pre-cleaning, the surface to be examined shall be thoroughly dried by normal evaporation or with forced hot air, provided the surface temperature is not raised above 125 degrees Fahrenheit. The surface to be examined shall be allowed a minimum of 5 minutes drying time, between the time when the last trace of cleaning solvent visually disappears and the application of penetrant, to allow complete evaporation of the cleaning solvent.

3.3 PENETRANT APPLICATION

The surface to be examined shall be thoroughly coated with penetrant by brushing, spraying or dipping. Pools of penetrant should be prevented from forming on the object. The test surface shall be kept wetted for the minimum period of 10 minutes and not more than 1 hour. If the penetrant material should thicken, congeal, or dry, the test surface shall be completely rewetted with the penetrant and shall be kept thoroughly wetted for one additional penetration time.

APPENDIX B
FLUORESCENT POST-EMULSIFIED STANDARD TECHNIQUE

3.4 EXCESS PENETRANT REMOVAL

After the penetration time has elapsed, the excess penetrant on the surface shall be removed by emulsification. The emulsifier shall be applied by spraying or dipping. Emulsification time shall be governed by surface roughness and the type of discontinuities sought. It shall not exceed 5 minutes unless other times are qualified in a special technique.

After emulsification, the mixture shall be removed by a warm water rinse. During the rinse and after washing, the area undergoing examination shall be visually inspected with a black light to ensure complete removal of all penetrant from the surface. If the examination area does not wash clean and has an excessive fluorescent background because of insufficient emulsification of the penetrant, that area shall be completely reprocessed with a longer emulsification time. That longer time shall not exceed 5 minutes unless the longer time has been qualified as a special technique. Reprocessing shall begin with the pre-cleaning operation, Section 3.1.

3.5 DRYING

The examination surface shall be dry before nonaqueous developer is applied.

The surfaces may be dried by blotting with clean lint-free materials or by using circulating warm air, provided the temperature of the surface is not raised above 125 degrees Fahrenheit. The time for surface drying after removal of last traces of excess penetrant and before application of developer shall be limited to a minimum of 5 minutes and a maximum of 15 minutes.

3.6 DEVELOPING

Nonaqueous developer shall be applied as soon as practicable after drying. It shall be applied by spraying, except where safety or restricted access preclude it. The developer shall be thoroughly agitated before application and applied in the form of a light fog spray covering the examination surface in a thin even film. Under conditions of safety or restricted access, the developer may be applied by brushing, covering the surface in a thin film without excessive smearing of residual penetrant. It shall be up to the discretion of the examiner who will be interpreting the results as to whether brushing on developer is applicable.

APPENDIX B
FLUORESCENT POST-EMULSIFIED STANDARD TECHNIQUE

In the event the developer is applied too heavily, or there is excessive fluorescence (background), the surface shall be re-examined beginning with pre-cleaning, Section 3.1.

3.7 EXAMINATION

The examination is to be conducted in a darkened area using the filtered "black light." The bulb shall be allowed to warm up for at least 5 minutes before use in an examination. The black light intensity at the surface under examination shall be determined at least once every 8 hours and whenever the work location is changed, using a meter which is sensitive to light in the ultraviolet spectrum, centered on 365 nm. Two readings shall be taken: the first without a filter and the second with an ultraviolet (365 nm) filter over the sensing element of the meter. The second reading is deducted from the first, and the difference shall be a minimum of 800 $\mu W/cm^2$. The person evaluating the indications shall adapt his eyes before inspection. When entering the darkened inspection area from a room illuminated artificially, at least 5 minutes shall be allowed for dark adaptation. When entering the darkened inspection area from a sunlight illuminated area, at least 10 minutes shall be allowed for dark adaptation. If the examiner wears glasses or lenses, they shall not be photosensitive.

The surface under examination shall be observed during the application of developer and immediately following developer application to detect the nature of any indications that tend to bleed out profusely. Developing time for final interpretation begins immediately after the nonaqueous developer is dry. Final interpretation shall be made after allowing the penetrant to bleed out for 7 to 30 minutes. If bleed-out does not alter the examination results, longer periods up to 1 hour are permitted.

APPENDIX C
COMPARATOR BLOCK MANUFACTURE AND USE IN TECHNIQUE QUALIFICATION

1.0 PURPOSE

This appendix defines the specific requirements for the manufacture of comparator blocks and how they are used in technique qualification.

2.0 SCOPE

This appendix shall be used in conjunction with NDT-PT-4000, "General Liquid Penetrant Examination Procedure," and NDT-GA-2000, "General Administrative Procedure."

3.0 EXAMINATION REQUIREMENTS

3.1 MANUFACTURING SPECIFICATIONS

Conventional American Society of Mechanical Engineers (ASME) liquid penetrant comparators shall be made of aluminum, ASTM* B209, Type 2024 or SB-211, Type 2024, 3/8-inch thick, and shall have approximate face dimensions of 2 by 3 inches. At the center of each face, an area approximately 1 inch in diameter shall be marked with 950 degrees Fahrenheit temperature-indicating crayon or paint. The marked area shall be heated with a blow torch, or similar device, to a temperature between 950 and 975 degrees Fahrenheit. The specimen shall then be immediately quenched in cold water to produce a network of fine cracks on each face. The block shall then be dried by heating to approximately 300 degrees Fahrenheit. The block will then be given a unique number to distinguish it from other blocks. An example block is shown in Figure C-1. Commercially available crack blocks which have been fabricated in accordance with the ASME Boiler and Pressure Vessel Code may also be used.

3.2 TECHNIQUE QUALIFICATION

As a standard technique, the temperature of the penetrant and the surface of the part to be processed shall not be below 60 degrees Fahrenheit nor above 125 degrees Fahrenheit throughout the examination period. For standard technique qualification a demonstration examination of a cracked block shall be provided for approval of the Authorized Inspector and the Nondestructive Examination (NDE) Level III liquid penetrant examiner. The demonstration will be done at 60 degrees Fahrenheit and then again at 125 degrees Fahrenheit to show penetration effectiveness throughout this temperature range.

*American Society for Testing and Materials.

APPENDIX C
COMPARATOR BLOCK MANUFACTURE AND USE IN TECHNIQUE QUALIFICATION

All other penetrant techniques shall be qualified before use, for the temperatures at which they will be used, by comparative demonstration to the standard technique on an ASME crack block as defined in Section 3.1. Technique qualification shall be approved by the Authorized Inspector (where applicable) and by a NDE Level III in liquid penetrant. Technique qualification shall be documented using the Technique Qualification Sheet, Figure C-2 and controlled according to NDT-GA-2000.

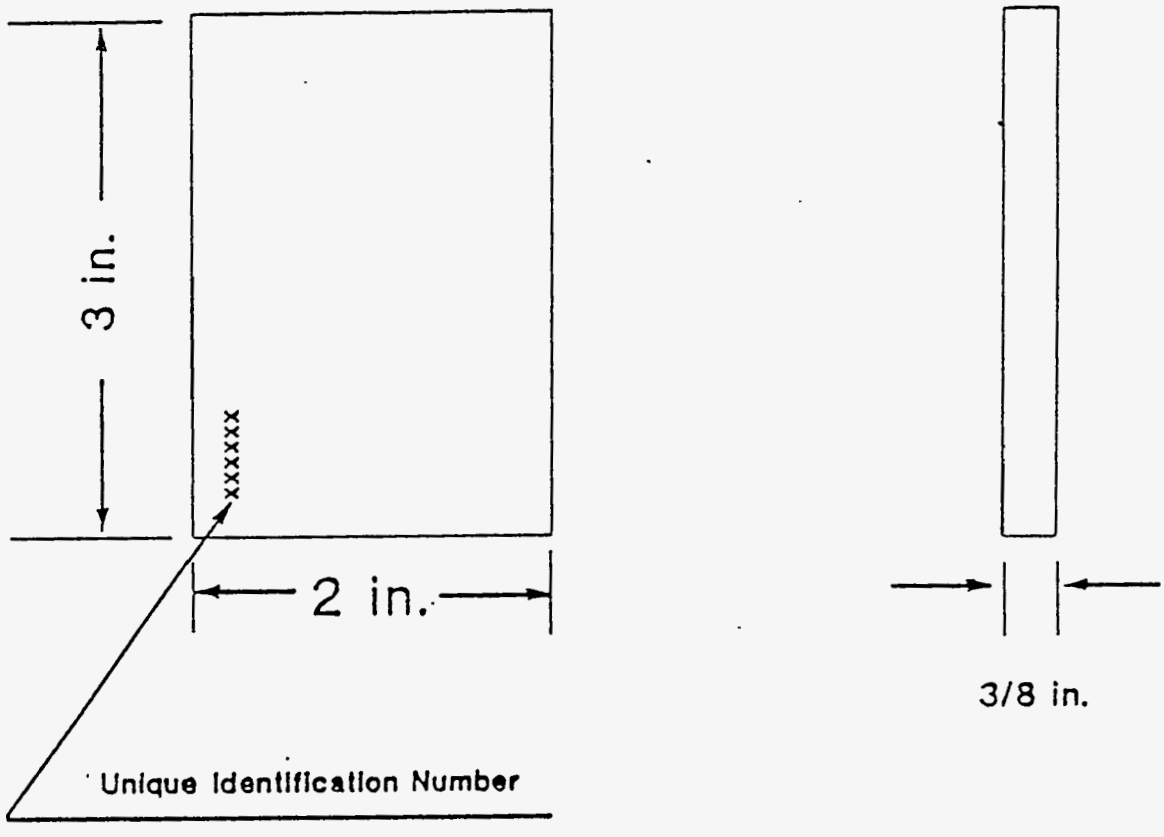
Where examinations at temperatures below 60 degrees Fahrenheit are to be qualified, the penetrant materials and block shall be cooled to below the proposed examination temperature before the application of penetrant materials and maintained at this temperature throughout the examination. Photographs shall be taken at various stages of development. The same block shall now be cleaned ultrasonically for at least 4 hours and then reprocessed using the standard technique (60 to 125 degrees Fahrenheit) with photographs taken at the same intervals as taken during the low-temperature examination. Indications of cracks shall be compared between the photographs and if the indications obtained under the proposed conditions are essentially the same as obtained during examination between 60 and 125 degrees Fahrenheit, the proposed technique shall be considered qualified for use.

If the proposed temperature for the examination is above 125 degrees Fahrenheit, then only the block need be held at this temperature throughout the examination, not the penetrant materials. The block shall be photographed at the proposed temperature and compared as described above.

A special technique qualified at a temperature lower than 60 degrees Fahrenheit shall be considered qualified from that temperature to 60 degrees Fahrenheit.

To qualify a technique for temperatures above 125 degrees Fahrenheit, the upper and lower temperature limits shall be established, and the special technique shall be qualified at these temperatures.

Figure C-1. Liquid Penetrant Comparator.



(NOTE: Dimensions given are for guidance only and are not critical.)

Figure C-2. Technique Qualification Sheet.

REFERENCE NDT-PT-4000 REV 1

TECHNIQUE QUALIFICATION SHEET

STANDARD TECHNIQUE ☐
SPECIAL TECHNIQUE ☐ #

PENETRANT MATERIALS MANUFACTURER

COMPARATOR BLOCK ID. # _____

QUALIFIED TEMPERATURE RANGE _____ MINIMUM TO _____ MAXIMUM

TECHNIQUE QUALIFICATION

		MINIMUM	MAXIMUM
○ PENETRANT _____	PENETRATION TIME		
○ CLEANER/REMOVER _____ ☐ NA	DRY TIME		
○ EMULSIFIER _____ ☐ NA	EMULSIFIER TIME		
○ DEVELOPER _____	DEVELOP TIME		

ADDITIONAL COMMENTS/INFORMATION

REFERENCE STANDARD TECHNIQUE

○ PENETRANT _____	PENETRATION TIME _____
○ CLEANER/REMOVER _____ ☐ NA	DRY TIME _____
○ EMULSIFIER _____ ☐ NA	EMULSIFIER TIME _____
○ DEVELOPER _____	DEVELOP TIME _____

PT EXAMINER / PT LEVEL	PT LEVEL III APPROVAL	AUTHORIZED INSPECTOR ☐ NA
DATE	DATE	DATE

MES-010.005X CBRS Mid-Interval Data Sheet Page 1
Craft NON DESTRUCTIVE Funct Test
Facility WESF Data Sheet Sequence #: 2C*9408030004

Comp Id: USA 9511 B(U) Safe Appl: Regulatory-3 Due: 09/28/94
Loop: T0001 Bldg: 225B MFR: SANDIA NATIONAL LAB Last Done:
Seq: 1 Room: Model: R-1 Procedure: N/A
Sys #: C99R Locn: CRANE PAD Serial #:
Interval:12M DS Key: 053036|S Funct Code: 01 Recall Status: A
Function Desc: ANNUAL NDE TESTING OF THE BUSS CASK OSD #:
Dwg/Sht/Coord/Rev#: / / / Mel No.

NOTE: The BUSS cask is required to have annual NonDestructive Examination (NDE) testing performed according to Chapter 8, Section 8.1.4.1, 8.1.4.2 and 8.2 of the Safety Analysis Report for Packaging (SARP). The leak detector (Helium Mass Spectroscopy) must have a sensitivity of 5.0 x 10(-6) atm-cm(3)/sec.

1. Does the BUSS cask containment boundary meet the leak rate criteria of less than 1.0 x 10(-5) atm-cm(3)/sec? (Yes)/No/NA WDP 10/21/94

2. Does the lid seal meet the leak rate criteria of less than 1.0 x 10(-4) atm-cm(3)/sec? (Yes)/No/NA WDP 10/21/94

3. Does the upper port seal meet the leak rate criteria of less than 1.0 x 10(-4) atm-cm(3)/sec? (Yes)/No/NA WDP 10/21/94

4. Does the lower port seal meet the leak rate criteria of less than 1.0 x 10(-4) atm-cm(3)/sec? (Yes)/No/NA WDP 10/21/94

5. Does the sum of the leak rates for the lid, upper and lower port meet the leak rate criteria of less than 1.0 x 10(-4) atm-cm(3)/sec? (Yes)/No/NA WDP 10/21/94

6. Do the lift lugs meet the criteria of no detectable cracks using dye penetrant? (Yes)/No/NA JL 10/20/94

7. Do the trunnions meet the criteria of no detectable cracks using dye penetrant? (Yes)/No/NA JL 10/20/94

8. Restore BUSS cask to shipping configuration. Paul J Samuelson

HPT SURVEYED W. S. Wilson 10/17/94 Please Circle: (Accept or Reject
Signature Date

Reason _____

Previous Reason: _____

Instructions: PERFORM ANNUAL NON-DESTRUCTIVE EVALUATION (NDE) OF THE BUSS CASK PER NDT-LT6000 AND NDT-PT4000

Revision Required (Y/(N)) Procedure _____ Data Sheet _____

Technician Bill Purdy 10/21/94 Hours 32.00 Manager Jim Kvanes 10/21/94
Work Order # 23794-01022

Westinghouse Hanford Company

NDE PENETRANT PROCEDURE AND TEST REPORT

NON DESTRUCTIVE EXAMINATION
306 BLDG., 300 AREA - TEL. 376-5401

Job No. 94-204

Requestor	Company	Project/System/Work Package/Traveler No.
PAUL T. SAUERESSIG	WHC	1.0 BUSS CASK TRAILOR SKID. 2.0 BUSS CASK TRUNNIONS AND LIFT LUGS. PKG.#2B-94-01022/W.

SIN	Bldg.	Area
S6-65	225B	200E

10/19/94 KBOIN KBG52

Acceptance Std.	Section	Para.	Date	NA
NL 9912119				
SME SECTION VIII	APPENDIX 8		1989	

Dwg. No.	NA	Material	NCR	NA
T83109 SHT 1 OF 1		S/S		X
S51171 SHT 1 OF 1				

PRODUCT OR STAGE OF MANUFACTURING

- [ ] As Cast
- [ ] As Forged
- [ ] As Machined
- [X] As Assembled
- [ ] As Welded
- [ ] Weld Prep
- [ ] Root Pass
- [X] Final
- [ ] Other
- [ ] Repair No.

WHC PROCEDURE NO.

