



National Aeronautics and  
Space Administration

**John C. Stennis Space Center**  
Stennis Space Center, MS 39529-6000

**SWI-8834-0001 Rev 7**  
**March 2022**

# **John C. Stennis Space Center Lifting Devices and Equipment Management Instructions**

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|-----------------------------------------------------------------------|-----------------|----------------|
| Stennis<br>Work<br>Instruction                                        | SWI-8834-0001   | 7              |
|                                                                       | <i>Number</i>   | <i>Rev.</i>    |
|                                                                       | Effective Date: | March 18, 2022 |
|                                                                       | Review Date:    | March 18, 2027 |
| Page 2 of 36                                                          |                 |                |
| Responsible Office: RA00/Center Operations Directorate                |                 |                |
| <b>SUBJECT: Lifting Devices and Equipment Management Instructions</b> |                 |                |

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|-----------------------------------------------------------------------|-----------------|----------------|
| Stennis<br>Work<br>Instruction                                        | SWI-8834-0001   | 7              |
|                                                                       | <i>Number</i>   | <i>Rev.</i>    |
|                                                                       | Effective Date: | March 18, 2022 |
|                                                                       | Review Date:    | March 18, 2027 |
| Page 3 of 36                                                          |                 |                |
| Responsible Office: RA00/Center Operations Directorate                |                 |                |
| <b>SUBJECT: Lifting Devices and Equipment Management Instructions</b> |                 |                |

## Document History Log

| Status/Change/<br>Revision | Change Date | Originator/Phone         | Description                                                                                                                                                                                                                                                      |
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| Rev 1                      | 7/9/02      | Rich Harris, X3790       | Revision incorporating NASA-STD-8719.9                                                                                                                                                                                                                           |
| Rev 2                      | 1/21/03     | Rich Harris, X3790       | All, Additional incorporation of NASA-STD-8719.9                                                                                                                                                                                                                 |
| Rev 3                      | 04/24/03    | Rich Harris, X3790       | Added Paras 1.5, 1.15, 1.16, 1.17, Section 12 in full                                                                                                                                                                                                            |
| Rev 4                      | 06/16/06    | Rich Harris, X3790       | Deleted old para 3.3 EXCEPTIONS, deleted Inventory of Cranes, various minor changes. Reformatted to meet requirements of SPR 1400.1. Section titles/paragraphs added or rearranged and renumbered. Title amended from Management Plan to Management Instructions |
| Rev 5                      | 03/20/07    | Rich Harris,X8-3790      | Added new requirement paragraph 1.5. Renumbered existing 1.5 to 1.6.                                                                                                                                                                                             |
| Rev 5-1                    | 3/6/2014    | Brennan Sanders, X8-3243 | Administrative Changes. Added number 11 to section 3.3.a                                                                                                                                                                                                         |
| Rev 5-2                    | 9/3/2014    | Brennan Sanders, X8-3243 | Administrative changes. Updated 10.5.1, Overhead Crane & Hoist Operator Daily or Pre-Use Checklist.                                                                                                                                                              |
| Rev. 5-3                   | 8/13/2015   | Brennan Sanders, X8-3243 | Administrative changes. Updated 3.5 for clarity.                                                                                                                                                                                                                 |
| Rev. 6                     | 01/13/2017  | Todd Mannion X8-2713     | Administrative changes.                                                                                                                                                                                                                                          |
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|                                                                       |                 |                |
|-----------------------------------------------------------------------|-----------------|----------------|
| Stennis<br>Work<br>Instruction                                        | SWI-8834-0001   | 7              |
|                                                                       | <i>Number</i>   | <i>Rev.</i>    |
|                                                                       | Effective Date: | March 18, 2022 |
|                                                                       | Review Date:    | March 18, 2027 |
| Page 4 of 36                                                          |                 |                |
| Responsible Office: RA00/Center Operations Directorate                |                 |                |
| <b>SUBJECT: Lifting Devices and Equipment Management Instructions</b> |                 |                |

## Table of Contents

|            |                                                                        |           |
|------------|------------------------------------------------------------------------|-----------|
| <b>1.0</b> | <b>OVERVIEW.....</b>                                                   | <b>7</b>  |
| 1.1        | Purpose.....                                                           | 7         |
| 1.2        | Applicability .....                                                    | 7         |
| 1.3        | Applicable Equipment .....                                             | 7         |
| 1.3.1      | Overhead and Gantry Cranes .....                                       | 8         |
| 1.3.2      | Mobile Cranes and Derricks.....                                        | 8         |
| 1.3.3      | Hoists and Winches .....                                               | 8         |
| 1.3.4      | Hoist-Supported Personnel Lifting Devices.....                         | 8         |
| 1.3.5      | Load Positioning and Load Measuring Devices.....                       | 8         |
| 1.3.6      | Hooks.....                                                             | 8         |
| 1.3.7      | Jacks .....                                                            | 8         |
| 1.3.8      | Slings and Rigging Hardware.....                                       | 9         |
| 1.3.9      | Mobile Aerial Platforms .....                                          | 9         |
| 1.3.10     | High Lift Industrial Trucks.....                                       | 9         |
| 1.4        | References and Forms.....                                              | 9         |
| 1.5        | Definitions and Requirements for LDE Operations.....                   | 10        |
| 1.5.1      | Critical Lifts .....                                                   | 10        |
| 1.5.2      | Engineered Lifts .....                                                 | 11        |
| 1.5.3      | Noncritical Lifts .....                                                | 11        |
| 1.5.4      | Severe Service Environments.....                                       | 11        |
| 1.6        | Suspended Load Operations .....                                        | 11        |
| <b>2.0</b> | <b>ROLES AND RESPONSIBILITIES.....</b>                                 | <b>12</b> |
| 2.1        | NASA Lifting Device and Equipment Manager (LDEM).....                  | 12        |
| 2.2        | Alternate NASA Lifting Device and Equipment Manager.....               | 12        |
| 2.3        | Synergy Achieving Consolidated Operations and Maintenance (SACOM)..... | 13        |
| 2.4        | Employees.....                                                         | 13        |
| <b>3.0</b> | <b>OPERATIONAL RESPONSIBILITIES AND REQUIREMENTS.....</b>              | <b>13</b> |
| 3.1        | Lifting Operation .....                                                | 13        |
| 3.2        | Inspection Maintenance and Repair.....                                 | 14        |
| 3.3        | Management of Critical and Engineered Lifts for Hoisted Loads .....    | 14        |
| 3.4        | Management of Critical and Engineered Lifts for Supported Loads .....  | 15        |
| 3.5        | Record Keeping and Trend Analysis .....                                | 15        |
| 3.6        | Variances.....                                                         | 16        |
| 3.7        | Audits and Self-Assessments.....                                       | 16        |
| 3.8        | Critical LDE Identification .....                                      | 16        |
| 3.9        | Removal of LDE from Critical Lift Operations Designation .....         | 16        |
| 3.10       | Checklists for Critical Lift Device Verification.....                  | 16        |

|                                                                       |                 |                |
|-----------------------------------------------------------------------|-----------------|----------------|
| Stennis<br>Work<br>Instruction                                        | SWI-8834-0001   | 7              |
|                                                                       | <i>Number</i>   | <i>Rev.</i>    |
|                                                                       | Effective Date: | March 18, 2022 |
|                                                                       | Review Date:    | March 18, 2027 |
| Page 5 of 36                                                          |                 |                |
| Responsible Office: RA00/Center Operations Directorate                |                 |                |
| <b>SUBJECT: Lifting Devices and Equipment Management Instructions</b> |                 |                |

|             |                                                                  |           |
|-------------|------------------------------------------------------------------|-----------|
| <b>4.0</b>  | <b>MAINTENANCE RESPONSIBILITIES AND REQUIREMENTS.....</b>        | <b>17</b> |
| 4.1         | General.....                                                     | 17        |
| 4.2         | Procedures.....                                                  | 17        |
| 4.3         | Repair or Replacement Components .....                           | 17        |
| 4.4         | Scheduling/Equipment Inventory .....                             | 18        |
| <b>5.0</b>  | <b>EQUIPMENT CERTIFICATION REQUIREMENTS .....</b>                | <b>18</b> |
| 5.1         | General.....                                                     | 18        |
| 5.2         | Certification Requirements .....                                 | 18        |
| 5.3         | Voiding Certifications.....                                      | 19        |
| 5.4         | Load Testing .....                                               | 19        |
| 5.5         | Condition Inspection.....                                        | 19        |
| 5.6         | Hooks .....                                                      | 20        |
| 5.7         | Nondestructive Testing .....                                     | 20        |
| <b>6.0</b>  | <b>MODIFICATIONS OR ADDITIONS .....</b>                          | <b>20</b> |
| 6.1         | General.....                                                     | 20        |
| 6.2         | Records .....                                                    | 20        |
| <b>7.0</b>  | <b>EQUIPMENT HISTORY FILE .....</b>                              | <b>20</b> |
| 7.1         | General.....                                                     | 20        |
| 7.2         | Content.....                                                     | 21        |
| 7.3         | Records .....                                                    | 21        |
| <b>8.0</b>  | <b>PROCUREMENT AND DESIGN REQUIREMENTS.....</b>                  | <b>21</b> |
| <b>9.0</b>  | <b>LDE OPERATOR TRAINING AND CERTIFICATON REQUIREMENTS .....</b> | <b>21</b> |
| 9.1         | General.....                                                     | 21        |
| 9.2         | Training.....                                                    | 22        |
| 9.2.1       | Lifting Device Operators .....                                   | 22        |
| 9.2.2       | Riggers and Signal Persons.....                                  | 24        |
| 9.3         | Documentation.....                                               | 25        |
| <b>10.0</b> | <b>LIFTING DEVICE INSPECTION REQUIREMENTS .....</b>              | <b>25</b> |
| 10.1        | Frequent Inspections (Pre-use) .....                             | 25        |
| 10.2        | Periodic Inspections .....                                       | 26        |
| 10.3        | Documentation.....                                               | 26        |
| 10.4        | Discrepancies .....                                              | 26        |
| <b>11.0</b> | <b>OPERATIONS SAFETY .....</b>                                   | <b>26</b> |
| 11.1        | General .....                                                    | 26        |
| 11.2        | Safety Hazard Analysis .....                                     | 27        |
| 11.3        | Crew Responsibilities.....                                       | 27        |

