APR 08 1997 Sta. 37

ENGINEERING DATA TRANSMITTAL

Page 1 of 1

1. EDT 619562

2. To: (Receiving Organization)	3. From: (Originating Organization)	4. Related EDT No.:
Distribution	Packaging Engineering	NA
5. Proj./Prog./Dept./Div.:	**6. Design Authority/ Design Agent/Cog. Engr.:**	**7. Purchase Order No.:**
03E00	E. P. Clements	NA
8. Originator Remarks:		**9. Equip./Component No.:**
For approval.		NA
		10. System/Bldg./Facility:
		NA
11. Receiver Remarks: **11A. Design Baseline Document?** [ ] Yes [X] No		**12. Major Assm. Dwg. No.:**
		NA
		13. Permit/Permit Application No.:
		NA
		14. Required Response Date:

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 Desig-nator	(G) Reason for Trans-mittal	(H) Origi-nator Dispo-sition	(I) Receiv-er Dispo-sition
1	HNF-SD-TP-RPT-026		0	Spreader Beam Analysis for the CASTOR GSF Cask	NA	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 2. Release 3. Information 4. Review 5. Post-Review 6. Dist. (Receipt Acknow. Required)	1. Approved 2. Approved w/comment 3. Disapproved w/comment 4. Reviewed no/comment 5. Reviewed w/comment 6. Receipt acknowledged

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

(G) Reason	(H) Disp.	(J) Name (K) Signature (L) Date (M) MSIN	(G) Reason	(H) Disp.	(J) Name (K) Signature (L) Date (M) MSIN
		Design Authority	1	1	SS Shiraga 4/4/97 H1-15
		Design Agent			
1	1	Cog.Eng.: EP Clements 4/4/97 H1-15			
1	1	Cog. Mgr.: JG Field 4/4/97 H1-15			
		QA			
		Safety			
		Env.			

18.	19.	20.	21. DOE APPROVAL (if required) Ctrl. No.
EP Clements 4/4/97 Signature of EDT Originator Date	Authorized Representative for Receiving Organization Date	JG Field 4/4/97 Design Authority/ Cognizant Manager Date	[ ] Approved [ ] Approved w/comments [ ] Disapproved w/comments

BD-7400-172-2 (05/96) GEF097

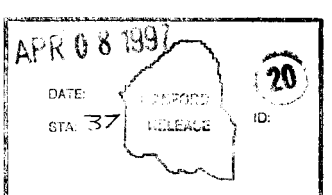
Spreader Beam Analysis for the CASTOR GSF Cask

E. P. Clements
Rust Federal Services Inc. Northwest Operations, Richland, WA 99352
U.S. Department of Energy Contract DE-AC06-96RL13200

EDT/ECN: EDT 619562 UC: 512
Org Code: 03E00 Charge Code: P0FK06
B&R Code: 820201000 Total Pages: ~~34~~ 33

Key Words: spreader beam, CASTOR GSF cask, load test

Abstract: The purpose of this report is to document the results of the 150% rated capacity load test that was performed by DynCorp Hoisting and Rigging for the CASTOR GSF special lifting beams.



T. L. Birkland 4/1/97
Release Approval Date

Release Stamp

Approved for Public Release

CONTENTS

LIST OF FIGURES

LIST OF TERMS

ANSI	American National Standards Institute
ASTM	American Society for Testing and Materials
IAEA	International Atomic Energy Agency
SARP	Safety Analysis Report for Packaging

SPREADER BEAM ANALYSIS FOR THE CASTOR GSF CASK

1.0 INTRODUCTION

The purpose of this report is to document the results of the 150% rated capacity load test performed by DynCorp Hoisting and Rigging on the CASTOR GSF special cask lifting beams. The two lifting beams were originally rated and tested at 20,000 kg (44,000 lb) by the cask manufacturer in Germany. The testing performed by DynCorp rated and tested the lifting beams to 30,000 kg (66,000 lb) +0%, -5%, for Hanford Site use.

The CASTOR GSF cask, used to transport Isotopic Heat Sources (canisters), must be lifted with its own designed lifting beam system (Figures 1, 2, and 3). As designed, the beam material is RSt 37-2 (equivalent to American Society for Testing and Materials [ASTM] A-570), the eye plate is St 52-2 (equivalent to ASTM A-516), and the lifting pin is St 50 (equivalent to ASTM A-515). The beam has two opposing 58 mm (2.3 in.) diameter by 120 mm (4.7 in.) length, high grade steel pins that engage the cask for lifting. The pins have a manual locking mechanism to prevent disengagement from the casks. The static, gross weight (loaded) of the cask 18,640 kg (41,000 lb) on the pins prevents movement of the pins during lifting. This is due to the frictional force of the cask on the pins when lifting begins.

2.0 SUMMARY OF RESULTS

The two lifting beams (1A and 1B) delivered as auxiliary equipment with the CASTOR GSF casks were designed, built, tested, and used by the cask manufacturer in Germany (Section 5.1). The beams were built and tested to International Atomic Energy Agency (IAEA) requirements. For use at the Hanford Site, the beams shall meet the requirements listed in the *Hanford Site Hoisting and Rigging Manual*, Section 11.0, "Below-the-Hook-Lifting Devices" (RL 1993) and the American National Standard Institute (ANSI) N14.6, *Radioactive Materials Special Lifting Devices for Shipping Containers Weighing 10,000 lb (4500 kg) or More* (ANSI 1993). To meet the Hanford Site and ANSI criteria, both lifting beams were analyzed to ensure 3 to 1 against yield, requirements are met (Section 5.3). The beams were physically load tested (Section 5.2) in accordance with the *Hanford Site Hoisting and Rigging Manual*, Section 11.0, "Below-the-Hook-Lifting Devices" and ANSI N14.6, Section 6.3(a), "Testing," to verify continuing compliance. The two lifting beams were tested to 150% 30,000 kg (66,000 lb) +0%, -5% for an actual load test of 29,345 kg (64,560 lb) held for 10 minutes. This test was performed with certified weights and rigging. The beams were inspected after testing as described in ANSI 6.3(a) and no discrepancies were found.