- [ ] NA
- [X] NDT-PT-4000 Rev. 2
- Appendix A Rev. 1

AREA TO BE INSPECTED

- [X] Full inspection; 100% of Area Requested
- [ ] Other (Explain below)

MANUFACTURER

- [X] Sherwin
- [ ] Magnaflux
- [ ] Other

DYE

- [X] Color Contract
- [ ] Fluorescent

Special PT Technique No.

- [X] NA

CLEANING

	Pre	Post
Alconol	[ ]	[ ]
Cleaner/Remover	[X]	[X]
Other	[ ]	[ ]

	Type	Batch No.	Time (min.)
Penetrant	DP-40	015F1	10
Cleaner [ ] NA	DR-60	412A4	5
Emulsifier [X] NA	-------	----------	----
Developer	D-100	426A6	7

Developer Application

- [X] Spray
- [ ] Dip
- [ ] Brush
- [ ] Powder

Light Level

- [ ] µW/cm 2
- [X] Foot Candles

> 100

Technique Pre Approval Level/Date

- [X] NA

Weld No., Part No., or Serial No.	Acc.	Rej.	No Rel. Ind.	Indications/Comments
T83109-000-01	X		X	LIFT LUG.
T83109-000-02	X		X	LIFT LUG.
S51171-000-1	X		X	TRUNNION.
S51171-000-2	X		X	TRUNNION.

Appendix C
Page 26
WHC-SD-WM-TI-672 Rev 0

Technician	PT Level	Interpreted by	PT Level	Reviewed by
JANIE NIEDERER	II	JANIE NIEDERER	II	J.C. Kroopnick
Date of Examination		**Date**		**Date**
10/19/94		10/19/94		10-24-94

A-7320-043 (01.94)

2.3.2 Refer to the following drawings in Volume II of the SARP for as-fabricated information.

- T83109 Lug, Lift, BUSS
- S51171 Trunnion, Cask Body
- S68157 Washer, Trunnion, Cask Body
- S48981 Cask Assembly

2.3.3 Dye-penetrant check lug welds for indications of cracking. Reinstall lugs to cask body using eight 2.37-in long bolts. Torque bolts to 250 ft-lb.

2.3.4 Remove 2 large brass washers from the trunnions (four screws per washer, one washer per trunnion). Dye-penetrant check each trunnion for cracks in the radius transition where the cylindrical lifting element joins the mounting flange. Reinstall washers to trunnions and torque screws to 20 ft-lb. Remount trunnions to cask body, tightening bolts in a crossing pattern. Trunnion bolt torque is 250 ft-lb.

2.4 Cask Lid

2.4.1 Inspect the cask lid annually. See Figure 2.3 for inspection points.

2.4.2 Refer to the following drawings in Volume II of the SARP for as-fabricated information.

- S54758 Lid Assembly, BUSS Cask
- T73693 Cask Lid, BUSS, 304
- T99946 Seal, Helicoflex, Cask Lid
- T99944 Retainer, Seal, Cask Lid
- S52562 Lid Lifting Assembly, Cask Lid
- S52563 Lifting Screw, Cask Lid
- S52564 Lifting Screw Tip, Cask Lid
- S52565 Indicator Pin, Cask Lid
- S52566 Spring Retainer, Cask Lid

2.4.3 Remove seal assembly from lid prior to inspection.

2.4.4 Thoroughly clean all surfaces of lid. Guidelines on cask washing methods and approved cleaners are contained in Section 6.1. Survey all cleaning materials for contamination.

2.4.5 Inspect lid surfaces for signs of mechanical damage such as gouges, dents, and distortions.

2.4.6 Inspect lid sealing surface for scratches or damage that might affect containment. The seals are extremely critical to scratches across the circular lay of the seal surface. Section 9.1.4 contains instructions for lid seal surface repairs.

2.3 Trunnions and Lifting Lugs

2.3.1 Inspect cask trunnions and lifting lugs annually for soundness. See Figure 2.2 for inspection points.

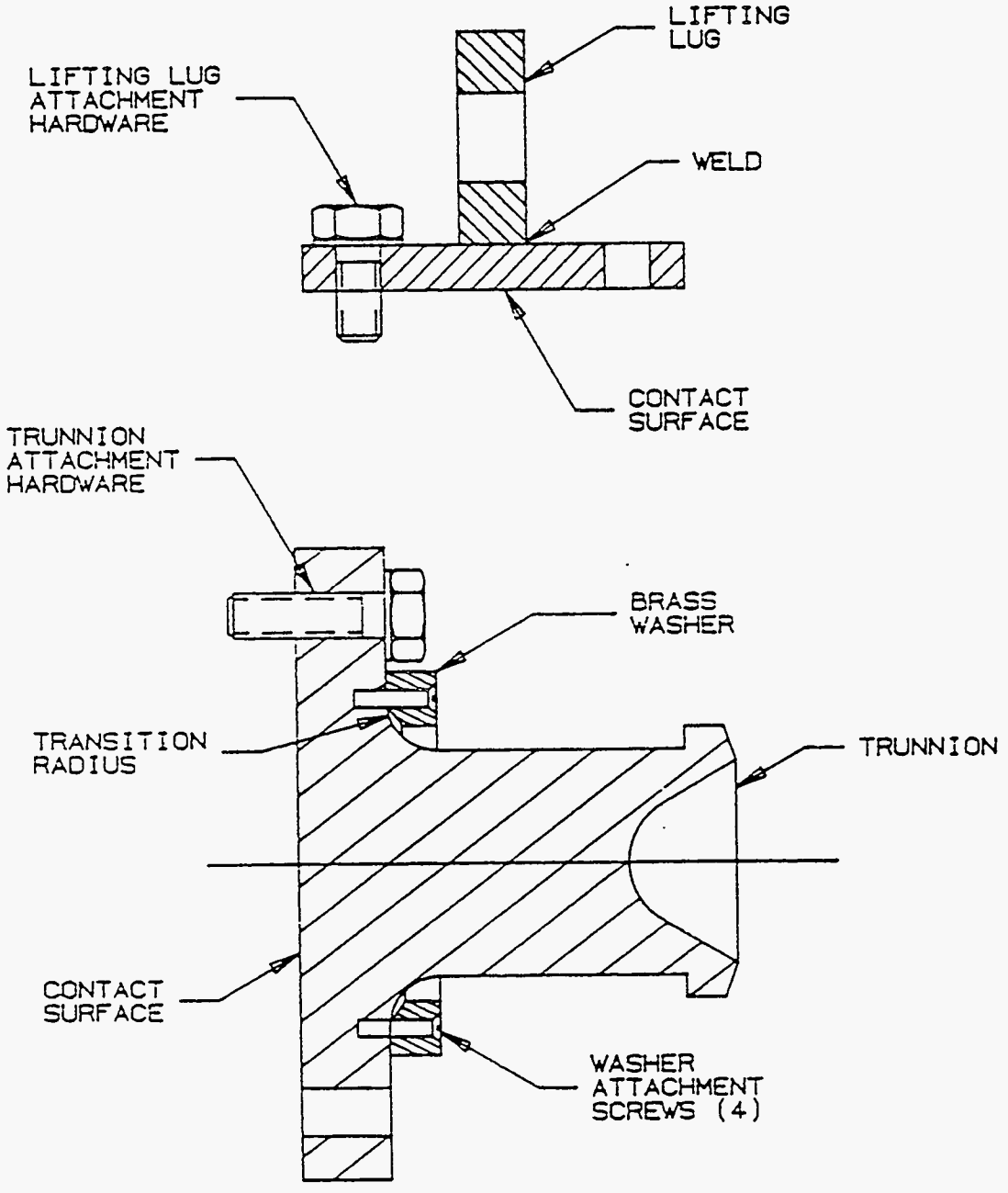


Figure 2.2
Cask Trunnions and Lifting Li

WELDING, CARBON, LOW-ALLOY, AND CORROSION-RESISTANT STEELS

Page	1	2	3	4	5	6	7	8	9
Issue	D	D	D	D	C	C	C	C	C

Drawing Call-Out: Weld and Inspect per 9912119-00 Class (1), (2), (3).

(1) Specify applicable class of weld from 1.1.
(2) Specify welding rods or electrodes per applicable material specification.
(3) Supplemental notes may be required. (See 6.1.)

1. GENERAL

1.1 Scope. This standard covers the requirements for process control, inspection, and acceptance of Class I and Class II arc welds in carbon and low-alloy steels and corrosion-resistant steels.

Class I -- A weld which is considered critical and, for higher reliability, has comprehensive inspection and nondestructive testing. See 4.4.2.1.

Class II -- A weld which has less stringent limits on imperfections and has less comprehensive inspection and nondestructive testing. See 4.4.2.2.

1.2 Definitions.

1.2.1 Welding Terms and Definitions. Welding terms and definitions used in this standard shall be in accordance with AWS A3.0 except as follows:

Porosity -- approximately spherical-shaped voids in the metal.

Aligned Porosity -- four or more individual voids within a specified weld length whose radiographic images are intersected by a straight line.

1.2.2 Welding Symbols. Welding symbols used on the product drawings shall be in accordance with ANSI/AWS A2.4.

1.2.3 Pentagon M Definition. /M/ is a symbol placed adjacent to a section of paragraph to designate requirements of information pertinent only to Bendix KCD, its suppliers and subcontractors.

1.2.4 /M/ Essential Process Variable. A welding condition which, when changed, will affect the mechanical or chemical properties (other than notch toughness) of the weldment.

2. DOCUMENTS

2.1 Required. The following documents are requirements to the extent stated elsewhere in this standard:

	9912114-00	Welders and Welding Operators Qualification
/M/	9921006-02	Inspection, Penetrant
/M/	9948013-00	Inspection, Radiographic
	MIL-I-6866B	Inspection, Penetrant
	MIL-I-6868E	Inspection, Magnetic Particle
	MIL-STD-00453B	Inspection, Radiographic
	MIL-STD-1595	Aerospace Welder Performance Qualification
	ANSI/AWS A2.4-76	Symbols For Welding and Nondestructive Testing
	AWS A 3.0-76	Welding Terms and Definitions
	ANSI/ASME Boiler and Pressure Vessel Code, Section VIII, 1977 Edition	Pressure Vessels
	ANSI/ASME Boiler and Pressure Vessel Code, Section IX, 1977 Edition	Welding and Brazing Qualifications

3. REQUIREMENTS

3.1 Welding Process. Welding shall be done by any of the arc welding processes, using manual, semiautomatic, and automatic techniques. When multiple choice of welding processes is given on a drawing, it shall be the responsibility of the fabricator to determine which process is appropriate for the specific weldment concerned.

3.2 Qualification of Welders and Welding Operators.

3.2.1 Manual or Semiautomatic Equipment. Welders using manual or semiautomatic welding equipment shall be qualified in accordance with one of the following:

(1) MIL-STD-1595

(2) ANSI/ASME Boiler and Pressure Vessel Code, Section IX

/M/ (3) 9912114

3.2.2 Automatic Equipment. Welding operators using automatic welding equipment shall be qualified in accordance with one of the following:

(1) MIL-STD-1595

(2) ANSI/ASME Boiler and Pressure Vessel Code, Section IX

/M/ (3) 9912114

3.3 Qualification of Welding Procedure.

3.3.1 The welding procedure for all Class I welds shall be qualified, and for those Class II welds for which the drawing requires qualification of procedure.

/M/ See 3.3.2.c for additional welding procedure requirements.

3.3.2 Welding procedure shall be qualified before welding is conducted on weldments for delivery, and shall consist of:

1.3.2 continued

a. Making sample welds on test parts which are made from base metal and filler metal meeting drawing requirements for weldments for delivery and which represent the thickness and design characteristics of welds in weldment for delivery. All aspects of welding practice appropriate for use on weldments for delivery, such as inert gas backup, back chipping or grinding root passes, preheat, current settings, etc., as applicable shall be documented.

b. Inspecting sample welds using methods specified on the drawing and/or herein, and by sectioning in a adequate number of places, to ensure that welds meet applicable quality requirements.

c. On the basis of a. and b. above, establish written procedures for all welds present in the weldment for delivery. These procedures shall be followed in fabricating weldments for delivery. /M/ For all welds, regardless of class and qualification applicability, a welding procedure consisting of detailed methods and essential process variables as determined by engineering shall be included in the manufacturing work directions.

d. All welding procedures and qualification inspection data shall be recorded and kept on file by the welding fabricator and shall be available to the Buyer.

e. When so specified, the welding procedure shall be subject to Sandia approval prior to welding on parts intended for delivery.

3.4 Weld Preparation. Loose scale, slag, rust, grease, oil, and other foreign matter shall be removed from surfaces to be welded.

3.4.1 Carbon and Low-Alloy Steels. Beveling and weld preparation may be done by oxygen cutting, provided cracking does not occur in the metal.

3.4.2 Corrosion-Resistant Steels. Beveling and weld preparation may be done by flux-oxygen cutting, provided cracking does not occur in the metal and provided at least 1/8 inch of metal is removed from all cut edges by mechanical means, grinding, etc.

.5 Preheat.

.5.1 Carbon and Low-Alloy Steels. Low-alloy steels having a carbon content greater than 0.25% and carbon steels having a carbon content greater than 0.35% shall be preheated to and maintained at a minimum temperature of 350°F during welding.

.5.2 Corrosion-Resistant Steels. Hardenable steels of the 400 series shall be preheated to avoid cracking.

.6 Low Hydrogen Covered Electrodes (EXX15, EXX16, EXX18 or EXX28). To prevent cracking in welds, low hydrogen flux-covered electrodes shall be stored and used in accordance with the recommendations of the electrode manufacturer and the electrode material specification.

.7 Weld Defects. Imperfections that exceed the limits specified in Table I shall be considered defects and are unacceptable.

TABLE I

LIMITS OF IMPERFECTIONS IN ACCEPTABLE WELDS

Imperfection	Limit	
	Class I Weld	Class II Weld
Cracks in weld bead	Unacceptable	Unacceptable
Cracks in parent metal	Unacceptable	Unacceptable
Crater Cracks	Unacceptable	Unacceptable
Incomplete fusion and inadequate joint penetration	Unacceptable	As determined by inspection methods for Class II welds, the aggregate length of the imperfections shall not exceed 1-1/2 T in a weld length of 6T and the length of any individual imperfection shall not exceed 1/2 T. If the weld length is less than 6T, the aggregate length of the imperfections shall not exceed 1/4 the weld length and the length of any individual imperfection shall not exceed 1/12 the weld length. (See Note 1)
Porosity (Internal)	The maximum size and population of porosity shall be in accordance with Appendix IV of Section VIII of ASME Boiler and Pressure Vessel Code.	Porosity is not normally detected by inspection methods for Class II welds and, therefore, is not a factor in their acceptability.
Inclusions (Internal)	Approximately spherical inclusions shall be evaluated as porosity. Any elongated inclusion which has a length greater than 1/4 T or 1/4 inch, whichever is less, shall be unacceptable. Any group of inclusions in line shall not have an aggregate length greater than T in a length of 12 T, except when the distance between successive inclusions exceeds 6L (where L is the length of the longest inclusions in the group). (See Note 1)	Inclusions are not normally detected by inspection methods for Class II welds and, therefore, are not a factor in their acceptability.
Undercut	Unacceptable	Unacceptable (See Note 2)
Overlap	Unacceptable	Unacceptable (See Note 2)
Convexity of butt welds on either side	Weld Size Up to 0.125 inch 0.125 to 0.500 inch 0.500 inch and larger	Maximum Reinforcement Height 0.050 inch 25% of weld size 0.125 inch
Concavity	Unacceptable in butt welds. In fillet welds, actual throat shall not be less than the theoretical throat for specified weld size.	
Size of fillet welds	Specified weld size (length of legs) +50%, -0%	

NOTES:

1. (T) is the specified weld size.
2. Infrequent undercut and overlap may be acceptable.

3.8 Repair of Defects. Repair of defects is permissible, if the repaired weldment, the repair weld itself, and the adjacent parent metal meet the requirements of the original weldment. Weldments that are heat treated after welding may be repair-welded only after reduction to a strength level lower than 125,000 psi tensile ultimate, and provided that heat treatment follows repairing. A repaired weldment shall be reinspected in the same manner as the original weldment.

3.9 Marking. Impression stamping and other marking methods that may degrade the weldment shall be used only when permitted and then only in the area designated by the product drawing.