|                                                                       |                 |                |
|-----------------------------------------------------------------------|-----------------|----------------|
| Stennis<br>Work<br>Instruction                                        | SWI-8834-0001   | 7              |
|                                                                       | <i>Number</i>   | <i>Rev.</i>    |
|                                                                       | Effective Date: | March 18, 2022 |
|                                                                       | Review Date:    | March 18, 2027 |
| Page 6 of 36                                                          |                 |                |
| Responsible Office: RA00/Center Operations Directorate                |                 |                |
| <b>SUBJECT: Lifting Devices and Equipment Management Instructions</b> |                 |                |

|             |                                                                                 |           |
|-------------|---------------------------------------------------------------------------------|-----------|
| 11.4        | Safety Devices .....                                                            | 27        |
| 11.5        | Procedures .....                                                                | 27        |
| 11.6        | Communications.....                                                             | 27        |
| 11.7        | Safety of Non-lift Personnel.....                                               | 28        |
| 11.8        | Safety of Lift Personnel.....                                                   | 28        |
| 11.9        | Outdoor LDE Operations .....                                                    | 28        |
| 11.10       | Stability Factors.....                                                          | 28        |
| 11.11       | Emergency Procedures .....                                                      | 29        |
| 11.12       | Explosive Safety.....                                                           | 29        |
| <b>12.0</b> | <b>ADDITIONAL REQUIREMENTS.....</b>                                             | <b>29</b> |
| 12.1        | General.....                                                                    | 29        |
| 12.2        | Capacity Labels.....                                                            | 29        |
| 12.3        | Lockout and Tagout .....                                                        | 29        |
| <b>13.0</b> | <b>RIGGING HARDWARE AND SLINGS.....</b>                                         | <b>29</b> |
| 13.1        | General.....                                                                    | 29        |
| 13.2        | Identification .....                                                            | 30        |
| 13.3        | Testing.....                                                                    | 31        |
| 13.3.1      | Proof Load Test .....                                                           | 31        |
| 13.3.2      | Periodic Load Test .....                                                        | 31        |
| 13.4        | Inspection of Wire Rope, Hook, Chain, and Link .....                            | 32        |
| 13.5        | Inspection of Common Rigging Hardware .....                                     | 32        |
| 13.6        | Shop-Fabricated Gear .....                                                      | 32        |
| <b>14.0</b> | <b>ACRONYMS .....</b>                                                           | <b>33</b> |
|             | Appendix 1: Mobile Crane and Derrick Critical Lift Requirements Checklist ..... | 34        |
|             | Appendix 2: Forklift Critical Lift Requirements Checklist .....                 | 35        |
|             | Appendix 3: Overhead Crane Critical Lift Requirements Checklist .....           | 36        |

|                                                                       |                 |                |
|-----------------------------------------------------------------------|-----------------|----------------|
| Stennis<br>Work<br>Instruction                                        | SWI-8834-0001   | 7              |
|                                                                       | <i>Number</i>   | <i>Rev.</i>    |
|                                                                       | Effective Date: | March 18, 2022 |
|                                                                       | Review Date:    | March 18, 2027 |
| Page 7 of 36                                                          |                 |                |
| Responsible Office: RA00/Center Operations Directorate                |                 |                |
| <b>SUBJECT: Lifting Devices and Equipment Management Instructions</b> |                 |                |

## 1.0 OVERVIEW

### 1.1 Purpose

This Stennis Work Instruction (SWI) establishes minimum requirements for design, procurement, maintenance, inspection, testing, certification, repair, alteration, operation, training and personnel certification of John C. Stennis Space Center (SSC) lifting devices and equipment (LDE). This document provides SSC-specific requirements and references the National Aeronautics and Space Administration (NASA) Lifting Standard, the Occupational Safety and Health Administration (OSHA), and the applicable National Consensus Standards (NCS). In the event there is a conflict between this document and the referenced documents, the order of precedence shall be as follows:

1. OSHA
2. NASA Lifting Standard, except where more stringent than OSHA
3. SSC LDE Management Instructions, except where more stringent than OSHA or the NASA Lifting Standard
4. NCS, unless evoked by regulation

### 1.2 Applicability

This document is applicable to NASA and NASA contractors. Resident Agencies shall comply with this document to the extent specified in their contractual documents. All lifting operations and LDE shall comply with OSHA regulations. Compliance with this document is mandatory for all NASA-owned, NASA-leased and NASA contractor-supplied LDE used in NASA operations. LDE equipped with features or components not covered by the requirements of this document shall be inspected, tested, and approved prior to use. This document covers three (3) types of lifting operations and LDE: critical, engineered, and noncritical.

### 1.3 Applicable Equipment

This document is applicable to NASA-owned, NASA-leased and NASA contractor-supplied overhead and gantry cranes (including top running, monorail, underhung, and jib cranes), mobile cranes, derricks, hoists, winches used for lifting applications, hoist-supported personnel lifting devices, load positioning devices (e.g., Hydra Sets®), load measuring devices, hooks, jacks used for critical lifts, slings and rigging hardware, mobile aerial platforms, and high lift industrial trucks used in support of NASA operations. This document does not apply to front-end loaders, elevators, or lifting devices used in non-lifting applications.

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|-----------------------------------------------------------------------|-----------------|----------------|
| Stennis<br>Work<br>Instruction                                        | SWI-8834-0001   | 7              |
|                                                                       | <i>Number</i>   | <i>Rev.</i>    |
|                                                                       | Effective Date: | March 18, 2022 |
|                                                                       | Review Date:    | March 18, 2027 |
| Page 8 of 36                                                          |                 |                |
| Responsible Office: RA00/Center Operations Directorate                |                 |                |
| <b>SUBJECT: Lifting Devices and Equipment Management Instructions</b> |                 |                |

### **1.3.1 Overhead and Gantry Cranes**

Overhead and gantry cranes must comply with the applicable OSHA regulations, the requirements in NASA-STD-8719.9, ASME B30 series standards (ASME B30.2, B30.11, B30.17, or B30.24), and Crane Manufacturers Association of America (CMAA) Specification 70 or 74.

### **1.3.2 Mobile Cranes and Derricks**

Mobile cranes and derricks must comply with the applicable OSHA regulations, the requirements in NASA-STD-8719.9, and ASME B30 series standards (ASME B30.5 and B30.6).

### **1.3.3 Hoists and Winches**

Hoists and winches must comply with the applicable OSHA regulations, the requirements in NASA-STD-8719.9, and ASME B30 series standards (ASME B30.7, B30.16 or B30.21).

### **1.3.4 Hoist-Supported Personnel Lifting Devices**

Hoist-supported personnel lifting devices must comply with the applicable OSHA regulations, the requirements in NASA-STD-8719.9, and applicable NCS.

### **1.3.5 Load Positioning and Load Measuring Devices**

Load position and load measuring devices must comply with the applicable OSHA regulations, the requirements in NASA-STD-8719.9, and ASME B30 series standards (ASME B30.20 or B30.26).

### **1.3.6 Hooks**

Hooks must comply with the applicable OSHA regulations, the requirements in NASA-STD-8719.9, and ASME B30 series standards (ASME B30.10).

### **1.3.7 Jacks**

Jacks used for critical lifts and engineered lifts must comply with the applicable OSHA regulations, the requirements in NASA-STD-8719.9, and ASME B30 series standards (ASME B30.1).

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|-----------------------------------------------------------------------|-----------------|----------------|
| Stennis<br>Work<br>Instruction                                        | SWI-8834-0001   | 7              |
|                                                                       | <i>Number</i>   | <i>Rev.</i>    |
|                                                                       | Effective Date: | March 18, 2022 |
|                                                                       | Review Date:    | March 18, 2027 |
| Page 9 of 36                                                          |                 |                |
| Responsible Office: RA00/Center Operations Directorate                |                 |                |
| <b>SUBJECT: Lifting Devices and Equipment Management Instructions</b> |                 |                |

### 1.3.8 Slings and Rigging Hardware

Slings and rigging hardware must comply with the applicable OSHA regulations, the requirements in NASA-STD-8719.9, and ASME B30 series standards (ASME B30.9, B30.20, and B30.26).

### 1.3.9 Mobile Aerial Platforms

Mobile aerial platforms must comply with the applicable OSHA regulations, the requirements in NASA-STD-8719.9, and ANSI/SAIA A92 series standards (ANSI/SAIA A92.2, A92.3, A92.5, and A92.6).

### 1.3.10 High Lift Industrial Trucks

High lift industrial trucks including forklift trucks, platform trucks, picker trucks, and reach trucks must comply with the applicable OSHA regulations, the requirements in NASA-STD-8719.9, and ANSI/ITSDF B series standards (ANSI/ITSDF B56.1, B56.6, or B56.10).

## 1.4 References and Forms

All references are assumed to be the latest version unless otherwise indicated.

### References

ANSI/ITSDF B56.1, *Safety Standard for Low Lift and High Lift Trucks*

ANSI/ITSDF B56.6, *Safety Standard for Rough Terrain Forklift Trucks*

ANSI/ITSDF B56.10, *Safety Standard for Manually Propelled High Lift Industrial Trucks*

ANSI/SAIA A92.2, *Vehicle-Mounted Elevating and Rotating Aerial Devices*

ANSI/SAIA A92.3, *Manually Propelled Elevating Aerial Platforms*

ANSI/SAIA A92.5, *Boom-Supported Elevating Work Platforms*

ANSI/SAIA A92.6, *Self-Propelled Elevating Work Platforms*

ASME B30.1, *Jacks, Industrial Rollers, Air Casters, and Hydraulic Gantries*

ASME B30.2, *Overhead and Gantry Cranes (Top Running Bridge, Single or Multiple Girder, Top Running Trolley Hoist)*

ASME B30.4, *Portal, Tower, and Pedestal Cranes*

ASME B30.5, *Mobile and Locomotive Cranes*

ASME B30.6, *Derricks*

ASME B30.7, *Winches*

ASME B30.9, *Slings*

ASME B30.10, *Hooks*

ASME B30.11, *Monorails and Underhung Cranes*

|                                                                       |                 |                |
|-----------------------------------------------------------------------|-----------------|----------------|
| Stennis<br>Work<br>Instruction                                        | SWI-8834-0001   | 7              |
|                                                                       | <i>Number</i>   | <i>Rev.</i>    |
|                                                                       | Effective Date: | March 18, 2022 |
|                                                                       | Review Date:    | March 18, 2027 |
| Page 10 of 36                                                         |                 |                |
| Responsible Office: RA00/Center Operations Directorate                |                 |                |
| <b>SUBJECT: Lifting Devices and Equipment Management Instructions</b> |                 |                |

