MWI 6430.1
REVISION E
EFFECTIVE DATE: September 27, 2004
EXPIRATION DATE: September 27, 2009

MARSHALL WORK INSTRUCTION

AD01

LIFTING EQUIPMENT AND OPERATIONS

DOCUMENT HISTORY LOG

Status (Baseline/ Revision/ Canceled)	Document Revision	Effective Date	Description
Baseline		5/14/99	Document converted from MSFC-P15.1-C05 to a directive. Previous history retained in system as part of canceled or superseded ISO Document files.
Revision	A	8/20/99	Changes made to reflect new organizational codes. Paragraph 6.1.1, step 1: deleted Safety and Mission Assurance Office and Facilities Engineering Department from Responsible Organization column.
Revision	B	1/5/01	Changed Table 1 to eliminate annual crane operations survey and require organizations to review upcoming operations yearly and notify FED of new requirements. Revised 6.4.1 to require the use of MSFC Forms 4328 and 4332 for daily crane inspections. Replaced unnumbered forms in Appendices B and C with MSFC Forms 4328 and 4332. Added documentation requirements to Section 9 for daily inspections. To resolve RCAR 135, paragraph 6.7 revised to resolve conflict with Table 3, Step 14, and require MSFC Form 4331 to be used for deviations/waivers.
Revision	C	6/25/01	Added sentence "The responsible contracting officer…" to section 2, Applicability. This is to implement recommendation from Close Call Investigation Report, Hoist at Building 4648. Added paragraph 6.9 to establish LDE Committee to satisfy 2001 Code Q audit finding. Added statement regarding disposition of records to paragraph 9.5. This is to satisfy NCR 438.
Revision	D	4/15/2004	Document re-written to reflect changes in headquarters documentation migrating from NSS/GO 1740.9b to NASA-STD 8719.9.
Revision	E	9/27/2004	Requirements distinguished by use of the word "shall." Changed font to Times New Roman. Document also reflects minor editorial and organizational changes.

1. PURPOSE

The purpose of this Marshall Work Instruction (MWI) is to identify the MSFC organizations and their responsibilities for ensuring compliance with NASA-STD-8719.9.

This document applies to overhead and gantry cranes (including top running monorail, underhung, and jib cranes); mobile cranes; derricks; hoists; special hoist-supported, personnel-lifting devices; Hydra-sets; load measuring devices; hooks; slings and rigging; mobile aerial platforms; forklifts; and jacks. It does not address elevators or front-end loaders.

2. APPLICABILITY

This MWI applies to all MSFC facilities and organizations that operate or maintain equipment covered by NASA-STD-8719.9. Compliance with NASA-STD-8719.9 is mandatory for all NASA-owned and NASA contractor-supplied equipment used in support of NASA operations at NASA installations. The responsible contracting officer shall include relevant requirements of this MWI in any contract that requires the contractor to purchase, install, modify, maintain, or operate equipment governed by this MWI. In addition, the contracting officer and responsible NASA installation/program safety office shall evaluate the need for compliance at contractor installations performing NASA work and shall make compliance a contractual requirement where deemed necessary.

It is understood that NASA organizations may delegate some or all of their designated responsibilities to subordinate divisions within their organization, to other NASA organizations, or to contractor organizations through contract specifications and statements of work.

3. APPLICABLE DOCUMENTS

3.1 MWI 6410.1, “Packaging, Handling, and Moving Program Critical Hardware”

3.2 NPR 8715.3, “NASA Safety Manual”

3.3 NASA-STD-8719.9, “Standard for Lifting Devices and Equipment”

3.4 MWI 3410.1, “Personnel Certification Program”

4. REFERENCES

None

5. DEFINITIONS

5.1 Critical-Lift Operations. Lifting and lowering operations with special, high-dollar items (i.e., spacecraft, one-of-a-kind articles, or major facility components, etc.) whose loss would

have serious programmatic impact. Critical lifts also include operations with special personnel and equipment safety concerns beyond normal lifting hazards.

5.2 Failure Mode and Effects Analysis. A systematic, methodical analysis performed to identify and document all identifiable failure modes at a prescribed level and to specify the resultant effect of the modes of failure.

5.3 Hazard Analysis**.** A systematic analysis performed on cranes being qualified to handle loads classified as critical or program-critical hardware. The analysis is required for initial certification to handle critical loads and must be updated, as needed, to reflect any changes in operations or crane configuration. The analysis must determine potential sources of danger, identify most probable failure modes, and recommend resolutions for those conditions found in the hardware-facility-environment-human relationship which could cause loss of life, personal injury, or loss of crane, facility, or load. The analysis must include crane description, reference documentation, severity assessment, and assessment of specified passive and structural components between the hook and the holding brakes.

