This document is an Engineering Data Transmittal dated January 6, 2000. It contains the following information:

**To (Receiving Organization):** Documentation and Records Management

**From (Originating Organization):** Technical Integration (FSA 13300)

**Project/Program/Department/Division:** Spent Nuclear Fuel Project

**Design Authority/Designer/Engineer:** D. M. Chenault

**Originator Remarks:**


**Receiver Remarks:**

- Design Development report verifies the design adequacy per tested verification of required safety factors
- The acceptance test report verifies each production grapple has been proof tested as required

**DATA TRANSMITTED**

<table>
<thead>
<tr>
<th>Item No</th>
<th>Document/Drawing No</th>
<th>Sheet No</th>
<th>Rev No</th>
<th>Title or Description of Data Transmitted</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>SNF-5567</td>
<td>N/A</td>
<td>0</td>
<td>SNF Storage Projects Fuel Basket Handling Grapple Design Development Test Report</td>
</tr>
<tr>
<td>2</td>
<td>SNF-5568</td>
<td>N/A</td>
<td>0</td>
<td>MCE Engineering Test Report Fuel Basket Handling Grapple Acceptance Test</td>
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</table>

**Approval Designator:**

- E S O D O R N/A
- (See WHC CM 3.5 Sec 127)

**Reason for Transmittal:**

- 1 Approval
- 2 Release
- 3 Information
- 4 Review
- 5 Post Review
- 6 Dist (Receipt Acknow Required)

**Dispositional Action:**

- 1 Approved
- 2 Approved w/comment
- 3 Disapproved w/comment
- 4 Reviewed w/comment
- 5 Reviewed w/comment
- 6 Receipt acknowledged

**SIGNATURE/DISTRIBUTION**

- Design Authority: D. M. Chenault
- Design Agent: D. W. Medford
- Cog Eng: D. W. Medford
- Cog Mgr: D. W. Medford
- QA: J. D. Mathews
- Safety: T. J. Ruane
- Env: S. F. Jale

**DOE APPROVAL:**

- Ctrl No: 00003170
- Approved
- Approved w/comments
- Disapproved w/comments
MCO ENGINEERING TEST REPORT FUEL BASKET HANDLING GRAPPLE ACCEPTANCE TEST

D M Chenault
Fluor Hanford Incorporated Richland WA 99352
U S Department of Energy Contract DE AC06 96RL13200

EDT/ECN 628503 Org Code YA300 B&R Code EW7040000
UC 510 Charge Code 105528/DA00 Total Pages 28

Key Words Grapple Proof Test Basket Lift Fuel

Abstract Acceptance testing of the production SNF Fuel Basket lift grapples to the required 150 percent maximum lift load is documented herein. The report shows the results affirming the proof test passage.
May 10 1999

Mr Ron L Butler
DE&S Hanford
PO Box 350
Richland WA 99352

Subject CONTRACT 00003170 SUBMITTALS AND NOTICE OF COMPLETION

Dear Mr Butler

Mid-Columbia Engineering, Inc (MCE Engineering) is notifying you of our completion of the grapple repair per the terms of contract 00003170. At this time we are enclosing our load test documentation for your records. The repaired grapple assemblies have been delivered to the buyer’s technical representative Doug Chenault per the terms of the contract.

I have instructed our Back Office to prepare invoicing for $10,983.00 per the firm fixed price terms of the contract.

Please feel free to contact me at (509) 943-6706 Ext 234 with any items requiring clarification.

Sincerely
Mid-Columbia Engineering, Inc

Eric Straalsund
General Manager

EKS/imp 063L-99-EKS
MCE Engineering Test Report

Fuel Basket Handling Grapple

Acceptance Test

Job No  PO 3170

Prepared by
Engineering

Concurred by
Manager Manufacturing

Approved by
General Manager Engineering

Date 5/10/99

Date 5/10/99

Date 5/10/99
Introduction

This report provides the results of an acceptance test that was completed on nine grapple assemblies for handling MCO fuel baskets for the SNF Project. These grapple assemblies were fabricated to MCE Drawing Number DES 12 1 REV 1. Specifically, testing was formed to evaluate the load acceptance of a new material (Inconel 718) being used on the actuator shaft and engagement balls. This report summarizes the results of the test and provides an initial evaluation of the test results. NDE testing which was performed following completion of the load test is also described along with the results of this test.

Test Objective

The primary objective of this test was to confirm the load rating of the grapple per applicable requirements of ANSI 14.6 American National Standard for Radioactive Materials—Special Lifting Devices for Shipping Containers Weighing 10,000 pounds (4500 kg) or More. The above Standard requires a load test of 150% of the design load which must be held for a minimum of 10 minutes followed by a Liquid Penetrant or Magnetic Particle examination of critical areas and welds in accordance with the ANSI/ASME Boiler and Pressure Vessel Code 1989 Section III Division 1 section NF 5350.