ASME B30.16, *Overhead Hoists (Underhung)*  
 ASME B30.17, *Cranes and Monorails (With Underhung Trolley or Bridge)*  
 ASME B30.20, *Below-the-Hook Lifting Devices*  
 ASME B30.21, *Lever Hoists*  
 ASMEB30.24, *Container Cranes*  
 ASME B30.26, *Rigging Hardware*  
 ASNT CP-189, *ASNT Standard for Qualification and Certification of Nondestructive Testing Personnel*  
 CMAA 70, *Specification for Top Running Bridge and Gantry Type Multiple Girder Electric Overhead Traveling Cranes*  
 CMAA 74, *Specification for Top Running and Under Running Single Girder Electric Overhead Cranes Utilizing Under Running Trolley Hoist*  
 NAS410, *NAS Certification and Qualification of Nondestructive Test Personnel*  
 NASA-STD-8719.9, *Lifting Standard*  
 NASA-STD-8719.12, *Safety Standard for Explosives, Propellants, and Pyrotechnics*  
 OSHA 29 CFR 1910, *Occupational Safety and Health Standard, General Industry*  
 OSHA 29 CFR 1926, *Occupational Safety and Health Standard, Construction*  
 SMI-8830-0114, *Wire Rope, Hook, Chain and Block Inspection*  
 SNT-TC-1A, *Personnel Qualification and Certification in Nondestructive Testing*  
 SPR 1400.1, *Records and Management Program Requirements*  
 SSTD-8070-0007-CONFIG, *Standard for Variance and Alternate Standard Requests*

#### **Forms**

SSC-517, *Variance Request*

### **1.5 Definitions and Requirements for LDE Operations**

Organizations performing lifting operations shall utilize a documented process to gather input from stakeholders and the NASA Lifting Device and Equipment Manager (LDEM) to classify lifts and identify appropriate LDE to perform these lifts.

#### **1.5.1 Critical Lifts**

An operation shall be classified as a critical lift when failure/loss of control presents an elevated risk of serious injury, loss of life, or loss of one-of-a-kind articles, high dollar items, or major facility components whose loss would have serious programmatic or institutional impact; or mobile crane/derrick lifts in which the load exceeds 75 percent of rated capacity. Hoisting of personnel with a mobile crane or derrick is a critical lift activity. For programmatic lifting operations, the respective Program Manager will classify lifts involving program hardware as critical or noncritical. Program lifting operations identified as noncritical may be reclassified as critical by the LDEM or the NASA Safety and Mission Assurance (SMA) Directorate if the lift involves hazards that are not program specific but reveal safety or facility

|                                                                       |                 |                |
|-----------------------------------------------------------------------|-----------------|----------------|
| Stennis<br>Work<br>Instruction                                        | SWI-8834-0001   | 7              |
|                                                                       | <i>Number</i>   | <i>Rev.</i>    |
|                                                                       | Effective Date: | March 18, 2022 |
|                                                                       | Review Date:    | March 18, 2027 |
| Page 11 of 36                                                         |                 |                |
| Responsible Office: RA00/Center Operations Directorate                |                 |                |
| <b>SUBJECT: Lifting Devices and Equipment Management Instructions</b> |                 |                |

concerns beyond normal lifting operations. Additionally, the NASA SMA Representative or their designee shall be notified of the operation prior to the lift.

**Exception:** Forklift and jacking (pallet jacks) operations for packaged program hardware is typically considered to be a warehouse / shipping operation and does not constitute a critical lift.

### 1.5.2 Engineered Lifts

Engineered lifts are similar to critical lifts in that there is an elevated risk to facilities, equipment, or personnel. Lifts utilizing multiple lifting devices which could present significant risks are generally classified as engineered lifts. Engineered lifts require a written lift plan approved by the LDEM prior to commencement of the operation. Additionally, the NASA SMA Representative or their designee shall be notified of the operation prior to the lift.

### 1.5.3 Noncritical Lifts

Noncritical lifts involve routine lifting operations, and are governed by standard industry rules and practices except as supplemented with unique NASA testing, operations, maintenance, inspection, training, and personnel certification requirements contained in this document and the NASA Lifting Standard (NASA-STD-8719.9).

### 1.5.4 Severe Service Environments

The operating environment of LDE has an impact on maintenance, testing, and inspection requirements. Factors such as corrosive atmospheres or elevated oxygen environments that are associated with clean line operations and test facilities can introduce factors that will accelerate the deterioration of components and structural elements. These factors require that LDE receive preventive maintenance, testing, and inspection on a more frequent basis than LDE subjected to normal operating environments. LDE designated as severe service shall have a tailored maintenance, testing, and inspection program that accounts for the unique operating environment.

## 1.6 Suspended Load Operations

Personnel shall not be located under a suspended load except as specifically authorized by the OSHA-approved NASA Alternate Standard for Suspended Load Operations. Suspended Load Operations shall comply with Appendix A of NASA-STD-8719.9.

|                                                                       |                 |                |
|-----------------------------------------------------------------------|-----------------|----------------|
| Stennis<br>Work<br>Instruction                                        | SWI-8834-0001   | 7              |
|                                                                       | <i>Number</i>   | <i>Rev.</i>    |
|                                                                       | Effective Date: | March 18, 2022 |
|                                                                       | Review Date:    | March 18, 2027 |
| Page 12 of 36                                                         |                 |                |
| Responsible Office: RA00/Center Operations Directorate                |                 |                |
| <b>SUBJECT: Lifting Devices and Equipment Management Instructions</b> |                 |                |

## 2.0 ROLES AND RESPONSIBILITIES

This section defines responsibilities of personnel and organizations directly involved in LDE operations.

### 2.1 NASA Lifting Device and Equipment Manager (LDEM)

The LDEM is responsible for the overall management, maintenance, and operation of the SSC LDE program and coordination with all contractors, tenants, and agencies.

- a. The LDEM shall represent the Center on the Agency Lifting Device and Equipment Committee (LDEC).
- b. The LDEM shall establish a Center LDEC and coordinate selection of committee members with contractors, tenants, and agencies. The LDEM shall chair the committee. The LDEC will meet annually, or more frequently as needed, to review program performance and initiate program revisions and corrective actions.
- d. The LDEM shall review designs, specifications, and statements of work for modified or new LDE (excluding standard rigging hardware), and provide recommendations that promote compliance with NASA-STD-8719.9.
- e. Lift plans shall be approved by the LDEM for critical and engineered lifts. Changes to approved lift plans, during lifting operations, shall be approved by the LDEM or the NASA SMA personnel or NASA SMA designee present at the lift. Lift plans shall, at a minimum, address the following:
  1. Identification of the LDE.
  2. Identification of the weight and the center of gravity of the load.
  3. Identification and mitigation of hazards.
  4. Verification of operator and LDE certifications.
  5. Verification of appropriate weather conditions.
  6. Verification of pre-operational LDE inspection.
  7. Verification of the keep-out-zone for safety of non-lift personnel.
  8. Detailed description of the lifting process.

### 2.2 Alternate NASA Lifting Device and Equipment Manager

The Alternate LDEM has the delegated authority to act on behalf of the LDEM. The Alternate LDEM shall support the overall management, maintenance, and operation of the SSC LDE program.

|                                                                       |                 |                |
|-----------------------------------------------------------------------|-----------------|----------------|
| Stennis<br>Work<br>Instruction                                        | SWI-8834-0001   | 7              |
|                                                                       | <i>Number</i>   | <i>Rev.</i>    |
|                                                                       | Effective Date: | March 18, 2022 |
|                                                                       | Review Date:    | March 18, 2027 |
| Page 13 of 36                                                         |                 |                |
| Responsible Office: RA00/Center Operations Directorate                |                 |                |
| <b>SUBJECT: Lifting Devices and Equipment Management Instructions</b> |                 |                |

### 2.3 Synergy Achieving Consolidated Operations and Maintenance (SACOM) Contract

The SACOM Contractor shall conduct operations of NASA-owned or leased LDE, unless otherwise approved by the NASA LDEM.

- a. Designate a counterpart to the NASA LDEM that directly supports the SSC LDE program.
- b. Provide preventive and repair maintenance, scheduling, testing, and certification of lifting devices identified in the SSC System Operation and Maintenance Responsibility Database (SOMRD).
- c. Establish, maintain, and document a training and certification program for operators of LDE. Training shall be provided by an approved independent third-party training contractor, unless noted otherwise or approved by the NASA LDEM.
- d. Manage and operate LDE in accordance with this document, NASA-STD-8719.9, OSHA, and NCS.
- e. Support and coordinate LDE operations throughout the Center as required.

### 2.4 Employees

Employees are responsible for compliance with LDE safety standards, procedures, and requirements.

## 3.0 OPERATIONAL RESPONSIBILITIES AND REQUIREMENTS

This section defines the responsibilities and requirements for conducting lifting operations.

### 3.1 Lifting Operation

A designated person shall be assigned responsibility for each lifting operation and shall ensure the following:

- a. Trained and/or certified personnel operate LDE.
- b. LDE is operated safely and used within its design and operational limits.
- c. An approved lift plan is used for critical and engineered lifts.
- d. LDE is properly tagged and certified.

|                                                                       |                 |                |
|-----------------------------------------------------------------------|-----------------|----------------|
| Stennis<br>Work<br>Instruction                                        | SWI-8834-0001   | 7              |
|                                                                       | <i>Number</i>   | <i>Rev.</i>    |
|                                                                       | Effective Date: | March 18, 2022 |
|                                                                       | Review Date:    | March 18, 2027 |
| Page 14 of 36                                                         |                 |                |
| Responsible Office: RA00/Center Operations Directorate                |                 |                |
| <b>SUBJECT: Lifting Devices and Equipment Management Instructions</b> |                 |                |

- e. Appropriate personnel protective equipment (PPE) is utilized.
- f. Appropriate keep-out-zones are established and maintained during lifting operations.

### 3.2 Inspection Maintenance and Repair

Organizations utilizing LDE shall ensure the following:

- a. LDE is inspected, maintained, and repaired by qualified personnel.
- b. Inspectors, maintenance, and repair personnel have the appropriate tools and training to competently accomplish their work.
- c. Inspectors, maintenance, and repair personnel have access to adequate information including operation and maintenance manuals, repair procedures, spare parts list, wiring diagrams, and documented inspection/maintenance/repair history.

