Periodic Inspection of Below-the-Hook Lifting Devices at Tank Farms

Tank Farm Plant Maintenance Procedure

MAINTENANCE

USQ # N/A-4

CHANGE HISTORY (≤ LAST 5 REV-MODS)

<table>
<thead>
<tr>
<th>Rev-Mod</th>
<th>Release Date</th>
<th>Justification</th>
<th>Summary of Changes</th>
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<tr>
<td>A-0</td>
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<td>New Procedure</td>
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1.0 PURPOSE AND SCOPE

1.1 Purpose

This procedure is a uniform way to inspect Below-the-Hook lifting devices and their attachments in accordance with DOE-RL-92-36, Hanford Hoisting and Rigging Manual.

1.2 Scope

This procedure applies to the inspection of Below-the-Hook Lifting Devices and their attachments in accordance with DOE-RL-92-36, Hanford Hoisting and Rigging Manual.

2.0 INFORMATION

2.1 General Information

2.1.1 Requirements for periodic inspection of Below-the-Hook Lifting Devices are controlled by DOE-RL-92-36 Hanford Hoisting and Rigging Manual.

2.1.2 Below-the-Hook Lifting Devices inspected will include but are not limited to:
- Structural and Mechanical Lifting Devices
- Wire Rope Slings
- Alloy Steel Chain Slings
- Hook Inspection
- Lifting Magnets

2.1.3 The subsections within 5.0 can be worked independently, concurrently, or in parallel with other sections as directed by the field work supervisor with those directions recorded in the Work Record or Comments Section of the Data Sheet.

2.2 Terms and Definitions

NDE – Non Destructive Examination

QWRI – Qualified Wire Rope Inspector

VI – Vendor Information
3.0 PRECAUTIONS AND LIMITATIONS

3.1 Personnel Safety

3.1.1 If a lock and tag is required during the performance of this procedure, perform Lockout/Tagout in accordance with DOE-0336, Hanford Site Lockout/Tagout Procedure.

3.2 Radiation and Contamination control

3.2.1 Work in radiological areas will be performed using a radiological work permit following review by Radiological Control per ALARA Work Planning procedure TFC-ESHQ-RP_RWP-C-03.

3.3 Environmental

If any hazardous waste is generated during performance of this procedure, consult with Facility/Plant/Area Hazardous Waste Coordinator for Specific instructions to ensure compliance with all environmental standards for disposal.
4.0 PREREQUISITES

4.1 Special Tools, Equipment, and Supplies

Measuring and Test Equipment (M&TE) used to collect quantitative data during performance of this procedure shall meet the following requirements:

- Be within its current calibration cycle as evidenced by an affixed calibration label
- Be capable of desired range
- Have an accuracy with state-of-the-art limitations equal to or greater than input tolerance specified on PM Data Sheet

OR

At least 4 times greater than specified device tolerance.

The following supplies may be needed to perform this procedure:

- Dial Calipers, graduated in .001-in increments
- Measuring tape or rule with minimum graduations of 1/32-in.
- Clean cloths rags
- “DO NOT OPERATE” tags (Not to be confused with a Danger Do Not Operate tag used for Lock Out/Tag Out)
- Flashlight
- Magnifying glass
- Angle Finder or Protractor
- Other tools as required by the FWS.

4.2 Performance Documents

The following documents may be needed to perform this procedure:

- Vendor Information ie., drawings (if applicable)
- Equipment History File, Load Test Information, CMTRs, Data Sheets
- Waste planning checklist.
4.0 PREREQUISITES (CONT.)

4.3 Field Preparation

4.3.1 Obtain release from Operations prior to beginning performance of this procedure.

4.3.2 For potentially contaminated equipment, obtain radiological survey prior to beginning inspection or removal of equipment or component from is location for inspection.

4.3.3 **FWS VERIFIES** a Qualified Inspector performs the periodic inspection on all below the hook lifting devices.
5.0 PROCEDURE

NOTE - The subsections within 5.0 can be worked independently, concurrently, or in parallel with other sections as directed by the FWS with those directions recorded on work record or Comments Section of the Data Sheet.