3.0 CONCLUSION

The two CASTOR GSF cask lifting beams are only intended and designed for their particular use as described in the CASTOR Safety Analysis Report for Packaging (SARP) (HNF-SD-TP-SARP-021). The beams meet both the *Hanford Site Hoisting and Rigging Manual* (Section 11.0) and ANSI N14.6 (Section 6.3.1[a]) criteria for use on the Hanford Site. Analysis demonstrates the beams meet a safety factor of 3 to 1 against yield for the approved load. The Hanford Site approved rating is 29,345 kg (64,500 lb).

Figure 1. Lift Test Adaptor.

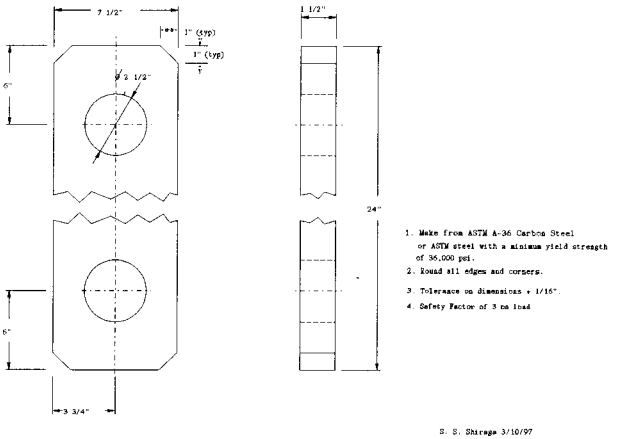


Figure 2. CASTOR Lifting Beam.

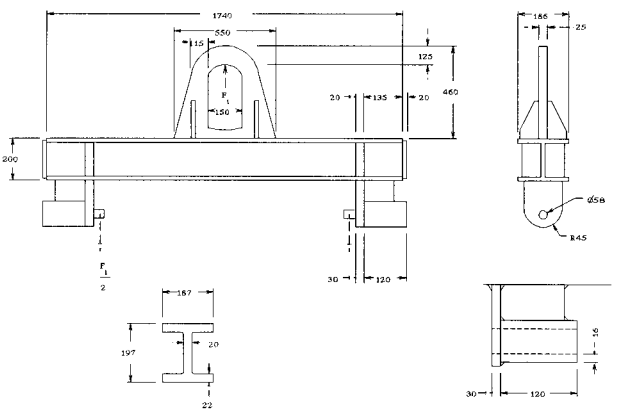
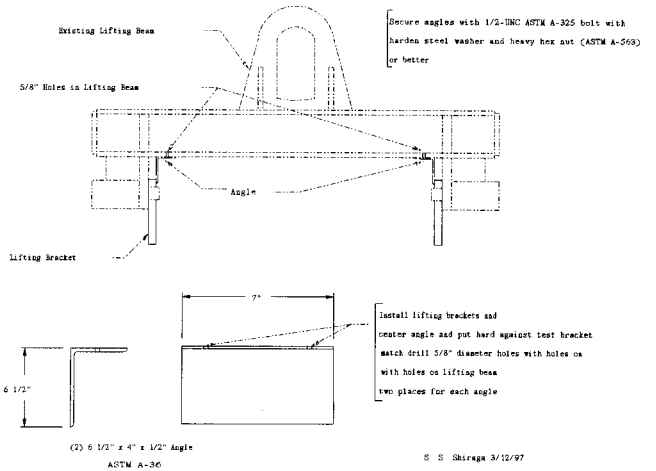


Figure 3. Lift Test Arrangement.



4.0 REFERENCES

ANSI, 1993, *American National Standard for Radioactive Materials - Special Lifting Devices for Shipping Containers Weighing 10,000 lb (4500 kg) or More*, ANSI N14.6, American National Standards Institute, New York, New York.

HNF-SD-TP-SARP-021, *Safety Analysis Report for Packaging (Onsite) CASTOR GSF Cask*, Rust Federal Services Inc. Northwest Operations, Richland, Washington.

RL, 1993, *Hanford Site Hoisting and Rigging Manual*, DOE/RL-92-36, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

Prüfnachweis für Lastaufnahme- und Anschlagmittel

gem. § 40 VBG 9a

Betriebsmittel-Nr. .....

Kette ☐ Seil ☐ Band ☐ Traverse ☒ Nr. 1 Gehänge ☐ ..... ☐

Kunde GNB, Mülheim an der Ruhr

Einsatzort Verladung

Hersteller/Lieferer Eisenbau GmbH Oberhausen

Anzahl der ~~Stränge~~ Aufhängebolzen = 2

Werksabnahmezeugnis

l = 150 mm d = 58 mm

Werkstoff RSt 37-2

Tragfähigkeit des ~~senkrechten~~

Güteklasse

~~Einzelstranges~~ 20.000 kg

Zubehör

Prüflast 20.000 kg

Fabr. ~~Zeichen~~-Nr. 17 8 73

Gesamttragfähigkeit bei

Typ Baujahr 19 87

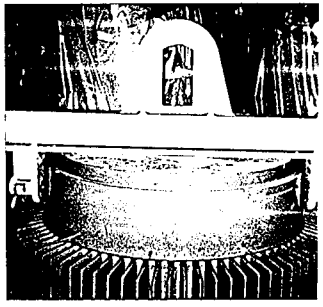
45° Neigungs-) ——— kg

Eigengewicht ca. 250 kg

60° Neigungs-) ——— kg

Instandsetzung und Wärmebehandlung von Ketten der Güteklasse 3, 5, 6 und 8 nur von Kettenherstellern und Werkstätten, die hierzu vom Fachausschuß Eisen und Metall, Sachgebiet Ketten, ermächtigt sind.

Skizze / Foto



Mit Nennlast geprüft: 04.07.1996

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D-KRANTECHNIK
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PLA 793

Prüfnachweis für Lastaufnahme- und Anschlagmittel gem. § 40 VBG 9a

Betriebsmittel-Nr. .....