### 3.3 Management of Critical and Engineered Lifts for Hoisted Loads

A hoisted load lift is defined as a lift where the LDE is lifting the load from above, such as a crane, hoist, chain fall, etc. A designated person shall be responsible for the overall operation and shall ensure that the following activities are completed:

- a. A lift plan is approved by the LDEM.
- b. A documented pre-lift meeting is held with all personnel involved with the lift.
- c. A spotter is assigned to the lifting equipment operator when required.
- d. A signal person is assigned to the lifting equipment operator when required.
- e. Personnel are qualified and certified, and understand how the job will be accomplished.
- f. LDE is selected and verified in conformance with the applicable requirements.
- g. The lifting device is properly set up and positioned.
- h. The area is inspected for hazardous/unsafe conditions and secured from unauthorized or non-essential personnel entry.
- i. Appropriate PPE is utilized.
- j. The lifting operation is performed in accordance with the approved lift plan.
- k. Details of the lifting operation are documented, transmitted to the appropriate organization, and placed in a history file.
- l. A representative from the SMA organization or their designee of the company performing the lift is present and responsible for the safety of operations.

Assignment flexibility will be allowed for special situations (remote crane operations, routine and repetitive lifts) whereas a designee acts for the designated person in accomplishing the requirements of the lift plan.

|                                                                       |                 |                |
|-----------------------------------------------------------------------|-----------------|----------------|
| Stennis<br>Work<br>Instruction                                        | SWI-8834-0001   | 7              |
|                                                                       | <i>Number</i>   | <i>Rev.</i>    |
|                                                                       | Effective Date: | March 18, 2022 |
|                                                                       | Review Date:    | March 18, 2027 |
| Page 15 of 36                                                         |                 |                |
| Responsible Office: RA00/Center Operations Directorate                |                 |                |
| <b>SUBJECT: Lifting Devices and Equipment Management Instructions</b> |                 |                |

A NASA SMA Representative or designated individual shall be notified prior to the lift. The NASA SMA Representative or designated individual shall be notified of all lift operation changes incurred subsequent to the initial notification.

### 3.4 Management of Critical and Engineered Lifts for Supported Loads

A supported load lift is defined as a lift where the LDE is beneath the load, such as a forklift, jack, scissor lift, etc. A designated person shall be responsible for the overall operation and shall ensure that the following activities are completed:

- a. A lift plan is approved by the LDEM.
- b. A documented pre-lift meeting is held with all personnel involved with the lift.
- c. A spotter is assigned to the LDE operator when required.
- d. A signal person is assigned to the lifting equipment operator when required.
- e. Personnel are qualified and certified, and understand how the job will be accomplished.
- f. LDE is selected and verified in conformance with the applicable requirements.
- g. The lifting device is properly set up and positioned.
- h. The work area is inspected for hazardous/unsafe conditions and secured from unauthorized or non-essential personnel entry.
- i. Appropriate PPE is utilized.
- j. The lifting operation is performed in accordance with the approved lift plan.
- k. Details of the lifting operation are documented, transmitted to the appropriate organization, and placed in a history file.
- l. A representative from the SMA organization or their designee of the company performing the lift is present and responsible for the safety of operations.

Assignment flexibility will be allowed for special situations (remote forklift operations, routine and repetitive lifts, etc.), whereas a designee acts for the designated person in accomplishing the requirements of the critical lift plan.

A NASA SMA Representative or designated individual shall be notified prior to the lift.

**Exception:** Ground Support Equipment (GSE)/Specialty Tooling such as Vertical Engine Installers and Program Critical Hardware (PCH) manipulators/positioners used in routine and repetitive lifting operations do not require LDEM approval.

### 3.5 Record Keeping and Trend Analysis

LDE history files shall be maintained that will support trend and data analysis, and will include equipment type, manufacturer, age, maintenance, operational problems,

|                                                                       |                 |                |
|-----------------------------------------------------------------------|-----------------|----------------|
| Stennis<br>Work<br>Instruction                                        | SWI-8834-0001   | 7              |
|                                                                       | <i>Number</i>   | <i>Rev.</i>    |
|                                                                       | Effective Date: | March 18, 2022 |
|                                                                       | Review Date:    | March 18, 2027 |
| Page 16 of 36                                                         |                 |                |
| Responsible Office: RA00/Center Operations Directorate                |                 |                |
| <b>SUBJECT: Lifting Devices and Equipment Management Instructions</b> |                 |                |

discrepancy and corrective actions, mishaps, safety notices, variances, and load test results.

The SACOM Contractor shall utilize the Computerized Maintenance Management System (CMMS) for data collection and file storage of data for maintenance and load tests of NASA-owned LDE.

All other NASA data shall be maintained in Central Engineering Files (CEF).

Site contractors and resident agencies shall maintain data collection and file storage of inspections, maintenance records, load tests, and device manuals as governed by NASA-STD-8719.9 and regulatory requirements.

### **3.6 Variances**

If a mandatory requirement cannot be met, a variance request shall be documented on Form SSC-517 and prepared in accordance with SSTD-8070-0007-CONFIG. Variance requests shall be maintained in CEF.

### **3.7 Audits and Self-Assessments**

The SACOM Contractor shall perform a lifting device assessment in conjunction with the Facility Condition Assessment (FCA) and generate a status report for review by the LDEM.

### **3.8 Critical LDE Identification**

The LDEM and SMA Directorate are responsible for approval of requests to designate LDE for critical lift operations.

### **3.9 Removal of LDE from Critical Lift Operations Designation**

LDE no longer requiring critical lift certification shall be removed from the critical lift operations lists. It is the responsibility of the funding organization to notify the LDEM of the change so the requirements can be revised to establish the lifting device as an active noncritical LDE or placed in idle/standby status.

### **3.10 Checklists for Critical Lift Device Verification**

Checklists are provided in the Appendix to assist in verifying the requirements for common critical lifting devices. The latest revision of NASA-STD-8719.9 shall be used to validate that all requirements are met.

|                                                                       |                 |                |
|-----------------------------------------------------------------------|-----------------|----------------|
| Stennis<br>Work<br>Instruction                                        | SWI-8834-0001   | 7              |
|                                                                       | <i>Number</i>   | <i>Rev.</i>    |
|                                                                       | Effective Date: | March 18, 2022 |
|                                                                       | Review Date:    | March 18, 2027 |
| Page 17 of 36                                                         |                 |                |
| Responsible Office: RA00/Center Operations Directorate                |                 |                |
| <b>SUBJECT: Lifting Devices and Equipment Management Instructions</b> |                 |                |

## 4.0 MAINTENANCE RESPONSIBILITIES AND REQUIREMENTS

### 4.1 General

The SACOM Contractor is responsible for maintenance of SSC lifting devices identified in the SOMRD.

The SACOM Contractor preventive maintenance program shall be Reliability Centered Maintenance (RCM) while ensuring compliance with the minimum requirements of OSHA, NASA-STD-8719.9, and the original equipment manufacturer (OEM). The SACOM Contractor will normally provide repair maintenance for NASA-owned lifting devices and will provide oversight and coordination with outside contractors performing repair maintenance.

### 4.2 Procedures

The SACOM Contractor shall perform preventive maintenance tasks and condition inspections described in the Maintenance Instructions (MI) shown in the Inventory of Cranes, Monorails, and Hoists, and shall perform the tasks at the frequencies specified in the MI. MI shall be reviewed periodically to ensure they are current.

The SACOM Contractor shall maintain OEM manuals for lifting devices in CEF.

CMMS work plans shall be used to initiate and record lifting device activity. Deficiencies discovered during a preventive maintenance activity may be corrected during that activity or by a future corrective maintenance activity. Deficiencies that impact the safe operation of the lifting device shall be corrected immediately, or the lifting device shall be taken out of service until corrective action is complete. Deficiencies shall be recorded in the CMMS database or the appropriate nonconformance system. Nonconformance document numbers shall be referenced in the CMMS work plan.

### 4.3 Repair or Replacement Components

Repaired or replaced components shall be in accordance with OEM requirements. Load bearing structural members or major components of LDE that are cracked, bent, broken, or excessively worn shall be repaired or replaced. All repair and replacement activities shall be documented on the work plan and entered into the CMMS.

**Note:** Major repairs to items in the load path of LDE require notification to the LDEM, and subsequent proof load test and new certification.

|                                                                       |                 |                |
|-----------------------------------------------------------------------|-----------------|----------------|
| Stennis<br>Work<br>Instruction                                        | SWI-8834-0001   | 7              |
|                                                                       | <i>Number</i>   | <i>Rev.</i>    |
|                                                                       | Effective Date: | March 18, 2022 |
|                                                                       | Review Date:    | March 18, 2027 |
| Page 18 of 36                                                         |                 |                |
| Responsible Office: RA00/Center Operations Directorate                |                 |                |
| <b>SUBJECT: Lifting Devices and Equipment Management Instructions</b> |                 |                |

**Note:** Repaired or modified LDE components that do not affect the lifting or holding capability of the LDE shall undergo a functional check prior to the LDE being placed back into service to verify the component repairs or modifications are acceptable.

**Note:** Replacement-in-kind is not considered a modification and does not require LDEM approval.

#### 4.4 Scheduling/Equipment Inventory

CMMS generated work plans shall be used to schedule maintenance activity. The SACOM Contract Equipment Numbering Database shall be used to update the SOMRD and catalogue the inventory of NASA-owned lifting devices.

### 5.0 EQUIPMENT CERTIFICATION REQUIREMENTS

#### 5.1 General

Equipment certification shall be based on a condition inspection and load test(s). The purpose of the condition inspection is to ensure that the overall structural, mechanical, electrical and control components of the LDE have been maintained in a safe and serviceable condition and are functioning properly. The purpose of the load test(s) is to ensure that the equipment is capable of safely lifting and moving a rated load through normal design motion(s). Qualified personnel, under the direction of a competent person, shall perform all inspections and tests.

#### 5.2 Certification Requirements

Critical LDE shall be certified annually, except rigging hardware (shackles, rings, swivels, eye bolts, turnbuckles, etc.) which shall be certified on a two-year cycle. Slings shall be certified within one year prior to use for a critical lift. Noncritical LDE shall be certified on a four-year cycle, except rigging hardware (shackles, rings, swivels, eye bolts, turnbuckles, etc.) which shall be certified prior to first use. Following the load test(s), the lifting device shall be given a permanently affixed tag identifying the equipment and indicating the certification expiration date. Inadequacies found during the certification process shall be documented on the work plan and/or nonconformance system, and if determined to be a hazard, corrected prior to further use.