Basis for Testing

The test was to be conducted using Test Procedure EP#9 Rev 0. The completed Test Procedure along with data sheets for each grapple tested is included as Appendix A to this report. The design load specified for this grapple is 3200 pounds. The required test load is thus (3200)(1.5) = 4800 pounds.

Test Description

The test was performed using the test setup described in Appendix A. The test hardware was the prototype grapple which had been designed and fabricated by MCE Engineering based on a detailed design provided by the client. The test fixture consists of a load reacting cylinder mechanism which transfers load from a hydraulic cylinder through the grapple to a lower plate which is fastened to the mating portion of the grapple. The loading device is a 0 to 10,000 psig double acting Enerpac hydraulic cylinder. Loading was monitored by a calibrated 0 to 10,000 psig Ashcroft gage. Prior to the test, the Ashcroft gage was calibrated by Bellhaven. Calibration of the Ashcroft gage found the gauge to read in error by nominally 25% low. The five point calibration curve was used to correct readings taken from the gauge to actual pressure and corresponding load. However, during testing the correction calculation was incorrectly applied and the test pressure and loads were significantly over applied. This resulted in testing each of the test articles at loads much greater than the target load of 4800 pounds. See Table 4.1 for actual test loads. Appendix B of this report includes copies of the Ashcroft calibration data and calculations.

The test was conducted at MCE Engineering’s fabrication division, G&M Manufacturing. The test was witnessed by the client engineering and quality assurance representatives.
### Table 4.1 Summary of Test Conditions

<table>
<thead>
<tr>
<th>Grapple ID</th>
<th>Displayed Pressure</th>
<th>Corrected Pressure</th>
<th>Calculated Load</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>H 1 82864 010 001 Backbore Design</td>
<td>1650</td>
<td>2360 90</td>
<td>11119.85</td>
<td>Held load 10 Minutes</td>
</tr>
<tr>
<td>H 1 82864 010 002</td>
<td>1700</td>
<td>2425 42</td>
<td>11423.72</td>
<td>Held load Minutes</td>
</tr>
<tr>
<td>DES 12 1 010 004</td>
<td>1650</td>
<td>2360 90</td>
<td>11119.85</td>
<td>Held load 10 minutes</td>
</tr>
<tr>
<td>DES 12 1 010 005</td>
<td>1650</td>
<td>2360 90</td>
<td>11119.85</td>
<td>Held load 10 minutes</td>
</tr>
<tr>
<td>DES 12 1 010 006</td>
<td>1650</td>
<td>2360 90</td>
<td>11119.85</td>
<td>Held load 10 minutes</td>
</tr>
<tr>
<td>DES 12 1 010 007</td>
<td>1600</td>
<td>2296 39</td>
<td>10815.98</td>
<td>Held load 10 minutes</td>
</tr>
<tr>
<td>DES 12 1 010 008</td>
<td>1650</td>
<td>2360 90</td>
<td>11119.85</td>
<td>Held load 10 minutes</td>
</tr>
<tr>
<td>DES 12 1 010 009</td>
<td>1700</td>
<td>2425 42</td>
<td>11423.72</td>
<td>Held load 10 minutes</td>
</tr>
<tr>
<td>H 1 82864 010 001 Retaining Wire Design</td>
<td>2807</td>
<td>3853 81</td>
<td>18151.43</td>
<td>Load Test 3X and 5X Load per MCE EP 11</td>
</tr>
</tbody>
</table>

#### 5.0 Test Results

Following completion of the loading sequence, each test unit was disassembled and visually inspected for any damage. Local deformation of the fuel basket receptacle interface lip was observed at the contact point with the detent balls. Minor deformation of the actuator shaft/detent ball interface was also observed. This local deformation of the fuel basket receptacle and actuator shaft was well within expected limits. There was no deformation noted at the grapple housing/detent ball interface.

Following testing, each actuator shaft (item 7) was liquid penetrant inspected per ASME Section III Division 1 1989 and accepted per requirements of NF 5350. This examination was performed to insure that no cracking had occurred. The test indicated that no cracking had occurred. The examination reports are included as Appendix C to this document.

#### 6.0 Conclusions

Testing of the MCO Basket grapple prototype at nominally 350% of expected design load indicated that the unit functioned as planned with only the expected local deformation at contact points. Testing indicates that the load capability of the grapple assembly has not been compromised as a result of changing the actuator shaft and engagement ball materials to Inconel 718.