5.4 Lifting Devices. For purposes of this instruction, this term is used to refer to overhead and gantry cranes (including top running monorail, underhung, and jib cranes); mobile cranes; derricks; hoists; special hoist-supported, personnel-lifting devices; Hydra-sets; load measuring devices; hooks; slings and rigging; mobile aerial platforms; forklifts; and jacks. It should be noted that NASA-STD-8719.9 uses the terms “lifting device” and “lifting equipment” interchangeably.

5.5 Lifting Equipment. For purposes of this instruction, this term is used to refer to all hardware attached to or below the hook for the purpose of lifting a load (e.g., Hydra-sets; special hoist-supported, personnel-lifting devices; slings; and all types of rigging equipment). It should be noted that NASA-STD-8719.9 uses the terms “lifting device” and “lifting equipment” interchangeably.

5.6 Mobile Equipment. Mobile equipment is defined as mobile cranes, forklifts, and aerial lift platforms in this document.

5.7 Noncritical Lift Operations. Lifting and lowering operations involving routine minimal hazards. These operations are governed by standard industry rules and practices, except as supplemented by unique NASA-testing, operations, maintenance, inspection, and personnel licensing requirements contained in NASA-STD-8719.9.

5.8 Nondestructive Evaluation. Test and inspection methods used to determine the integrity of equipment that does not involve destruction of the test object. Examples are ultrasonic, magnetic particle, eddy current, X-ray, dye penetrant, etc.

5.9 Operational Test. A test to determine if the equipment (limit switches, emergency stop, controls, brakes, etc.) is functioning properly.

5.10 Program Critical Hardware (PCH). Those items meeting one or more of the criteria contained in MWI 6410.1.

5.11 Proof Load Test. A load test performed prior to first use, after major modification of the load path, or at other prescribed times. This test verifies material strength, construction, and workmanship, and uses a load typically greater than the rated load. The percentage above rated load varies with equipment type.

5.12 Qualified. Indicates that a piece of equipment or lifting device has been through a verification process and meets all specifications.

5.13 Rated Load, Safe Working Load, or Rated Capacity. An assigned weight that is the maximum load the device or equipment is to operationally handle and maintain. This value is marked on the device indicating maximum working capacity. If the device has never been down rated or up rated, this is also the "manufacturer's rated load."

5.14 Periodic Load Test or Rated Load Test. A load test performed at predetermined intervals with a load equal to the rated load. The acceptable tolerance of the periodic load test is +5%/-0%.

6. INSTRUCTIONS

In this MWI, three organizations are identified as responsible for different types of lifting device and equipment. Facilities Engineering Department (FED) is responsible for overhead cranes, derrick cranes, hoists, and hooks. Logistics Services Department (LSD) is responsible for mobile equipment. Other equipment such as Hydra-sets; special hoist-supported, personnel lifting devices; and slings shall be the responsibility of an organization with ownership.

6.1 Identification of Critical-Lift Requirements.

6.1.1 Department/Program/Project Manager Responsibilities. Department managers and program/project managers shall determine the need for critical-lift equipment based on the loads to be handled in their organizations or programs. Refer to the Appendix for the MSFC process to identify critical lifts. The department managers and program/project managers shall notify FED or LSD in writing of their critical lifting requirements and shall provide funds for new cranes and to bring specific cranes into critical status, as required.

6.1.2 FED and LSD Responsibilities. FED or LSD shall, in return, notify the project/program manager of the capability (critical or noncritical) of the lifting systems cited and what actions, if any, are needed to bring the subject devices into critical compliance.

6.2 Equipment Classification.

FED shall identify fixed-lifting systems (i.e., overhead cranes, hoists, derricks, etc.) as to

whether it can be qualified as critical or noncritical. LSD shall identify mobile lifting systems as to whether it can be qualified as critical or noncritical.

The owner organization, FED (fixed cranes); LSD (mobile equipment); or user (all other equipment); is responsible to complete MSFC Form 4330 for critical device qualification. The Safety & Mission Assurance Directorate (S&MA) shall review MSFC Form 4330 for accuracy and approval.

6.3 Hazard Analysis.

S&MA shall perform a hazard analysis on each lifting device to be used for critical lifts and on each hoist-supported, personnel-lifting device as a part of the initial qualification process, and track identified hazards (record and maintain current status) until final closure is verified. S&MA shall utilize a system of risk acceptance for hazards that cannot be eliminated. S&MA shall update the hazard analysis, as required, to reflect any changes in operation and/or configuration. This analysis shall be maintained in the crane historical file.

6.4 New and Modified Lifting Equipment.

6.4.1 There is a process for ensuring that new and modified lifting devices and equipment complies with pertinent requirements of NASA-STD-8719.9. This process begins with the definition of operational needs, device/equipment performance requirements, and specifications for new and/or modified cranes and hoists.