5.1 Structural and Mechanical Lifting Devices

5.1.1 COMPLETE inspection report for each lifting device identified in the Data Sheet.

Structural Components

5.1.2 INSPECT spreader beam for the following (Table 3):

- Missing or illegible lifter identification. If lifting device comprises several lifting devices that can be detached, each individual lifting device shall be marked.
- Structural members for deformation, cracks or excessive wear on any part of the lifter.
- Loose or missing guards, fasteners, covers stops or nameplates
- All functional operating mechanisms and automatic hold-and-release mechanisms for misadjustments interfering with operation
- Loose bolts or fasteners
- Cracked or worn gears, pulleys, sheaves, sprockets, bearings, chains, and belts
- Excessive wear of friction pads, linkages and other mechanical parts
- Excessive wear at hoist hooking points and load support clevises or pins.

5.1.3 CLOSELY INSPECT welded areas that are covered by paint.

5.1.4 IF any conditions are found that impact the safe operation of the equipment, ATTACH a DO NOT OPERATE tag to the equipment AND NOTIFY Operations or Facility Manager and Maintenance Manager.

5.1.5 RECORD results of inspection on the Data Sheet.
Wire Rope Slings

NOTE - Wire rope slings covered in this section are attached to or are part of the Structural and Mechanical Lifting Device.

5.1.6 INSPECT wire rope slings for the following:
- Missing or illegible sling identification
- 10 randomly distributed broken wires in one rope lay, or 5 broken wires on one strand in one rope lay (for stand-laid and single-part slings)
- Broken wires in braided and cable-laid slings meeting or exceeding the values in (Table 1)
- Severe localized abrasion or scraping
- Kinking, crushing, birdcaging, or any other damage resulting from distortion of the rope’s structure
- Any evidence of heat damage
- End attachments that are cracked, deformed or worn to the extent that the strength of the sling is substantially affected
- Severe corrosion of the rope or end attachments.

5.1.7 IF any wire rope sling is found with any defects found in Step 5.1.6 above, ATTACH a DO NOT OPERATE tag to the equipment AND NOTIFY Operations or Facility Manager and Maintenance Manager.

5.1.8 RECORD results of inspection on the Data Sheet.
Alloy Steel Chain Slings

NOTE - Alloyed Steel Chain slings covered in this section are attached to or are part of the Structural and Mechanical Lifting Device.

5.1.9 INSPECT each chain link for the following: (Figure 1)
- Missing or illegible sling identification
- Cracks or Breaks
- Excessive wear nicks or gouges (Table 2)
- Stretched chain links or components
- Bent, twisted or deformed chain links or components
- Weld Splatter
- Evidence of heat damage
- Excessive pitting or corrosion
- Lack of hinged components from articulating freely
- Weld splatter
- Other conditions including visible damage that cause doubt as to the continued use of the chain sling.

5.1.10 IF any alloy steel chain sling is found with any defects found in Step 5.1.9 above, ATTACH a DO NOT OPERATE tag to the equipment AND NOTIFY Operations or Facility Manager and Maintenance Manager.

5.1.11 RECORD results of inspection on the Data Sheet.
Hook Inspection

NOTE - Hooks covered in this section are attached to or are part of the Structural and Mechanical Lifting Device.

5.1.12 **INSPECT** each hook for the following:
- Missing or illegible manufacturer’s identification
- Missing or illegible rated load identification
- Excessive pitting or corrosion
- Cracks, nicks or gouges
- Wear – any wear exceeding 10% of the original section dimension of the hook or its load pin (as directed by manufacturer)
- Deformation – any visibly apparent bend or twist from the plane of the unbent hook.
- Throat opening – any distortion causing an increase in throat opening of 5% not to exceed ¼ inch
- Inability to lock – any self-locking hook that does not lock
- Inoperative latch – any damaged or malfunctioning latch that does not close the hooks throat
- Damaged, missing, or malfunctioning hook attachment and securing means
- Thread wear, damage or corrosion
- Evidence of excessive heat exposure, or unauthorized welding
- Evidence of unauthorized alterations such as drilling, machining, grinding or other modifications.