Kette ☐ Seil ☐ Band ☐ Traverse ☒ Nr. 2 Gehänge ☐ ..... ☐

Kunde GNB, Mülheim Einsatzort Verladung

Hersteller/Lieferer Eisenbau GmbH Oberhausen Anzahl der ~~Stränge~~ Aufhängebolzen = 2

Werksabnahmezeugnis l = 150 mm d = 58 mm

Werkstoff RSt 37-2 Tragfähigkeit ~~des senkrechten~~

Güteklasse ~~Einzelstranges~~ 20.000 kg

Zubehör Prüflast 20.000 kg

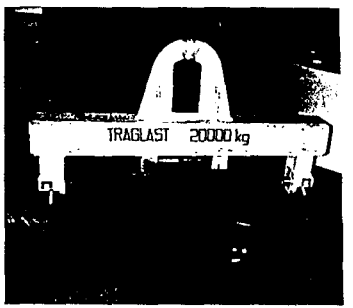
Fabr. ~~Zeichn.~~-Nr. 17873 Gesamttragfähigkeit bei

Typ ..... Baujahr 1987 45° Neigungs-Ø ..... — kg

Eigengewicht ca. 250 kg 60° Neigungs-Ø ..... — kg

Instandsetzung und Wärmebehandlung von Ketten der Güteklasse 3, 5, 6 und 8 nur von Kettenherstellern und Werkstätten, die hierzu vom Fachausschuß Eisen und Metall, Sachgebiet Ketten, ermächtigt sind.

Skizze / Foto



Mit Nennlast geprüft:

25.11.1996

D-KRANTECHNIK 4030 Ratingen K.-H. Rausch BG-2 862 Sachverständiger der Kran- + Hebetechnik

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Fax: (0041) 8330804

5.2 HANFORD LOAD TESTS

CRANE & RIGGING WORK ORDER

PAGE: 1 03/07/97 07:59:56

Job Number 3R-97-8754/W

1. Requested By DONALD LARUE
   Org. 408 . Telephone No. 376-7105 MSIN G3-08
2. Charge Code P0FK06
3. Date of Request 03/04/97
4. Response Required N/A
5. Type of Work
6. Location

   Area 1100AREA
   Bldg 1171 Room
   Other

7. Description

   INSPECT- LOAD TEST 2 SPREADER BARS FOR LOADING GERMAN CASKS @ 324

   CONTACT AT 324 TO GET THE SPREADER BARS IS STEVE HALSTEAD 376-3973. PERFORM A 150% LOAD TEST. (66,000 LBS). ALSO PERFORM
   INSPECTION TO PROCEDURE 7-GN-100 & LOAD TEST TO A WRITTEN PROCEDURE IN THIS PACKAGE. RECORD ALL INFORMATION ON DATA SHEETS IN THIS PACKAGE.

		Signature	Date
8.	Released by	R. J. GILLESPIE	03/03/97
9.	Craft Complete		
10.	Field Work Complete		3/27/97
	Cancelled		

11. Resources Required

Res Code	Description	Qty	Est Hrs	Servicing Org.	Act Hrs
013	Crane Operator	1		C/R	6
035	Iron Worker	3		C/R	25
14B	Truck Driver - Hv	1		C/R	6
SUPR	Supervisor	1		C/R	6
3R-PL	Planner/Scheduler			C/R	

43 TOTAL

DATA SHEET (Sheet 1 of 5)

7.0 INSTRUCTIONS (Record S - Satisfactory, U - Unsatisfactory or N/A - Not Applicable on steps below).

STEP	S-U-N/A	COMMENTS	INITIAL/DATE
7.1.1	S	OK	RKK 3/26/97
7.1.2	S	OK	RKK 3/26/97
7.1.3	S	OK	RKK 3/26/97
7.1.4	S	OK	RKK 3/26/97
7.2.1.a	N/A		
b	N/A		
c	N/A		
d	N/A		
e	N/A		
f	N/A		
g	N/A		
7.3.1.a	N/A		
b	N/A		
c	N/A		
d	N/A		
e	N/A		
f	N/A		
g	N/A		
h	N/A		
7.3.2	N/A		

DATA SHEET (Sheet 2 of 5)

7.0 INSTRUCTIONS (Record S - Satisfactory, U - Unsatisfactory or N/A - Not Applicable on steps below).

STEP	S-U-N/A	COMMENTS	INITIAL/DATE
7.4.1.a	N/A		
b	N/A		--
c	N/A		
d	N/A		
e	N/A	Record results of inspection on Hook Identification Record Data Sheet(s).	
f	N/A	Record results of inspection on Hook Identification Record Data Sheet(s).	
7.4.2.a	N/A	Record results of inspection on Hook Identification Record Data Sheet(s).	
b	N/A	Record results of inspection on Hook Identification Record Data Sheet(s).	
c	N/A	Record results of inspection on Hook Identification Record Data Sheet(s).	
7.4.3	N/A	Record results of inspection on Hook Identification Record Data Sheet(s).	
7.4.4.a	N/A		
b	N/A		
c	N/A		
d	N/A		
7.5.1.a	S	OK	RKK 3/26/97
b	S	OK	RKK 3/26/97
c	N/A		
d	S	OK	RKK 3/26/97
e	N/A		
f	S	OK	RKK 3/26/97
g	S	OK	RKK 3/26/97

DATA SHEET (Sheet 3 of 5)

7.0 INSTRUCTIONS (Record S - Satisfactory, U - Unsatisfactory or N/A - Not Applicable on steps below).

STEP	S-U-N/A	COMMENTS	INITIAL/DATE
7.5.2.a	S	OK	RKK 3/26/97
b	S	OK	RKK 3/26/97
c	S	OK	RKK 3/26/97
d	N/A		
e	N/A		
f	N/A		

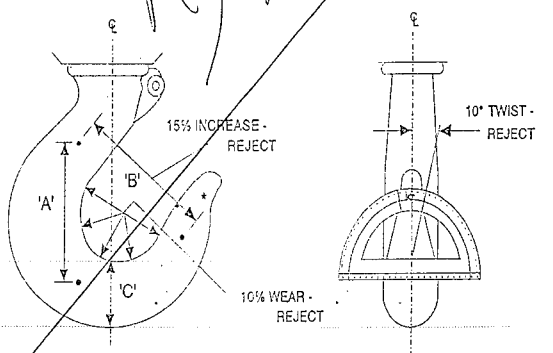
DATA SHEET (Sheet 4 of 5)

HOOK IDENTIFICATION RECORD

Inspection Type (Circle one): Initial/Monthly/Periodic _____
(Specify return to service, pre-Critical Lift, etc.)

