APPROVAL SHEET FOR SUSPENDED LOAD OPERATIONS

SLO-KSC -2007- 005

TITLE: ELM-PS Bumper Panel Install - Canister, PM Bumper Panel Install - Canister

DOCUMENT NUMBER/TITLE: JTP-461116, JTP-361357

PREPARED BY: JAXA JEM Development Project / S&MA DATE: Dec. 2007

REQUIRED APPROVAL

CONTRACTOR _____ DESIGN _____ R & QA _____ OPERATIONS _____ SAFETY

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KSC FORM 20-209 NS (04/05)

NASA SUSPENDED LOAD OPERATION ANALYSIS/APPROVAL (SLOAA)

OPERATION:

1. To install/removal (if needed) the bumper panel/Y-restraint to Experiment Logistics Module - Pressurized Section (ELM-PS).
2. To install/removal (if needed) the bumper panel/Y-restraint to Pressurized Module (PM).

SUPPORTING DOCUMENTS:

The associated operational procedure/systems assurance analysis are as follows:

1. JTP-461116 ELM-PS Bumper Panel Install - Canister
2. JTP-361357 PM Bumper Panel Install - Canister
3. SAA21CRS1-001, 30 Ton Highbay Bridge Crane-Space Station Processing Facility(SSPF)
4. OMI L5166, Cargo Element Lifting Assembly (CELA) – O&C/SSPF
5. E5006, Strongback Operations
6. Recycle Procedure (if needed)

GENERAL DESCRIPTION:

1. When installation/removal (if needed) the bumper panel to ELM-PS, 4 workers will insert their bodies under the lifting device to attach the bumper panel.
2. When installation/removal the Y-restraint to ELM-PS, 4 workers will insert their bodies under the lifting device to attach/remove the Y-restraint.
3. When installation/removal (if needed) the bumper panel to PM, 4 workers will insert their bodies under the lifting device to attach the bumper panel.
4. When installation/removal the Y-restraint to PM, 4 workers will insert their bodies under the lifting device to attach/remove the Y-restraint.

These tasks are completed in the following JTP-461116 sequences:

- Installation/Removal the Y-restraint.
- Installation the bumper panel.

These tasks are completed in the following JTP-361357 sequences:

- Installation/Removal the Y-restraint.
- Installation the bumper panel.

Note; There are four restraints and eight bumper panels for each module.

RATIONAL/ANALYSIS:
The suspended load tasks comply with the NASA Alternate Safety Standard for Suspended Load Operations as follows:

Alternate Standard Requirement #1a:
These operations cannot be conducted without placing personnel or hands under the suspended the lifting device. It has been determined that there are no design, procedural, or operational means to eliminate personnel exposure to a suspended load, without exposing flight hardware to unacceptable damage.

Alternate Standard Requirement #1b:
1. The possible use of a secondary support system to catch the load in the event of a crane failure was analyzed. It was determined use of a secondary support system was not feasible because of positioning of the ELM-PS over canister inside structures and under the CELA.
2. The possible use of a secondary support system to catch the load in the event of a crane failure was analyzed. It was determined use of a secondary support system was not feasible because of positioning of the PM over canister inside structure and under the Strong Back.

Alternate Standard Requirement #1c:
1. The maximum number of personnel allowed under the load during installation bumper panel to ELM-PS is four.
2. The maximum number of personnel allowed under the load during installation/removal Y-restraint ELM-PS is four.
3. The maximum number of personnel allowed under the load during installation bumper panel to PM is four.
4. The maximum number of personnel allowed under the load during installation/removal Y-restraint PM is four.

Alternate Standard Requirement #1d:
1. Installation of bumper panel to ELM-PS will be accomplished as quickly and safely as possible to minimize exposure time. It will take four workers up to 10 minutes to install each bumper panel under suspended load.
2. Installation/removal of Y-restraint to ELM-PS will be accomplished as quickly and safely as possible to minimize exposure time. It will take four workers up to 10 minutes to install/remove each Y-restraint under suspended load.
3. Installation of bumper panel to PM will be accomplished as quickly and safely as possible to minimize exposure time. It will take four workers up to 10 minutes to install each bumper panel under suspended load.
4. Installation/removal of Y-restraint to PM will be accomplished as quickly and safely as possible to minimize exposure time. It will take four workers up to 10 minutes to install/remove each Y-restraint under suspended load.

