| PAYLOAD HAZARD REPORT | | a. NO: GHR-AMS02-009 |
|---|---|---|
| b. Alpha Magnetic Spectrometer-02 (AMS-02) GSE | | c. II |
| d. SUBSYSTEM: GHE Lifting Equipment | e. HAZARD GROUP: Structures | f. DATE: May 2008 |
| g. HAZARD TITLE: Structural failure of hardware during ground handling/moving/operations | | i. HAZARD CATEGORY ☒ CATASTROPHIC ☐ CRITICAL |

h. APPLICABLE SAFETY REQUIREMENTS:
KHB1700.7C

For Structural Failure of Flight Hardware, see AMS- 02-F01

j. DESCRIPTION OF HAZARD:

Structural failure or inadvertent separation of the AMS-02 lifting equipment could result in injury to personnel and/or damage to STS/ISS equipment, payloads, ground support equipment and/or facilities.

(Note: The eyebolts on the Lower USS-02 Shipping Cover are not permanently attached.)

k. HAZARD CAUSES:

1. Inadequate structural design of the AMS-02 lifting equipment.
2. Structural deterioration of the AMS-02 lifting equipment due to use or aging.
3. Improper attachment of the AMS-02 swivel hoist rings.
4. Overload of the AMS-02 lifting equipment.
5. Improper assembly of the AMS-02 lifting equipment.
6. Personnel error.

l. HAZARD CONTROLS:

(See continuation sheet)

m. SAFETY VERIFICATION METHODS:

(See continuation sheet)

n. STATUS OF VERIFICATION:

(See continuation sheet)

| o. APPROVAL | PAYLOAD ORGANIZATION | SSP/ISS |
|---|---|---|
| PHASE I | | |
| PHASE II | 10/3/08 | 10/3/08 |
| PHASE III | | |

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| PAYLOAD HAZARD REPORT CONTINUATION SHEET | a. NO: | GHR AMS02--009 |
|---|---|---|
| b. Alpha Magnetic Spectrometer-02 (AMS-02) GSE | c. Phase | II |

k. HAZARD CAUSES:

1. Inadequate structural design of the AMS-02 lifting equipment.

l. HAZARD CONTROLS:

1.1. The AMS-02 lifting equipment is being designed to a safety factor of 5:1 against ultimate for all crane lifting operations. For forklift operations, the Lower USS-02 Support Fixture is being designed to a safety factor of 3:1 against yield. For dolly towing (5 mph), the PSS is being designed to a safety factor of 2:1 against yield and 3:1 against ultimate. (See attached AMS-02 Ground Support Lifting/Handling Equipment Matrix)

m. SAFETY VERIFICATION METHODS:

1.1.1 Stress analyses will be performed to verify the proper safety factors defined in KHB 1700.7C were used.

1.1.2 Load testing and tagging of all AMS-02 lifting hardware.

n. STATUS OF VERIFICATION:

1.1.1 Open

1.1.2 Open

| PAYLOAD HAZARD REPORT CONTINUATION SHEET | a. NO: | GHR AMS02--009 |
|---|---|---|
| b. PAYLOAD: Alpha Magnetic Spectrometer-02 (AMS-02) GSE | c. Phase | II |

k. HAZARD CAUSES:

2. Structural deterioration of the AMS-02 lifting equipment due to use or aging.

l. HAZARD CONTROLS:

2.1 Nondestructive Inspection (NDI) will be performed on AMS-02 shackles, swivel hoist rings, eyebolts that are not permanently attached, and master link assemblies.

2.2 The AMS-02 lifting equipment will be visually inspected each day prior to use and structural inspections for proper identification of load rating and expiration date will be performed per KHB 1700.7C, Section 4.5.1.2.d.

m. SAFETY VERIFICATION METHODS:

2.1.1 Review AMS-02 records to ensure NDI was performed.

2.2.1 Review of AMS-02 lifting procedures to ensure inspections are included.

n. STATUS OF VERIFICATION:

2.1.1 Open

2.2.1. Open

| PAYLOAD HAZARD REPORT CONTINUATION SHEET | a. NO: | GHR AMS02--009 |
|---|---|---|
| b. PAYLOAD: Alpha Magnetic Spectrometer-02 (AMS-02) GSE | c. Phase | II |

k. HAZARD CAUSES:
3. Improper attachment of the AMS-02 swivel hoist rings.

l. HAZARD CONTROLS:

3.1 Torque values and visual inspections for AMS-02 swivel hoist rings and removable eyebolts will be specified on AMS-02 drawings to assure full thread engagement after mounting.

m. SAFETY VERIFICATION METHODS:
3.1.1 Review of AMS-02 drawings to ensure requirements are called out on drawings.