From this test, it is concluded that the design configuration meets or exceeds the requirements specified in ANSI N 14.6 for Special Lifting Devices for Shipping Containers Weighing 10,000 Pounds (4500 kg) or More.
Appendix A

MCE Engineering Procedure #9 Rev 0

Fuel Basket Handling Grapple

Load Test Procedure and Data Sheets
MCE Engineering Engineering Procedure #9

FUEL BASKET HANDLING GRAPPLE LOAD

TEST PROCEDURE

JOB NO P O M 414379, Task 18

Revision 0

Prepared by

Date

Concurred by

Manager, Manufacturing

Date

Concurred by

QA Manager

Date

Approved by

Vice President, Engineering

Date

Concurred by

Client Authorized Engineering Rep

Date
10 INTRODUCTION

This document details load test requirements for a new grapple fixture for handling MCO fuel baskets. This grapple is documented in a released MCE Engineering Drawing DES-1-1 Sheet 1, Rev 1, and DES 1-1 Sheet 2, Rev 0. Specifically, this document defines the test objectives, acceptance criteria, and test responsibilities.

20 TEST OBJECTIVES

The primary objective of this testing is to confirm load rating of the grapple per applicable requirements of ANSI 14.6, "American National Standard for radioactive materials - special lifting devices for shipping containers weighing 10,000 pounds (4500g) or more." ANSI N14.6 requires a load test of 150% design load, held for a minimum of 10 minutes, followed by a Liquid Penetrant or Magnetic Particle examination in accordance with the ANSI/ASME Boiler and Pressure Code, 1989, Section III, Division 1.

30 TEST RESPONSIBILITIES

3.1 MCE Engineering (MCE)
MCE Engineering's Engineering staff shall prepare the test procedure and conduct load testing. Upon completion of the load test, MCE's Engineering staff shall document the test results in a letter report to be included with the Grapple Fabrication Data Package. The Test Procedure and Test Report shall be reviewed and concurred by MCE's Quality Assurance Staff. QA will NOT be required to witness testing.

3.2 Duke Engineering Services Hanford (DESH)
Duke Engineering Services is the end user of the grapple. DESH shall review and concure the test procedure, provide an optional witness of test activities - if desired, and review and concure the final test report. Duke Engineering Services shall also provide the required Fuel Basket Receptacle Interface.
4.3 Measurement Ranges and Accuracy
The test loads specified in this procedure are nominal. The test performer shall apply the
nominal load and record the actual load in the data sheet. The minimum increment for the
pressure gauge is 100 psi. It is reasonable that the pressure can be recorded to the nearest 50 psi.
However, to ensure results are conservative, all readings shall be rounded down. Data shall be
recorded in accordance with the tolerances specified on the forms in Appendices A, B, C, D, and
E. Loads applied to the test fixture are derived by dividing the applied pressure by the specified
effective cylinder area in retraction. For the Enerpac RRH-307 cylinder used for this test, the
effective cylinder area in retraction is specified to be 47.1 square inches. Thus, the
corresponding pressure for a 4800 (3200 * 150%) pound load is 1020 psig. For this test,
minimum pressure will be set to 1100 psig or a corresponding load of not less than 5181 pounds.

4.4 Instrument/Equipment Calibration
The measuring devices and the pressure gauge shall be calibrated, and documentation provided
with the test report as a record.

5.0 TEST REPORT
A report shall be prepared presenting the recorded data and observations using completed data
sheets generated during conduct of this test procedure. The report shall include a summary of the
testing performed and the results of the evaluations during testing. A copy of all required Non
Destructive Examinations shall be included with the report.

6.0 CONFIGURATION CONTROL
Prior to initiating formal test activities this test procedure shall be approved and released into
MCE Engineering's document control system. At the test director's and client's mutual
agreement, MINOR procedure changes can be implemented using red-line control. Red-line
mark-ups to the test procedure shall be initialed by the MCE Test Director AND the Authorized
Client Engineering Representative. MINOR procedure changes are changes that streamline test
conduct or alter the sequence of test activities. MAJOR procedure changes that alter the scope or
intent of testing requires signature approval commensurate with original document release and
requires a direct revision to this procedure.

7.0 TEST PROCEDURE
The associated data sheets are listed in Sections 7.1 through 7.4 of this procedure.
Figure 1  Test Apparatus Assembly
**APPENDIX F- TEST REVIEW SHEETS**

1) Identify Test Participants and sign data sheet.