4. QUALITY PROVISIONS

4.1 Lot Definition. A lot shall consist of all weldments of one design submitted for inspection at one time.

4.2 Responsibility for Inspection and Testing. Inspection and testing specified herein and on the product drawing shall be the responsibility of the Supplier.

4.3 Inspection Sequence. Weldments shall be inspected after any heat treatment and after any cleaning or other preparation required for proper inspection.

4.4 Inspection and Testing Requirements.

4.4.1 In-Process Inspection. In-process inspection shall be performed to verify conformance to the weld preparation requirements in 3.4 and the preheat requirements of 3.5.

4.4.2 Product Inspection and Testing.

4.4.2.1 Class I Welds. The inspection requirements for Class I welds shall be:

(1) 100% visual inspection

(2) 100% penetrant or magnetic particle inspection, and

(3) 100% radiographic inspection

4.4.2.2 Class II Welds. The inspection requirement for Class II welds shall be:

(1) 100% visual inspection

(2) Penetrant or magnetic particle inspection of a 10% sample of each lot of weldments but never fewer than one weldment per lot. The sample shall be selected at random. If any weldment in the sample is found defective, the lot shall be rejected. Weldments of a rejected lot may be individually accepted by 100% penetrant inspection.

NOTE: Table 1 limits imperfections in Class II welds, and, therefore, describes the quality of the weld regardless of the fact that the required visual and penetrant inspection may not detect internal defects.

4.4.2.3 Class I and Class II Welds. Under the referee circumstances, the Production Agency reserves the right to require removal of a portion of any doubtful weld for testing or metallurgical examination. This portion can be removed by trepanning or other suitable method.

4.5 Inspection and Testing Methods.

4.5.1 Visual Inspection. Visual examination of welds and adjacent parent metal shall be with the aid of magnification not exceeding 10X.

4.5.2 Penetrant, Magnetic Particle and Radiographic Inspection. Penetrant inspection shall be in accordance with MIL-I-6866 or 9921006. Magnetic particle inspection shall be in accordance with MIL-I-6868. Radiographic inspection shall be in accordance with MIL-STD-453 or 9948013, Quality Level 2.

4.6 Inspection Records. The Supplier shall maintain the inspection records for at least one year after completion of welding.

5. PACKAGING, HANDLING AND STORAGE

Not applicable.

6. NOTES

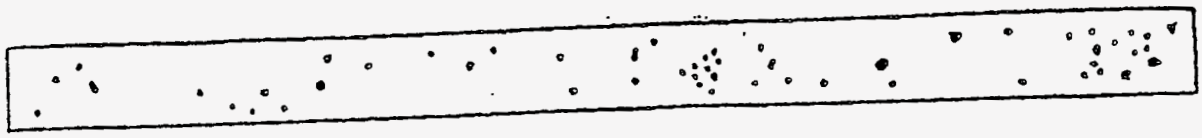
6.1 Design Guidance.

6.1.1 Class I Weld Restrictions. Avoid specifying Class I welds for fillet welds and groove welds that do not require complete joint penetration.

6.1.2 Machining after Welding. Machining after welding that substantially reduces the thickness of the weld may result in a wider heat-affected zone and lower mechanical properties than assumed. For critical applications, consider limiting the extent of machining after welding.

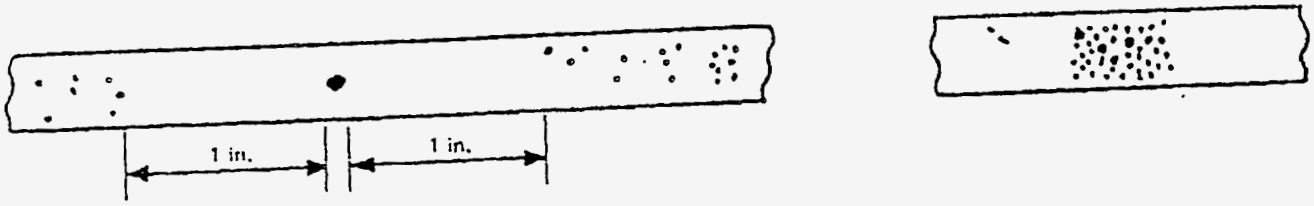
6.1.3 Post-Weld Heat Treatment. Post-weld heat treatment, when required, should be specified on the product drawing.

6.1.4 Repair of Welds. Repair welding may result in a wider heat-affected zone and lower mechanical properties than assumed. For critical application, consider limiting the extent of repairs.



RANDOM ROUNDED INDICATIONS

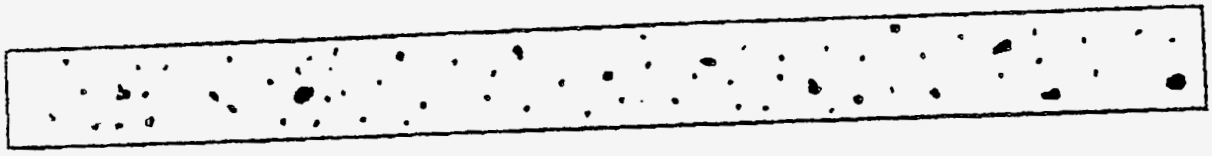
Typical concentration and size permitted
in any 6 in. length of weld



ISOLATED INDICATION
Maximum size per Table 4-1

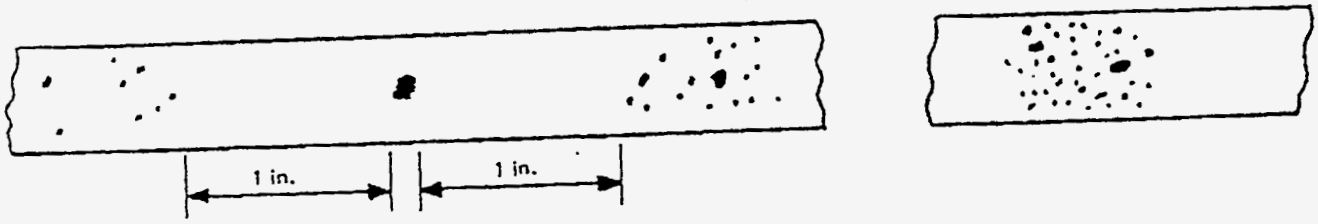
CLUSTER

FIG. 4-3 CHARTS FOR t EQUAL TO ⅛ in. to ¼ in., INCLUSIVE



RANDOM ROUNDED INDICATIONS

Typical concentration and size permitted
in any 6 in. length of weld



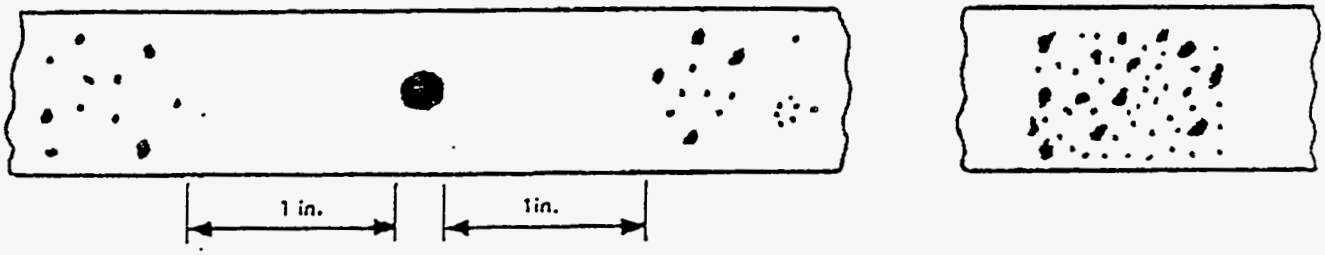
ISOLATED INDICATION
Maximum size per Table 4-1

CLUSTER

FIG. 4-4 CHARTS FOR t OVER ¼ in. to ⅜ in., INCLUSIVE

RANDOM ROUNDED INDICATIONS

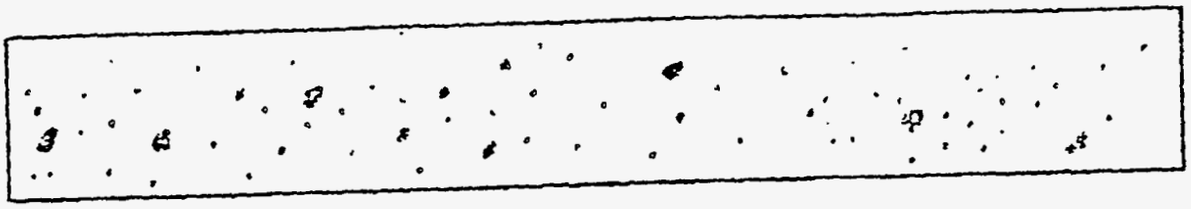
Typical concentration and size permitted
in any 6 in. length of weld



ISOLATED INDICATION
Maximum size per Table 4-1

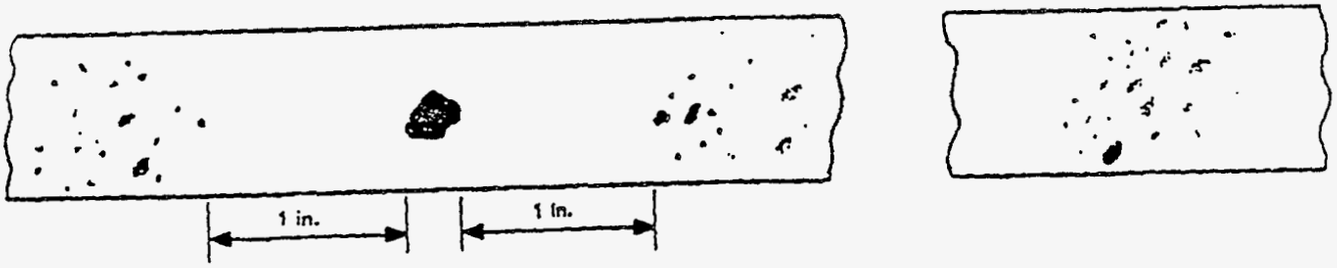
CLUSTER

FIG. 4-5 CHARTS FOR t OVER $\frac{3}{4}$ in. to $\frac{3}{4}$ in., INCLUSIVE



RANDOM ROUNDED INDICATIONS

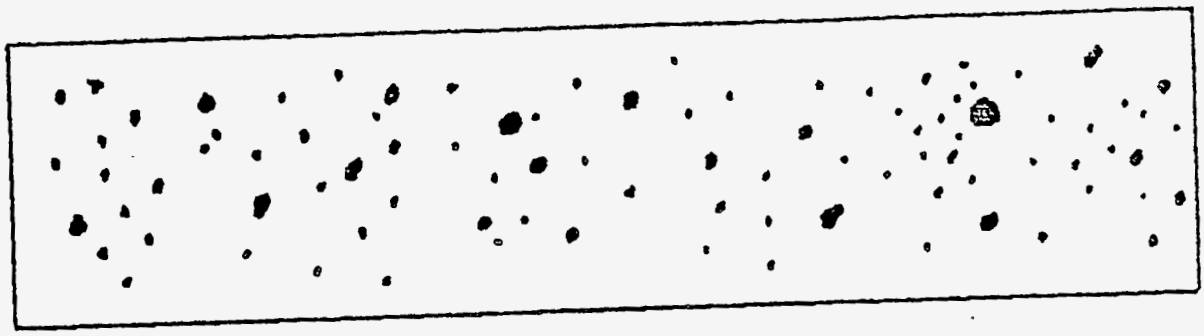
Typical concentration and size permitted
in any 6 in. length of weld.



ISOLATED INDICATION
Maximum size per Table 4-1

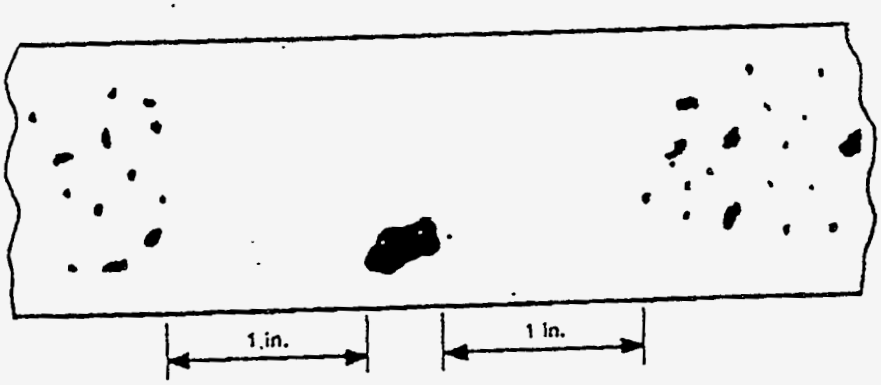
CLUSTER

FIG. 4-6 CHARTS FOR t OVER ¾ in. to 2 in., INCLUSIVE

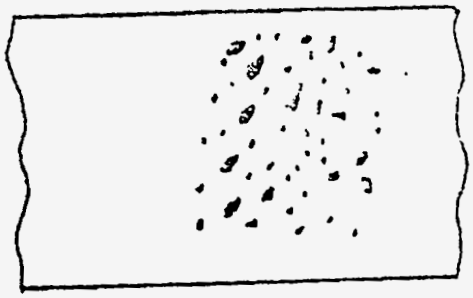


RANDOM ROUNDED INDICATIONS

Typical concentration of size permitted
in any 6 in. length of weld.

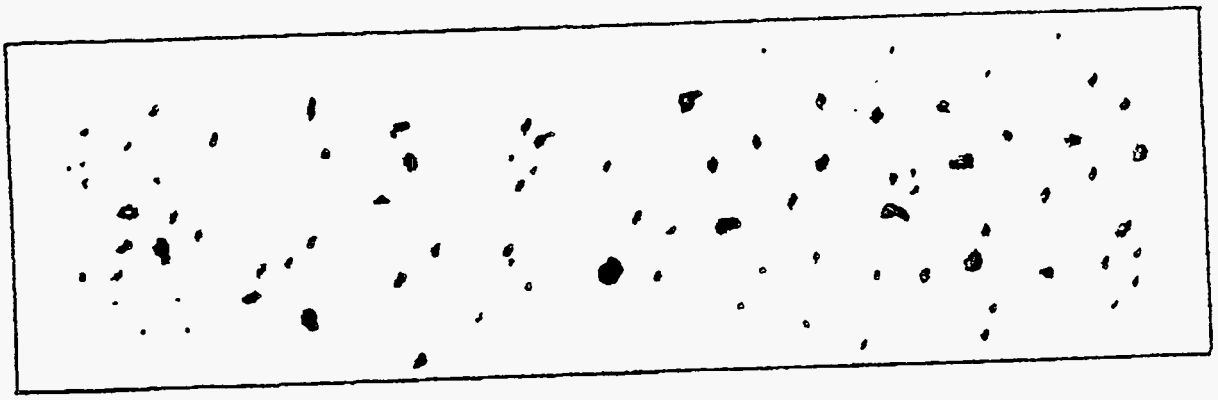


ISOLATED INDICATION
Maximum size per Table 4-1



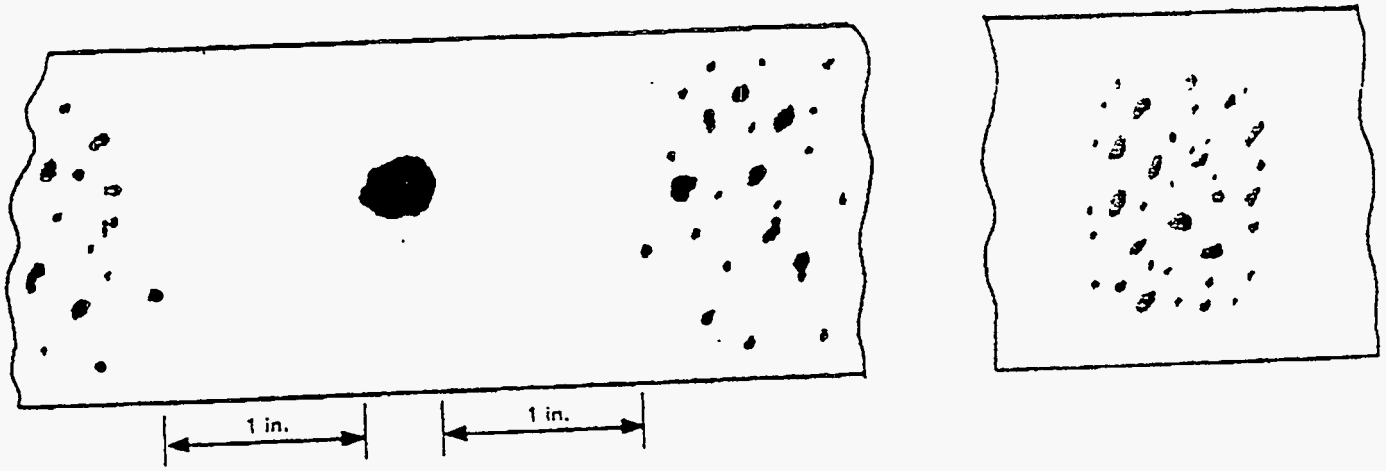
CLUSTER

FIG. 4-7 CHARTS FOR t OVER 2 in. to 4 in., INCLUSIVE



RANDOM ROUNDED INDICATIONS

Typical concentration and size permitted in any 6 in. length of weld.