6.4.2 Crane service classification, load capability, and desired control characteristics shall be considered in the design/ specification stage. The service classification shall be based on the worst expected duty the unit will encounter. All units shall be purchased capable of being used in critical operations unless use can be clearly defined as noncritical for the life of the unit.

6.4.3 Generally, high-quality, off-the-shelf, Original Equipment Manufacturer (OEM)-type devices/equipment are acceptable for critical and noncritical lifts if designed, installed, and maintained in accordance with NASA-STD-8719.9.

6.4.4 FED (for permanently installed equipment) or LSD (for mobile equipment) shall be responsible for performing the following functions:

6.4.4.1 Document load-handling requirements for new or modified crane or hoist, to include critical or noncritical designation. Prepare and document design procurement specifications to ensure the crane/hoist shall meet requirements of NASA-STD-8719.9.

6.4.4.2 Prepare or review crane/hoist installation instructions and authorize installation. Perform and document acceptance tests for new or modified cranes/hoists in accordance with requirements of NASA-STD-8719.9.

6.4.4.3 Review, update, and select Preventive Maintenance (PM) and Predictive Testing & Inspection (PT&I) tasks to be performed on the lifting device.

6.4.4.4 Provide engineering analysis/review/approval, as applicable, for repairs/modifications using other than OEM parts or where the original crane/hoist configuration requires modification.

6.4.4.5 Develop and file as-built configuration drawings for new or modified cranes and hoists.

6.5 Testing of Lifting Devices and Equipment.

FED and LSD shall perform and document the required tests on their responsible equipment. The equipment owner shall initiate the required tests and documentation for Hydra-sets; hoist-supported, personnel-lifting devices; lifting fixtures; structural slings; and slings (including associated equipment such as shackles, turnbuckles, eyebolts, etc.). There are three types of tests required for lifting devices/equipment: Proof-load tests, rated-load tests, and operational tests. All load and operational tests shall be performed by qualified personnel according to written (specific or general) technical operating procedures approved by NASA and/or contractor safety representatives.

6.5.1 Proof-load Tests: The proof-load tests and operational tests shall be performed prior to first use for new lifting devices or for existing cranes that have had modifications or alterations performed to components in the load path.

6.5.2 Rated-load Tests: Rated-load tests shall be performed on critical-lift equipment once a year and on noncritical-lift equipment at least once every 4 years.

6.5.3 Operational Tests: Operational tests shall be performed daily by the equipment user and by FED and LSD during load tests.

6.5.4 Test Reports. After each test, designated personnel shall prepare written, dated, and signed test reports which include a reference to the approved technical operating procedure used to perform the test. The reports shall document inadequacies identified during the test and, if determined to present a hazard, the inadequacies shall be corrected by the responsible organization prior to further use. These reports shall be kept on file by the responsible organization for a minimum of two test cycles and shall be made readily available. Written, dated, and signed test reports for hooks shall be prepared, together with the test reports, for the devices of which the hooks are a part.

6.5.5 Load Test Tags. The organization responsible for performing the required tests shall be responsible for providing, preparing, and applying load-test tags as described below.

6.5.5.1 Following proof-load or rated-load test, lifting devices shall be given a permanently affixed tag identifying the device and stating the next required rated-load test date or certified inspection date.

6.5.5.2 Following a proof-load or load test, all slings shall be given a permanently affixed tag identifying the equipment (part number) and stating the rated capacity based on the load-test value and the next periodic load test due date. For alloy steel chains, size, grade, and reach shall be stated along with the rated load. For natural or synthetic rope slings used for critical lifts, the marked rated load shall be 50 percent of the manufacturer's rated load. The type of material shall also be stated. All load-bearing components shall be traceable to the most recent load test. This may be accomplished by clearly marking/coding or tethering all components of the assembly through configuration control or other procedures. Load-bearing components not traceable to load test shall invalidate the load test of the whole assembly.

6.5.6 Use of Cranes/Hoists to Load Test Rigging Equipment. Cranes and hoists used to load test items such as slings, platforms, or lifting fixtures are subject to damage due to sudden unloading should the equipment fail. Cranes and hoists may be used to load test such items only if the following requirements are met:

6.5.6.1 The requirements of NASA-STD-8719.9, Appendix D.

6.5.6.2 S&MA and FED or LSD (representing the responsible engineering and operations/maintenance organizations) shall perform, document, and approve an engineering/safety analysis documenting the specified crane/hoist shall not be damaged due to sudden unloading following equipment failure when test weights to a specified maximum total weight are utilized. A copy of this documentation shall be placed in the individual crane historical file.

6.5.6.3 The crane/hoist shall be specifically identified as approved for load testing of lifting equipment.

6.5.6.4 The maximum allowable test weight to be used shall be specified, based on a specified percentage of the crane's or hoist's rated capacity as determined by the engineering/safety analysis.