3.1.2 QA reports documenting that installed hardware meet requirements.

n. STATUS OF VERIFICATION:
3.1.1 Open
3.1.2 Open

| PAYLOAD HAZARD REPORT CONTINUATION SHEET | a. NO: | GHR AMS02--009 |
|---|---|---|
| b. PAYLOAD: Alpha Magnetic Spectrometer-02 (AMS-02) GSE | c. Phase | II |

k. HAZARD CAUSES:

4. Overload of the AMS-02 lifting equipment.

l. HAZARD CONTROLS:

4.1 The AMS-02 lifting equipment will be posted with the equipment identification, next required test date, quality control stamp, rated load, proof load and proof load date.

m. SAFETY VERIFICATION METHODS:

4.1.1 QA inspections/verifications that the AMS-02 lifting equipment is properly posted/tagged.

n. STATUS OF VERIFICATION:

4.1.1 Open

| PAYLOAD HAZARD REPORT CONTINUATION SHEET | a. NO: | GHR AMS02--009 |
|---|---|---|
| b. PAYLOAD: Alpha Magnetic Spectrometer-02 (AMS-02) GSE | c. Phase | II |

k. HAZARD CAUSES:

5. Improper assembly of the AMS-02 lifting equipment.

l. HAZARD CONTROLS:

5.1. Part and serial numbers for components of the AMS-02 lifting equipment that are normally disassembled will be specified on drawings and in procedures to assure proper reassembly.

5.2 Approved drawings and procedures will be used for reassembly of the AMS-02 lifting equipment.

5.3 Lower USS Shipping Assembly cover has removable eyebolts with shoulders to ensure proper determination of full thread engagement.

m. SAFETY VERIFICATION METHODS:

5.1.1 Review of AMS-02 drawings and procedures for the AMS-02 lifting equipment.

5.2.1 Review of AMS-02 procedures for reassembly instructions and QA inspections/ verifications of proper reassembly.

5.3.1 Inspection of eyebolt insertion.

n. STATUS OF VERIFICATION:

| | |
|---|---|
| 5.1.1 | Open |
| 5.2.1 | Open |
| 5.3.1 | Open |

| PAYLOAD HAZARD REPORT CONTINUATION SHEET | a. NO: | GHR AMS02--009 |
|---|---|---|
| b. PAYLOAD: Alpha Magnetic Spectrometer-02 (AMS-02) GSE | c. Phase | II |

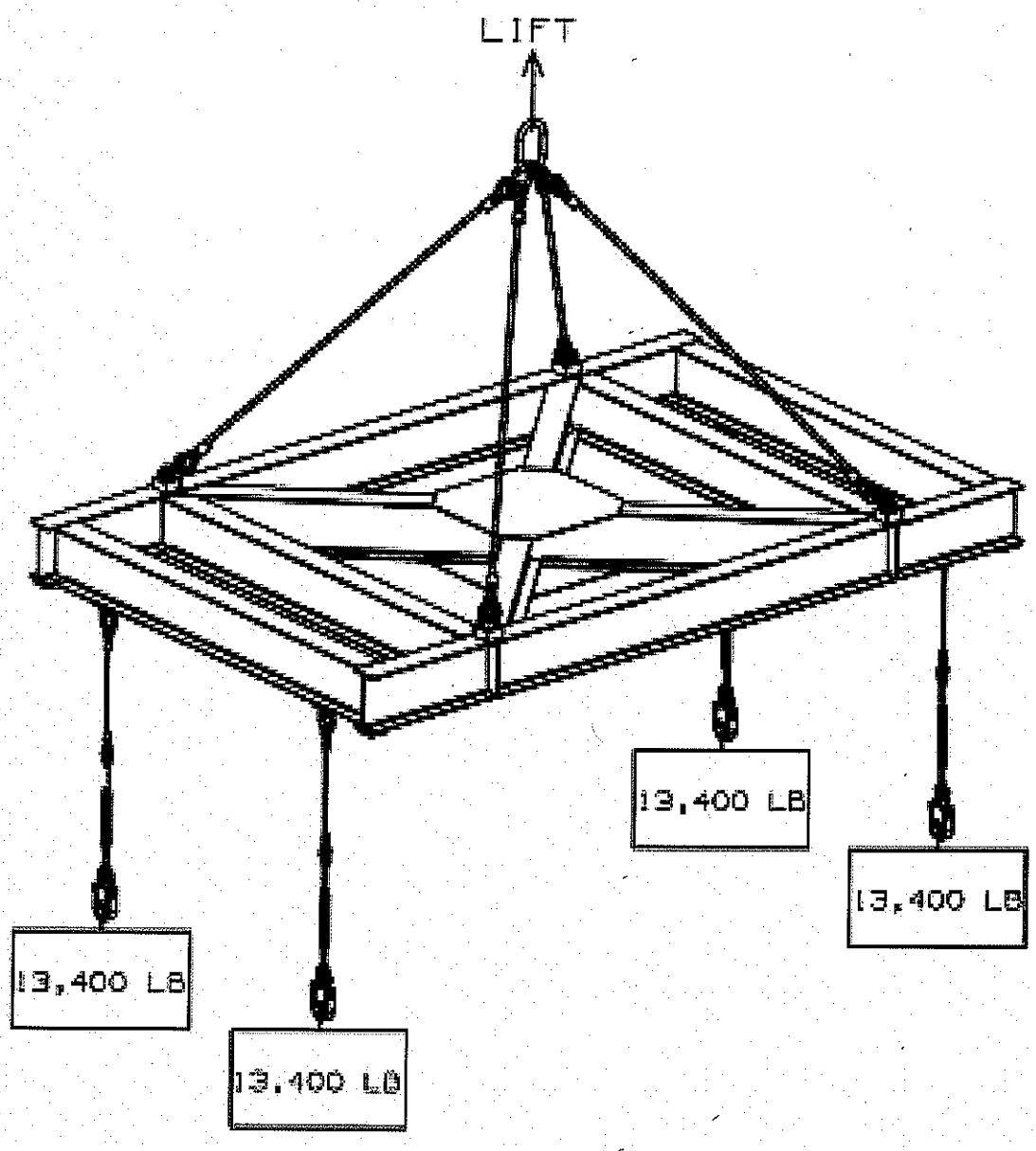
k. HAZARD CAUSES:
6. Personnel error.