ISOLATED INDICATION
Maximum size per Table 4-1

CLUSTER

FIG. 4-8 CHARTS FOR t OVER 4 in.

APPENDIX 8
METHODS FOR
LIQUID PENETRANT EXAMINATION (PT)

NOTE: Satisfactory application of this method of examination requires special skills in the techniques involved and in interpreting the results. The requirements specified herein presume application by suitably experienced personnel.

8-1 SCOPE

(a) This Appendix describes methods which shall be employed whenever liquid penetrant examination is specified in this Division.

(b) Article 6 of Section V shall be applied for detail requirements in methods, procedures and qualifications, unless specified within this Appendix.

(c) Liquid penetrant examination shall be performed in accordance with a written procedure, certified by the Manufacturer to be in accordance with the requirements of T-150 of Section V.

8-2 CERTIFICATION OF COMPETENCY OF NONDESTRUCTIVE EXAMINATION PERSONNEL

The manufacturer shall certify that each liquid penetrant examiner meets the following requirements.

(a) He has vision, with correction if necessary, to enable him to read a Jaeger Type No. 2 Standard Chart at a distance of not less than 12 in., and is capable of distinguishing and differentiating contrast between colors used. These requirements shall be checked annually.

(b) He is competent in the techniques of the liquid penetrant examination method for which he is certified, including making the examination and interpreting and evaluating the results, except that, where the examination method consists of more than one operation, he may be certified as being qualified only for one or more of these operations.

8-3 EVALUATION OF INDICATIONS

An indication is the evidence of a mechanical imperfection. Only indications with major dimensions greater than $\frac{1}{16}$ in. shall be considered relevant.

(a) A linear indication is one having a length greater than three times the width.

(b) A rounded indication is one of circular or elliptical shape with the length equal to or less than three times the width.

(c) Any questionable or doubtful indications shall be reexamined to determine whether or not they are relevant.

8-4 ACCEPTANCE STANDARDS

These acceptance standards shall apply unless other more restrictive standards are specified for specific materials or applications within this Division.

All surfaces to be examined shall be free of:

(a) relevant linear indications;

(b) relevant rounded indications greater than $\frac{3}{16}$ in.;

(c) four or more relevant rounded indications in a line separated by $\frac{1}{16}$ in. or less (edge to edge);

(d) an indication of an imperfection may be larger than the imperfection that causes it; however, the size of the indication is the basis for acceptance evaluation.

8-5 REPAIR REQUIREMENTS

Unacceptable imperfections shall be repaired and reexamination made to assure removal or reduction to an acceptable size. Whenever an imperfection is repaired by chipping or grinding and subsequent repair by welding is not required, the excavated area shall be blended into the surrounding surface so as to avoid sharp notches, crevices, or corners. Where welding is required after repair of an imperfection, the area shall

be cleaned and welding performed in accordance with a qualified welding procedure.

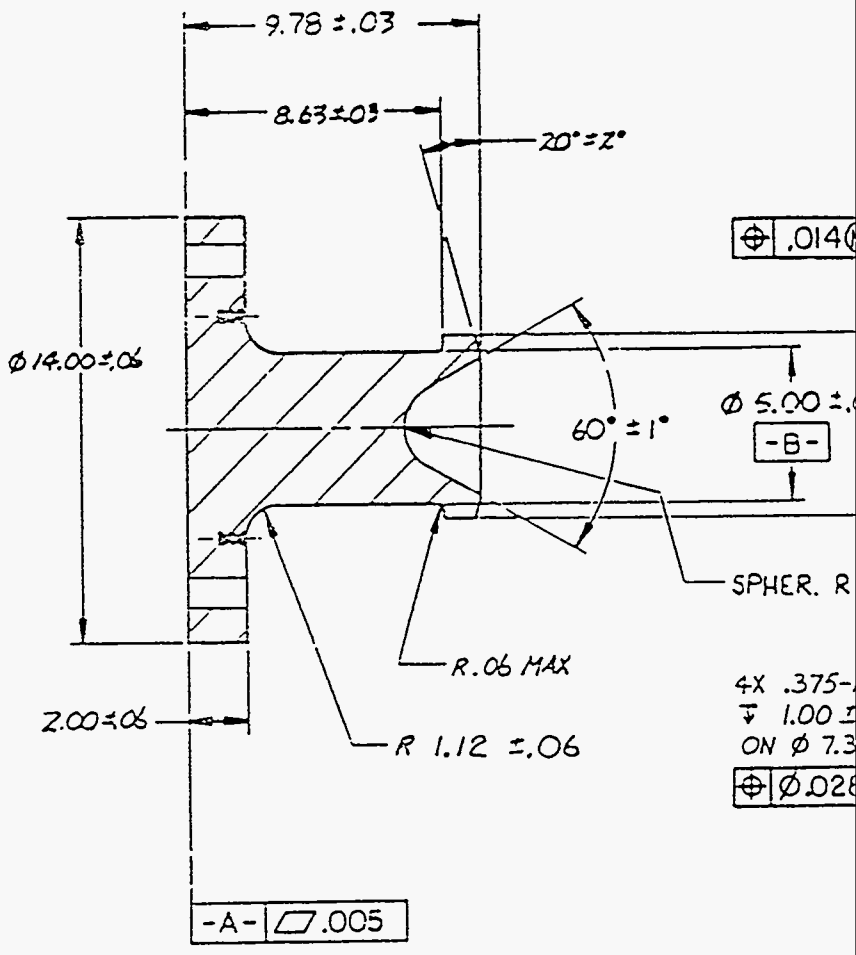
(a) Treatment of Indications Believed Nonrelevant. Any indication which is believed to be nonrelevant shall be regarded as an imperfection unless it is shown by reexamination by the same method or by the use of other nondestructive methods and/or by surface conditioning that no unacceptable imperfection is present.

(b) Examination of Areas From Which Defects Have Been Removed. After a defect is thought to have been removed and prior to making weld repairs, the area shall be examined by suitable methods to ensure it has been removed or reduced to an acceptably sized imperfection.

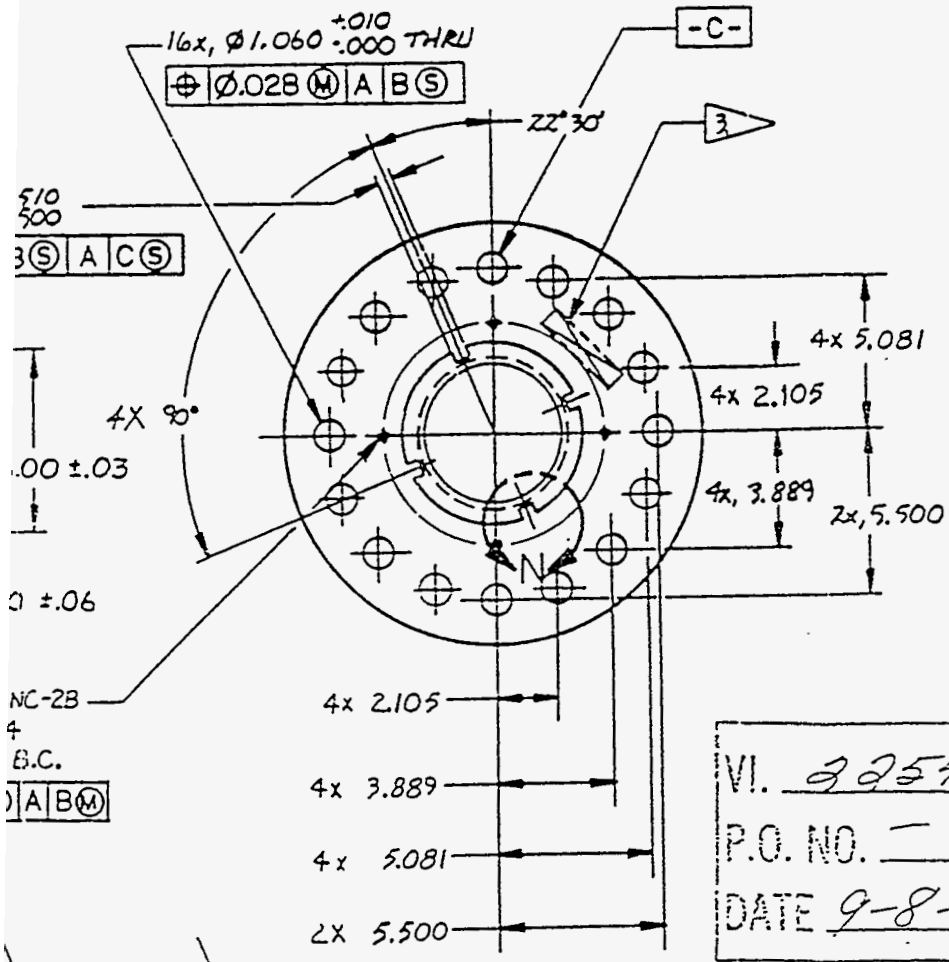
(c) Reexamination of Repair Areas. After repairs have been made, the repaired area shall be blended into the surrounding surface so as to avoid sharp notches, crevices, or corners and reexamined by the liquid penetrant method and by all other methods of examination that were originally required for the affected area, except that, when the depth of repair is less than the radiographic sensitivity required, reradiography may be omitted.

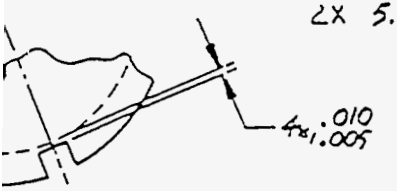
NOTES:

1. GENERAL REQUIREMENTS ARE DEFINED IN 990
2. MATERIAL: STEEL, STAINLESS, 17-4 PH PER AS
   TYPE 630, H 900
3. MARK DESIGN AGENCY PART NO. PER 9919100,
   LOCATE APPROX AS SHOWN.
4. ALL MACHINED SURFACES TO BE 63
5. PASSIVATE PER 9904301.



DESIGN AGENCY PART NO.	REVISIONS				
	ISSUE	DESCRIPTION	PREPARED BY	DATE	DWG	CHK
S51171-000	A	PLAT2BECKER, 7655/EAKES, 6322		7/5/84	RE	
	B	ADDED NOTE 5 R COOKE CD 7651/EAKES 6322		9/13/84		HRY
	C	ADDED .375-16 UNC HOLES REVISED ELET 2851 / EAKES 6322		12-19-84		JLM
	D	ADDED 8 THRU HOLES Ø1.060 J.ARCHULETA,(C&D)2855/ BRONOWSKI, 6323		6-18-85	D23	JLM





DETAIL N
SCALE: 1/2

VI. 92542 SHT. 373
P.O. NO. —
DATE 9-8-93 BLDG 9251B

AGENCY APPROVALS			SHEET 1
ORG	DATE	APPROVALS	ISSUE D
			SHEET INDEX
6323	9/8/93		PART CLASSIFICATION: UNCLASSIFIED
			DWG CLASSIFICATION LEVEL: UNCLASSIFIED

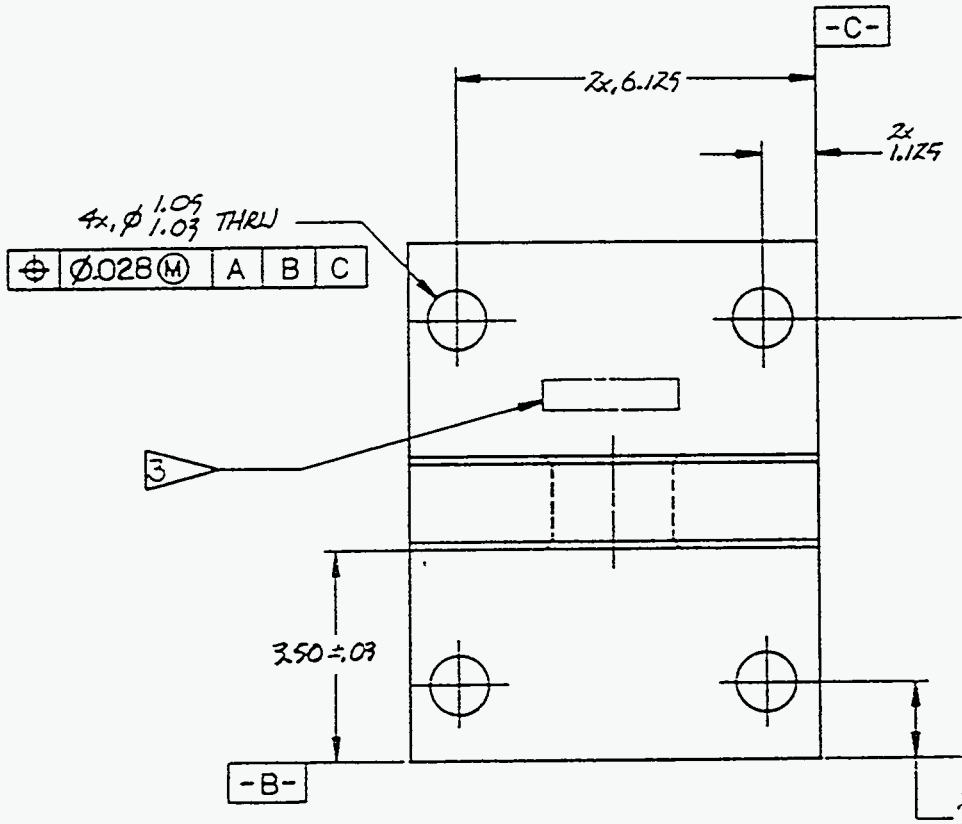
TITLE: TRUNNION, CASK BODY, (BUSS)

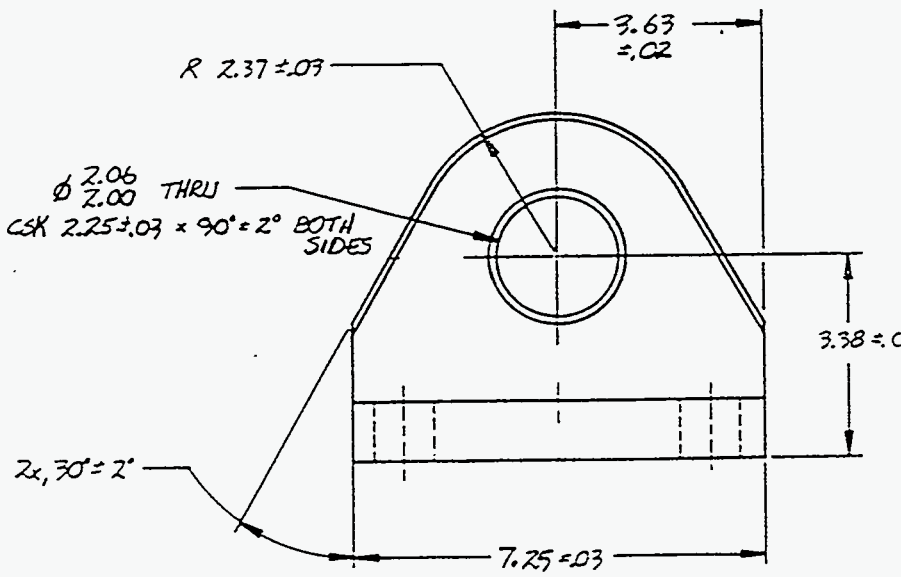
SIZE C | FSCM NO 14213 | DWG NUMBER S51171
SCALE 1/4 | SHEET 1 OF 1

SF5300C(9-81)

NOTES:

1. WELD AND INSPECT PER 9912119, ELECTRODES OR RODS PER AWS
2. PASSIVATE PER 9904301, TREA
3. MARK DESIGN AGENCY PART NO METHOD A, LOCATE APPROX.