Inspection Date _____ Hook Location/Bldg. _____
Hoist Mfg. _____ Hook I.D. No. _____
Hoist Serial No. _____ Hook Capacity _____
Hoist Capacity _____ Hook Mfg. _____
Hook Dimension "A" _____ Hook Dimension "B" _____
Hook Dimension "C" _____ / _____
Original if Known Current
Caliper Serial No. _____ Calibration Date _____
Hook NDE Accept _____ Reject _____ Date _____
Qualified Inspector _____ Date _____

NOTE: *Place numbers on hook as close to tip of hook as practical.



HOOK INSPECTION INFORMATION

1. See Attachment 1 or 2 for discontinuity repair guidelines.
2. If hook is twisted more than 10 degrees, replace hook.
3. Measure distance between 'B' punchmarks using calipers. The measurement between 'A' punchmarks is a reference standard to compare this dimension with.

DATA SHEET (Sheet 5 of 5)

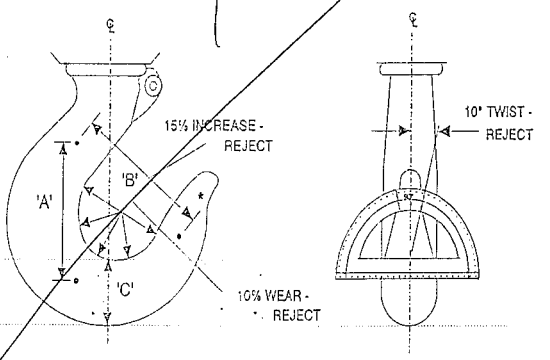
HOOK IDENTIFICATION RECORD

Inspection Type (Circle one): Initial/Monthly/Periodic_____
(Specify return to service, pre-Critical Lift, etc.)

Inspection Date _____ Hook Location/Bldg. _____
Hoist Mfg. _____ Hook I.D. No. _____
Hoist Serial No. _____ Hook Capacity _____
Hoist Capacity _____ Hook Mfg. _____
Hook Dimension "A" _____ Hook Dimension "B" _____
Hook Dimension "C" _____ _____
Original if Known Current

Caliper Serial No. _____ Calibration Date _____
Hook NDE Accept _____ Reject _____ Date _____
Qualified Inspector _____ Date _____

NOTE: *Place numbers on hook as close to tip of hook as practical.



HOOK INSPECTION INFORMATION

1. See Attachment 1 or 2 for discontinuity repair guidelines.
2. If hook is twisted more than 10 degrees, replace hook.
3. Measure distance between 'B' punchmarks using calipers. The measurement between 'A' punchmarks is a reference standard to compare this dimension with.

LOAD TEST PROCEDURE
BELOW-THE-HOOK LIFTING DEVICE

APPROVAL: N/A R.G
Facility Manager Date

APPROVAL: N/A R.G
Industrial Safety Date

APPROVAL: Roger Kirchner 3/26/97
Crane and Rigging Services Manager Date

LOAD TEST INSTRUCTIONS

1.0 PURPOSE

1.1 The purpose of this procedure is to provide a sequence of operations for load testing a below-the-hook lifting device.

2.0 REFERENCES

2.1 Hanford Site Hoisting and Rigging Manual DOE-RL-92-36

2.2 WHC-CM-4-4, VOL. 1-3, Industrial Safety Manual

2.3 Environmental, Safety, and Health Program Manual.

3.0 RESPONSIBILITIES

3.1 The equipment custodian (designated by the Facility manager) is responsible for ensuring maintenance inspections and testing of equipment are not delinquent. He is also responsible for maintaining records of the repairs, inspections, tests, and any maintenance performed.- He will assure these records are available for audit.

3.2 Industrial Safety shall ensure compliance with hoisting and rigging equipment requirements.

3.3 A designated leader shall be appointed to all hoisting and rigging (H&R) activities, which include both critical and noncritical lifts. For critical lifts, the designated leader may also be the PIC. For ordinary lifts, the designated leader may be a crew member.

3.4 Designated Leader or (if needed) Site Crane and Rigging Services (SC&RS) Supervisor/or Designee is responsible for (1) coordinating the test lift, (2) ensuring a procedure is prepared and approved, (3) ensuring that personnel are qualified to perform the work, (4) ensuring that all equipment and rigging are qualified.

3.4.1 Designated Leader or Supervisor shall conduct a pre-job meeting with all personnel involved in the test.

3.5 QC/NDE shall conduct NDE test of welds after load test. NDE requirements, if required, will be called out on design drawing or listed on the work package.

4.0 REQUIREMENTS

4.1 Before each load test, confirm that all equipment inspections and maintenance are current.

Roy K Knobbe — Equipment Custodian or Supervisor — 3/26/97 — Date

4.2 The Equipment Custodian or the SC&RS Supervisor shall verify that all rigging and accessories inspections are current.

Roy Knobbe — Equipment Custodian or SC&RS Supervisor — 3/26/97 — Date

4.3 Load test weight 64,360 is known and documented within a tolerance of +0%, -5%. Weights shall be traceable to a recognized standard, verified by: Engineering calculations, a calibrated (+0%, -5%) load measuring device or calculating load based on known unit weights and dimensions of test fixture.

4.3.1 Load test units accepted prior to test.

Roy Knobbe — Designated Leader or SC&RS Supervisor — 3/26/97 — Date

5.0 PRE-JOB MEETING

5.1 The Designated Leader or Supervisor shall conduct a pre-job meeting prior to work start to review this procedure with all involved personnel and resolve any safety concerns. The Supervisor shall ensure involved personnel wear appropriate safety attire (e.g., hard hat, safety shoes, gloves, safety glasses, and any other personal protective equipment required). A designated signal person shall be appointed by the SC&RS Supervisor.