6.6 Inspection of Lifting Devices and Equipment. Daily and periodic safety inspections shall be performed on all lifting devices and accessories. Inadequacies discovered during an inspection shall be documented and, if determined to be a hazard, corrected prior to further use. Inspections shall be performed by qualified designated personnel according to approved technical operating procedures and in conformance with NASA-STD-8719.9.

6.6.1 Operator Responsibilities: The equipment operator shall be responsible for performing daily inspections in accordance with NASA-STD-8719.9. Daily inspections shall be performed each shift the equipment is to be operated and documented on the appropriate MSFC form for

overhead cranes (MSFC Form 4332), mobile cranes (MSFC Form 4328), forklifts (MSFC Form 4258), and aerial lifts (MSFC Form 4329).

6.6.2 Equipment Owner Responsibilities: The equipment owner shall be responsible for performing formal periodic inspections on Hydra-sets; special hoist-supported, personnel-lifting devices; and slings as identified in NASA-STD-8719.9. Organizations without qualified inspectors can request this service from FED or other third party with qualified inspectors.

6.6.3 FED/LSD Responsibilities: FED shall be responsible for performing formal periodic inspections on overhead cranes, derrick cranes, hoists, and hooks as identified in NASA-STD-8719.9 and referenced above. LSD shall be responsible for performing formal periodic inspections on mobile equipment.

6.6.4 Inspection Reports for Lifting Devices: After each formal periodic inspection of lifting devices, qualified, authorized personnel shall prepare written, dated, and signed inspection reports. These reports shall include procedure reference and adequacy of the crane and/or its components. Inadequacies shall be documented and, if determined to be a hazard, corrected prior to further use. These reports shall be filed and readily available by FED (fixed cranes or hoists) or LSD (mobile equipment). Written, dated, and signed inspection reports for hooks shall be prepared in conjunction with the inspection reports for the equipment of which the hooks are a part.

Equipment owners shall prepare, file, and make readily available periodic inspection reports pertaining to Hydra-sets; hoist-supported, personnel-lifting devices; and rigging equipment. Inspection reports shall be prepared by FED and forwarded to the equipment owner when the equipment owner requests inspection services.

6.7 Maintenance of Lifting Devices and Equipment. A PM program shall be established by each responsible organization based on manufacturers' recommendations and/or experience gained from use of the equipment. The program shall include procedures and a scheduling system for normal periodic maintenance items, adjustments, replacements, and repairs. The program also shall ensure records are kept and unsafe test and inspection discrepancies are documented and corrected. FED shall be responsible for fixed cranes, LSD for mobile equipment, and equipment owners for other types of lifting equipment.

6.8 Operations Involving Lifting Devices and Equipment. All MSFC lifting operations shall be performed in accordance with the applicable requirements of NASA-STD-8719.9.

6.8.1 User Organizations: Department managers and program/ project managers shall be responsible for the following items pertaining to operations:

6.8.1.1 Determine if the lift is critical or noncritical, see Appendix.

6.8.1.2 Ensure all lifting equipment operators are certified prior to performing lift operations at MSFC.

6.8.1.3 Ensure all lifting equipment operators are familiar with the pertinent operations sections of NASA-STD-8719.9.

6.8.1.4 For each crane, mobile crane, or forklift, prepare general operating procedures describing crane operation, emergency steps, communication requirements, and special requirements including checklists and inspection requirements. Prepare a detailed technical operating procedure covering the same items for each hoist-supported, personnel-lifting device. Develop and document emergency procedures for contingency actions in the event of power loss, brake failure, or other emergencies.

6.8.1.5 Submit the general or technical operating procedure for each crane or hoist-supported, personnel-lifting device to S&MA for review and approval.

6.8.1.6 Note the hazards associated with the lift operation. Consider the environment in which the operation occurs and hazards associated with crane maintenance. A general hazard analysis for the operation of a specific crane may be developed.

6.8.1.7 Ensure that operations with a mobile crane near power lines shall be done in strict observation of NASA-STD-8719.9 Section 5.7.as and Section 5.7.at.

6.8.1.8 Develop methods and procedures for lowering a load in the event of crane (fixed or mobile) failure or other contingencies. Demonstrate and verify if practical. In most cases this shall consist of “making the operation safe” then notifying FED or LSD.

6.8.1.9 If the duration of the lift operation requires an operator change while a load is suspended, prepare a written procedure (tailored to the specific crane and operation) for accomplishing the change and ensuring the crane controls are manned at all times. Submit the procedure to S&MA for review and approval.

6.8.1.10 If the lift operation involves handling explosives or Electro Explosive Devices, comply with the “special criteria” requirements of NASA-STD-8719.9.

6.8.1.11 Support S&MA in the development of an Operational Hazard Analysis of the specific critical-lift operation.

6.8.1.12 Prepare a specific written procedure for each critical lift. Include MSFC Form 4339, Critical Lift Operation Certification, in procedure. Submit the written procedure to S&MA for review and approval.