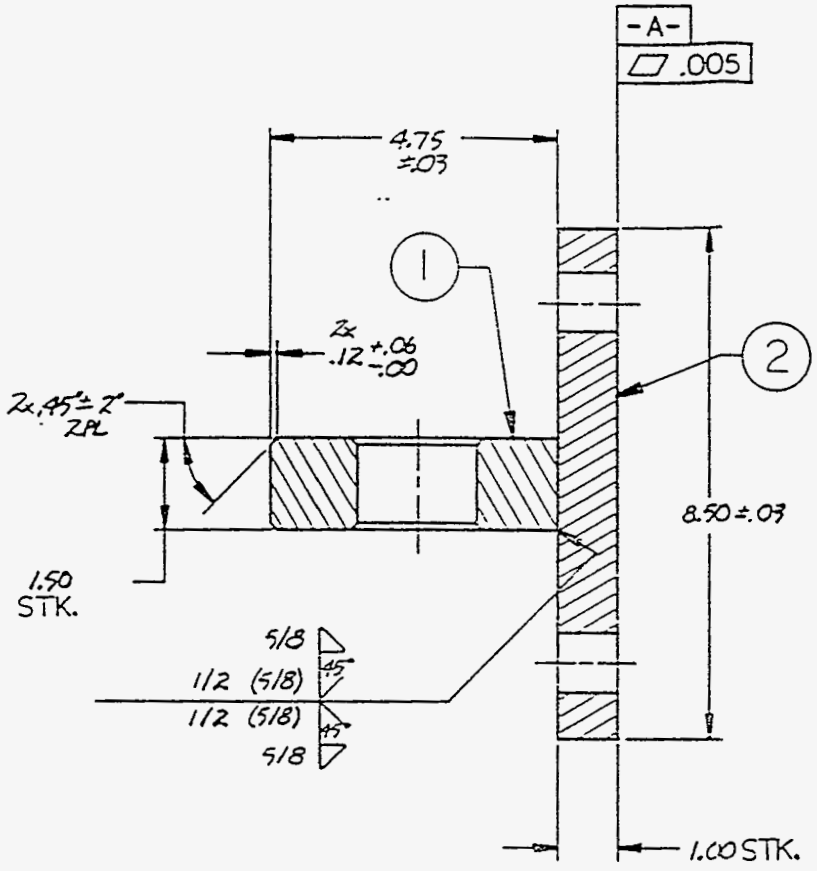




SSI, USING ER308
-77.
NT A.

R 9919100, CLASS C-1
SHOWN.

DESIGN AGENCY PART NO.	ISSUE	REVISIONS DESCRIPTION / PREPARED BY	DATE	DSGR	ENGR
T83109-000	A	PLATZBECKER, 7655 / EAKES, 6322	8/31/84	RE	HRY
	B	ADDED L/M & PASSIVATION C. JOJOLA (C&D) 7651 / EAKES 6323	9/14/84	RE	HRY



VI. 283542 SHT. 4/4
P.O. NO. —
DATE 9-8-93 BLDG. 2225

NO REQD	NO REQD	DESIGN AGENCY NUMBER	DESCRIPTION	NOTE	SHEET ZONE	ITEM
	1	MIL-S-5059	PLATE, STEEL, CRES TYPE 304, 1.00 STK.			2
	1	MIL-S-5059	PLATE, STEEL, CRES TYPE 304, 1.50 STK.			1
	NA	9919100	DESIGN AGENCY PART NO.			
	NA	9904301	PASSIVATION			
	NA	9912119	WELDING			
	NA	9900000	GENERAL REQUIREMENTS			

NA DOCUMENTS AS ASSIGNED | NO PROCESS MATERIAL | ALT ALTERNATE
ARS AS REQUIRED ASSEMBLY | EM EMBODIED MATERIAL

LIST OF MATERIAL

AGENCY APPROVALS	ORG	DATE	APPROVALS

SHEET 1
ISSUE B
SHEET INDEX
PART CLASSIFICATION
UNCLASSIFIED
DWG CLASSIFICATION LEVEL
UNCLASSIFIED

TITLE
LUG, LII (BUSS)

SIZE	FSCM NO	DWG NUMBER
C	14213	T83109

SCALE 1/2 | SHEET 1 OF 1

SF5300C(9-81)

Appendix D: Bolt Torque Test Data

==========J-2 WORK REQUEST (N120)==========

Page: 1 12:36:06 21 SEP 1994

New Request Num 10429

1. Document Number 2B-94-00954 /P *PREVENTIVE MAINTENANCE*
2. Work Item Title PM 2C23027 BUSS CASK TORQUE TEST

==========

3. System ~~B99R~~ C99R ~~*GENERAL ELECTRICAL SUPPORT*~~ BussCask JS 9/23/94 JS 10/7/94

4. Components

Component Number	Name
N/A	

Temporary Number	Name
N/A	

5. Location

Facility 2C *WESF*
Bldg/Rm 225B Other CRANE PAD Other

6. Associated Components

Component Number	Name
N/A	

	Date	Organization
7. Originator Name CRAWFORD,RE	09/21/94	16720
Telephone No. 372-0070 MSIN		

8. Charge Code ~~KBP02~~ ~~KBR01~~ JS 10/6/94 KB5B2 JS 10/7/94

9. Work Item Description

COMPLY WITH PREVENTIVE MAINTENANCE REQUIREMENTS PER PM 2C23027.
PERFORM (180 DAY) BUSS CASK TORQUE TEST.

	Signature	Date
10. Operations Review	RCrawford	9/22/94
11. Priority	2	
12. Phase Designator	OCT94 *SCHEDULED FOR OCTOBER 1994*	
13. Correct Maint. Assessment	N	
14. Personnel Safety Related	N	IMPACT LEVEL
15. Mode	IN	4

16. Resolution/Retest

NO LOCK AND TAG REQUIRED:

COMPLY WITH PREVENTIVE MAINTENANCE PROCEDURE PROVIDED.

RECORD DATA (AS REQUIRED) ON THE PM DATA SHEET/S.

RECORD PROBLEMS/DISCREPANCIES AND ANY ADDITIONAL INFORMATION ON THE J-5.

17. PIC STEEL,MD

==========J-2 WORK REQUEST (N120)====

New Request Num 10429
1. Document Number 2B-94-00454 /P *PREVENTIVE MAINTENANCE*
2. Work Item Title PM 2C23027 BUSS CASK TORQUE TEST

18. PIC Org. MAINTENANCE

19. Resolution By Signature R.E. Crawford Date 9/26/94
20. Plant Forces Work Review Required N Number N/A

21. Resources Required

Res Code	Description	No.	Est Hrs	Act Hrs
23	MILLWRIGHT	2	8	16 32
QC	QUALITY CONTROL	1	8	8
54	HEALTH PHYSICS TECHNICIANS	1	1	0

22. Cognizant Engineer Signature R.E. Crawford Date 9/26/94
23. Cognizant Manager N/A

24. Reference Documents Type

2C23027 PM
NO RWP REQUIRED

25. Field Work Complete Signature [illegible] Date 10/25/94

cedure No.: 2C23027 Rev: 0 Chg: 0 Bldg.: 225 Date Issued: _____

le: B.U.S.S. CASK TORQUE TEST Approval Des.: 0

tiator: RL DERTING Phone: 3-7782 MSIN: S6-61 Bldg: MO-400 Date 09/21/94

Engineer (print): PT SAUERSSIG Phone: 2-0071 MSIN: S6-65 Bldg: MO-410

janization Name: B-PLANT CAPSULE RETURN SECTION Org Code: 16800

IORITY (Check One) (Does not apply to field changes): ACTION DUE BY: _____

] Environmental or Personnel Safety 2[ ] Equipment Safety 3[ ] Routine

tification for 1 or 2: _____

TION REQUESTED/AUTHORIZED:

[ ] WRITE NEW PROCEDURE

Please provide the following information, as a minimum, in Description below.
Attach a draft if available:
Approval Designator.
Desired reviewers/approvers.
(print names in APPROVAL/CONCURRENCE section below)
DSR/TSR relationship and specifics.
Responsible Craft.
Equipment Name, Number, Model, Series, Manufacturer, Etc.
Reference Drawings and Vendor Information.
Facility Contacts.
Level of detail

[X] REVISE PROCEDURE per description

AS A (Check One):

[X] Field Change
(Obtain required approval signatures below)
(• Requires same approvals as procedure)

OR: [ ] Rewrite

OR: [ ] Retype

OR: [ ] Editorial Change

Does revision require CSRS or JCS Data Sheet(s) revision? Yes [ ] No [X]

[ ] CANCEL PROCEDURE

Provide justification in Description below.

Obtain approval signatures consistent with organizational approvals based upon procedure Approval Level.

DESIRED VALIDATION METHOD (not required for retype or field change)

[ ] Simulator [ ] Walk-through [ ] Table-top [ ] Reference [ ] First Use

ECALL INFORMATION: Performance Frequency: _____ Start (after procedure issue): _____

escription (attach additional sheets as needed): DELETE ALL REFERENCES TO LOCK AND TAG.

APPROVAL/CONCURRENCE SIGNATURES.

- Signature not required for editorial, rewrite, retype, or new procedure.
- Signature may or may not be required; see Field Change above.

	Printed Name	Signature	MSIN	Date
COG Eng.:	See Above	Paul J Sauerssig	S6-65	9/22/94
CE Mgr.:	ED ROBBINS		S6-65	9/22/94
Validation:	MD STEEL	* Mark D Steel	S6-61	9/22/94
QA:	DD McAFEE	* D D McAfee	S4-69	9/22/94
HSA:		*		
EA:		*		
Other:		*		

Forward to: PDCS Tracking MSIN S4-61 (100, 200 & 600 areas) OR MSIN L4-79 (all other areas)

PDCS Date Received: _____ Assigned author: _____

PDCS Final check by: _____ Date: _____

FACILITY MAINTENANCE SUPPORT SERVICES

(FMSS)

PREVENTIVE MAINTENANCE PROCEDURE

2C23027

Revision 0
Change 0

BENEFICIAL USES SHIPPING SYSTEM (BUSS) CASK TORQUE TEST

Approval Designator 3Q

Prepared by:	PDCS	R. L. Ganoe, Engineer
Validated by:	OPS/OMS	M. D. Steel
Approved by:	OPS/BP	P. T. Saueressig, Cog Engineer
	OPS/BP	E. D. Robbins, Cog Engineer Manager
	ESQ/QA	D. D. McAfee
Released by:	PDCS	C. J. Hutchison Records Management Specialist

RELEASE DATE: 8/15/94

Revision Status

Change Level	Date	Change Document	Page(s)	Description
Rev. 0	8/15/94	2U-94-0097	All	New procedure.

TABLE OF CONTENTS

1.0 PURPOSE AND SCOPE

This procedure provides a safe, uniform method to document and verify the torquing requirements of the BUSS Cask bolts on a semiannual frequency.

2.0 REFERENCES

None.

3.0 PERSONNEL REQUIREMENTS

3.1 Millwright(s).

3.2 Quality Assurance personnel (QA).

3.3 Health Physics Technician (HPT), as required.

3.4 Operations Personnel (OP), as required.

4.0 PRECAUTIONS AND LIMITATIONS

4.1 If during performance of this procedure, any of the following conditions are found, immediately stop work, place equipment in a safe condition, and notify Person In Charge (PIC) or Supervision:

- Any equipment malfunction which could prevent fulfillment of its functional requirements.
- Personnel error or procedural inadequacy which could prevent fulfillment of procedural requirements.

4.2 Contact Supervision for additional instructions if changing plant conditions affect work or delays in work extend past end of shift.

4.3 If any waste is generated during performance of this procedure, consult Facility/Plant/Area Hazardous Waste Coordinator for specific instructions to ensure compliance with WHC and DOE environmental standards, as applicable, for disposal.

4.4 Comply with WHC and plant/facility specific lock and tag and over-tagging requirements, as applicable.

4.5 If performance of any steps in this procedure is not required for procedure completion, steps not performed shall be indicated as such by entering "N/A" in the appropriate Data Sheet signoff space and explained in the COMMENTS section of the Data Sheet.

5.0 SPECIAL TOOLS, EQUIPMENT, AND MATERIALS

NOTES

Measuring and Test Equipment (M&TE) used to collect qualitative data during performance of this procedure shall:

- Be within their current calibration cycle as evidenced by affixed calibration labels.
- Be capable of the desired range.
- Have an accuracy consistent with state-of-the-art limitations:
  - equal to or greater than input tolerance specified on CBRS Data Sheet,

  OR, if device being calibrated is not CBRS associated,

  - at least 4 times greater than specified device tolerance.

5.1 Calibrated torque wrench with a range of 0 to 75 ft-lbs, as applicable.

5.2 Calibrated torque wrench with a range of 0 to 500 ft-lbs, as applicable.

5.3 Calibrated torque multiplier.

5.4 Appropriately-sized socket wrenches.

5.5 Torque seal (paint).

6.0 PREREQUISITES

6.1 Obtain release from Operations management prior to performing this procedure.

6.2 Verify that Operations personnel have configured system of equipment (as identified in JCS work package) to allow performance of this procedure.

6.3 Ensure that Quality Assurance Personnel (QA) are available to witness and verify at hold points of procedure.

6.4 If potential for radiological contamination exists, request HPT to perform an equipment survey prior to beginning maintenance or removing equipment or component from its installed location.

6.5 Verify that applicable lock and tag and over-tagging requirements have been satisfied.

7.0 INSTRUCTIONS

7.1 Basket Handle Bolts

7.1.1 REMOVE basket from the BUSS Cask cavity AND PLACE it IN the designated area.

7.1.2 LOOSEN the basket handle bolts using an appropriately-sized socket wrench.

QA HOLD POINT

7.1.3 REQUEST QA to witness and verify the serial number and expiration date of the torque wrench used in the torquing of the basket handle bolts. Record on Data Sheet.

7.1.4 TORQUE the 4 basket handle bolts to 25 ft-lbs.

QA HOLD POINT

a. REPEAT torque sequence until all bolts maintain a 25 ft-lb torque (witnessed by QA). Record on Data Sheet.

7.2 Bore Plug

QA HOLD POINT

7.2.1 REQUEST QA to witness and verify the serial number and expiration date of the torque wrench used in the torquing of the bore plug. Record on Data Sheet.

QA HOLD POINT

7.2.2 TORQUE the bore plug to 35 ft-lbs (witnessed by QA) using an appropriately-sized socket wrench. Record on Data Sheet.

7.3 Trunnion Bolts

7.3.1 LOOSEN the 16 trunnion bolts positioned in the north direction using an appropriately-sized socket wrench.

QA HOLD POINT

7.3.2 REQUEST QA to witness and verify the serial number and expiration date of the torque wrench and torque multiplier (if required) used in the torquing of the trunnion bolts. Record on Data Sheet.

7.3.3 TORQUE the 16 trunnion bolts to 250 ft-lbs using a cross-tightening pattern.

QA HOLD POINT

a. REPEAT torque sequence in a cross-tightening pattern until all bolts maintain a 250 ft-lb torque (witnessed by QA). Record on Data Sheet.

QA HOLD POINT

7.3.4 APPLY torque seal to the bolts (performed by QA). Record on Data Sheet.

7.3.5 LOOSEN the trunnion bolts positioned in the south direction using an appropriately-sized socket wrench.

QA HOLD POINT

7.3.6 REQUEST QA to witness and verify the serial number and expiration date of the torque wrench and torque multiplier (if required) used in the torquing of the trunnion bolts. Record on Data Sheet.

7.3.7 TORQUE the 16 trunnion bolts to 250 ft-lbs using a cross-tightening pattern.

QA HOLD POINT

a. REPEAT torque sequence in a cross-tightening pattern until all bolts maintain a 250 ft-lb torque (witnessed by QA). Record on Data Sheet.