l. HAZARD CONTROLS:

6.1 All lifts will be accomplished by approved procedures.

m. SAFETY VERIFICATION METHODS:
6.1.1 AMS-02 will participate in lift procedure development.per AMS-02 Launch Site Safety Plan.

n. STATUS OF VERIFICATION:
6.1.1 Open




**Primary Lifting Fixture (PLF)**

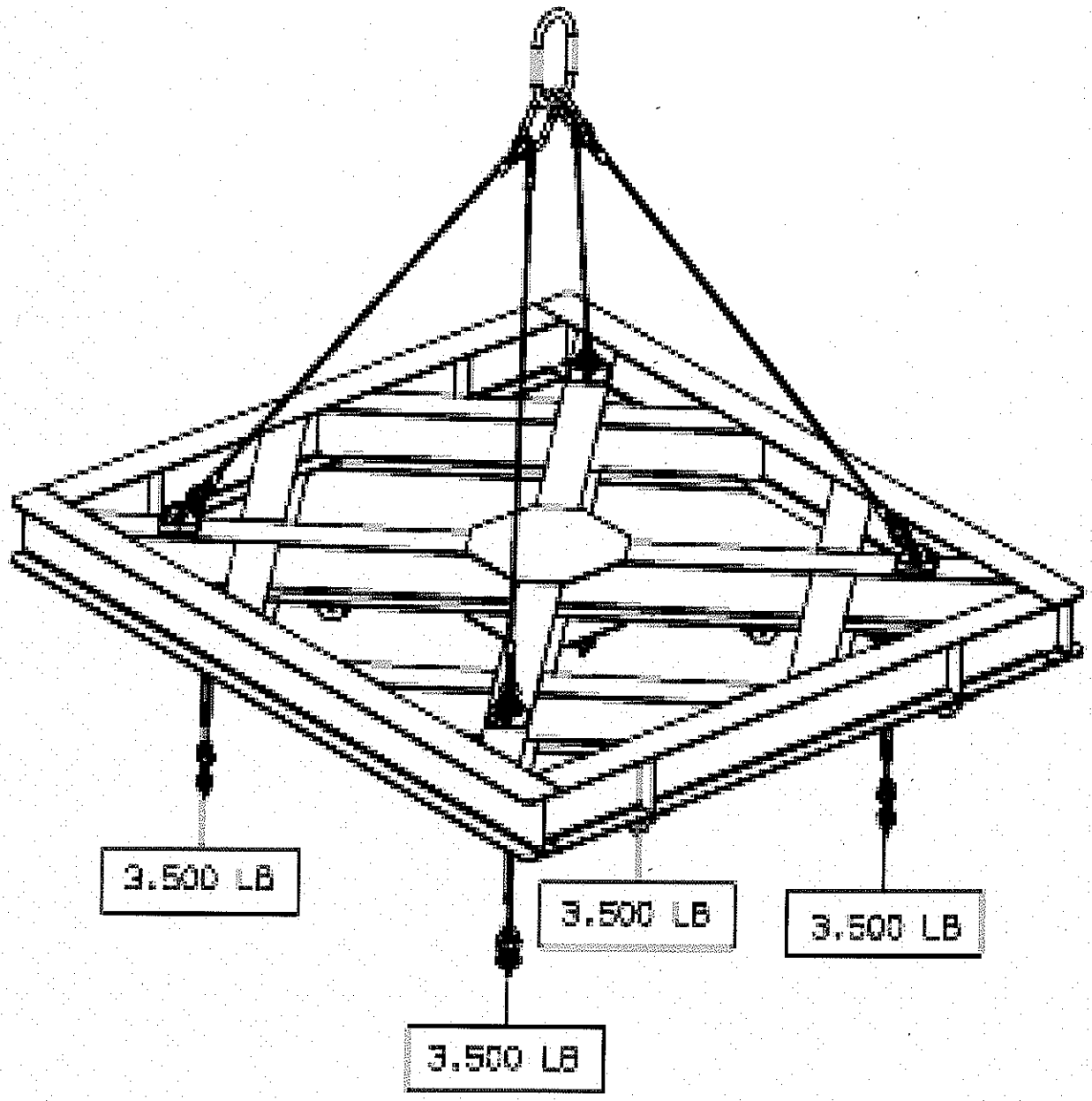
# GROUND SUPPORT LIFTING/HANDLING EQUIPMENT MATRIX

| DESIGNATOR NUMBER | ITEM NAME | SLING | | CRIT WELDS | | ACTUAL LOADS (lbs) | RATED LOADS (lbs) | PROOF LOAD (lbs) | DESIGN LOAD | | VERIFICATION STATUS |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Met | Syn | Yes | No | | | | Ult | Yield | |
| SEG38117112-301 | Primary Lifting Fixture Hoist Assembly Max (-305) 190.8 in (Length) x 123.8 in (Width) x 187.4 in (Height) Material: A-36 Steel | X | | | X | 25,600 | 26,800 | 53,600 | 162.56 K | N/A | Stress Analysis Completed per ESCG-4450-06-STAN-DOC-0049 |
| SEG38117112-303 | | X | | | X | 25,600 | 26,800 | 53,600 | 162.56 K | N/A | |
| SEG38117112-305 | | X | | | X | 25,600 | 26,800 | 53,600 | 162.56 K | N/A | |
| SEG38117112-307 | | X | | | X | 25,600 | 26,800 | 53,600 | 162.56 K | N/A | |
| SEG38117112-309 | | X | | | X | 25,600 | 26,800 | 53,600 | 152.56 K | N/A | |

NOTES: I

Identify whether slings are Metallic (Met) or Synthetic (Syn) by placing an "X" in the appropriate column. For synthetic slings, see Table 4-1 of KHB 1700.7 for the required safety factors and proof load test criteria.

Denote whether to the device has a critical weld by placing an "X" in the appropriate column. If there are critical welds, other test may to applicable (see KHB 1700.7 para. 4.5.1.1.D). A critical weld is a weld, which constitutes a single point of failure. Where feasibly, critical welds should be eliminated.