- a. When the adjustment, repair, disassembly, or replacement of a load bearing part, load controlling part, or operational safety device requires a load test for verification of satisfactory work performed, recertification is required.

|                                                                       |                 |                |
|-----------------------------------------------------------------------|-----------------|----------------|
| Stennis<br>Work<br>Instruction                                        | SWI-8834-0001   | 7              |
|                                                                       | <i>Number</i>   | <i>Rev.</i>    |
|                                                                       | Effective Date: | March 18, 2022 |
|                                                                       | Review Date:    | March 18, 2027 |
| Page 19 of 36                                                         |                 |                |
| Responsible Office: RA00/Center Operations Directorate                |                 |                |
| <b>SUBJECT: Lifting Devices and Equipment Management Instructions</b> |                 |                |

- b. Repaired or modified LDE components that do not affect the lifting, holding capability, or operational safety of the LDE shall undergo a functional check prior to being placed back into service to verify the repairs or modifications are acceptable.

### 5.3 Voiding Certifications

Certifications shall be voided upon detection of a major deficiency; or after adjustment, repair, disassembly, replacement, or alteration of a load bearing or load controlling part or operational safety device which requires a load test(s) for verification of satisfactory work.

### 5.4 Load Testing

Load tests shall comply with OSHA regulations, NASA-STD-8719.9, the requirements in this document, and be based on manufacturer recommendations. Two types of load tests are required for LDE: proof load tests and periodic load tests.

- a. A proof load test is required for all new LDE and major repairs to items in the load path of LDE prior to being placed in service.
- b. A periodic load test shall be performed on LDE at least every four (4) years, excluding rigging hardware (shackles, rings, swivels, eye bolts, turnbuckles, etc.) used for noncritical and engineered lifts.
- c. Critical lift certified LDE require an annual load test, except rigging hardware (shackles, rings, swivels, eye bolts, turnbuckles, etc.) which shall be load tested within two (2) years prior to use for a critical lift unless designated as non-load test rigging hardware.

**Note:** When a proof load test is required, a periodic load test shall also be performed.

**Note:** Performance of a proof load test satisfies the periodic load test requirement for slings and rigging hardware.

### 5.5 Condition Inspection

A condition inspection shall be performed before, during, and after a load test by qualified personnel. The inspection shall comply with OSHA regulations, NCS, and be based on OEM recommendations. Personnel performing the inspection shall

|                                                                       |                 |                |
|-----------------------------------------------------------------------|-----------------|----------------|
| Stennis<br>Work<br>Instruction                                        | SWI-8834-0001   | 7              |
|                                                                       | <i>Number</i>   | <i>Rev.</i>    |
|                                                                       | Effective Date: | March 18, 2022 |
|                                                                       | Review Date:    | March 18, 2027 |
| Responsible Office: RA00/Center Operations Directorate                |                 |                |
| <b>SUBJECT: Lifting Devices and Equipment Management Instructions</b> |                 |                |

record the results on the work plan. Deficiencies shall be documented on the work plan and identify the corrective action taken.

## 5.6 Hooks

Testing and inspection of hooks shall comply with OSHA regulations, NASA-STD-8719.9, and be based on manufacturer recommendations.

## 5.7 Nondestructive Testing

Personnel performing Nondestructive Testing (NDT) shall be licensed in accordance with a nationally or internationally recognized NDT organization or standards such as ASNT-CP-189, SNT-TC-1A, NAS-410, or a similar document.

# 6.0 MODIFICATIONS OR ADDITIONS

## 6.1 General

Modifications or additions which affect the capacity or safe operation of the LDE are prohibited, except where the requirements of OSHA, NASA-STD-8719.9, and NCS are met. Modifications to upgrade, rerate, or modernize LDE require LDEM approval.

**Note:** Restoring LDE to its original condition by technically recognized and accepted procedures is not a modification or addition provided the capacity or safe operation of the LDE is unchanged.

## 6.2 Records

Documentation shall be filed in CEF for all modifications and additions to LDE. Load charts, procedures, instruction manuals, and instruction plates/tags/decals, maintenance requirements, etc., shall be modified as necessary to correspond with the modification or addition.

# 7.0 EQUIPMENT HISTORY FILE

## 7.1 General

The SACOM Contractor is responsible for maintaining the SSC lifting systems history file in the CMMS. CMMS generated work plans that identify LDE with a unique number shall be used to capture and store individual history on each lifting

|                                                                       |                 |                |
|-----------------------------------------------------------------------|-----------------|----------------|
| Stennis<br>Work<br>Instruction                                        | SWI-8834-0001   | 7              |
|                                                                       | <i>Number</i>   | <i>Rev.</i>    |
|                                                                       | Effective Date: | March 18, 2022 |
|                                                                       | Review Date:    | March 18, 2027 |
| Page 21 of 36                                                         |                 |                |
| Responsible Office: RA00/Center Operations Directorate                |                 |                |
| <b>SUBJECT: Lifting Devices and Equipment Management Instructions</b> |                 |                |

device. The SACOM Contract equipment numbering process shall be used to update the CMMS database.

## 7.2 Content

The history file shall identify equipment type, manufacturer, date of manufacture, date of installation, maintenance, operational problems, discrepancy and corrective actions, mishaps, safety notices, waivers, load test results, certification data, and modifications or additions.

## 7.3 Records

OEM manuals, safety hazard analyses, studies, design changes, Failure Modes and Effects Analysis (FMEA), and other significant data shall be maintained in CEF.

## 8.0 PROCUREMENT AND DESIGN REQUIREMENTS

LDE purchased for NASA operations shall be high quality, from reputable manufacturers with relevant experience, and shall meet the requirements of the SSC LDE Program. Commercial off the shelf (COTS) equipment is preferred to one-of-a-kind, custom-built LDE whenever possible.

LDE must be designed and constructed in accordance with the applicable OSHA regulations, NASA-STD-8719.9, and NCS.

When critical or custom-built LDE (excluding hooks, rigging hardware, and slings, subject to LDEM approval) is designed or procured, the responsible organization shall notify the LDEM and provide the LDEM with the information necessary for review and approval of the design/procurement.

## 9.0 LDE OPERATOR TRAINING AND CERTIFICATON REQUIREMENTS

### 9.1 General

The SSC Certification Board is responsible for approving a comprehensive SSC LDE training and certification program. Training and certification shall meet OSHA regulations and NASA STD-8719.9 requirements.

- a. Personnel operating NASA-owned or leased LDE shall be properly trained and/or certified in accordance with this document.

|                                                                       |                 |                |
|-----------------------------------------------------------------------|-----------------|----------------|
| Stennis<br>Work<br>Instruction                                        | SWI-8834-0001   | 7              |
|                                                                       | <i>Number</i>   | <i>Rev.</i>    |
|                                                                       | Effective Date: | March 18, 2022 |
|                                                                       | Review Date:    | March 18, 2027 |
| Page 22 of 36                                                         |                 |                |
| Responsible Office: RA00/Center Operations Directorate                |                 |                |
| <b>SUBJECT: Lifting Devices and Equipment Management Instructions</b> |                 |                |

- b. Contractor personnel operating their own LDE shall be trained and/or certified by a recognized certification organization. The LDEM or designee reserve the right to review and approve the contractor's training and certification program prior to conducting LDE operations at SSC.
- c. Maintenance and inspection personnel shall be trained and/or certified in accordance with the requirements of this document, prior to operating lifting devices, with the following exceptions:
  1. Training course materials and proficiency tests may be modified to suit appropriate conditions that the maintenance and inspection personnel may experience.
  2. Lifting of loads shall be restricted to dummy loads in the performance of maintenance and inspection activities.
  3. The certification shall include the statement, "Maintenance/Inspection Activities Only".

## 9.2 Training

Training shall be provided by an approved independent third-party training contractor for operators of NASA-owned or leased lifting devices, unless otherwise indicated or approved. Two levels of operator certification shall be established for critical lift and noncritical lifting operations.

### 9.2.1 Lifting Device Operators

The following requirements are applicable to lifting device operators.

- a. All lifting device operators shall be trained. Operators of overhead and gantry cranes, mobile cranes and derricks, powered hoists and winches, hoist-supported personnel lifting devices, mobile aerial platforms, and high lift industrial trucks shall be certified.
  1. Certifications shall be renewed periodically (not to exceed a 4-year interval), except for high lift industrial trucks which shall not exceed a 3-year interval.
  2. Noncertified operators (applicable to manual hoists and winches used in noncritical lifting operations) shall receive periodic refresher training (not to exceed a 4-year interval).

|                                                                       |                 |                |
|-----------------------------------------------------------------------|-----------------|----------------|
| Stennis<br>Work<br>Instruction                                        | SWI-8834-0001   | 7              |
|                                                                       | <i>Number</i>   | <i>Rev.</i>    |
|                                                                       | Effective Date: | March 18, 2022 |
|                                                                       | Review Date:    | March 18, 2027 |
| Page 23 of 36                                                         |                 |                |
| Responsible Office: RA00/Center Operations Directorate                |                 |                |
| <b>SUBJECT: Lifting Devices and Equipment Management Instructions</b> |                 |                |

3. Lifting device operators shall be trained for the operation and the care of fire extinguishers when the lifting device control station is located in a cab or equivalent enclosure.
4. Hand signal charts must be either posted on the equipment or conspicuously posted in the vicinity of the hoisting operation for cranes and derricks used in construction.

- b. The training and certification program for noncritical lifts shall comply with the requirements specified herein.

Classroom training with written and practical examination as appropriate for the type and capacity (mobile cranes only) of equipment for which the certification is valid shall, at a minimum, include:

1. Safe operating procedures for the type and capacity (mobile cranes only) of equipment the individual will operate.
2. Controls and operational/performance characteristics.
3. Application of load chart information.
4. Ability to calculate load/capacity information on a variety of configurations of the equipment.
5. Operational and maneuvering skills.
6. General rigging techniques.
7. Standard signaling methods (e.g. hand, radio, etc.).
8. Pre-use inspection requirements.
9. Physical Examinations as required by NPR 1800.1 (criteria to be determined by the cognizant medical official and in compliance with regulatory requirements).

- c. The training and certification program for critical and engineered lifts shall comply with the requirements specified herein.

Classroom training with written and practical examination for the **specific equipment** for which the certification is valid shall, at a minimum, include:

1. Safe operating procedures for the **specific type** of equipment the individual will operate.
2. Critical lift hazards and procedures.
3. Controls and operational/performance characteristics.
4. Application of load chart information.
5. Ability to calculate load/capacity information on a variety of configurations of the equipment.
6. Operational and maneuvering skills.
7. General rigging techniques.

|                                                                       |                 |                |
|-----------------------------------------------------------------------|-----------------|----------------|
| Stennis<br>Work<br>Instruction                                        | SWI-8834-0001   | 7              |
|                                                                       | <i>Number</i>   | <i>Rev.</i>    |
|                                                                       | Effective Date: | March 18, 2022 |
|                                                                       | Review Date:    | March 18, 2027 |
| Page 24 of 36                                                         |                 |                |
| Responsible Office: RA00/Center Operations Directorate                |                 |                |
| <b>SUBJECT: Lifting Devices and Equipment Management Instructions</b> |                 |                |

8. Standard signaling methods (e.g. hand, radio, etc.).
9. Pre-use inspection requirements.
10. Physical Examinations as required by NPR 1800.1 (criteria to be determined by the cognizant medical official and in compliance with regulatory requirements).