QA HOLD POINT

7.3.8 APPLY torque seal to the bolts (performed by QA). Record on Data Sheet.

7.4 Trunnion Brass Washer Screws

7.4.1 LOOSEN the 8 trunnion brass washer screws using an appropriately-sized socket wrench.

QA HOLD POINT

7.4.2 REQUEST QA to witness and verify the serial number and expiration date of the torque wrench used in the torquing of the trunnion brass washer screws. Record on Data Sheet.

7.4.3 TORQUE the 8 washer screws to 20 ft-lbs using a cross-tightening pattern.

QA HOLD POINT

a. REPEAT torque sequence in a cross-tightening pattern until all washer screws maintain a 20 ft-lb torque (witnessed by QA). Record on Data Sheet.

7.5 Lifting Lug Bolts

7.5.1 LOOSEN the 8 lifting lug bolts using an appropriately-sized socket wrench.

QA HOLD POINT

7.5.2 REQUEST QA to witness and verify the serial number and expiration date of the torque wrench and torque multiplier (if required) used in the torquing of the lifting lug bolts. Record on Data Sheet.

7.5.3 TORQUE the 8 lifting lug bolts to 250 ft-lbs using a cross-tightening pattern.

QA HOLD POINT

a. REPEAT torque sequence in a cross-tightening pattern until all bolts maintain a 250 ft-lb torque (witnessed by QA). Record on Data Sheet.

QA HOLD POINT

7.5.4 APPLY torque seal to the bolts (performed by QA). Record on Data Sheet.

7.6 Upper/Lower Port Cover Handle Screws

7.6.1 REMOVE both upper and lower port covers from the BUSS Cask body.

7.6.2 LOOSEN the 4 port cover handle screws using an appropriately-sized socket wrench.

QA HOLD POINT

7.6.3 REQUEST QA to witness and verify the serial number and expiration date of the torque wrench used in the torquing of the handle screws. Record on Data Sheet.

7.6.4 TORQUE the 4 handle screws to 5 ft-lbs.

QA HOLD POINT

a. REPEAT torque sequence until the handle screws maintain a 5 ft-lb torque (witnessed by QA). Record on Data Sheet.

7.6.5 STORE the upper and lower port covers in the designated tool box.

7.7 Key Screws

7.7.1 LOOSEN the 4 key screws using an appropriately-sized socket wrench.

QA HOLD POINT

7.7.2 REQUEST QA to witness and verify the serial number and expiration date of the torque wrench used in the torquing of the key screws. Record on Data Sheet.

7.7.3 TORQUE the 4 key screws to 30 ft-lbs.

QA HOLD POINT

a. REPEAT torque sequence until the key screws maintain a 30 ft-lb torque (witnessed by QA). Record on Data Sheet.

7.8 Lower Impact Limiter Fill Cover Screws

7.8.1 LOOSEN the 16 impact limiter fill cover screws using an appropriately-sized socket wrench.

QA HOLD POINT

7.8.2 REQUSET QA to witness and verify the serial number and expiration date of the torque wrench used in the torquing of the fill cover screws. Record on Data Sheet.

7.8.3 TORQUE the 16 fill cover screws to 5 ft-lbs using a cross-tightening pattern.

QA HOLD POINT

a. REPEAT torque sequence in a cross-tightening pattern until the fill cover screws maintain a 5 ft-lb torque (witnessed by QA). Record on Data Sheet.

7.9 Lower Impact Limiter Outer End Cap Screws

7.9.1 LOOSEN the 3 outer end cap screws using an appropriately-sized socket wrench.

QA HOLD POINT

7.9.2 REQUEST QA to witness and verify the serial number and expiration date of the torque wrench used in the torquing of the outer end cap screws. Record on Data Sheet.

7.9.3 TORQUE the 3 cap screws to 20 ft-lbs.

QA HOLD POINT

a. REPEAT torque sequence until the cap screws maintain a 20 ft-lb torque (witnessed by QA). Record on Data Sheet.

NOTE
This section will only be performed if the crane is available. WHC will authorize continuance onto next section.

7.10 Upper Impact Limiter Fill Cover Screws

7.10.1 LOOSEN the 16 impact limiter fill cover screws using an appropriately-sized socket wrench.

QA HOLD POINT

7.10.2 REQUEST QA to witness and verify the serial number and expiration date of the torque wrench used in the torquing of the fill cover screws. Record on Data Sheet.

7.10.3 TORQUE the 16 fill cover screws to 5 ft-lbs using a cross-tightening pattern.

QA HOLD POINT

a. REPEAT torque sequence in a cross-tightening pattern until the fill cover screws maintain a 5 ft-lb torque (witnessed by QA). Record on Data Sheet.

7.11 Upper Impact Limiter Outer End Cap Screws

7.11.1 LOOSEN the 3 outer end cap screws using an appropriately-sized socket wrench.

QA HOLD POINT

7.11.2 REQUEST QA to witness and verify the serial number and expiration date of the torque wrench used in the torquing of the outer end cap screws. Record on Data Sheet.

7.11.3 TORQUE the 3 cap screws to 20 ft-lbs.

QA HOLD POINT

a. REPEAT torque sequence until the cap screws maintain a 20 ft-lb torque (witnessed by QA). Record on Data Sheet.

7.12 Transportation Skid Brass Wear Strip Mounting Screws

7.12.1 LOOSEN the 10 wear strip mounting screws using an appropriately-sized socket wrench.

QA HOLD POINT

7.12.2 REQUEST QA to witness and verify the serial number and expiration date of the torque wrench used in the torquing of the wear strip mounting screws. Record on Data Sheet.

7.12.3 TORQUE the 10 mounting screws to 50 ft-lbs.

QA HOLD POINT

a. REPEAT torque sequence until the mounting screws maintain a 50 ft-lb torque (witnessed by QA). Record on Data Sheet.

7.13 Hexagonal Base-to-Skid Retaining Screws

7.13.1 LOOSEN the 2 base-to-skid retaining screws using an appropriately-sized socket wrench.

QA HOLD POINT

7.13.2 REQUEST QA to witness and verify the serial number and expiration date of the torque wrench used in the torquing of the base-to-skid retaining screws. Record on Data Sheet.

7.13.3 TORQUE the 2 retaining screws to 10 ft-lbs.

QA HOLD POINT

a. REPEAT torque sequence until the retaining screws maintain a 10 ft-lb torque (witnessed by QA). Record on Data Sheet.

7.14 Personnel Barrier to Skid Assembly Screws

7.14.1 LOOSEN the 18 barrier-to-skid screws using an appropriately-sized socket wrench.

QA HOLD POINT

7.14.2 REQUEST QA to witness and verify the serial number and expiration date of the torque wrench used in the torquing of the barrier-to-skid screws. Record on Data Sheet.

7.14.3 TORQUE the 18 barrier-to-skid screws to 20 ft-lbs.

QA HOLD POINT

a. REPEAT torque sequence until the barrier-to-skid screws maintain a 20 ft-lb torque (witnessed by QA). Record on Data Sheet.

7.15 Skid-to-Trailer Tie-Down Bolts

7.15.1 LOOSEN the 8 skid-to-trailer tie-down bolts using an appropriately-sized socket wrench.

QA HOLD POINT

7.15.2 REQUEST QA to witness and verify the serial number and expiration date of the torque wrench and torque multiplier (if required) used in the torquing of the tie-down bolts. Record on Data Sheet.

7.15.3 TORQUE the 8 tie-down bolts to 290 ft-lbs.

QA HOLD POINT

a. REPEAT torque sequence until all bolts maintain a 290 ft-lb torque (witnessed by QA). Record on Data Sheet.

QA HOLD POINT

7.15.4 APPLY torque seal to the bolts (performed by QA). Record on Data Sheet.

8.0 RESTORATION

None.

9.0 TESTING AND ACCEPTANCE

None.

10.0 DISPOSITION

10.1 Person In charge (PIC) shall record Work Request Number which was generated as a result of this procedure, if applicable.

10.2 Inform Maintenance and Operations management that the maintenance procedure is complete.

10.3 Return Work Package to PIC or Maintenance supervisor.

11.0 BIBLIOGRAPHY

11.1 WHC-CM-4-3, Industrial Safety Manual, Standard PP-7, "Personal Protective Equipment," and Standard G-1, "Lock and Tag."

11.2 WHC-CM-1-6, WHC Radiological Control Manual, Chapter 2, Part 3, "Posting," and Chapter 3, Part 2, "Work Preparation."

DATA SHEET (Sheet 1 of 7)

STEP		H/W/V	QA SIGN/STAMP
7.1.3	Torque wrench data (basket handle bolts): CAL. EXPIRATION DATE 7-21-95 S/N 813-88-01-030	V	10-21-94 WHC QA/QC 18
7.1.4.a	Perform final torque (25 ft-lbs)	W	10-21-94 WHC QA/QC 18
7.2.1	Torque wrench data (bore plug): CAL. EXPIRATION DATE 6-21-95 S/N 813-88-01-030	V	10-21-94 WHC QA/QC 18
7.2.2	Perform final torque (35 ft-lbs)	W	10-21-94 WHC QA/QC 18
7.3.2	Torque wrench data (trunnion bolts north direction): CAL. EXPIRATION DATE 6-21-95 S/N 813-88-01-030 Torque multiplier data (if required): CAL. EXPIRATION DATE 7-15-95 S/N 813-88-04-601	V	WHC QA/QC 18 10-20-94
7.3.3.a	Perform final torque (250 ft-lbs)	W	10-20-94 WHC QA/QC 18
7.3.4	Apply torque seal to bolts.	V	10-20-94 WHC QA/QC 18

DATA SHEET (Sheet 2 of 7)

STEP		H/W/V	QA SIGN/STAMP
7.3.6	Torque wrench data (trunnion bolts south direction): CAL. EXPIRATION DATE 813-88-01-030 S/N 6-21-95 → CG -10-20-14 Torque multiplier data (if required): CAL. EXPIRATION DATE 7-1545- S/N 81388-04-001	V	10-20-94
7.3.7.a	Perform final torque (250 ft-lbs)	W	10-20-94
7.3.8	Apply torque seal to bolts.	V	10-20-94
7.4.2	Torque wrench data (trunnion washer screws): CAL. EXPIRATION DATE 4/21/95 S/N 813-88-01-030	V	10/20/94
7.4.3.a	Perform final torque (20 ft-lbs)	W	10/20/94

DATA SHEET (Sheet 3 of 7)

STEP		H/W/V	QA SIGN/STAMP
7.5.2	Torque wrench data (lifting lug bolts): CAL. EXPIRATION DATE 6-21-95 S/N 813-88-01-030 Torque multiplier data (if required): CAL. EXPIRATION DATE 7-15-95 S/N 813-88-04-001	V	WHC 38 QA/QC 10-20-94
7.5.3.a	Perform final torque (250 ft-lbs)	W	10-20-94 WHC 38 QA/QC
7.5.4	Apply torque seal to bolts.	V	10-20-94 WHC 38 QA/QC
7.6.3	Torque wrench data (port cover handle screws): CAL. EXPIRATION DATE EXP. 4.12.95 776-88.01.254 S/N 776-88.01.254	V	bl WHC 38 QA/QC 10.18.94
7.6.4.a	Perform final torque (5 ft-lbs)	W	μ 10.18.94 WHC 38 QA/QC
7.7.2	Torque wrench data (key screws): CAL. EXPIRATION DATE 6.21.95 S/N 813.88.01.030	V	μ 10.18.94 WHC 38 QA/QC
7.7.3.a	Perform final torque (30 ft-lbs)	W	TOP ONLY - SEE COMMENTS μ 10.18.94 WHC 38 QA/QC Bottom 10-20-94 WHC 38 QA/QC

DATA SHEET (Sheet 4 of 7)

STEP		H/W/V	QA SIGN/STAMP
7.8.2	Torque wrench data (lower impact limiter fill cover screws): CAL. EXPIRATION DATE 9-20-95 S/N ~~345628~~ 776-58-01-254 10-20-94	V	WHC QA 18 DOC 10-20-94
7.8.3.a	Perform final torque (5 ft-lbs)	W	WHC QA 18 DOC 10-20-94
7.9.2	Torque wrench data (lower impact limiter outer end cap screws): CAL. EXPIRATION DATE 6·3·95 S/N 813·88·01·022	V	WHC QA 38 DOC 10.18.94
7.9.3.a	Perform final torque (20 ft-lbs)	W	3 BOLTS WHC QA 38 DOC 10.18.94
7.10.2	Torque wrench data (upper impact limiter fill cover screws): CAL. EXPIRATION DATE 9-20-95 S/N 776-58-01-254	V	WHC QA 18 DOC 10-20-94
7.10.3.a	Perform final torque (5 ft-lbs)	W	10-20-94 WHC QA 18 DOC
7.11.2	Torque wrench data (upper impact limiter outer end cap screws): CAL. EXPIRATION DATE exp 6·3·95 813·88·01·022 S/N 813·88·01·022	V	WHC QA 38 DOC 10.18.94
7.11.3.a	Perform final torque (20 ft-lbs)	W	3 BOLTS WHC QA 38 DOC 10.18.94

See PACKAGE 2B-94-959

DATA SHEET (Sheet 5 of 7)

STEP		H/W/V	QA SIGN/STAMP
7.12.2	Torque wrench data (transporation skid wear strip mounting screws): CAL. EXPIRATION DATE 10-19-94 S/N 813-88-01-026	V	10-19-94
7.12.3.a	Perform final torque (50 ft-lbs)	W	10-19-94
7.13.2	Torque wrench data (hexagonal base-to-skid retaining screws): CAL. EXPIRATION DATE 4-12-95 S/N 776-88-01-254	V	10-19-94
7.13.3.a	Perform final torque (10 ft-lbs)	W	10-19-94
7.14.2	Torque wrench data (personnel barrier to skid assembly screws): CAL. EXPIRATION DATE EXP. 6-3-95 813-88-01-022 S/N 813-88-01-022	V	10.18.94
7.14.3.a	Perform final torque (20 ft-lbs)	W	18 Bolts 10.18.94

DATA SHEET (Sheet 6 of 7)

STEP		H/W/V	QA SIGN/STAMP
7.15.2	Torque wrench data (skid-to-trailer tie-down bolts): CAL. EXPIRATION DATE 6-21-95 S/N 813-88-01-030 Torque multiplier data (if required): CAL. EXPIRATION DATE 7-15-95 S/N 813-88-04-001	V	10-19-94
7.15.3.a	Perform final torque (290 ft-lbs)	W	10-19-94
7.15.4	Apply torque seal to bolts.	V	10-19-94

DATA SHEET (Sheet 7 of 7)

10.0 **DISPOSITION**

10.1 Person In charge (PIC) shall record Work Request Number of items requiring additional maintenance.

M D Fto — PIC
10/25/94 — DATE
N/A — WORK REQUEST NO.

Work Performed by:

John Walkup	John Walkup	10-25-94
Print Name	Signature	Date
Steve Mauiri	Steve Mauiri	10-25-94
Print Name	Signature	Date

COMMENTS: BOTTOM KEY BOLT COULD NOT BE REMOVED AT THIS TIME - TOP ONLY TORQUED JJ 10.18.94
TORQUED BOTTOM O-V 10.20-94

J-5

CRAFT/RESOURCE USAGE LOG AND MAINTENANCE RECORD

1. Document Number: 2B-94-00954 R

Date	Turnover, Problem Description, Action Taken	Name	Craft/ Resource Type	Hours
10/18/94	Basket handle bolt broke off on removal, drilled out bolt & removed thread insert, reinstalled insert and replaced bolt with spares.	Walkup & Maciri	23	16
10/20/94	Bottom cask body key bolt difficulty in removal. Replaced both bottom key bolts with spares	Walkup & Michelle	23	2

Summary by Craft/Resource Type

Craft/Resource Type	Total Hours	Craft/Resource Type	Total Hours

Appendix E: Impact Limiter Inspection and Weight Test Data

New Request Num 10386 0098
1. Document Number 2B-94-0098 /P *PREVENTIVE MAINTENANCE*
2. Work Item Title PM 2C23026 BUSS CASK IMPACT LIMITER INSPECT.