6.8.1.13 Outdoor crane operations shall be suspended when lightning occurs within a 10-mile radius of MSFC. Notice is given from the MSFC Emergency Operations Center when this

occurs. Work may be resumed after the all clear is given or the storm clouds are no longer visible on the horizon and a call is made to the MSFC Emergency Operations Center at (256) 544-3131 to verify there is no lightning within 10 miles of MSFC.

6.8.2 S&MA: S&MA shall be responsible for the following items pertaining to operations:

6.8.2.1 Review, revise (if needed) and approve a general or technical operating procedure for each crane or hoist-supported personnel-lifting device, as submitted by the user organization.

6.8.2.2 Review, revise (if necessary), and approve written procedures designed for a specific crane and operation to accomplish an operator change while ensuring the crane controls are manned at all times.

6.8.2.3 Perform an Operational Hazard Analysis of the specific critical-lift operation.

6.8.2.4 Review, revise (if necessary), and approve a specific written procedure for each critical lift.

6.8.2.5 For cranes used for and designated as critical, analyze and document the hazards associated with the lift operation. Consider the environment in which the operation occurs and hazards associated with crane maintenance. Perform a systems safety analysis of the equipment, facility, load, and interfaces as a whole in support of the lifting operation. A general hazard analysis for operation of a specific crane may be developed, with provision made for the analysis and documentation of the unique hazards associated with each lift operation. This analysis shall be maintained in the crane historical file.

6.9 Deviations. If a mandatory requirement of NASA-STD-8719.9 cannot be met, the requesting organization shall prepare a deviation/waiver package according to NPR 8715.3, with technical data and assistance provided by FED and/or LSD. MSFC Form 4331 shall be used for lifting equipment deviations/waivers. Deviations/waivers shall be approved by the Center Director, FED Manager (for fixed cranes), S&MA Director, LSD Manager (for mobile equipment), and cognizant program/project manager. Deviation/Waivers shall be recorded on MSFC Form 4331, and a copy shall be maintained in the historical file for the life of the equipment.

6.9.1 S&MA shall forward the deviation/waiver package to NASA Headquarters Safety for concurrence if it falls into the following category:

6.9.1.1 Deviations/waivers of Occupational Safety & Health Administration (OSHA) requirements. OSHA requirements shall not be circumvented by a NASA deviation/waiver unless approved by OSHA. After review by Headquarters, the deviation/waiver shall be forwarded to OSHA for approval.

6.9.2 S&MA shall provide deviation/waiver documentation for permanent variances to NASA

Headquarters for incorporation into the NASA Safety Information System.

6.10 Documentation, Record Keeping, and Trend Analysis. NASA-STD-8719.9 requires the establishment of a data collection system at MSFC which shall support NASA-wide lifting device trend and data analysis. This initiative is a joint responsibility of S&MA, FED, and LSD. The data collection system shall compile information such as type and manufacturer of the equipment, age, maintenance history, operational problems and their corrective actions, lifting mishaps, safety notices, inspection discrepancies, waivers, and proof and load test results. The compiled data shall be provided to the NASA Safety Information System for analysis and the creation of a historical data base (responsibility of NASA Headquarters Safety Office).

FED shall be responsible for maintaining MSFC's hard copy historical crane/hoist files. LSD shall be responsible for maintaining hard copy historical files for mobile equipments. These files are intended to provide complete documentation to the maximum extent possible of all engineering, manufacturer, maintenance and repair, test, inspection, safety, and assurance activity related to any given crane/hoist for the life of that lifting device. These files are not intended to include information regarding specific lift operations performed with cranes/hoists. FED shall use these files as a basis for performing engineering functions as well as providing technical data and assistance to other NASA organizations as specified in this instruction.

6.11 Lifting Devices and Equipment (LDE) Committee. FED and the Industrial Safety Department shall establish a LDE Committee to control the programmatic issues related to lifting devices and equipment. The LDE Committee shall consist of representatives from FED, Operations and Maintenance Group (chair); Industrial Safety Department; FED, Design Group; FED, Construction Group; LSD, Transportation and Logistics Engineering Group; and the respective users, where appropriate. Members of the LDE Committee shall review recommended requirements and procedures, qualification packages for equipment prior to use, specifications for equipment to be purchased, and requests for waivers of requirements as part of their normal duties. Actions shall be reported to the Committee in the regular meetings. Note: The Committee shall not review using organization's organizational instructions for crane operations/controls and specific hardware-lifting procedures.

7. NOTES

7.1 NASA-STD-8719.9 is a NASA Headquarters standard that establishes NASA's ***minimum*** safety requirements for the design, testing, inspection, personnel certification/recertification, maintenance, and use of lifting devices and equipment. NASA Headquarters encourages each NASA installation to assess individual programs and develop additional requirements as needed. MSFC has done so, and this instruction incorporates some Center-specific requirements. MSFC organizations are expected to develop additional Center-specific requirements as they prepare their compliance plan documentation.