Roy Knobbe — Designated Leader or SC&RS Supervisor — 3/26/97 — Date

6.0 LOAD TEST

6.1 Barricade or rope off work area to warn unauthorized personnel of load test in progress.

6.2 Position hook or device over center of gravity of load.

6.3 Attach rigging to hook or attachment as directed by the supervisor. Stop and inspect, adjust rigging as needed.

6.4 Hoist load a few inches and hold for 5 minutes.

6.5 Set load down and remove rigging or test weight assembly. Visually inspect load bearing parts to verify that no damage has been done.

6.6 NDE of load bearing welds after load test (if required).
Type of NDE: MT____ PT____ VISUAL____

N/A
NDE Accept

N/A
NDE Reject

7.0 LOAD TEST REPORT

7.1 Complete load test report.

7.2 The reports shall be placed in the Crane History file by the equipment custodian.

LOAD TEST REPORT FORM

* Building No./Facility 324 Bldg. Load Test Date 3-26-97
* I.D. No. 1-A Model No. N/A Manufacturer Herstteller
* Rated Capacity 44,000
* Last Load Test Date N/A Weight(s) Lifted 64,560
* This Load Test: Weight Lifted 64,560
* Dynamometer: Calibration ID No. 815-24.06-038 Recal Due Date 3-5-98
Range 50 Ton +- 500 Lbs

Remarks:

[ ] Quality Assurance
or
[ ] Third Party Verification
(Check One)

N/A
Signature Date

After Load Test Place This Document in the Crane History File.

MES MAINTENANCE PROCEDURE PERIODIC TO ANNUAL CONDITION INSPECTION OF BELOW-THE-HOOK LIFTING DEVICES	PROC. NO. 7-GN-100 REV. 2, CHG. A PAGE 17 of 21

DATA SHEET (Sheet 1 of 5)

7.0 INSTRUCTIONS (Record S - Satisfactory, U - Unsatisfactory or N/A - Not Applicable on steps below).

STEP	S-U-N/A	COMMENTS	INITIAL/DATE
7.1.1	S	OK	RKK 3/24/97
7.1.2	S	OK	RKK 3/24/97
7.1.3	S	OK	RKK 3/24/97
7.1.4	S	OK	RKK 3-26-97
7.2.1.a	n/A		
b	n/A		
c	n/A		
d	n/A		
e	n/A		
f	n/A		
g	n/A		
7.3.1.a	n/A		
b	n/A		
c	n/A		
d	n/A		
e	n/A		
f	n/A		
g	n/A		
h	n/A		
7.3.2	n/A		

DATA SHEET (Sheet 2 of 5)

7.0 INSTRUCTIONS (Record S - Satisfactory, U - Unsatisfactory or N/A - Not Applicable on steps below).

STEP	S-U-N/A	COMMENTS	INITIAL/DATE
7.4.1.a	N/A		
b	N/A		--
c	N/A		
d	N/A		
e	N/A	Record results of inspection on Hook Identification Record Data Sheet(s).	
f	N/A	Record results of inspection on Hook Identification Record Data Sheet(s).	
7.4.2.a	N/A	Record results of inspection on Hook Identification Record Data Sheet(s).	
b	N/A	Record results of inspection on Hook Identification Record Data Sheet(s).	
c	N/A	Record results of inspection on Hook Identification Record Data Sheet(s).	
7.4.3	N/A	Record results of inspection on Hook Identification Record Data Sheet(s).	
7.4.4.a	N/A		
b	N/A		
c	N/A		
d	N/A		
7.5.1.a	S	OK	RKK 3-26-97
b	S	OK	RKK 3-26-97
c	N/A		
d	S	OK	RKK 3-26-97
e	N/A		
f	S	OK	RKK 3-26-97
g	S	OK	RKK 3-26-97

DATA SHEET (Sheet 3 of 5)

7.0 INSTRUCTIONS (Record S - Satisfactory, U - Unsatisfactory or N/A - Not Applicable on steps below).

STEP	S-U-N/A	COMMENTS	INITIAL/DATE
7.5.2.a	S	OK	RKK 3/26/97
b	S	OK	RKK 3/26/97
c	S	OK	RKK 3/26/97
d	N/A		
e	N/A		
f	N/A		

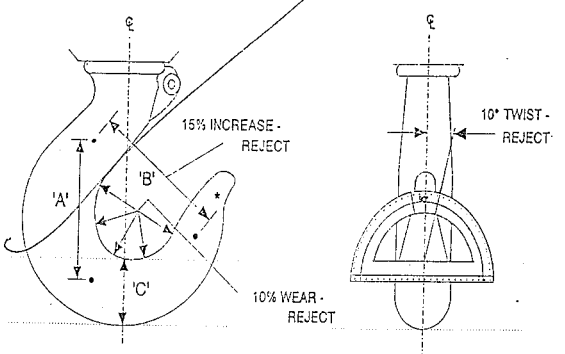
DATA SHEET (Sheet 4 of 5)

HOOK IDENTIFICATION RECORD

Inspection Type (Circle one): Initial/Monthly/Periodic _____
(Specify return to service, pre-Critical Lift, etc.)

Inspection Date _____ Hook Location/Bldg. _____
Hoist Mfg. _____ Hook I.D. No. _____
Hoist Serial No. _____ Hook Capacity _____
Hoist Capacity _____ Hook Mfg. _____
Hook Dimension "A" _____ Hook Dimension "B" _____
Hook Dimension "C" _____
Original if Known Current
Caliper Serial No. _____ Calibration Date _____
Hook NDE Accept _____ Reject _____ Date _____
Qualified Inspector _____ Date _____

NOTE: *Place numbers on hook as close to tip of hook as practical.



HOOK INSPECTION INFORMATION

1. See Attachment 1 or 2 for discontinuity repair guidelines.
2. If hook is twisted more than 10 degrees, replace hook.
3. Measure distance between 'B' punchmarks using calipers. The measurement between 'A' punchmarks is a reference standard to compare this dimension with.