==========

3. System C99R *BUSSCASK*

4. Components

Component Number	Name
N/A	

Temporary Number	Name
N/A	

5. Location

Facility 2C *WESF*
Bldg/Rm 225B Other CRANE PAD Other

6. Associated Components

Component Number	Name
N/A	

	Date	Organization
7. Originator Name CRAWFORD,RE	09/21/94	16720
Telephone No. 372-0160 MSIN		

8. Charge Code ~~KBP02~~ KB5B3 JS 10/6/94 KB5B3 JM 10/7/94

9. Work Item Description

COMPLY WITH PREVENTIVE MAINTENANCE REQUIREMENTS PER PM 2C23026.
PERFORM (360 DAY) BUSS CASK IMPACT LIMITER INSPECTION.

	Signature	Date
10. Operations Review	K.A. Burton	9/20/94
11. Priority	2	
12. Phase Designator	Oct94	
13. Correct Maint. Assessment	N	
14. Personnel Safety Related	N	IMPACT LEVEL
15. Mode	IN	4

16. Resolution/Retest

NO LOCK AND TAG REQUIRED:

COMPLY WITH PREVENTIVE MAINTENANCE PROCEDURE PROVIDED.

RECORD DATA (AS REQUIRED) ON THE PM DATA SHEET/S.

RECORD PROBLEMS/DISCREPANCIES AND ANY ADDITIONAL INFORMATION ON THE J-5.

17. PIC STEEL,MD

New Request Num 10386
1. Document Number 2B-94-989 /P *PREVENTIVE MAINTENANCE*
2. Work Item Title PM 2C23026 BUSS CASK IMPACT LIMITER INSPECT.

18. PIC Org. MAINTENANCE

19. Resolution By — Signature: K.E. Crawford — Date: 9/29/94
20. Plant Forces Work Review Required N Number N/A

21. Resources Required

Res Code	Description	No.	Est Hrs	Act Hrs
23	MILLWRIGHT	2	16	16
EP 10/11/94	EXEMPT PERSONNEL	1	16	8
QC 887	QUALITY CONTROL	1	16	8
~~32~~ 32	CRANE/HYDROCRANE OPERATOR	1	8	4
54	HEALTH PHYSICS TECHNICIANS	1	1	0
35 Riggers		1	4	4

887 10/11/94

22. Cognizant Engineer — ~~Signature~~ K.E. Crawford — Date: 9/20/94
23. Cognizant Manager — N/A — Date: 09/21/94

24. Reference Documents — Type

2C23026	PM
NO RWP REQUIRED	
2C23026	

pz 9/29/94

25. Field Work Complete — Signature: M.D. Abbott — Date: 10/25/94

P-2 PROCEDURE ACTION AUTHORIZATIO PDCS No.

Procedure No.: 2C23026 Rev: 0 Chg: 0 Bldg.: 225-B Date Issued:

Title: B.U.S.S. CASK IMPACT LIMITER INSPECT. Approval Des.: SQ

Initiator: RL DERTING Phone: 3-7782 MSIN: S6-61 Bldg: MO-400 Date 09/21/94

Cog Engineer (print): PT SAUERESSIG Phone: 2-0071 MSIN: S6-65 Bldg: MO-410

Organization Name: B-PLANT CAPSULE RETURN SECTION Org Code: 16800

PRIORITY (Check One) (Does not apply to field changes): ACTION DUE BY:

1[ ] Environmental or Personnel Safety 2[ ] Equipment Safety 3[ ] Routine

Justification for 1 or 2:

ACTION REQUESTED/AUTHORIZED:

[ ] WRITE NEW PROCEDURE

Please provide the following information, as a minimum, in Description below. Attach a draft if available:

- Approval Designator.
- Desired reviewers/approvers. (print names in APPROVAL/CONCURRENCE section below)
- OSR/TSR relationship and specifics.
- Responsible Craft.
- Equipment Name, Number, Model, Series, Manufacturer, Etc.
- Reference Drawings and Vendor Information.
- Facility Contacts.
- Level of detail

[X] REVISE PROCEDURE per description

AS A (Check One):

[X] Field Change
(Obtain required approval signatures below)
(• Requires same approvals as procedure)

OR: [ ] Rewrite

OR: [ ] Retype

OR: [ ] Editorial Change

Does revision require C3RS or JCS Data Sheet(s) revision? Yes [ ] No [X]

[ ] CANCEL PROCEDURE

Provide justification in Description below.

Obtain approval signatures consistent with organizational approvals based upon procedure Approval Level.

DESIRED VALIDATION METHOD (not required for retype or field change)

[ ] Simulator [ ] Walk-through [ ] Table-top [ ] Reference [ ] First Use

RECALL INFORMATION: Performance Frequency: Start (after procedure issue):

Description (attach additional sheets as needed): DELETE ALL REFERENCES TO LOCK AND TAG.

APPROVAL/CONCURRENCE SIGNATURES.

- Signature not required for editorial, rewrite, retype, or new procedure.
- Signature may or may not be required; see Field Change above.

	Printed Name	Signature	MSIN	Date
COG Eng.:	See Above	Paul T Saueressig	S6-65	9/22/94
CE Mgr.:	ED ROBBINS	*	S6-65	9/22/94
Validation:	RG LEE	*	S6-61	9-22-94
QA:	DD McAFEE	*	S4-69	9/22/94
HSA:	GJ CARR	*	R3-10	9/26/94
EA:		*		
Other:		*		

Forward to: PDCS Tracking MSIN S4-61 (100, 200 & 60C areas)

PDCS Date Received: Assigned author:

PDCS Final check by: Date:

FACILITY MAINTENANCE SUPPORT SERVICES

(FMSS)

PREVENTIVE MAINTENANCE PROCEDURE

2C23026

Revision 0
Change 0

BUSS CASK
IMPACT LIMITER
ANNUAL INSPECTION

Approval Designator SQ

Prepared by:	PDCS	R. R. Anderson, Engineer
Validated by:	OPS/OMS	R. G. Lee
Approved by:	OPS/BP	P. T. Saueressig, Cognizant Engineer
	ESQ/QA	D. D. McAffe,
	ESQ/NS	G. J. Carr
	OPS/BP	E. D. Robbins, Cognizant Engineer Manager
Released by:	PDCS	G. A. Buel, RMS

RELEASE DATE: 8/25/94

Revision Status

Change Level	Date	Change Document	Page(s)	Description
Rev. 0	8/25/94	94-0098	All	New Procedure.

TABLE OF CONTENTS

1.0 PURPOSE AND SCOPE

This procedure provides a safe, uniform method to perform annual inspection at B-Plant of buss cask impact limiters and associated hardware, limiter S/N: S48929-001 and S/N: S48929-002.

2.0 REFERENCES

None.

3.0 PERSONNEL REQUIREMENTS

3.1 Millwright (2).

3.2 Plant Engineer or Person-in-Charge.

3.3 Quality Control Inspector.

4.0 PRECAUTIONS AND LIMITATIONS

4.1 If, during performance of this procedure, any of the following conditions are found, immediately stop work, place equipment in a safe condition, and notify Person In Charge (PIC) or Supervision:

- Any equipment malfunction which could prevent fulfillment of its functional requirements.
- Personnel error or procedural inadequacy which could prevent fulfillment of procedural requirements.

4.2 Contact Supervision for additional instructions if changing plant conditions affect work or delays in work extend past end of shift.

4.3 Comply with WHC and DOE environmental standards, as applicable, when disposing of any waste generated during performance of this procedure. Consult Facility/Plant/Area Hazardous Waste Coordinator for specific instructions.

4.4 Comply with WHC and plant/facility specific lock and tag and over-tagging requirements as applicable.

4.5 If performance of any steps in this procedure is not required for procedure completion, steps not performed shall be indicated as such by entering "N/A" in appropriate Data Sheet signature space and explained in the COMMENTS section of Data Sheet.

4.6 Sections or steps within sections of this procedure may be performed out of sequence, as required for maintenance or plant conditions.

4.7 Rigging and lifting shall be performed in compliance with the Hanford Site Hoisting and Rigging Manual.

5.0 SPECIAL TOOLS, EQUIPMENT, AND MATERIALS

NOTES

Measuring and Test Equipment (M&TE) used to collect qualitative data during performance of this procedure shall:

- Be within their current calibration cycle as evidenced by affixed calibration labels.
- Be capable of the desired range.
- Have an accuracy consistent with state-of-the-art limitations:
  - equal to or greater than input tolerance specified on CBRS Data Sheet,

  OR, if device being calibrated is not CBRS associated,

  - at least 4 times greater than specified device tolerance.

5.1 Overhead Crane, 40,000 pound minimum capacity.

5.2 Calibrated Dynamometer.

5.3 Tools, equipment and supplies as noted Pg. 1-15 to 1-17 of Bibliography item 11.4.

6.0 PREREQUISITES

6.1 Obtain release from Operations management prior to beginning performance of this procedure.

6.2 If potential for radiological contamination exists, request HPT to perform equipment survey prior to beginning maintenance or prior to removal of equipment or component from its installed location.

6.3 Verify that applicable lock and tag and over-tagging requirements have been satisfied.

7.0 INSTRUCTIONS

7.1 Lifting Holes

NOTES

Lifting holes (6) are located on outer end (3) and circumference (3) as shown in Figure 1.

Lifting hole inspection is to be performed for both impact limiters.

7.1.1 INSPECT Impact Limiter lifting holes (6) visually for thread wear or damage. RECORD results on Data Sheet.

7.1.2 EXAMINE visually area adjacent to lifting holes for distortion. RECORD results on Data Sheet.

7.1.3 CHECK that threaded inserts are tight. RECORD results on Data Sheet.

7.2 Weighing

QC HOLD POINT

NOTE

A calibrated dynamometer shall be used to measure the weight which is compared to the original weight marked on the Identification Plates. Notify WESF engineering if an out of tolerance of -1% to +3% is found.

CAUTION

Impact limiter weight is approximately 3000 lbs. Each of the 6 lifting points is individually capable of lifting the load. Lifting points are usually used two or three at a time.

These lifts are not considered critical lifts.

Lifting bridal has been tagged for 3.1 ton capacity through October 1994. The rigging specialist may substitute similar-rated equipment.

Safety-shoes and hardhats are required on the crane pad.

[ ]QC 7.2.1 VERIFY that the dynamometer calibration is current. RECORD Serial Number, date calibrated, and calibration due dates on Data Sheet.

7.2.2 ENGAGE impact limiter lifting bridal for vertical lift of impact limiter S/N S48929-001 (cask interface area down) for weighing.

7.2.3 SET dynamometer indication to zero OR RECORD weight of bridal.

7.2.4 INSTALL swivel-lifting eyes into each of three lift points at the end of the impact limiter.

[ ]QC 7.2.5 VERIFY that the torque wrench calibration is current. RECORD serial number, date calibrated, and calibration due dates on Data Sheet.

7.2.6 TORQUE each swivel-lifting eye to 100 ft-lbs. RECORD on Data Sheet.

7.2.7 APPLY minimum tension to rigging. ADJUST as required.

7.2.8 STAND CLEAR AND SLOWLY LIFT impact limiter approximately 2".

[ ]QC 7.2.9 RECORD weight on Data Sheet.

[ ]QC 7.2.10 CALCULATE the net percentage change between the listed weight of 3006 lbs. and the measured weight and record result on Data Sheet.

7.2.11 LOWER impact limiter slowly onto crane pad surface AND DISENGAGE swivel-lifting eyes.

NOTE

Lifting instructions applying to the impact limiter are located on the BUSS cask handling frame. The handling frame has a keyed floating pad that interlocks with the impact limiter. This pad needs to be re-aligned to insure that the BUSS cask can be easily reassembled.

7.2.12 ENGAGE the impact limiter lifting bridal for vertical lift of impact limiter S/N S48929-002 (cask interface area up) for weighing.

7.2.13 SET dynamometer indication to zero OR RECORD weight of bridal.

7.2.14 INSTALL swivel-lifting eyes into each of three lift points on the outer circumference of the impact limiter.

[ ]QC 7.2.15 VERIFY that the torque wrench calibration is current. RECORD serial number, date calibrated, and calibration due date on Data Sheet.

7.2.16 TORQUE each swivel-lifting eye to 100 ft-lbs. RECORD on Data Sheet.

NOTE

Use softeners to prevent slings from scratching impact limiter when tension is applied.

7.2.17 APPLY minimum tension to rigging and ADJUST as required.

7.2.18 STAND CLEAR AND SLOWLY LIFT impact limiter approximately 2".

[ ]QC 7.2.19 RECORD weight on Data Sheet.

7.2.20 LOWER impact limiter slowly onto handling frame pad surface AND ENSURE visually that the impact limiter engages the raised keyed area of the handling frame pad.

7.2.21 DISENGAGE swivel eyes AND STORE bridal in BUSS cask gang box.

[ ]QC 7.2.22 CALCULATE the net percentage change between the listed weight of 2994 lbs. and the measured weight AND RECORD result on Data Sheet.

[ ]QC 7.2.21 VERIFY that the weights and net percent change are entered and calculated correctly: [(Measured-Listed)/Listed]x100 %.

7.3 Exterior Surface Visual Inspection

NOTES

Inspection is to be performed for both impact limiters

Small dents are permissible on exterior surface.

7.3.1 VERIFY that the exterior surface of limiter skin is free of dents, gouges, or tears. RECORD results on Data Sheet.

7.3.2 CLEAN AND REPAINT damaged areas resulting from dings and scrapes.

7.4 Limiter/Cask Interface Inspection

QC HOLD POINT

NOTES

Inspection is to be performed for both impact limiters.

Emphasize visual inspection of the tape joint groove. See Figure 2.

For interface inspection, impact limiter may be placed on a stand, if available, therefore steps 7.4.1 through 7.4.8 and 7.4.12 through 7.4.15 may not be necessary to perform.

Lifting instructions apply to an impact limiter with the initial position of the cask interface area down. The impact limiter is raised, then turned in the orientation in which it is transported, exposing the cask interface surface to the side.

7.4.1 PLACE cardboard or rubber matting on the abrasive surface of the concrete crane pad to protect the impact limiter as it is lifted, rotated, and set down.

7.4.2 INSTALL bridal on two side lifting points ensuring a third, unused, sling is in between the two being used for initial lift.

[ ] QC 7.4.3 VERIFY that the torque wrench calibration is current. RECORD serial number, date calibrated, and calibration due dates on Data Sheet.

7.4.4 TORQUE swivel-lifting eyes to 100 ft-lbs. RECORD on Data Sheet.

7.4.5 APPLY minimum tension to rigging. INSPECT AND ADJUST as required.

7.4.6 STAND CLEAR AND RAISE impact limiter slowly to allow bottom end of limiter to rotate beneath point of rigging.

7.4.7 SET DOWN limiter on its side and continue to hold minimum tension on slings to prevent limiter from rolling.

7.4.8 CHOCK limiter on two (2) sides.

[ ]QC 7.4.9 VERIFY that the limiter-to-cask interface structure is free of wear, galling or damage. RECORD results on Data Sheet.

[ ]QC 7.4.10 VERIFY by visual inspection that the interface structure welds are free of cracks. RECORD results on Data Sheet.

[ ]QC 7.4.11 VERIFY that the air flow holes not obstructed. RECORD results on Data Sheet.

7.4.12 LOWER the crane block sufficiently to allow the third, unused, bridal sling to be installed into lifting point on end of impact limiter, if required.

7.4.13 STAND CLEAR AND SLOWLY LIFT impact limiter. The bridal sling installed in end of impact limiter will engage first. Continue lifting until center of gravity of impact limiter rotates below the rigging point.

7.4.14 LOWER impact limiter slowly, placing cask interface side down, as it was originally positioned.

7.4.15 PERFORM vertical lift to reposition impact limiter to the centerline of crane pad.

7.5 Limiter Fill Cover Inspection/Gasket Replacement

NOTES

Inspection and gasket replacement is to be performed for both impact limiters.

Gaskets have a limited shelf life. Controls should be in place to ensure that out of date gaskets are not used. Three years from manufacture date of sheet stock is recommended maximum life.

7.5.1 REMOVE set screws (4) securing each of the four (4) fill covers.

7.5.2 REMOVE loose material adhered to the cover or limiter.

7.5.3 WIPE away debris and dirt using a dry rag.

7.5.4 VERIFY that the replacement gaskets meet shelf life requirement identified on package. RECORD on Data Sheet.

7.5.5 INSTALL a new gasket on each fill hole in proper orientation over screw holes.

7.5.6 INSTALL fill covers with fasteners loose prior to torque application.

[ ]QC 7.5.7 VERIFY that the torque wrench calibration is current. RECORD serial number, date calibrated, and calibration due dates on Data Sheet.