7.2 NASA-STD-8719.9 meets or exceeds OSHA and American National Standards Institute (ANSI) requirements; however, it is not a substitute for the applicable OSHA or ANSI standards.

Some, but not all, OSHA and ANSI requirements are included in NASA-STD-8719.9 to add emphasis and clarity. All of the requirements contained in the codes and standards cited as reference documents in NASA-STD-8719.9 apply in full to all NASA and onsite NASA contractor-lifting devices, equipment, and operations. It is necessary to review the referenced codes and standards, as well as NASA-STD-8719.9, to obtain a complete understanding of the applicable requirements that must be satisfied.

7.3 The responsibility for implementation and enforcement of NASA-STD-8719.9 is assigned to S&MA. The responsibility and funding for performing many of the required activities is assigned to FED, LSD, department managers, and program/project managers. Effective compliance with NASA-STD-8719.9 and an efficient, incident-free lifting program at MSFC are, therefore, dependent upon the creation of ongoing partnership relations among responsible NASA and contractor organizations. Frequent, open communication and sharing of information and resources will enable all involved organizations to successfully provide contributions to MSFC's Safe Lifting Program.

8. SAFETY PRECAUTIONS AND WARNING NOTES

None

9. RECORDS

The following records shall be maintained by the organizations responsible for different types of lifting device and equipment. Records maintained for the life of the equipment may be destroyed 1 year after the disposal of the equipment. Other records shall be destroyed at the end of the retention period.

9.1 Design Records are records of engineering review and approval of designs and configuration changes for cranes; hoists; structural slings; and special hoist-supported, personnel-lifting devices. These records shall be maintained for the life of the equipment.

9.2 Inspection and Test Records document the completion of required periodic inspections and test activities. These records shall be maintained for a minimum of two test or inspection cycles.

9.3 Acceptance Inspection and Test Records document inspections and tests required before placing new or extensively modified or repaired equipment into service. These records shall be maintained for the life of the equipment.

9.4 Critical-Lift Equipment Qualification Records pertain to the qualification of lifting equipment to handle critical loads. These records shall be maintained for the life of the equipment and documented on MSFC Form 4330.

9.5 Personnel Certification Records pertain to personnel certification of operators of lifting equipment as well as material handling riggers and flagmen for both critical and noncritical lift

operations. These records shall be maintained for a minimum of 2 years after expiration of the certification by S&MA.

9.6 Nonconformance Reports document deficiencies identified during inspections and tests. These records shall be maintained for the same period as the associated Inspection and Test Records.

9.7 Corrective Action Records are to document the correction of deficiencies identified during inspections and tests. These records shall be maintained for the same period as the associated Inspection and Test Reports.

9.8 Servicing Records document maintenance and adjustment activities performed for lifting equipment. These records shall be maintained for a minimum of 2 years and shall reside in the historical hard copy file.

9.9 Daily inspection checklists are not required to be maintained. However, they are to be available during crane operation.

9.10 Historical Crane/Hoist File is to be maintained per paragraph 6.10 and maintained for the life of the equipment.

9.11 Critical-Lift Documentation, MSFC Form 4339, shall be available during the lift operation and maintained per individual organization's directions.

10. PERSONNEL TRAINING AND CERTIFICATION

10.1 Organizations utilizing lifting equipment shall be responsible for ensuring only certified (licensed) and trained operators are authorized to use/operate lifting devices. Certification of operators for handling PCH shall be required in addition to certification for handling critical lifts. S&MA shall be responsible for ensuring a training, examination, and licensing program is established or made available. For those NASA installations that do not have a training program, all crane operators shall be trained and certified by a recognized crane certification organization that normally performs this function. Certification shall also include riggers and flagmen.

10.2 S&MA shall be responsible for ensuring two levels of training and proficiency are established (critical and noncritical) for crane/hoist operators, riggers, and flagmen. Operations where critical lifts are involved shall require a more rigid operator certification program than those operations involving more routine lifts not involving critical hardware or unique hazards.

10.3 S&MA shall be responsible for ensuring that a training and operator certification program is established and implemented for the use of Hydra-sets and special hoist-supported, personnel-lifting devices.