DATA SHEET (Sheet 5 of 5)

HOOK IDENTIFICATION RECORD

Inspection Type (Circle one): Initial/Monthly/Periodic_____
(Specify return to service, pre-Critical Lift, etc.)

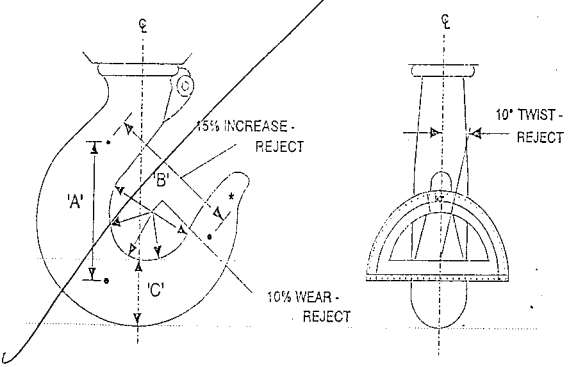
Inspection Date _____ Hook Location/Bldg. _____
Hoist Mfg. _____ Hook I.D. No. _____
Hoist Serial No. _____ Hook Capacity _____
Hoist Capacity _____ Hook Mfg. _____
Hook Dimension "A" _____ Hook Dimension "B" _____
Hook Dimension "C" _____ / _____
Original if Known Current

Caliper Serial No. _____ Calibration Date _____

Hook NDE Accept _____ Reject _____ Date _____

Qualified Inspector _____ Date _____

NOTE: *Place numbers on hook as close to tip of hook as practical.



HOOK INSPECTION INFORMATION

1. See Attachment 1 or 2 for discontinuity repair guidelines.
2. If hook is twisted more than 10 degrees, replace hook.
3. Measure distance between 'B' punchmarks using calipers. The measurement between 'A' punchmarks is a reference standard to compare this dimension with.

LOAD TEST PROCEDURE
BELOW-THE-HOOK LIFTING DEVICE

APPROVAL: N/A R.G
Facility Manager Date

APPROVAL: N/A R.G
Industrial Safety Date

APPROVAL: Roger Kuehn 3/24/97
Crane and Rigging Services Manager Date

LOAD TEST INSTRUCTIONS

1.0 PURPOSE

1.1 The purpose of this procedure is to provide a sequence of operations for load testing a below-the-hook lifting device.

2.0 REFERENCES

2.1 Hanford Site Hoisting and Rigging Manual DOE-RL-92-36

2.2 WHC-CM-4-4, VOL. 1-3, Industrial Safety Manual

2.3 Environmental, Safety, and Health Program Manual.

3.0 RESPONSIBILITIES

3.1 The equipment custodian (designated by the Facility manager) is responsible for ensuring maintenance inspections and testing of equipment are not delinquent. He is also responsible for maintaining records of the repairs, inspections, tests, and any maintenance performed. He will assure these records are available for audit.

3.2 Industrial Safety shall ensure compliance with hoisting and rigging equipment requirements.

3.3 A designated leader shall be appointed to all hoisting and rigging (H&R) activities, which include both critical and noncritical lifts. For critical lifts, the designated leader may also be the PIC. For ordinary lifts, the designated leader may be a crew member.

3.4 Designated Leader or (if needed) Site Crane and Rigging Services (SC&RS) Supervisor/or Designee is responsible for (1) coordinating the test lift, (2) ensuring a procedure is prepared and approved, (3) ensuring that personnel are qualified to perform the work, (4) ensuring that all equipment and rigging are qualified.

3.4.1 Designated Leader or Supervisor shall conduct a pre-job meeting with all personnel involved in the test.

3.5 QC/NDE shall conduct NDE test of welds after load test. NDE requirements, if required, will be called out on design drawing or listed on the work package.

4.0 REQUIREMENTS

4.1 Before each load test, confirm that all equipment inspections and maintenance are current.

Ray Kruckeberg — Equipment Custodian or Supervisor — 3/26/97 — Date

4.2 The Equipment Custodian or the SC&RS Supervisor shall verify that all rigging and accessories inspections are current.

Ray Kruckeberg — Equipment Custodian or SC&RS Supervisor — 3/26/97 — Date

4.3 Load test weight 64,560 is known and documented within a tolerance of +0%, -5%. Weights shall be traceable to a recognized standard, verified by: Engineering calculations, a calibrated (+0%, -5%) load measuring device or calculating load based on known unit weights and dimensions of test fixture.

4.3.1 Load test units accepted prior to test.

Ray Kruckeberg — Designated Leader or SC&RS Supervisor — 3/26/97 — Date

5.0 PRE-JOB MEETING

5.1 The Designated Leader or Supervisor shall conduct a pre-job meeting prior to work start to review this procedure with all involved personnel and resolve any safety concerns. The Supervisor shall ensure involved personnel wear appropriate safety attire (e.g., hard hat, safety shoes, gloves, safety glasses, and any other personal protective equipment required). A designated signal person shall be appointed by the SC&RS Supervisor.

Ray Kruckeberg — Designated Leader or SC&RS Supervisor — 3/26/97 — Date

6.0 LOAD TEST

6.1 Barricade or rope off work area to warn unauthorized personnel of load test in progress.

6.2 Position hook or device over center of gravity of load.

6.3 Attach rigging to hook or attachment as directed by the supervisor. Stop and inspect, adjust rigging as needed.

6.4 Hoist load a few inches and hold for 5 minutes.

6.5 Set load down and remove rigging or test weight assembly. Visually inspect load bearing parts to verify that no damage has been done.

6.6 NDE of load bearing welds after load test (if required).
Type of NDE: MT____ PT____ VISUAL____

N/A
NDE Accept

N/A
NDE Reject

7.0 LOAD TEST REPORT

7.1 Complete load test report.

7.2 The reports shall be placed in the Crane History file by the equipment custodian.

LOAD TEST REPORT FORM

* Building No./Facility 324 Bldg. Load Test Date 3-26-97

* I.D. No. 1-B Model No. N/A Manufacturer Herstteller

* Rated Capacity 44,000

* Last Load Test Date N/A. Weight(s) Lifted 64,560

* This Load Test: Weight Lifted 64,560

* Dynamometer: Calibration ID No. 815-29-06-038 Recal Due Date 3-5-98
Range 50 ton +- 500 LBS

Remarks:

[ ] Quality Assurance
or
[ ] Third Party Verification
(Check One)

N/A
Signature

Date

After Load Test Place This Document in the Crane History File.