**Note:** Critical lift certification is lifting device specific. The critical lift certification shall include the make and model of the lifting device, or the unique SSC lifting device identification number. For example, personnel certified to operate the B Test Stand Main Derrick cannot operate other SSC derricks without a valid **specific equipment** certification.

**Exception:** For chain fall hoists (manual, electric, pneumatic) critical lift certification shall be designated by the type of equipment.

- d. Operators of manual hoists and winches used in noncritical lifting operations shall be trained and shall comply with the requirements specified herein.
  1. Safe operating procedures for the type of equipment the individual will operate.
  2. Proper operation of the equipment in compliance with instructions provided by the equipment manufacturer.
  3. Ability to calculate load/capacity information on a variety of configurations of the equipment.
  4. General rigging techniques.
  5. Standard signaling methods (e.g. hand, radio, etc.).
  6. Pre-use inspection requirements.

### 9.2.2 Riggers and Signal Persons

The following requirements are applicable to riggers and signal persons.

- a. All personnel engaged in rigging operations and signal persons shall be trained. Rigging and signal personnel that engage in critical and engineered lifting operations shall be certified.
  1. Certifications shall be renewed periodically (not to exceed a 3-year interval).
  2. Noncertified personnel shall receive periodic refresher training (not to exceed a 4-year interval).

|                                                                       |                 |                |
|-----------------------------------------------------------------------|-----------------|----------------|
| Stennis<br>Work<br>Instruction                                        | SWI-8834-0001   | 7              |
|                                                                       | <i>Number</i>   | <i>Rev.</i>    |
|                                                                       | Effective Date: | March 18, 2022 |
|                                                                       | Review Date:    | March 18, 2027 |
| Page 25 of 36                                                         |                 |                |
| Responsible Office: RA00/Center Operations Directorate                |                 |                |
| <b>SUBJECT: Lifting Devices and Equipment Management Instructions</b> |                 |                |

- b. Noncertified riggers and signal persons shall be trained and shall comply with the requirements specified herein.
  - 1. Safe work practices for lifting operations.
  - 2. General rigging techniques.
  - 3. Standard signaling methods (e.g. hand, radio, etc.).
  - 4. Basic lifting device operations and limitations.
  - 5. Pre-use inspection requirements (rigging hardware and slings).
- c. Certified riggers and signal persons shall receive classroom training with written or oral test and practical examination.
  - 1. Safe work practices for lifting operations.
  - 2. Advanced rigging techniques.
  - 3. Standard signaling methods (e.g. hand, radio, etc.).
  - 4. Advanced lifting device operations and limitations.
  - 5. Pre-use inspection requirements (rigging hardware and slings).
  - 6. Physical Examinations as required by NPR 1800.1 (criteria to be determined by the cognizant medical official and in compliance with regulatory requirements).

### 9.3 Documentation

Compliance with all training and certification requirements shall be maintained for each employee by the SSC Certification Board. Documentation shall be made available for review by the LDEM as requested.

## 10.0 LIFTING DEVICE INSPECTION REQUIREMENTS

### 10.1 Frequent Inspections (Pre-use)

A competent person must perform a visual and functional inspection prior to each shift during which the equipment will be used. The inspection must consist of observation for apparent deficiencies. The results of the inspection must be documented, unless noted otherwise. Inspection forms shall be appropriately tailored to the type of lifting device being inspected. Standard inspection forms (templates) shall be provided to the LDEM annually for review and approval of the content and the format. The inspection must comply with OSHA regulations and the recommendations of the lifting device manufacturer.

Equipment that has been idle for three (3) months or more must be inspected by a qualified person in accordance with the requirements of this section before initial use.

|                                                                       |                 |                |
|-----------------------------------------------------------------------|-----------------|----------------|
| Stennis<br>Work<br>Instruction                                        | SWI-8834-0001   | 7              |
|                                                                       | <i>Number</i>   | <i>Rev.</i>    |
|                                                                       | Effective Date: | March 18, 2022 |
|                                                                       | Review Date:    | March 18, 2027 |
| Responsible Office: RA00/Center Operations Directorate                |                 |                |
| <b>SUBJECT: Lifting Devices and Equipment Management Instructions</b> |                 |                |

## 10.2 Periodic Inspections

A qualified person must perform a comprehensive inspection of the equipment annually or more frequently as required by OSHA. The inspection must consist of a detailed assessment for deficiencies to include partial disassembly of components as appropriate. The inspection must comply with OSHA regulations and the recommendations of the lifting device manufacturer. The results of the inspection shall be documented and provided to the LDEM for review.

## 10.3 Documentation

Results of the pre-use inspection shall be documented on the applicable inspection form for NASA-owned or leased lifting devices. The pre-use inspection form shall be maintained for thirty (30) days, except for mobile cranes and derricks. Inspection forms for mobile cranes and derricks shall be maintained for three (3) months. Inspection forms with open discrepancies requiring corrective action shall be maintained until the corrective action is complete. The inspection forms shall be retained in the cab of mobile and derrick cranes, and attached to or appropriately near all other lifting devices. The documented results of the periodic inspection shall be maintained for twelve (12) months.

**Note:** This requirement does not apply to jacks and manual chain fall hoists commonly used in support of construction activity.

## 10.4 Discrepancies

Discrepancies shall be brought to the attention of management prior to equipment use. Each discrepancy shall be reviewed and evaluated by management and their LDE representative for impact on safety and operability of the equipment. Discrepancies that present an immediate hazard will result in the equipment being tagged-out until suitable corrective action is completed. Minor discrepancies that do not present an immediate hazard shall be corrected within a suitable time as determined by the LDE representative. A work plan shall be initiated to correct the discrepancy. A unique work plan number will be entered on the inspection form.

## 11.0 OPERATIONS SAFETY

### 11.1 General

LDE operations shall comply with OSHA, NASA-STD-8719.9, and the requirements in this document. Contractors, agencies, and organizations utilizing LDE are responsible for assuring that employees are trained and informed of the hazards

|                                                                       |                 |                |
|-----------------------------------------------------------------------|-----------------|----------------|
| Stennis<br>Work<br>Instruction                                        | SWI-8834-0001   | 7              |
|                                                                       | <i>Number</i>   | <i>Rev.</i>    |
|                                                                       | Effective Date: | March 18, 2022 |
|                                                                       | Review Date:    | March 18, 2027 |
| Page 27 of 36                                                         |                 |                |
| Responsible Office: RA00/Center Operations Directorate                |                 |                |
| <b>SUBJECT: Lifting Devices and Equipment Management Instructions</b> |                 |                |

associated with LDE operations. Employees are responsible for abiding by safety standards and procedures applicable to LDE operations.

## 11.2 Safety Hazard Analysis

A recognized safety hazard analysis shall be performed on all lifting devices used for critical lifts or custom-built LDE per NASA-STD-8719.9 (excluding hooks, rigging hardware, and slings, subject to LDEM approval).

## 11.3 Crew Responsibilities

The concept of effective team work shall be stressed by the designated person of a lifting operation. The designated person shall verify that each team member understands his/her responsibilities for the lifting operation. Team members shall work together to ensure the safety of lifting operations. Every team member is responsible for recognizing potential problems and making all team members aware. All team members have the authority to stop the job at any time unsafe conditions are found.

## 11.4 Safety Devices

- a. Lifting device operators shall be completely knowledgeable of the operation of safety systems on lifting devices. Lifting device operators shall completely understand that safety devices such as interlocks and limit switches shall not be used for operational controls. Operators shall be trained to approach operational limits (i.e. limit switches) only at slow speed.
- b. Management shall assure that documented procedures are developed for controlling the bypassing of safety devices. Management shall control the usage of keys for safety device bypassing. Where this is not practical or where safety devices may be bypassed by other means, permission shall be obtained from management and notification of the bypass posted near equipment controls.

## 11.5 Procedures

An approved lift plan is required for all critical and engineered lifts.

## 11.6 Communications

- a. Signal persons shall be trained on the types and application of signal methods (e.g. hand, radio, etc.) and LDE operations. The operator of the LDE shall not

|                                                                       |                 |                |
|-----------------------------------------------------------------------|-----------------|----------------|
| Stennis<br>Work<br>Instruction                                        | SWI-8834-0001   | 7              |
|                                                                       | <i>Number</i>   | <i>Rev.</i>    |
|                                                                       | Effective Date: | March 18, 2022 |
|                                                                       | Review Date:    | March 18, 2027 |
| Page 28 of 36                                                         |                 |                |
| Responsible Office: RA00/Center Operations Directorate                |                 |                |
| <b>SUBJECT: Lifting Devices and Equipment Management Instructions</b> |                 |                |

engage in any movement of the lifting device without receiving an appropriate signal.

- b. Critical, complex, or blind lifts require constant communication between the lifting device operator and signal person(s). In the event communication ceases, the operator shall stop until communication is reestablished.

### 11.7 Safety of Non-lift Personnel

Keep-out-zone(s) shall be established prior to the initiation of lifting operations. Keep-out-zones shall be conspicuously defined with an appropriate barrier (rope, tape, cones, etc.). Only personnel associated with the lifting operation are allowed inside the barrier.

### 11.8 Safety of Lift Personnel

Personnel executing LDE operations or working inside the barrier must use appropriate PPE based on the hazards that are present or likely to be present. Minimum PPE requirements for hoisted load lifting operations are protective footwear, hard hats, and safety glasses. Personnel handling the load or rigging equipment must also wear appropriate protective gloves. Personnel shall not be allowed under a suspended load, except as specifically authorized by the OSHA-approved NASA Alternate Standard for Suspended Load Operations.

### 11.9 Outdoor LDE Operations

- a. For material lifts, hoisted load lifting operations shall not commence if winds exceed the requirements of the lifting device manufacturer. For personnel lifts, winds shall not exceed 10 mph steady-state; 15 mph gusts. The effects of wind on the load and lifting device shall be considered in all hoisted load lifting operations. Lifting operations shall be suspended if winds exceed 30 mph, regardless of the lifting device manufacturer rating. Lifting operations are not to be initiated while under a lightning or severe weather warning.
- b. In the event severe weather conditions or a lightning warning occurs during a lifting operation, the designated person and SMA Representative (if present) shall determine appropriate action (e.g. secure the load and terminate the lift).