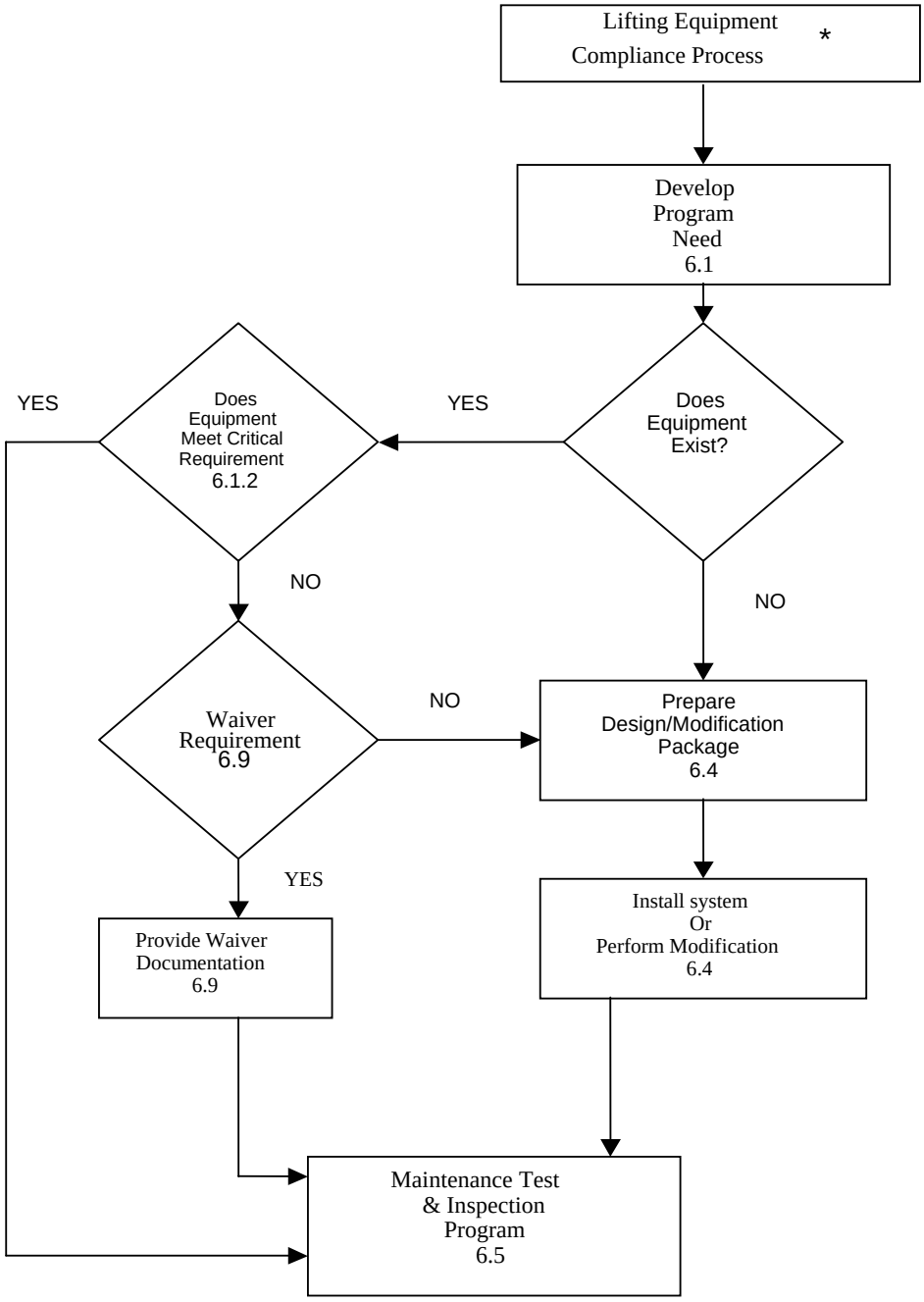
10.4 Refer to MWI 3410.1, “Personnel Certification Program,” for additional information.