<table>
<thead>
<tr>
<th>Title</th>
<th>Name</th>
<th>Signature</th>
<th>Initials</th>
</tr>
</thead>
<tbody>
<tr>
<td>MCE Test Director</td>
<td>[Signature]</td>
<td>[Signature]</td>
<td>[Initials]</td>
</tr>
<tr>
<td>MCE Test Performer</td>
<td>Eric Standard</td>
<td>[Signature]</td>
<td>[Initials]</td>
</tr>
<tr>
<td>Authorized Client Engineering</td>
<td>[Signature]</td>
<td>[Signature]</td>
<td>[Initials]</td>
</tr>
<tr>
<td>Representative</td>
<td>[Signature]</td>
<td>[Signature]</td>
<td>[Initials]</td>
</tr>
<tr>
<td>Authorized Client QA Representative</td>
<td>[Signature]</td>
<td>[Signature]</td>
<td>[Initials]</td>
</tr>
<tr>
<td>Other (Identify)</td>
<td>[Signature]</td>
<td>[Signature]</td>
<td>[Initials]</td>
</tr>
<tr>
<td>Other (Identify)</td>
<td>[Signature]</td>
<td>[Signature]</td>
<td>[Initials]</td>
</tr>
</tbody>
</table>

2) Verify fabrication traveler for the grapple assembly
   
   Verified by [Signature]

3) Record information for measurement and test equipment
   As a minimum record model number, serial number, and calibration data for the Pressure Gauge and dimensional measurement gauges (Blocks, micrometer gauges, etc.)

<table>
<thead>
<tr>
<th>Description - Model</th>
<th>Serial Number</th>
<th>Calibration Data</th>
<th>Verified By</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accelerator</td>
<td>88451</td>
<td>CAL - 98-125 5/21.97</td>
<td>[Signature]</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>5/3/99</td>
</tr>
</tbody>
</table>

F 1
7.2 APPLY 5181-POUND TEST LOAD

Apply pressure in nominal 100 psig increments until 1100 psig is obtained. Note: the pressure gauge is marked in 100 pound increments; record actual pressure measurements to the degree practical, typically within 50 pounds.

<table>
<thead>
<tr>
<th>PSIG (Nominal)</th>
<th>PSIG (Displayed)</th>
<th>CALCULATED LOAD (PSIG/471)</th>
<th>START TIME</th>
<th>END TIME</th>
<th>NOTES</th>
<th>RECORDED BY</th>
</tr>
</thead>
<tbody>
<tr>
<td>1100 psig</td>
<td>1650</td>
<td>5121 lbs</td>
<td>8:11 AM</td>
<td>8:21 AM</td>
<td>Maintain Load for Minimum of 10 Minutes</td>
<td>54:49</td>
</tr>
</tbody>
</table>

7.3 Remove Grapple from Test Chamber and Inspect

Remove Grapple from Test Chamber and visually inspect the grapple body and actuator rod for any physical damage or local yielding beyond expected deformations. Record Observations Below

No deformations beyond expected.

7.4 Conduct Non Destructive Examinations


471 (1.582 - 8215.71) = 5121 lbs for needed proof load.
7.2 APPLY 5181-POUND TEST LOAD

Apply pressure in nominal 100 pssg increments until 1100 pssg is obtained. Note the pressure gauge is marked in 100 pound increments. Record actual pressure measurements to the degree practical typically within 50 pounds.

<table>
<thead>
<tr>
<th>PSIG (Nominal)</th>
<th>PSIG (Displayed)</th>
<th>CALCULATED LOAD (PSIG/4.71)</th>
<th>START TIME</th>
<th>END TIME</th>
<th>NOTES</th>
<th>RECORDED BY</th>
</tr>
</thead>
<tbody>
<tr>
<td>1100</td>
<td>1700</td>
<td></td>
<td>4:17pm</td>
<td>4:27pm</td>
<td>Maintain Load for Minimum of 10 Minutes</td>
<td>OMC</td>
</tr>
</tbody>
</table>

7.3 Remove Grapple from Test Chamber and Inspect

Remove Grapple from Test Chamber and visually inspect the grapple body and actuator rod for any physical damage or local yielding beyond expected deformations. Record Observations Below

Test Acceptable - No Indications beyond expected.

7.4 Conduct Non Destructive Examinations

Send unit for Non Destructive Examinations. Liquid Penetrant or Magnetic Particle performed using personnel and procedures qualified in accordance with ANSI/ASME Boiler and Pressure Vessel Code 1989, Section V, Articles 16-724 and 25. Acceptance standards shall be as indicated in paragraphs NF 5350 and NF 5340 of the ANSI/ASME Boiler and Pressure Vessel Code 1989, Section III, Division 1. Affix copies or NDE Procedure and Personnel Qualifications to the Test Report.
APPENDIX F - TEST REVIEW SHEETS

7.2 APPLY 5181-POUND TEST LOAD

Apply pressure in nominal 100 psig increments until 1100 psig is obtained. Note: the pressure gauge is marked in 100 pound increments. Record actual pressure measurements to the degree practical, typically within 50 pounds.