**Multi-Purpose Lifting Fixture**

# GROUND SUPPORT LIFTING/HANDLING EQUIPMENT MATRIX

| DESIGNATOR NUMBER | ITEM NAME | SLING | | CRIT WELDS | | ACTUAL LOADS (lbs) | RATED LOADS (lbs) | PROOF LOAD (lbs) | DESIGN LOAD | | VERIFICATION STATUS |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Met | Syn | Yes | No | | | | Ult | Yield | |
| SEG38117125-301 | Multi-Purpose Lifting Fixture Hoist Assembly Max (-301) 125.3 in (Length) x 109.0 in (Width) x 242.3 in (Height) Material A-36 Steel | X | | | X | 3860 | 7000 | 14000 | 35K | 21K | Stress Analysis completed per ESCG-4005-05-STAN-DOC-0103 (As per pp 1-7 in report, analysis was done for 7000 lbs) |
| SEG38117125-305 | | X | | | X | 6759 | 7000 | 14000 | 35K | 21K | |
| SEG38117125-307 | | X | | | X | 2632 | 7000 | 14000 | 35K | 21K | |
| SEG38117125-309 | | X | | | X | 700 | 7000 | 14000 | 35K | 21K | |
| SEG38117125-311 | | X | | | X | 6759 | 7000 | 14000 | 35K | 21K | |
| SEG38117125-313 | | X | | | X | 6759 | 7000 | 14000 | 35K | 21K | |

NOTES: I Identify whether slings are Metallic (Met) or Synthetic (Syn) by placing an "X" in the appropriate column. For synthetic slings, see Table 4-1 of KHB 1700.7 for the required safety factors and proof load test criteria.

Denote whether to the device has a critical weld by placing an "X" in the appropriate column. If there are critical welds, other test may to applicable (see KHB 1700.7 para. 4.5.1.1.D). A critical weld is a weld, which constitutes a single point of failure. Where feasibly, critical welds should be eliminated.