5.1.13 **RECORD** hook dimensions on Hook Identification Record Data Sheets. (Figure 2)

5.1.14 IF any hook is found with any defects found in Step 5.1.12 above, **ATTACH** a DO NOT OPERATE tag to the equipment AND **NOTIFY** Operations or Facility Manager and Maintenance Manager.

5.1.15 **RECORD** results of inspection on the Data Sheet.
5.2 Lifting Magnets

5.2.1 COMPLETE inspection report for each lifting magnet identified in the Data Sheet.

5.2.2 INSPECT lifting magnet for the following:
- Cleanliness of magnetic surface.
- Missing or illegible lifter identification. If lifting device comprises several lifting devices that can be detached, each individual lifting device shall be marked.
- Structural members for deformation, cracks or excessive wear on any part of the lifter.
- Loose or missing guards, fasteners, covers stops or nameplates
- All functional operating mechanisms and automatic hold-and-release mechanisms for misadjustments interfering with operation
- Loose bolts or fasteners
- Cracked or worn gears, pulleys, sheaves, sprockets, bearings, chains, and belts
- Excessive wear of friction pads, linkages and other mechanical parts
- Excessive wear at hoist hooking points, load support clevises or pins
- Locks, switches, warning labels and lifting parts for deformation wear or corrosion
- Electrical power supply, equipment, controls, meters indicators and alarms for proper operation
- Lifting magnet coil ohm and ground readings.

5.2.3 IF any conditions are found that impact the safe operation of the equipment, ATTACH a DO NOT OPERATE tag to the equipment AND NOTIFY Operations or Facility Manager and Maintenance Manager.

5.2.4 RECORD results of inspection on the Data Sheet.
5.3 Lifting Clamps

5.3.1 COMPLETE inspection report for each Lifting Clamp identified in the Data Sheet.

5.3.2 INSPECT Lifting Clamps for the following:
- Deformation, cracks, or wear
- Loose or missing guards, fasteners, covers, stops or nameplates
- Excessive pitting, corrosion, nicks or gouges
- Indications of heat damage, including weld splatter, arc strikes, or evidence of unauthorized welding or modification
- Improper assembly or unauthorized replacement components
- Severely, worn, broke, chipped, damaged, clogged gripping teeth
- Contamination, excessive surface wear, lack of material integrity or bonding of the gripping surface.
- Damaged or distorted pins
- Severely worn, bent, distorted, stretched, cracked or broken bail
- Cracked welds
- Bent, twisted, distorted, stretched, elongated pins holes
- Damaged, distorted, or worn threads including foreign material on threads
- Impaired, seized or bound cam linkage, ball movement, or locking lever
- Broken, deformed or missing springs
- Broken, worn or loose cams.

5.3.3 IF any lifting clamp is found with any defects found in Step 5.3.2 above, ATTACH a DO NOT OPERATE tag to the equipment AND NOTIFY Operations or Facility Manager and Maintenance Manager.

5.3.4 RECORD results of inspection on the Data Sheet.
5.4 **Restoration**

5.4.1 **NOTIFY** operations and construction management that procedure is complete.

5.4.2 **ENSURE** equipment has been restored to original configuration.

5.4.3 Once inspection is completed and accepted, **ENSURE** a tag is affixed to the device stating the load test date and next inspection due date. (Figure 3)

5.4.4 **ENSURE** Test Equipment information and calibration status are recorded on Data Sheet.

5.4.5 **IF** any problems were encountered with this procedure, **INFORM** FWS.

5.5 **Acceptance Criteria**

5.5.1 Acceptance Criteria has been met when steps in this procedure have been satisfactorily performed and As-Left values meet the specifications and tolerance(s) per the Data Sheet.

5.6 **Review**

5.6.1 **INFORM** FWS test is complete.

5.6.2 **FWS REVIEW AND ENSURE** the following:
   - Completed Data Sheets meet the acceptance criteria.
   - Comments sections are filled out appropriately.
   - Inspection records are sent to equipment custodian to be maintained in equipment history file.

5.7 **Records**

This procedure is performed within a work package, as such, the procedure in its entirety will be maintained as a record per the Work Control process.