<table>
<thead>
<tr>
<th>PSIG (Nominal)</th>
<th>PSIG (Displayed)</th>
<th>CALCULATED LOAD (PSIG/4.71)</th>
<th>START TIME</th>
<th>END TIME</th>
<th>NOTES</th>
<th>RECORDED BY</th>
</tr>
</thead>
<tbody>
<tr>
<td>1019</td>
<td>1650</td>
<td>921#</td>
<td>1:03</td>
<td>4:13</td>
<td>Maintain Load for Minimum of 10 Minutes</td>
<td>A. W. L.</td>
</tr>
</tbody>
</table>

7.3 Remove Grapple from Test Chamber and Inspect

Remove Grapple from Test Chamber and visually inspect the grapple body and actuator rod for any physical damage or local yielding beyond expected deformations. Record Observations Below.

Test Successful - No indications beyond expected.

7.4 Conduct Non Destructive Examinations

Send unit for Non Destructive Examinations - Liquid Penetrant or Magnetic Particle performed using personnel and procedures qualified in accordance with ANSI/ASME Boiler and Pressure Vessel Code 1989 Section V Articles 1, 6, 7, 24, and 25. Acceptance standards shall be as indicated in paragraphs NF-5350 and NF-5340 of the ANSI/ASME Boiler and Pressure Vessel Code 1989 Section III Division 1. Affix copies or NDE Procedure and Personnel Qualifications to the Test Report.
PROCEDURE TITLE: SNF Storage Projects Fuel Basket Handling Grapple Design Development Test Procedure B (Final Review - Revision A Comments Incorporated)

JOB NO: POM-414379, Task 11

APPENDIX F: TEST REVIEW SHEETS

7.2 APPLY 5181-POUND TEST LOAD

Apply pressure in nominal 100 psig increments until 1100 psig is obtained. Note: the pressure gauge is marked in 100 pound increments, record actual pressure measurements to the degree practical typically within 50 pounds.

<table>
<thead>
<tr>
<th>PSIG (Nominal)</th>
<th>PSIG (Display)</th>
<th>CALCULATED LOAD (PSIG/472)</th>
<th>START TIME</th>
<th>END TIME</th>
<th>NOTES</th>
<th>RECORDED BY</th>
</tr>
</thead>
<tbody>
<tr>
<td>1100 1049</td>
<td>1150</td>
<td></td>
<td>3:47PM</td>
<td>3:57PM</td>
<td>Maintain Load for Minimum of 10 Minutes</td>
<td>Doe</td>
</tr>
</tbody>
</table>

7.3 Remove Grapple from Test Chamber and Inspect

Remove Grapple from Test Chamber and visually inspect the grapple body and actuator rod for any physical damage or local yielding beyond expected deformations. Record Observations Below:

Test Successful - No indications beyond expected.

7.4 Conduct Non Destructive Examinations

Send unit for Non Destructive Examinations - Liquid Penetrant or Magnetic Particle performed using personnel and procedures qualified in accordance with ANSI/ASME Boiler and Pressure Vessel Code 1989 Section V Articles 16724 and 25. Acceptance standards shall be as indicated in paragraphs NF 5350 and NF 5340 of the ANSI/ASME Boiler and Pressure Vessel Code 1989 Section III Division 1. Affix copies or NDE Procedure and Personnel Qualifications to the Test Report.
7.2 APPLY 5181-POUND TEST LOAD

Apply pressure in nominal 100 psig increments until 1100 psig is obtained. Note the pressure gauge is marked in 100 pound increments, record actual pressure measurements to the degree practical typically within 50 pounds.

<table>
<thead>
<tr>
<th>PSIG (Nominal)</th>
<th>PSIG (Displayed)</th>
<th>CALCULATED LOAD (PSIG/4 71)</th>
<th>START TIME</th>
<th>END TIME</th>
<th>NOTES</th>
<th>RECORDED BY</th>
</tr>
</thead>
<tbody>
<tr>
<td>1100 psig</td>
<td>1650</td>
<td>4927.4 lb</td>
<td>3:30 PM</td>
<td>3:42 PM</td>
<td>Maintain Load for Minimum of 10 Minutes</td>
<td><strong>Doe</strong></td>
</tr>
</tbody>
</table>

7.3 Remove Grapple from Test Chamber and Inspect

Remove Grapple from Test Chamber and visually inspect the grapple body and actuator rod for any physical damage or local yielding beyond expected deformations. Record Observations Below.

Test Successful No Indications Beyond Expected

7.4 Conduct Non Destructive Examinations

Send unit for Non Destructive Examinations - Liquid Penetrant or Magnetic Particle performed using personnel and procedures qualified in accordance with ANSI/ASME Boiler and Pressure Vessel Code 1989 Section V Articles 1 6 7 24 and 25. Acceptance standards shall be as indicated in paragraphs NF 5350 and NF-5340 of the ANSI/ASME Boiler and Pressure Vessel Code 1989 Section III Division 1. Affix copies of NDE Procedure and Personnel Qualifications to the Test Report.
APPENDIX F- TEST REVIEW SHEETS

7.2 APPLY 5181-POUND TEST LOAD

Apply pressure in nominal 106 psig increments until 1100 psig is obtained. Note: the pressure gauge is marked in 100 pound increments; record actual pressure measurements to the degree practical typically within 50 pounds.