Alternate Standard Requirement #2: Suspended load operations are reviewed and approved on a case-by-case/specific need basis - see General Description and Alternate Standard Requirement #1.

Alternate Standard Requirement #3: Only those suspended load operations approved by the NASA Safety and Mission Assurance Division Chief will be permitted. The NASA Safety and Mission Assurance Division will maintain a list of approved suspended load operations.

Alternate Standard Requirement #4: The work authorizing documents are written to allow only required personnel under the suspended load. The work authorizing documents are available on site for inspection during the operation.

Alternate Standard Requirement #5: A new suspended load operation not covered by this SLOAA, deemed necessary due to unusual or unforeseen circumstances where real time action is required, shall be documented and approved by the NASA Safety and Mission Assurance Division Chief.

Alternate Standard Requirement #6: The suspended load operations addressed in this analysis involve the 30 ton SSPF Highbay bridge cranes. The cranes are designed, tested, inspected, maintained, and operated in accordance with the NASA Standard for Lifting Devices and Equipment, NASA-STD-8719.9.

The SSPF Highbay 30 ton crane hoists are equipped with two magnetic holding brakes, each capable of holding the load up to the crane's rated capacity. Each brake's ability to hold the rated load (30 tons) is verified annually. The cranes are designed to meet a 5 to 1 safety factor based on ultimate strength for the hoist load bearing components. The 30 ton cranes are load tested annually at 100% of their rated capacities. Detailed preventive maintenance is performed monthly, quarterly, semiannually, and annually on the cranes to ensure proper operation. Nondestructive testing of the crane hooks is performed annually.

The Cargo Element Lifting Assembly (CELA) is utilized for operations 1, described on page 1, and the Strongback is utilized for operation 2.

The Cargo Element Lifting Assembly (CELA) is rated at 26,500 lbs. and is designed to meet a 5 to 1 safety factor based on ultimate strength. The combined weight of the CELA, Long Spacer, and miscellaneous hoisting equipment is approximately 33,000 lbs.

The strongback is rated hoist 65,000lbs. And is designed to the American Institute of Steel construction standard. The strongback has an annual visual inspection and the strongback down rod links are load tested on an annual basis.

Alternate Standard Requirement #7: An SAA has been completed on the 30 ton bridge cranes. The SAA includes a Failure Modes and Effects Analysis/Critical Items List (FMEA/CIL) and a hazard analysis (see supporting documents). No critical single failure points were identified during this analysis.

Alternate Standard Requirement #8: Visual inspections for cracks or other signs of damage or anomalies are performed on the hoist hooks, hoist beams, hoist cables, hoist rod assemblies, and hoist fittings, and crane functional checks are performed before each operation per NASA-STD-8719.9.

Alternate Standard Requirement #9: Trained and licensed crane operators shall remain at the hoist controls while personnel are under the load.

Alternate Standard Requirement #10: Appropriate safety control areas are established before initiating operations. Only the minimum number of people will be permitted in this area.

Alternate Standard Requirement #11: A pretask briefing and a safety walkdown of the area will be conducted prior to the lift to ensure that all systems and personnel are ready to support. All participants are instructed on their specific tasks and warned of potential hazards. Following any crew change, the new personnel are instructed by the task leader on their specific tasks and warned of any hazards involved.

Alternate Standard Requirement #12: The person beneath the suspended load will be in voice contact with the hoist operator and/or task leader. Upon loss of communication, the operation shall stop immediately, personnel shall clear the hazardous area, and the load shall be safed. Operations shall not continue until communications are restored.

Alternate Standard Requirement #13: Personnel working beneath the load shall be in continuous sight of the hoist operator and/or task leader.

Alternate Standard Requirement #14: The NASA Safety and Mission Assurance Division shall conduct periodic reviews to ensure the continued safety of suspended load procedures.

Alternate Standard Requirement #15: The NASA Safety and Mission Assurance Division will provide copies of approved SLOAAs, a list of approved suspended load operations, a list of cranes/hoists used for suspended load operations and copies of the associated FMEA/CIL and hazards analyses to NASA Headquarters.

APPROVAL: DATE:

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