11. FLOW DIAGRAMS

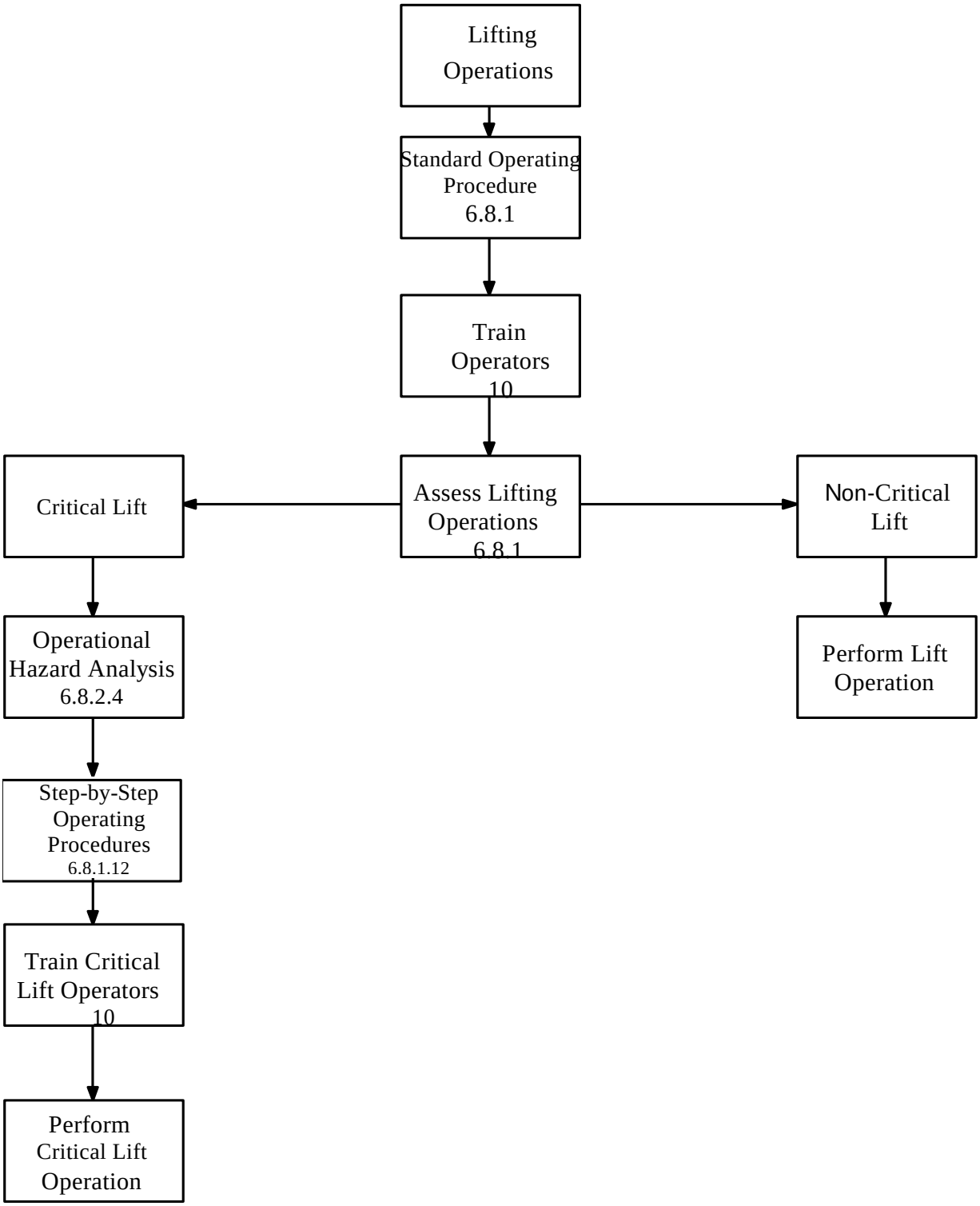
See the following two pages for flow diagrams 1 and 2.

FLOW DIAGRAM 1: LIFTING EQUIPMENT COMPLIANCE

*All LDE at MSFC meets non-critical requirements



FLOW DIAGRAM 2: LIFTING OPERATION COMPLIANCE



12. CANCELLATION

MWI 6430.1D dated April 15, 2004

Original signed by
Robin N. Henderson for

David A. King
Director

Appendix - Critical Lift Decision Process

Appendix: Critical-Lift Decision Process

Question	Yes	No
1. Does the load to be lifted meet one of the following criteria used to define a critical load? • Assemblies with close tolerances of delicate construction which could be damaged by improper handling and such resulting damage could compromise a flight vehicle, payload, or the safety of personnel, regardless of whether the item is considered "Flight Hardware." (Reference MWI 6410.1) • Equipment, hardware, software, and items returned from space. A special designation by the assigned program office shall be required for a returned item to be handled as Critical. (Reference MWI 6410.1) • Lifting or lowering operations with special, high-dollar items (i.e., spacecraft, one-of-a-kind articles, or major facility components, etc.) whose loss would have serious programmatic impact. (Reference NASA-STD-8719.9)		
2. Does the planned lifting or lowering operation involve special personnel and device/equipment safety concerns beyond normal lifting hazards such as the following? (Reference NASA-STD-8719.9) • Lifting/lowering personnel with cranes. • Lifting/lowering hazardous materials such as explosives. • Performing a two-point lift using two or more cranes or lifting devices (i.e., jacks, fork lifts, etc.) to lift/lower a single load. Note 1. • Operations that require personnel to be beneath a suspended load. (Reference NASA-STD-8719.9, Appendix C) • There is a high probability of damage to the lifting device or equipment which would result in significant repair costs and/or schedule delays for future lift operations. • The mechanics of the lifting and handling operation itself create a high probability of damage to facilities, devices, equipment, and/or the load.		
Read both questions presented above, and answer "YES" or "NO." If the response to both questions is "NO," the lift operation is classified as **Noncritical**. If the response to at least one question is "YES," the lift operation is classified as **Critical**.		

Note 1 - S&MA may review the two-point lift and waive critical-lift requirements at its discretion, due to the mechanics, configuration, and operation to be performed. This is not applicable to two-point lifts designated as "Critical Lifts" meeting the criteria of Question 1.