### 11.10 Stability Factors

LDE operators shall consider the potential for tipping with or without use of outriggers, such as wind conditions, ground conditions, action of freely suspended loads, condition and inflation of rubber tires, boom lengths, and operation speeds.

|                                                                       |                 |                |
|-----------------------------------------------------------------------|-----------------|----------------|
| Stennis<br>Work<br>Instruction                                        | SWI-8834-0001   | 7              |
|                                                                       | <i>Number</i>   | <i>Rev.</i>    |
|                                                                       | Effective Date: | March 18, 2022 |
|                                                                       | Review Date:    | March 18, 2027 |
| Responsible Office: RA00/Center Operations Directorate                |                 |                |
| <b>SUBJECT: Lifting Devices and Equipment Management Instructions</b> |                 |                |

### 11.11 Emergency Procedures

The procedure for loss of power, component failure, or loss of controllability of any lifting device shall consist of:

- a. Secure main power source for power-operated equipment by contacting qualified personnel if necessary.
- b. Lockout and tagout the lifting device.
- c. Secure the affected area.
- d. Initiate an emergency trouble call.
- e. Notify the LDEM and SMA Representative.
- f. Emergency lowering of the load, if appropriate, shall follow the instructions in the lifting device operating manual for those lifting devices equipped with this feature.

### 11.12 Explosive Safety

LDE operations for handling explosives, propellants, and pyrotechnics shall comply with NASA-STD-8719.12.

## 12.0 ADDITIONAL REQUIREMENTS

### 12.1 General

The purpose of this section is to identify additional requirements for SSC LDE.

### 12.2 Capacity Labels

LDE shall be conspicuously marked with its capacity rating in pounds or tons.

### 12.3 Lockout and Tagout

Approved lockout and tagout procedures shall be used to secure power-operated LDE with deficiencies that adversely affect safe operation of the lifting device. Manual LDE shall be conspicuously tagged as out-of-service.

## 13.0 RIGGING HARDWARE AND SLINGS

### 13.1 General

|                                                                       |                 |                |
|-----------------------------------------------------------------------|-----------------|----------------|
| Stennis<br>Work<br>Instruction                                        | SWI-8834-0001   | 7              |
|                                                                       | <i>Number</i>   | <i>Rev.</i>    |
|                                                                       | Effective Date: | March 18, 2022 |
|                                                                       | Review Date:    | March 18, 2027 |
| Page 30 of 36                                                         |                 |                |
| Responsible Office: RA00/Center Operations Directorate                |                 |                |
| <b>SUBJECT: Lifting Devices and Equipment Management Instructions</b> |                 |                |

This section provides maintenance, inspection, and test requirements for rigging hardware, slings, and miscellaneous equipment. Rigging hardware, slings, and other similar equipment shall be purchased from a reputable domestic manufacturer.

## 13.2 Identification

- a. Slings and rigging hardware (see exception for noncritical rigging hardware) shall be tagged to clearly identify the manufacturer, the rated capacity, and the test certification date. For multiple part hardware that can be separated (i.e. shackles with pins), the subordinate part (pin) shall be identified to the primary part (bow). A dog-tag system shall be used. The dog-tag shall be color coded to identify the category of the sling or rigging hardware in accordance with the following:

| <u>"Dog-tag" Color</u> | <u>Lift Category</u> |
|------------------------|----------------------|
| Red                    | Critical             |
| Blue                   | Non-load Test        |
| Green                  | Personnel            |
| Silver                 | Noncritical "Slings" |

**Exception:** Noncritical rigging hardware (shackles, rings, swivels, eye bolts, turnbuckles, etc.) shall be permanently marked to identify the manufacturer by name or trademark, the size, and/or the rated or working load limit. Other identification such as material grade, torque value, etc. shall comply with NCS.

- b. Slings
  1. Synthetic web and synthetic fiber round slings shall include:
    - (a) Name or trademark of manufacturer.
    - (b) Manufacturer's code or stock number.
    - (c) Unique identification number.
    - (d) Rated capacity by hitch type (usually vertical, basket, or choker).
    - (e) Type of material and construction.
    - (f) Load test date (proof or periodic rated load test) (should be same as date of manufacture).
  2. Synthetic web and round slings used to hoist personnel shall be marked (stenciled or other legible manner) "Personnel Lifting Only" on the body (webbing of the sling) or, in the case of round slings, on the protective fabric cover of the sling.

|                                                                       |                 |                |
|-----------------------------------------------------------------------|-----------------|----------------|
| Stennis<br>Work<br>Instruction                                        | SWI-8834-0001   | 7              |
|                                                                       | <i>Number</i>   | <i>Rev.</i>    |
|                                                                       | Effective Date: | March 18, 2022 |
|                                                                       | Review Date:    | March 18, 2027 |
| Page 31 of 36                                                         |                 |                |
| Responsible Office: RA00/Center Operations Directorate                |                 |                |
| <b>SUBJECT: Lifting Devices and Equipment Management Instructions</b> |                 |                |

3. Synthetic rope slings shall not be used for critical lifts.

**Note:** This requirement only applies to synthetic rope slings. It does not apply to other slings made of synthetic fibers such as synthetic round slings and synthetic web slings.

### 13.3 Testing

Tests shall comply with the applicable OSHA regulations, NASA STD-8719.9, NCS, and be based upon manufacturer recommendations.

The use of lifting devices for load testing items such as rigging hardware, slings, platforms, and lifting fixtures or to relieve a portion of the weight of a constrained load shall be subject to the limitations defined in NASA STD-8719.9.

#### 13.3.1 Proof Load Test

Rigging hardware shall be given an initial proof load test by the manufacturer. If a certificate of proof load test is not available from the manufacturer, the hardware shall be proof load tested in accordance with NASA-STD-8719.9.

#### 13.3.2 Periodic Load Test

Rigging hardware and slings shall be given a periodic load test in accordance with NASA STD-8719.9.

- a. Noncritical slings shall be tested at least once every four (4) years unless designated as non-load test slings.
- b. Rigging hardware shall be load tested within two (2) years prior to use for a critical lift unless designated as non-load test rigging hardware.
- c. Slings shall be load tested within one (1) year prior to use for a critical lift unless designated as a non-load test sling.

Subject to LDEM approval, slings and rigging hardware may be designated as non-load test slings/rigging hardware due to considerations such as usage, inspection and testing history, and potential for test induced damage. Non-load test slings/rigging hardware are not subject to periodic load testing requirements.

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|-----------------------------------------------------------------------|-----------------|----------------|
| Stennis<br>Work<br>Instruction                                        | SWI-8834-0001   | 7              |
|                                                                       | <i>Number</i>   | <i>Rev.</i>    |
|                                                                       | Effective Date: | March 18, 2022 |
|                                                                       | Review Date:    | March 18, 2027 |
| Page 32 of 36                                                         |                 |                |
| Responsible Office: RA00/Center Operations Directorate                |                 |                |
| <b>SUBJECT: Lifting Devices and Equipment Management Instructions</b> |                 |                |

### 13.4 Inspection of Wire Rope, Hook, Chain, and Link

Inspect wire rope, hook, chain, and links for SSC LDE in accordance with SMI-8830-0114. The inspection criteria in SMI-8830-0114 applies to slings made from chain or wire rope. Inspection criteria shall meet the minimum requirements as defined in OSHA and NASA STD-8719.9.

Synthetic rope, webbing and round slings shall be inspected before each use. The inspection shall cover the entire length of the sling, including splices, end attachments, and fittings. The sling shall be removed from service if inspection by a qualified person reveals any of the following:

- a. Cuts, gouges, badly abraded spots, or other abnormal wear.
- b. Seriously worn surface fibers or yarns.
- c. Considerable filament or fiber breakage along the line where adjacent strands meet.
- d. Powder or particles of broken filaments or fibers inside the rope between the strands (twist or pry rope open for inspection).
- e. Discoloration or harshness that may indicate rotting, chemical damage, or excessive exposure to sunlight. Inspect filaments or fibers for weakness or brittleness.
- f. Kinks, crushing, or bird caging.
- g. Variations in the size or roundness of the strands.
- h. Melting or charring of any part of the sling.
- i. Severe pitting or corrosion, or cracked, distorted, or broken fittings.
- j. Knots in any part of the sling.
- k. Other visible damage that causes doubt as to the strength of the sling.

### 13.5 Inspection of Common Rigging Hardware

Visual inspection of other common rigging hardware (shackles, rings, swivels, eye bolts, turnbuckles, etc.) shall be performed by a competent user prior to each use. Conditions such as nicks, cracks, gouges, peening, weld splatter, distortion, spreading, twisting, etc. shall be cause for removal of the component from service and disposal.

### 13.6 Shop-Fabricated Gear

Use of shop fabricated/homemade rigging hardware (slings, shackles, rings, swivels, eye bolts, turnbuckles, etc.) is prohibited.

|                                                                       |                 |                |
|-----------------------------------------------------------------------|-----------------|----------------|
| Stennis<br>Work<br>Instruction                                        | SWI-8834-0001   | 7              |
|                                                                       | <i>Number</i>   | <i>Rev.</i>    |
|                                                                       | Effective Date: | March 18, 2022 |
|                                                                       | Review Date:    | March 18, 2027 |
| Responsible Office: RA00/Center Operations Directorate                |                 |                |
| <b>SUBJECT: Lifting Devices and Equipment Management Instructions</b> |                 |                |