[ ]QC 7.5.8 TORQUE fill cover fasteners to 5 ft-lbs. RECORD on Data Sheet.

7.6 Turnbuckle Attachment Lugs

QC HOLD POINT

NOTES

Inspection is to be performed for both impact limiters.

Remove paint for further inspection only if obvious cracks are observed through the paint.

[ ]QC 7.6.1 EXAMINE the four (4) turnbuckle attachment lugs for visual signs of wear or damage. RECORD results on Data Sheet.

7.6.2 EXAMINE area around the turnbuckle attachment lugs of the impact limiter for gross defects (i.e., dents, impact limiter skin distortion, paint chipping/cracking). RECORD results on Data Sheet.

7.7 Nonstructural Weld Inspection

QC HOLD POINT

NOTES

Inspection is to be performed for both impact limiters.

Remove paint for further inspection only if obvious cracks are observed through the paint.

[ ]QC 7.7.1 EXAMINE circumferential area of the impact limiter for gross defects (i.e. dents, impact limiter skin distortion, paint chipping/cracking). RECORD results on data sheet.

8.0 RESTORATION

8.1 Ensure that the test equipment has been disconnected and removed.

8.2 Ensure that alarms are reset or cleared.

9.0 TESTING AND ACCEPTANCE

9.1 None.

10.0 DISPOSITION

10.1 Inform Maintenance and Operations Management that the Buss Cask Annual Inspection is complete.

10.2 Return Work Package to PIC or Maintenance Supervisor.

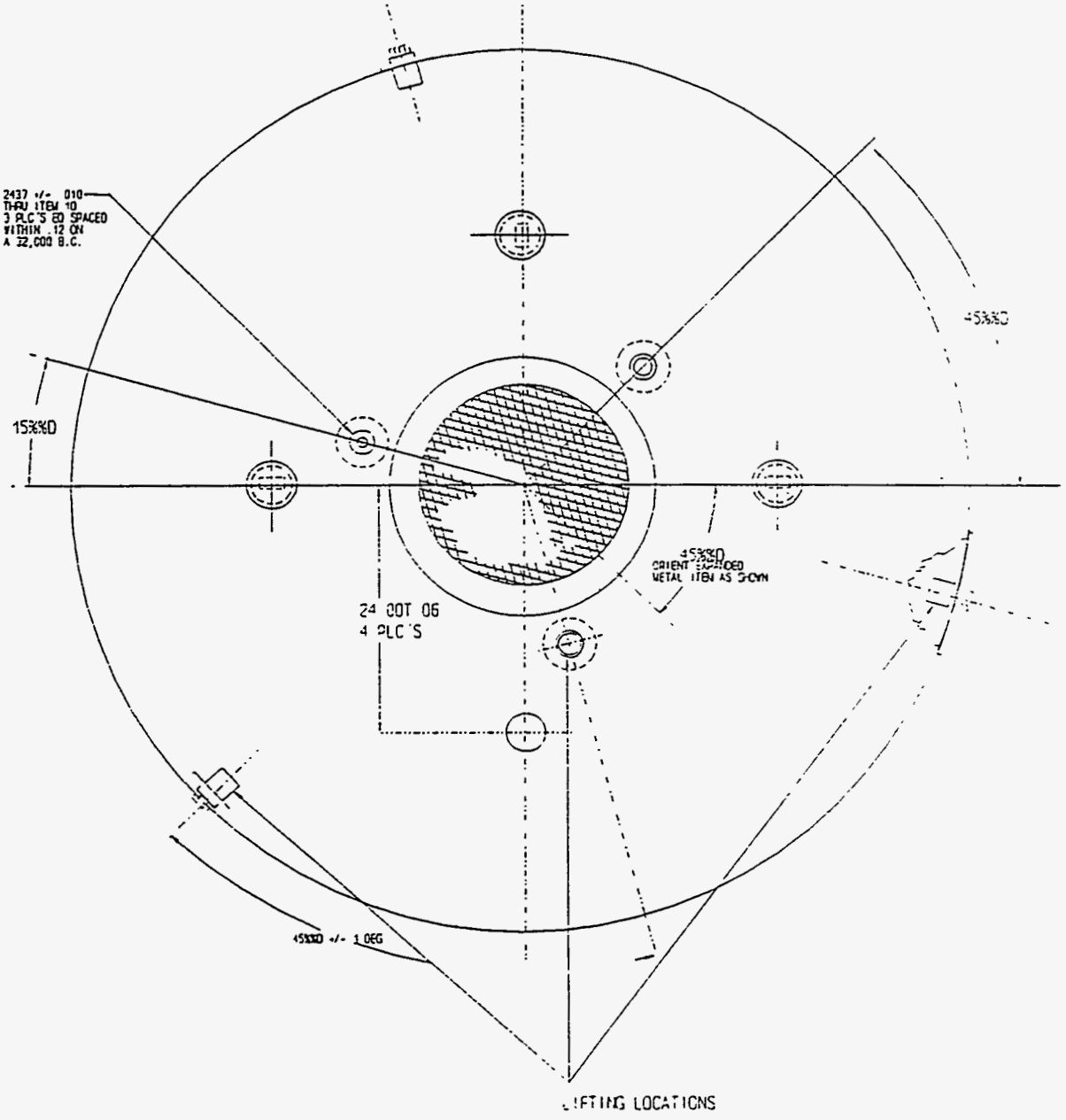
11.0 BIBLIOGRAPHY

11.1 WHC-CM-4-3, Industrial Safety Manual, Section TE, "Tools and Equipment," Standard No. PP-7, "Personal Protective Equipment," and Standard G-1, "Lock and Tag."

11.2 WHC-CM-1-6, WHC Radiological Control Manual, Chapter 2, Part 3, "Posting," and Chapter 3, Part 2, "Work Preparation."

11.3 DOE-RL 9236, Hanford Site Hoisting and Rigging Manual.

11.4 Maintenance Manual for the Beneficial Uses Shipping System Cask. SANDS-0967, TTC-1220, UC-722, Revision 1, May 1993 (CVI # 22542).



LIFTING LOCATIONS

FIGURE 1 - LIFTING LOCA

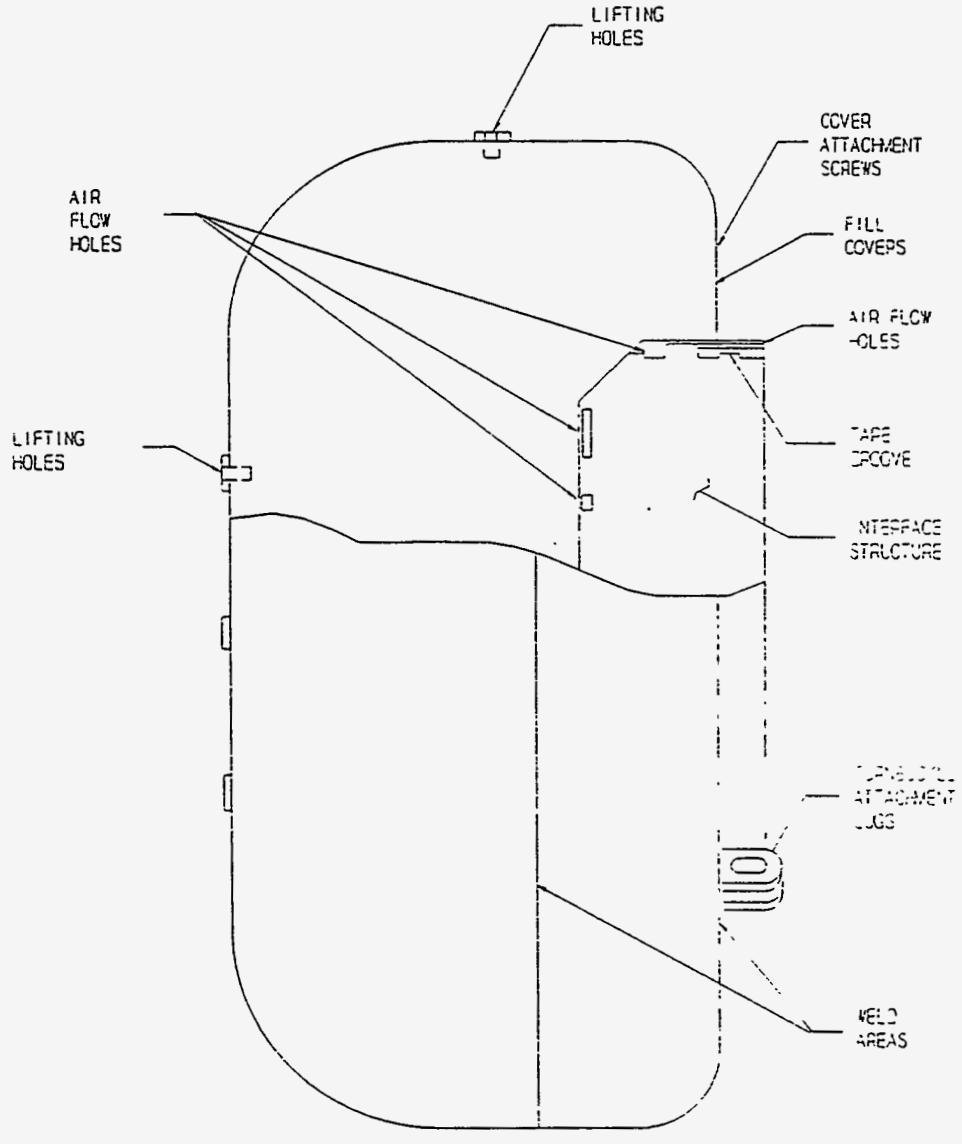


FIGURE 2 - IMPACT LIMITER.

DATA SHEET

DATE: 10/12/94

Step	Description		
7.1	LIFTING HOLE INSPECTION:	S48929-001	S48929-002
7.1.1	Inspect lifting holes,	OK	OK
7.1.2	adj. area, inserts tight.	OK	OK
7.1.3	[signature] 10/12/94		
	MILLWRIGHT SIGNATURE /DATE		
	[signature] 10/12/94		
	ENGINEERING SIGNATURE/DATE		

7.2 LIMITER WEIGHT:

7.2.1 Dynamometer information

Dynamometer Serial Number: 28703 815-29-06-035
Dynamometer last Calibrated: 9/20/94
Calibration due date: 9/20/95

[signature] / [stamp] / 10/12/94
QC SIGNATURE STAMP DATE

7.2.3 Bridal Weight (if applicable): 30 lbs

7.2.5 Torque wrench information

Torque wrench serial number: 813-88-01-026
Torque wrench last calibrated: 12/07/93
Calibration due date: 12/07/94

[signature] / [stamp] / 10/12/94
QC SIGNATURE STAMP DATE

7.2.6 Verify that swivel-lifting eyes are torqued to 100 ft-lbs. YES [X]
S48929-001

7.2.9 Present Weight: 3025 List Weight: 3006 lbs.

7.2.10 % Weight Change: 0.63

7.2.15 Torque wrench information — Torque wrench serial number: 813-88-01-026
Torque wrench last calibrated: 12/07/93
Calibration due date: 12/07/94

T. Thompson / WHC 121 OAIO / 10/12/94
QC SIGNATURE / STAMP / DATE

7.2.16 Verify that swivel-lifting eyes are torqued to 100 ft-lbs. YES [X]

7.2.19 Present Weight: 3015 List Weight: 2994 lbs.

7.2.22 % Weight Change: 0.70

7.2.23 Verify weights, % diff. correct — T. Thompson / WHC 121 OAIO / 10/13/94
QC Signature / Stamp/Date

7.3 EXTERIOR SURFACE VISUAL INSPECTION:

7.3.1 Surface Condition (Note dents, gouges, repairs and location of damage):
S/N S48929-001: None detected

S/N S48929-002: None detected

[signature] 10/12/94 — Paul T Summerlin 10/12/94
MILLWRIGHT SIGNATURE /DATE — ENGINEERING SIGNATURE /DATE

7.4 LIMITER/CASK INTERFACE INSPECTION:

7.4.3 Torque wrench information — Torque wrench serial number: 813-88-01-026
Torque wrench last calibrated: 12/07/93
Calibration due date: 12/07/94

T. Thompson / WHC 121 OAIO / 10/12/94
QC SIGNATURE / STAMP / DATE

7.4.4 Verify that swivel-lifting eyes are torqued to 100 ft-lbs. YES [X]

7.4.9 Verify that both interfaces are free of wear, galling or damage:

Comments: S/N S48929-001 Observed Galling & Raised edges I.W.T. 10/12/94

S/N S48929-002 Interfaces (ok) I.W.T. 10/12/94

R D Michael 10/12/94 — I. Thompson — 10/12/94
MILLWRIGHT SIGNATURE /DATE — QC SIGNATURE /STAMP /DATE

7.4.10 Verify that interface structure welds are free of cracks:

Comments: S/N S48929-001 ✓

S/N s48929-002 ✓

R D Michael 10/12/94 — [signature] — 10-12-94
MILLWRIGHT SIGNATURE /DATE — QC SIGNATURE /STAMP /DATE

7.4.11 Verify that air flow holes are not obstructed for both limiters:

Comments: S/N S48929-001 ✓ Air flow holes (ok) I.W.T. 10/12/94

S/N S48929-002 ✓ Air flow holes (ok) I.W.T. 10/12/94

R D Michael 10/12/94 — T. Thompson — 10/12/94
MILLWRIGHT SIGNATURE /DATE — QC SIGNATURE /STAMP /DATE

7.5 FILL COVER INSPECTION/GASKET REPLACEMENT:

7.5.4 Verify that new gaskets, cover screws are torqued for both limiters:

Comments: S/N S48929-001 ✓ New gaskets installed Screws Torqued I.W.T. 10/11/94
P/N 548928-000 use before 9/30/95

S/N S48929-002 New gaskets installed
P/N 548928-000 use before 9/30/95

R D Michael 10/13/94 — Paul J Sameson — 10/13/94
MILLWRIGHT SIGNATURE /DATE — ENGINEERING SIGNATURE /DATE

7.5.7 Torque wrench information — Torque wrench serial number: 276-88-01-254
Torque wrench last calibrated: 9/20/94
Calibration due date: 9/20/95

T. Thompson / WHC 12-0 DATE / 10/12/94
QC SIGNATURE STAMP DATE

7.5.8 Torque fill cover to 5 ft-lbs: (S/N S48929-001) ✓ T. Thompson / WHC 12-0 DATE / 10/12/94
QC SIGNATURE STAMP DATE

7.5.8 Torque fill cover to 5 ft-lbs (S/N S48929-002) [signature] / WHC 18-0 DATE / 10-13-94
QC SIGNATURE STAMP DATE

7.6 TURNBUCKLE ATTACHMENT LUGS:

7.6.1/7.6.2 Visual inspection for lug damage, skin distortion and weld cracks for both limiters.

Comments: S/N S48929-001 OK

S/N S48929-002 OK

R. T. Michael / 10/12/94 — T. Thompson / WHC 12-0 DATE / 10/12/94
MILLWRIGHT SIGNATURE /DATE — QC SIGNATURE /STAMP /DATE

7.7 NONSTRUCTURAL WELD INSPECTION:

7.7.1 Visual inspection around circumferential area for dents, skin distortion, and paint chipping/cracking for both limiters.

Comments: S/N S48929-001 OK T.T 10/12/94

S/N S48929-002 OK T.T 10/12/94

R. T. Michael / 10/12/94 — T. Thompson / WHC 12-0 DATE / 10/12/94
MILLWRIGHT SIGNATURE /DATE — QC SIGNATURE /STAMP /DATE

J-5	CRAFT/RESOURCE USAGE LOG AND MAINTENANCE RECORD	1. Document Number 2B-94-00989 / P

Date	Turnover, Problem Description, Action Taken	Name	Craft/ Resource Type	Hours
10/12/94	Removed the raised edges and tightened loose screws on impact limiter wear strip.	PT Sauressig	23	2
10/21/94	PM Completed	Michael	23	14

Summary by Craft/Resource Type

Craft/Resource Type	Total Hours	Craft/Resource Type	Total Hours