<table>
<thead>
<tr>
<th>PSIG (Nominal)</th>
<th>PSIG (Displayed)</th>
<th>CALCULATED LOAD (PSIG/4 71)</th>
<th>START TIME</th>
<th>END TIME</th>
<th>NOTES</th>
<th>RECORDED BY</th>
</tr>
</thead>
<tbody>
<tr>
<td>1100 psi</td>
<td>1200</td>
<td>4927</td>
<td>3:15 PM</td>
<td>3:35</td>
<td>Maintain Load for Minimum of 10 Minutes</td>
<td>5/31/99</td>
</tr>
</tbody>
</table>

7.3 Remove Grapple from Test Chamber and Inspect

Remove Grapple from Test Chamber and visually inspect the grapple body and actuator rod for any physical damage or local yielding beyond expected deformations. Record Observations Below:

Test Successful No Indications Beyond Expected

7.4 Conduct Non Destructive Examinations

Send unit for Non Destructive Examinations - Liquid Penetrant or Magnetic Particle performed using personnel and procedures qualified in accordance with ANSI/ASME Boiler and Pressure Vessel Code 1989, Section V Articles 1, 7, 24, and 25. Acceptance standards shall be as indicated in paragraphs NF 5350 and NF-5340 of the ANSI/ASME Boiler and Pressure Vessel Code 1989, Section III Division 1. Affix copies of NDE Procedure and Personnel Qualifications to the Test Report.

\[
4.71 \times (1200 \times 825 - 205) = 4927
\]
## APPENDIX F - TEST REVIEW SHEETS

Apply pressure in nominal 100 psig increments until 1100 psig is obtained. Note the pressure gauge is marked in 100 pound increments; record actual pressure measurements to the degree practical, typically within 50 pounds.

<table>
<thead>
<tr>
<th>PSIG (Nominal)</th>
<th>PSIG (Displayed)</th>
<th>CALCULATED LOAD (PSIG/4.71)</th>
<th>START TIME</th>
<th>END TIME</th>
<th>NOTES</th>
<th>RECORDED BY</th>
</tr>
</thead>
<tbody>
<tr>
<td>1000 psig</td>
<td>1650</td>
<td>31</td>
<td>2:40 PM</td>
<td>3:00 PM</td>
<td>Maintain Load for Minimum of 10 Minutes</td>
<td>JACE</td>
</tr>
</tbody>
</table>

7.3 Remove Grapple from Test Chamber and Inspect

Remove Grapple from Test Chamber and visually inspect the grapple body and actuator rod for any physical damage or local yielding beyond expected deformations. Record Observations Below:

- Displayed pressure adjusts for 33% calibration change in gauge (see graph of pressures)
- Test Successful. No indications beyond expected

7.4 Conduct Non Destructive Examinations


\[ \Delta 7.1(1650 - 25) = 5(2.1) \]
## APPENDIX F- TEST REVIEW SHEETS

### 7.2 APPLY 5181-POUND TEST LOAD

Apply pressure in nominal 100 psig increments until 1100 psig is obtained. Note: the pressure gauges are marked in 100-pound increments, record actual pressure measurements to the nearest practical value typically with a 50-pound increment.

<table>
<thead>
<tr>
<th>Nominal (psig)</th>
<th>Displayed</th>
<th>Calculated Load (psig/471)</th>
<th>Start Time</th>
<th>End Time</th>
<th>Notes</th>
<th>Recorded By</th>
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<tbody>
<tr>
<td>1100</td>
<td>1700</td>
<td>471</td>
<td>2:23</td>
<td>2:41</td>
<td>Maintain load for minimum of 10 minutes</td>
<td>ELS</td>
</tr>
</tbody>
</table>

### 7.3 Remove Grapple from Test Chamber and Inspect

Remove grapple from test chamber and visually inspect the grapple body and actuator rod for any physical damage or local yielding beyond expected deformations. Record observations below.

Test successful. No indicators beyond expected.

### 7.4 Conduct Non Destructive Examinations

Send unit for non-destructive examinations - Liquid Penetrant or Magnetic Particle, performed using personnel and procedures qualified in accordance with ANSI/ASME Boiler and Pressure Vessel Code, 1989, Section V, Articles 1, 6, 7, 24, and 25. Acceptance standards shall be as indicated in paragraphs NF-5550 and NF-5570 of the ANSI/ASME Boiler and Pressure Vessel Code, 1989, Section III, Division 1. Affix copies of NDE Procedure and Personnel Qualifications to the Test Report.