## 14.0 ACRONYMS

|              |                                                           |
|--------------|-----------------------------------------------------------|
| <b>ANSI</b>  | American National Standards Institute                     |
| <b>ASME</b>  | American Society of Mechanical Engineers                  |
| <b>ASNT</b>  | American Society for Nondestructive Testing               |
| <b>CEF</b>   | Central Engineering Files                                 |
| <b>CFR</b>   | Code of Federal Regulations                               |
| <b>CMAA</b>  | Crane Manufacturers Association of America                |
| <b>CMMS</b>  | Computerized Maintenance Management System                |
| <b>COTS</b>  | Commercial Off the Shelf                                  |
| <b>FCA</b>   | Facility Condition Assessment                             |
| <b>FMEA</b>  | Failure Mode and Effects Analysis                         |
| <b>GSE</b>   | Ground Support Equipment                                  |
| <b>ITSDF</b> | Industrial Truck Standards Development Foundation         |
| <b>LDE</b>   | Lifting Devices and Equipment                             |
| <b>LDEC</b>  | Lifting Device and Equipment Committee                    |
| <b>LDEM</b>  | Lifting Device and Equipment Manager                      |
| <b>MI</b>    | Maintenance Instruction                                   |
| <b>mph</b>   | miles per hour                                            |
| <b>NASA</b>  | National Aeronautics and Space Administration             |
| <b>NCS</b>   | National Consensus Standards                              |
| <b>NAS</b>   | National Aerospace Standard                               |
| <b>NDT</b>   | Non-destructive testing                                   |
| <b>NEMS</b>  | NASA Equipment Management System                          |
| <b>OEM</b>   | Original Equipment Manufacturer                           |
| <b>OSHA</b>  | Occupational Safety and Health Administration             |
| <b>PCH</b>   | Program Critical Hardware                                 |
| <b>PPE</b>   | Personal Protective Equipment                             |
| <b>RCM</b>   | Reliability Centered Maintenance                          |
| <b>SACOM</b> | Synergy Achieving Consolidated Operations and Maintenance |
| <b>SAIA</b>  | Scaffold and Access Industry Association                  |
| <b>SMA</b>   | Safety and Mission Assurance                              |
| <b>SMI</b>   | Stennis Maintenance Instruction                           |
| <b>SNT</b>   | Society for Nondestructive Testing                        |
| <b>SOMRD</b> | System Operation and Maintenance Responsibility Database  |
| <b>SPR</b>   | Stennis Procedural Requirements                           |
| <b>SSC</b>   | Stennis Space Center                                      |
| <b>STD</b>   | Standard                                                  |
| <b>SWI</b>   | Stennis Work Instruction                                  |

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|-----------------------------------------------------------------------|-----------------|----------------|
| Stennis<br>Work<br>Instruction                                        | SWI-8834-0001   | 7              |
|                                                                       | <i>Number</i>   | <i>Rev.</i>    |
|                                                                       | Effective Date: | March 18, 2022 |
|                                                                       | Review Date:    | March 18, 2027 |
| Page 34 of 36                                                         |                 |                |
| Responsible Office: RA00/Center Operations Directorate                |                 |                |
| <b>SUBJECT: Lifting Devices and Equipment Management Instructions</b> |                 |                |

## 15.0 APPENDICES

### Appendix 1: Mobile Crane and Derrick Critical Lift Requirements Checklist

|                                                            |                                                                                                                                                                |                  |  |                             |                  |    |     |
|------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|--|-----------------------------|------------------|----|-----|
| <b>Manufacturer:</b>                                       |                                                                                                                                                                | <b>Model:</b>    |  | <b>Serial No.:</b>          |                  |    |     |
| <b>NEMS No.:</b>                                           |                                                                                                                                                                |                  |  | <b>SSC Lift Device No.:</b> |                  |    |     |
| <b>Location:</b>                                           |                                                                                                                                                                | <b>Building:</b> |  | <b>Area:</b>                |                  |    |     |
| <b>Mobile Crane and Derrick Critical Lift Requirements</b> |                                                                                                                                                                |                  |  |                             | <b>CHECK ONE</b> |    |     |
|                                                            |                                                                                                                                                                |                  |  |                             | YES              | NO | N/A |
| <b>General</b>                                             |                                                                                                                                                                |                  |  |                             |                  |    |     |
| <b>1.</b>                                                  | Complies with applicable OSHA regulations (29 CFR 1910.180, 1910.181, and 1926.1400)?                                                                          |                  |  |                             |                  |    |     |
| <b>2.</b>                                                  | Complies with applicable ASME Series B30 standards (ASME B30.5 and B30.6)?                                                                                     |                  |  |                             |                  |    |     |
| <b>4.</b>                                                  | Complies with applicable NASA-STD- 8719.9 critical lift requirements?                                                                                          |                  |  |                             |                  |    |     |
| <b>5.</b>                                                  | Has a Safety Hazard Analysis been prepared, reviewed, and accepted by the LDEM?                                                                                |                  |  |                             |                  |    |     |
| <b>6.</b>                                                  | If used for hoisting personnel, has a Failure Mode and Effects Analysis (FMEA) been prepared, reviewed, and accepted by the LDEM?                              |                  |  |                             |                  |    |     |
| <b>Design Requirements</b>                                 |                                                                                                                                                                |                  |  |                             |                  |    |     |
| <b>7.</b>                                                  | Are two holding brakes provided, each capable of bringing a rated load to zero speed and holding it?                                                           |                  |  |                             |                  |    |     |
| <b>8.</b>                                                  | Incorporates an anti-two-block device that prevents the lower load block or hook assembly from contacting the upper load block, or boom point sheave assembly? |                  |  |                             |                  |    |     |
| <b>Hazardous Operations</b>                                |                                                                                                                                                                |                  |  |                             |                  |    |     |
| <b>9.</b>                                                  | Will the lifting device handle explosives, solid propellants, flammables, or any other type load that requires a non-electrical or static-free environment?    |                  |  |                             |                  |    |     |
| <b>10.</b>                                                 | If answer to "9" is "YES", are provisions for grounding the hook provided?                                                                                     |                  |  |                             |                  |    |     |

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|-----------------------------------------------------------------------|-----------------|----------------|
| Stennis<br>Work<br>Instruction                                        | SWI-8834-0001   | 7              |
|                                                                       | <i>Number</i>   | <i>Rev.</i>    |
|                                                                       | Effective Date: | March 18, 2022 |
|                                                                       | Review Date:    | March 18, 2027 |
| Page 35 of 36                                                         |                 |                |
| Responsible Office: RA00/Center Operations Directorate                |                 |                |
| <b>SUBJECT: Lifting Devices and Equipment Management Instructions</b> |                 |                |

## Appendix 2: Forklift Critical Lift Requirements Checklist

|                                              |                                                                                                |                  |  |                             |    |     |
|----------------------------------------------|------------------------------------------------------------------------------------------------|------------------|--|-----------------------------|----|-----|
| <b>Manufacturer:</b>                         |                                                                                                | <b>Model:</b>    |  | <b>Serial No.:</b>          |    |     |
| <b>NEMS No.:</b>                             |                                                                                                |                  |  | <b>SSC Lift Device No.:</b> |    |     |
| <b>Location:</b>                             |                                                                                                | <b>Building:</b> |  | <b>Area:</b>                |    |     |
| <h1>Forklift Critical Lift Requirements</h1> |                                                                                                |                  |  | <b>CHECK ONE</b>            |    |     |
|                                              |                                                                                                |                  |  | YES                         | NO | N/A |
| <b>General</b>                               |                                                                                                |                  |  |                             |    |     |
| <b>1.</b>                                    | Complies with applicable OSHA regulations (29 CFR 1910.178, 1926.600, 1926.601, and 1926.602)? |                  |  |                             |    |     |
| <b>2.</b>                                    | Complies with applicable ANSI/ITSDF Series B56 standards (B56.1 and B56.6)?                    |                  |  |                             |    |     |
| <b>3.</b>                                    | Complies with applicable NASA-STD-8719.9 critical lift requirements?                           |                  |  |                             |    |     |
| <b>4.</b>                                    | Has a Safety Hazard Analysis been prepared, reviewed and accepted by the LDEM?                 |                  |  |                             |    |     |
| <b>Design Requirements</b>                   |                                                                                                |                  |  |                             |    |     |
| <b>5.</b>                                    | There are no special design requirements                                                       |                  |  |                             |    | X   |

|                                                                       |                 |                |
|-----------------------------------------------------------------------|-----------------|----------------|
| Stennis<br>Work<br>Instruction                                        | SWI-8834-0001   | 7              |
|                                                                       | <i>Number</i>   | <i>Rev.</i>    |
|                                                                       | Effective Date: | March 18, 2022 |
|                                                                       | Review Date:    | March 18, 2027 |
| Page 36 of 36                                                         |                 |                |
| Responsible Office: RA00/Center Operations Directorate                |                 |                |
| <b>SUBJECT: Lifting Devices and Equipment Management Instructions</b> |                 |                |

### Appendix 3: Overhead Crane Critical Lift Requirements Checklist

|                                                     |                  |                   |                             |  |  |
|-----------------------------------------------------|------------------|-------------------|-----------------------------|--|--|
| <b>Manufacturer:</b>                                |                  | <b>Model No.:</b> | <b>Serial No.:</b>          |  |  |
| <b>NASA Equipment Management System (NEMS) No.:</b> |                  |                   | <b>SSC Lift Device No.:</b> |  |  |
| <b>Location:</b>                                    | <b>Building:</b> | <b>Area:</b>      |                             |  |  |

  

| Overhead Crane Critical Lift Requirements |                                                                                                                                                             | CHECK ONE |    |     |  |
|-------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|----|-----|--|
|                                           |                                                                                                                                                             | YES       | NO | N/A |  |
| <b>General</b>                            |                                                                                                                                                             |           |    |     |  |
| <b>1.</b>                                 | Complies with applicable OSHA regulations (29 CFR 1910.179, 1926.552, 1926.553, and 1926.554)?                                                              |           |    |     |  |
| <b>2.</b>                                 | Complies with applicable ANSI/ASME Series B30 standards (ASME B30.2, B30.4, B30.11, and B30.17)?                                                            |           |    |     |  |
| <b>3.</b>                                 | Complies with applicable CMAA standards (CMAA 70 and 74)?                                                                                                   |           |    |     |  |
| <b>4.</b>                                 | Complies with applicable NASA-STD-8719.9 critical lift requirements?                                                                                        |           |    |     |  |
| <b>5.</b>                                 | Has a Safety Hazard Analysis been prepared, reviewed, and accepted by the LDEM?                                                                             |           |    |     |  |
| <b>Design Requirements</b>                |                                                                                                                                                             |           |    |     |  |
| <b>6.</b>                                 | Are there two holding brakes provided, each capable of bringing a rated load to zero speed and holding it?                                                  |           |    |     |  |
| <b>7.</b>                                 | Are dual upper limit switches provided?                                                                                                                     |           |    |     |  |
| <b>8.</b>                                 | Is a lower limit switch provided to ensure no less than two wraps remain on the drum?                                                                       |           |    |     |  |
| <b>9.</b>                                 | Does the lifting device have a fail-safe control system that prevents the device from operating in an uncontrolled state due to a single-component failure? |           |    |     |  |
| <b>Hazardous Operations</b>               |                                                                                                                                                             |           |    |     |  |
| <b>10.</b>                                | Will the lifting device handle explosives, solid propellants, flammables, or any other type load that requires a non-electrical or static-free environment? |           |    |     |  |
| <b>11.</b>                                | If answer to "10" is "YES", are provisions for grounding the hook provided?                                                                                 |           |    |     |  |