The record custodian identified in the Company-level Records Inventory and Disposition Schedule (RID) is responsible for record retention in accordance with TFC-BSM-IRM_DC-C-02.
Figure 1 – Chain Inspection

**Look for Chain Stretch During Inspection**

- New Link: Links will ease up and elongate.
- Stretched Link: Measure 12 links of new chain.
- Compare New to Used: Measure 12 links of used chain.

**Inspect All Links for Bends, Twists, and Other Damage**

- Bend: Twisted

**Inspect All Links for Wear at the Bearing Surfaces**

- Inspect all links for wear at bearing surfaces.
- Measure the remaining material and discard if it is less than allowed by manufacturer.
- Look for extreme wear at bearing surfaces.

**Inspect All Links for Gouges, Cuts, Nicks, Cracks and Abrasion**

- Nicks, Gouges, Cuts
- Abrasion
- Cracks
Periodic Inspection of Below-the-Hook Lifting Devices at Tank Farms

Figure 2 – Hook Inspection

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

HOOK INSPECTION INFORMATION
The measurement between 'A' punchmarks is a reference standard to compare this dimension with. Hooks with manufacturer indicators also may be used for quick check measurement of the throat opening.
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Figure 3 – Sling Identification Tag
### Table 1 – Wire Rope Inspection Criteria

**ALLOWABLE BROKEN WIRES IN BRAIDED AND CABLE LAID SLINGS**

<table>
<thead>
<tr>
<th>Sling Body</th>
<th>Allowable Broken Wires per Lay or One Braid</th>
<th>Allowable Broken Strands per Sling Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 8 Part Braid</td>
<td>20</td>
<td>1</td>
</tr>
<tr>
<td>Cable Laid</td>
<td>20</td>
<td>1</td>
</tr>
<tr>
<td>8 Part and More</td>
<td>40</td>
<td>1</td>
</tr>
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### Periodic Inspection of Below-the-Hook Lifting Devices at Tank Farms

**Table 2 – Allowable Alloy Chain Link Wear**

<table>
<thead>
<tr>
<th>Nominal Chain or Coupling Link Size (inches)</th>
<th>Maximum Allowable Wear of Cross-Sectional Diameter (inches)</th>
<th>Remove from Service Dimension* (inches)</th>
</tr>
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<tbody>
<tr>
<td>9/32</td>
<td>3/64</td>
<td>15/64</td>
</tr>
<tr>
<td>3/8</td>
<td>5/64</td>
<td>19/64</td>
</tr>
<tr>
<td>1/2</td>
<td>7/64</td>
<td>19/64</td>
</tr>
<tr>
<td>5/8</td>
<td>9/64</td>
<td>31/64</td>
</tr>
<tr>
<td>3/4</td>
<td>10/64</td>
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<td>7/8</td>
<td>11/64</td>
<td>45/64</td>
</tr>
<tr>
<td>1</td>
<td>12/64</td>
<td>13/16</td>
</tr>
<tr>
<td>1-1/4</td>
<td>16/64</td>
<td>1</td>
</tr>
</tbody>
</table>

*When smallest section of link is less than these dimensions.*
# Table 3 – Spreader Beam Inspection Criteria

<table>
<thead>
<tr>
<th>Item</th>
<th>Normal Service</th>
<th>Heavy Service</th>
<th>Severe Service</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>Visual Monthly Note (1)</td>
<td>Visual Weekly To Monthly Note (1)</td>
<td>Record Semiannually Note (3)</td>
</tr>
<tr>
<td><strong>Frequent Inspection</strong> – structural deformation, cracks, or excessive wear of any part of the lifter</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Loose or missing guards, fasteners, covers, stops, or nameplates</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>All functional operating mechanisms and automatic hold and release mechanisms for maladjustments interfering with operation</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td><strong>Period Inspection</strong> – loose bolts or fasteners</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Cracked or worn gears, pulleys, sheaves, sprockets, bearings, chains, and belts</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Excessive wear of hoist hooking points and load support clevises or pins</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>

Notes: (1) by the operator or designated person with records not required.
(2) Visual inspection by the designated person making records of apparent external conditions to provide the basis for a continuing evaluation.
(3) As in note (2) unless external conditions indicate that disassembly should be done to permit detailed inspection.