5.3 CASTOR LIFTING BEAM EVALUATION

ENGINEERING SAFETY EVALUATION

Subject: CASTOR LIFTING BEAM EVALUATION Page: 1 of 5
Originator: S. S. Shiraga Date: 04/02/97
Checker: S. R. Crow Date: 04/03/97

I. Objective:

The objective of this evaluation is ensure the CASTOR lifting beam meets the requirements of the Hanford Site Hoisting and Rigging Manual. The requirement is a safety factor of 3 to 1 based on yield strength.

II. References:

DOE, DOE-RL-92-36, *Hanford Site Hoisting and Rigging Manual*, Richland Field Office, Richland, WA., January, 1993.

HNF-SD-TP-SARP-021, *Safety Analysis Report for Packaging (Onsite) CASTOR GSF Cask*, RFS NW Operations, Richland, WA.

Hudson, R. G., *The Engineers' Manual*, Second Edition, John Wiley and Sons, New York, New York, 1939.

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

D-Krantechnik, Lifting Beam Structural Calculations, Ratingen, Germany, May 7, 1996.

III. Results and Conclusions:

Results of this evaluation verifies the CASTOR Lifting Beam meets the requirements of the Hoisting and Rigging Manual (DOE, 1993). The evaluation is based on the nominal strengths of equivalent German structural steel. As shown in the evaluation the safety factors for the most critical components are equal to or greater than 3. Within this evaluation, the welds are assumed to have the same structural strength as the parent material. Since the welds are not located critical or high load areas, they are not evaluated.

ENGINEERING SAFETY EVALUATION

Subject: CASTOR LIFTING BEAM EVALUATION Page: 2 of 5
Originator: S. S. Shiraga Date: 04/02/97
Checker: S. R. Crow Date: 04/03/97

IV. Evaluation:

CASTOR LIFTING BEAM EVALUATION:

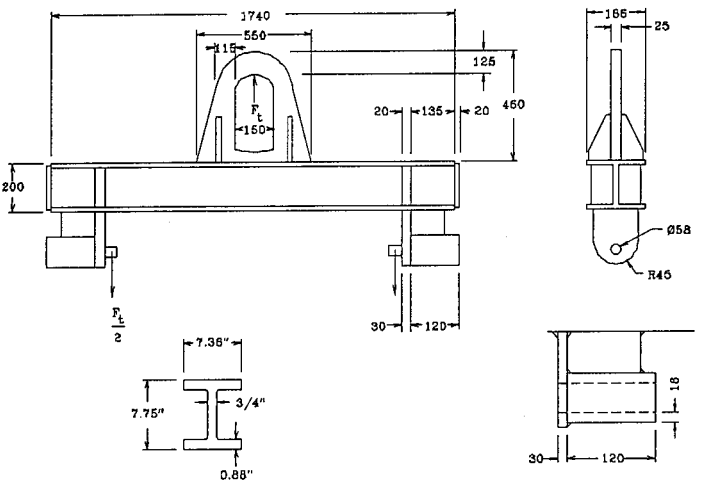
Assumed lifting weight of CASTOR w/o impact limiters (CASTOR SARP): $W_{cast} = 41000\,lbf$

Assumed maximum lifting weight of Lifting Beam: $W_{max} = 44000\,lbf$

Beam material (RSt 37-2) yield strength: $s_{37y} = 225 \frac{newton}{mm^2}$ $s_{37y} = 32.63 \cdot ksi$
ASTM Equivalent A-570.

Eye plate (St 52-2) yield strength: $s_{52y} = 345 \frac{newton}{mm^2}$ $s_{52y} = 50.04 \cdot ksi$
ASTM Equivalent A-516.

Lifting pin (St 50) yield strength: $s_{50y} = 275 \frac{newton}{mm^2}$ $s_{50y} = 39.89 \cdot ksi$
ASTM Equivalent A-515.



Beam Section

Except as noted all dimensions in mm

ENGINEERING SAFETY EVALUATION

Subject: CASTOR LIFTING BEAM EVALUATION Page: 3 of 5
Originator: S. S. Shiraga Date: 04/02/97
Checker: S. R. Crow Date: 04/03/97

Determine moment of inertia of I beam section about the axis perpendicular to the web:

Width of flange: $w_f = 7.38\,in$ Depth of section: $s_d = 7.75\,in$ Flange thickness: $t_f = 0.88\,in$

Thickness of web: $t_w = 0.75\,in$ Depth of web: $w_s := s_d - 2 \cdot t_f$

Moment of inertia (Hudson, 1939, page 84): $I_{bs} := \frac{w_f s_d^3 - w_s^3 \cdot (w_f - t_w)}{12}$ $I_{bs} = 168 \cdot in^4$

Distance of center of gravity: $d_{icg} := \frac{s_d}{2}$ $d_{icg} = 3.87 \cdot in$ Section Modulus: $S_{bs} := \frac{I_{bs}}{d_{icg}}$

Cross sectional area: $A_{bs} := 2 \cdot t_f w_f + t_w \cdot w_s$ $A_{bs} = 17.48 \cdot in^2$

Area of compression flange: $A_f := t_f w_f$ $A_f = 6.49 \cdot in^2$

Evaluate to AISC Design Requirements:

Width to thickness ratio: $\frac{w_f}{2 \cdot t_f} = 4.19$ Limiting width to thickness ratio: $\frac{65}{\sqrt{\frac{s_{37y}}{ksi}}} = 11.38$

Since width to thickness ratio not limiting, section is compact.