---

5/6/99

SNF-5558, Rev 0
Appendix B

Ashcroft Pressure Gauge Calibration

Serial Number Q 8451
Ashcroft Calibration Data  TAG NO  BEL99 251  Expires 5/5/2000

Reference Pressure  Ashcroft Displayed
1999 629  1400
3999 188  2900
5999 123  4450
7999 107  6000
9999 966  7600

Pressure As Found = 179.7 + 775(Actual Pressure)
or
Actual Pressure = (As Found Pressure +179.7)/775

Test Load = Actual Pressure × Area of Cylinder
Where Area of Cylinder = 4.71 Square Inches

Test Load = ((Ashcroft Pressure +179.7)/775) × 4.71

<table>
<thead>
<tr>
<th>Ashcroft Pressure</th>
<th>Actual Pressure</th>
<th>Test Load</th>
<th>Overload</th>
</tr>
</thead>
<tbody>
<tr>
<td>1650</td>
<td>2360.90</td>
<td>11119.85</td>
<td>3474954</td>
</tr>
<tr>
<td>1700</td>
<td>2425.42</td>
<td>11423.73</td>
<td>3569914</td>
</tr>
<tr>
<td>1650</td>
<td>2360.90</td>
<td>11119.85</td>
<td>3474954</td>
</tr>
<tr>
<td>1650</td>
<td>2360.90</td>
<td>11119.85</td>
<td>3474954</td>
</tr>
<tr>
<td>1650</td>
<td>2360.90</td>
<td>11119.85</td>
<td>3474954</td>
</tr>
<tr>
<td>1600</td>
<td>2296.39</td>
<td>10815.98</td>
<td>3376995</td>
</tr>
<tr>
<td>1650</td>
<td>2360.90</td>
<td>11119.85</td>
<td>3474954</td>
</tr>
<tr>
<td>1700</td>
<td>2425.42</td>
<td>11423.73</td>
<td>3569914</td>
</tr>
<tr>
<td>2807</td>
<td>3853.81</td>
<td>18151.43</td>
<td>5672321</td>
</tr>
</tbody>
</table>
**Belhaven**

**Calibration Data Sheet**

Tag No: BEL99-251

Instrument Type: Pressure Gauge

Manufacturer: Ashcroft

Serial No:

Model:

Cal Due Date: 5/5/2000

System:

Special Instructions: LIMITED CALIBRATION  This gauge does not meet mfg tolerances  The gauge is certified to have an accuracy of +/− 25% FS (2500 PSI)

<table>
<thead>
<tr>
<th>Cal Point</th>
<th>As Found</th>
<th>As Left</th>
<th>% Full Scale Accuracy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Units PSI</td>
<td>-5 9963</td>
<td>-10 9919</td>
<td>-15 4912</td>
</tr>
<tr>
<td>1999 629</td>
<td>1400</td>
<td>1400</td>
<td>-5 9963</td>
</tr>
<tr>
<td>3999 188</td>
<td>2900</td>
<td>2900</td>
<td>-10 9919</td>
</tr>
<tr>
<td>5999 123</td>
<td>4450</td>
<td>4450</td>
<td>-15 4912</td>
</tr>
<tr>
<td>7999 107</td>
<td>6000</td>
<td>6000</td>
<td>-19 9911</td>
</tr>
<tr>
<td>9998 968</td>
<td>7600</td>
<td>7600</td>
<td>-23 9897</td>
</tr>
</tbody>
</table>

Permitted Variation: 2500 0000 PSI

Cal Temp: 68 F

Test Equipment: Armetek Deadweight Tester  S/N 16132

Calibration Performed By: 

Date: 5-5-1999

**ORIGINAL**
Internal Memo

To 
 Dick Nelson, QA
From 
 Eric Straalsund, Engineering
Subject 
 Ashcroft Pressure Gauge Calibration
Date 
 5/22/98

On 5/21/98 I sent the Ashcroft Pressure Gauge Serial # Q-8451 to Bellhaven Instruments for its annual calibration. The Gauge received a 'LIMITED' calibration as it was reading approximately 25% lower than expected values.

Bellhaven provided MCE Engineering with the calibration curve and I have in turn plotted the data and calculated the best fit linear equation. Copies of the calibration data and best fit equation are provided with this memo.

For the upcoming Grapple Load Test (QA Class General Service), I propose using the Ashcroft Gauge and normalizing the resultant data with the calibration data.