Determine value of limiting laterally unsupported length for compact section in strong axis bending:

$$\frac{76 \cdot w_f}{\sqrt{\frac{s_{37y}}{ksi}}} = 8.18 \cdot ft \quad \text{or} \quad \frac{20000}{\left(\frac{s_d}{A_f}\right) \cdot \frac{s_{37y}}{ksi}} = 42.8 \cdot ft$$

Unsupported length of I beam: $L_b = 1740\,mm$ $L_b = 5.71 \cdot ft$

Therefore, since critical length not exceeded flexture allowable of beam is: $s_{37b} := 0.66\, s_{37y}$ $s_{37b} = 21.54 \cdot ksi$

Loading on Main Beam:

Idealize loading as a simply supported beam with a partially distributed uniform load over center section.
AISC, 1989, page 2-297.

Length between load: $l_1 := 1740\,mm - 2 \cdot (175 \cdot mm)$ Load width: $b_1 = 550 \cdot mm$

Distance from load: $a_1 := \frac{l_1 - b_1}{2}$ $a_1 = 420 \cdot mm$

Load on unit: $F_t = W_{max}$ Load per unit length: $f_1 := \frac{F_t}{b_1}$ $f_1 = 2032 \cdot \frac{lbf}{in}$

ENGINEERING SAFETY EVALUATION

Subject: CASTOR LIFTING BEAM EVALUATION Page: 4 of 5
Originator: S. S. Shiraga Date: 04/02/97
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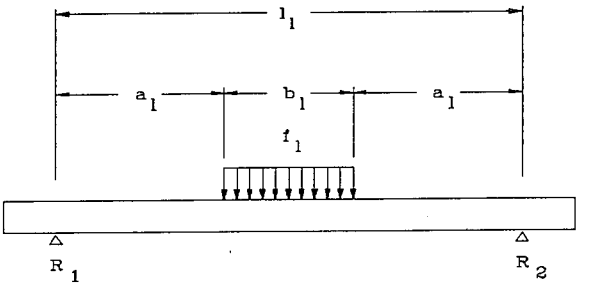

Since symmetrical, reaction load at load points: $R_1 := \frac{f_1 \cdot b_1}{2 \cdot l_1} \cdot (2 \cdot a_1 + b_1)$ $R_1 = 22000 \cdot lbf$

Maximum Moment: $M_{max} := R_1 \cdot \left(a_1 + \frac{R_1}{2 \cdot f_1} \right)$ $M_{max} = 482874 \cdot lbf \cdot in$

Bending stress: $\sigma_b := \frac{M_{max}}{S_{bs}}$ $\sigma_b = 11.17 \cdot ksi$ Shear at Edge: $\tau_b := \frac{R_1}{A_{bs}}$ $\tau_b = 1.26 \cdot ksi$

Safety Factor based on Yield Strength: $SF_b := \frac{s_{37y}}{\sigma_b}$ $SF_b = 3$

Loading on Lift Pin:

Assume as cantilevered circular beam that is loaded between cask lifting beam. Treat as short beam.

Pin diameter: $d_{pin} := 58 \cdot mm$ Load on pins: $F_p := \frac{F_t}{2}$ $F_p = 22000 \cdot lbf$

Cross sectional area of pin: $A_p := \pi \cdot \frac{d_{pin}^2}{4}$ Moment of inertia of cross section: $I_p := \frac{\pi \cdot d_{pin}^4}{64}$

Distance between pin supports: $l_{ps} := 1740\,mm - 2 \cdot (20 + 135 + 20) \cdot mm$

Gap between cask and lifting beam: $l_g := \frac{l_{ps} - 1365\,mm}{2}$ $l_g = 0.49 \cdot in$

ENGINEERING SAFETY EVALUATION

Subject: CASTOR LIFTING BEAM EVALUATION Page: 5 of 5
Originator: S. S. Shiraga Date: 04/02/97
Checker: S. R. Crow Date: 04/03/97

Shear stress on pin: $\tau_p = \frac{F_p \cdot \left(\frac{d_{pin}}{2}\right)^2}{3 \cdot l_p}$ $\tau_p = 7.16 \cdot ksi$

Bending: $\sigma_p = \frac{F_p \cdot l_g \cdot \frac{d_{pin}}{2}}{l_p}$ $\sigma_p = 9.26 \cdot ksi$

Principal stress: $\sigma_1 = \frac{\sigma_p}{2} + \sqrt{\left(\frac{\sigma_p}{2}\right)^2 + \tau_p^2}$ $\sigma_1 = 13.2 \cdot ksi$

Safety Factor based on Yield Strength: $SF_p = \frac{s_{50y}}{\sigma_1}$ $SF_p = 3$

Loading on lifting eye:

Thickness of plate: $t_e = 25 \cdot mm$ Length on each side of opening: $l_e = 115 \cdot mm$

Distance to outside edge: $d_{oe} = 125 \cdot mm$

Tensile stess on lifting eye: $\sigma_{et} = \frac{F_t}{2 \cdot t_e \cdot l_e}$ $\sigma_{et} = 4.94 \cdot ksi$

Safety Factor based on Yield Strength: $SF_{et} = \frac{s_{52y}}{\sigma_{et}}$ $SF_{et} = 10.1$

Shear tearout: $\tau_{tet} = \frac{F_t}{2 \cdot t_e \cdot d_{oe}}$ $\tau_{tet} = 4.54 \cdot ksi$

Safety Factor based on Yield Strength: $SF_{tet} = \frac{s_{52y}}{\tau_{tet}}$ $SF_{tet} = 11$

DISTRIBUTION SHEET

To	From	Page 1 of 1
Distribution	Packaging Engineering	Date 04/04/97
Project Title/Work Order		EDT No. 619562
Spreader Beam Analysis for the CASTOR GSF Cask (HNF-SD-TP-RPT-026)		ECN No. N/A

Name	MSIN	Text With All Attach.	Text Only	Attach./ Appendix Only	EDT/ECN Only
C. E. Brewer	S3-15	X			
E. P. Clements	H1-15	X			
J. G. Field	H1-15	X			
S. D. Halstead	L1-02	X			
R. K. Kroshus	G4-07	X			
D. M. LaRue	G3-08	X			
I. L. Metcalf	L6-26	X			
S. S. Shiraga	H1-15	X			
P. J. Weaver	L1-02	X			
Central Files	A3-88	X			
HNF-SD-TP-RPT-026 File	H1-15	X			