Linear Fit \( y = a + bx \)
Coefficient Data
\( a = -269.04762 \)
\( b = 0.82214266 \)

Desired Test Pressure is 1100 PSI. Solve for Display Pressure from above linear equation:
\[ 1100 = 269.04 + (0.822)x \]
\[ X = 1665 \text{ Lbs} \]
**Calibration Data Sheet**

**Tag No:** CAL98 95  
**DS Number:** BEL98-160

**Instrument Type:** Pressure Gauge 0-10K psi  
**Manufacturer:** Ashcroft  
**Serial No:** Q-8451  
**Model:** 0-10K

**Tolerances:** 35%  
**Manufacturer Data Only**

**Calibration Due Date:** 5/21/99

---

**Special Instructions**

---

<table>
<thead>
<tr>
<th>Proc Step No</th>
<th>Function Tested</th>
<th>Required Values PSI</th>
<th>As Found PSI</th>
<th>As Left PSI</th>
<th>% Out of Tol</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>1000 psi</td>
<td>650 psi</td>
<td>650 psi</td>
<td>-35.00%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2000 psi</td>
<td>1350 psi</td>
<td>1350 psi</td>
<td>-32.50%</td>
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<tr>
<td></td>
<td></td>
<td>3000 psi</td>
<td>2150 psi</td>
<td>2150 psi</td>
<td>-26.33%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5000 psi</td>
<td>3700 psi</td>
<td>3700 psi</td>
<td>-26.00%</td>
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<tr>
<td></td>
<td></td>
<td>9000 psi</td>
<td>7500 psi</td>
<td>7500 psi</td>
<td>-16.67%</td>
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<tr>
<td></td>
<td></td>
<td>10000 psi</td>
<td>7700 psi</td>
<td>7700 psi</td>
<td>-23.00%</td>
</tr>
</tbody>
</table>

**Test Equipment**

- Transcat Digital Pressure Gauge, S/N 590765, Cal Due Date 7/23/98  
- TAR of Gauge 25% Full Scale (10K psi)

- Ametek Dead Weight Tester, S/N 16132, Cal Due Date 1/22/99

---

**Calibrated By:** 
**Date:** 5/21/99

**Checked By:** 
**Date:**

**Approved By:** 
**Date:**
Certificate of Calibration

Tag: CAL98-95  Model: 0-10K  Manufacturer: Ashcroft

Instrument: Pressure Gauge 0-10K psi  Serial No: Q-8451

Calibration traceable to the National Institute of Standards and Technology in accordance with ANSI- Z540 1 has been accomplished on the above-named instrument by comparison with standards maintained by Belhaven. The accuracy and stability of all standards maintained by Belhaven are traceable to national standards maintained by the National Institute of Standards and Technology in Washington, D.C. and Boulder, Colorado.

Temperature at Calibration: 70°F
Accuracy of Instrument: Limited Calibration  See Data sheet
Calibrated Range: 1000 - 10000 psi
Calibration Report No: BEL98 160
Date Due: 5/21/99

Test Equipment:
Transcat Digital Pressure Gauge, S/N 590765, Cal Due Date 7/23/98
TAR of Gauge 25% Full Scale (10K psi)

Ametek Dead Weight Tester, S/N 16132, Cal Due Date 1/22/99

Calibrated by: [Signature] 5-21-98
Certified by: [Signature] 5-21-98

Quality Assurance Manager.
Appendix C

Liquid Penetrant Examination Reports
**Liquid Penetrant Examination Report**

**Examined For**
- G & M Machine: [Information Missing]
- Project or Location: [Information Missing]
- Date: 5-3-99

**Procedure No**
- NDE 03

**Examination Std**
- ASME Sec V

**Acceptance Std**
- AWS DI 1

**Item**
- Actuator Shaft (before test)

**Dwg**
- Des 121

**Materials**
- C/S S/S ALUM

**Cleaner**
- DublChek 60

**Penetrant**
- DublChek 40

**Developer**
- DublChek 100

**Surface of Shaft #5, 6, 8**
- XXX
- No indication noted

---

**Examined by**
- Sam Wellenbrock

**Level**
- II

**Date**
- 5-3-99
### Liquid Penetrant Examination Report

<table>
<thead>
<tr>
<th>Item</th>
<th>Procedure No</th>
<th>Examination Std</th>
<th>Material</th>
<th>Acceptance Std</th>
</tr>
</thead>
<tbody>
<tr>
<td>Actuator Shaft (after test)</td>
<td>NDE 03</td>
<td>Dwg Des 121</td>
<td>C/S</td>
<td>AWS D11</td>
</tr>
<tr>
<td>Cleaner</td>
<td>DublChek 60</td>
<td></td>
<td>C/S</td>
<td></td>
</tr>
<tr>
<td>Penetrant</td>
<td>DublChek 40</td>
<td></td>
<td>S/S</td>
<td></td>
</tr>
<tr>
<td>Developer</td>
<td>DublChek 100</td>
<td></td>
<td>ALUM</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Area</th>
<th>Accept</th>
<th>Reject</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surface of Shaft #1, 2, 4</td>
<td>XXX</td>
<td>No indications noted</td>
<td></td>
</tr>
<tr>
<td></td>
<td>XXX</td>
<td>No indications noted</td>
<td></td>
</tr>
</tbody>
</table>

Examined by: Sam Wellenbrock  
Level: 11  
Date: 5-4-99