



## Goddard Procedural Requirements (GPR)

<b>DIRECTIVE NO.</b>	<u>GPR 8719.1C</u>	<b>APPROVED BY Signature:</b>	<u>Original Signed By</u>
<b>EFFECTIVE DATE:</b>	<u>April 28, 2015</u>	<b>NAME:</b>	<u>Judith N. Bruner</u>
<b>EXPIRATION DATE:</b>	<u>April 28, 2020</u>	<b>TITLE:</b>	<u>Director, Safety and Mission Assurance</u>

### **COMPLIANCE IS MANDATORY**

Responsible Office: 360/Safety Division

Title: Lifting Devices and Equipment (LDE) Certifications and Operations

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## **PREFACE**

### **P.1 PURPOSE**

The purpose of this directive is to define the process, requirements, and responsibilities for performing LDE certifications and conducting safe lifting operations at Goddard Space Flight Center (GSFC) by implementing the requirements of NASA-STD 8719.9, Standards for Lifting Devices and Equipment.

### **P.2 APPLICABILITY**

This directive is applicable to all lifting certifications and operations, regardless of ownership of the LDE or the item being lifted, performed at and/or under the cognizance of GSFC, or that are performed by GSFC employees or support-services contractors, unless specifically excluded by this directive or by the Lifting Devices and Equipment Manager (LDEM).

This directive is not a substitute for applicable Occupational Safety and Health Administration (OSHA) and National Consensus Standards (NCS) and other applicable code requirements that apply to GSFC LDE, LDE Operators, and their respective operations.

When invoked as a contractual requirement, this directive is applicable to the extent specified in the contract supporting GSFC activities.

Lifting operations under privatization clauses shall be subjected to the provisions of this directive to the extent provided by the contract, and the requirements clearly specified therein.

### **P.3 AUTHORITY**

NPR 8715.3, NASA General Safety Program Requirements

### **P.4 REFERENCE DOCUMENTS**

- a. NPR 1800.1, NASA Occupational Health Program Procedures
- b. NPR 8621.1, NASA Procedural Requirements for Mishap and Close Call Reporting, Investigating, and Recordkeeping
- c. NASA-STD 8709.20, Management of Safety and Mission Assurance Technical Authority Requirements
- d. NASA-STD 8709.22, Safety and Mission Assurance Acronyms, Abbreviations, and Definitions
- e. NASA-STD 8719.9, Standard for Lifting Devices and Equipment
- f. GPR 1400.1, Waiver Processing
- g. GPR 8621.4, Mishap Preparedness and Contingency Plan
- h. GPR 8715.8, Fall Protection Requirements for GSFC
- i. GSFC 17-112, Employee Task-Specific Training Requirements Form

## P.5 CANCELLATION

- GPR 8719.1B, Certification and Recertification of Lifting Devices and Equipment and its Operators
- GPR 8834.1B, Lifting Operations Requirements

## P.6 SAFETY

Detailed safety requirements are contained in applicable test and inspection procedures and throughout this document.

## P.7 TRAINING

Those involved in lifting operations (i.e. lift team members) must be qualified to perform their role safely and effectively, based on initial and recurrent training, prior experience, and physical abilities.

Specific training requirements for LDE personnel licensing/certification are specified in NASA-STD 8719.9 and this directive.

## P.8 RECORDS

**Table 1**

Records Pertaining to LDE Certification Program			
No.	Record Title	Record Custodian	Retention
1	LDE Test & Inspection Reports	LDEM	Periodic: 4 Inspection cycles Frequent: 12 Inspection cycles
2	LDE Operator Certifications	LDEM	* <u>NRRS 3/33C</u> Destroy or delete 5 years after separation of employee or when no longer needed, whichever comes first.
3	Jack (critical) Operator Training (except aircraft jacks)	LDE Owner	*NRRS 3/33C
4	Completed Pre-Operational Daily Checklists	LDE Owner	For a minimum of 12 months
5	LDE Program documentation	LDEM	*NRRS 3/33C
6	Safety/Hazard Analysis	LDE Owner	* <u>NRRS 8/56.5C(4)</u> Destroy when 3 months old or when no longer needed, whichever is later.
7	Lifting Device and Equipment Committee (LDEC) Meeting Minutes	LDEM	* <u>NRRS 1/14B (1)(a)</u> Permanent. Retire to FRC when 2 years old. Transfer to NARA when 20 years old.

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Records Pertaining to LDE Certification Program			
No.	Record Title	Record Custodian	Retention
8	GSFC 17-112, Employee Task-Specific Training Requirement for civil servant employees	Supervisor	Maintained in the Employee Performance File in the IDP/Training Related Information section on the right side.

**Table 2**

Records Pertaining to LDE Lifting Operations			
No.	Record Title	Record Custodian	Retention
1	Lift Procedure(s)	Project/Program Office	*NRRS 8/103: Temporary. Cut off records at close of program/project or in 5-year blocks. Destroy/delete between 0 and 30 Years after cutoff.
2	Stress/Stability Analyses	Project Office	*NRRS 8/103
3	Waivers	Project/Program Office	* NRRS 8/103
4	User documents (e.g., technical interface information, analyses, problem records, and other relevant lift-specific information	Project/Program Office	* NRRS 8/103
5	Audit results (see P.9 Metrics) and corrective actions	Applicable Safety Office	* NRRS 8/103
6	LDE Program follow-up actions to metrics	LDE Program	* NRRS 8/103

\*NRRS – NASA Records Retention Schedules (NRRS 1441.1)

## P.9 METRICS

Appropriate data, which may include information derived from activities specified in paragraphs 1.2.1 d and 1.2.1 g (e.g., number of deficiencies identified, time to complete corrective actions, number of waivers generated, etc.), the results of audits and mishap investigations (including tracking of appropriate follow up actions) and analysis of trends, shall be captured and analyzed to measure the performance of GSFC lifting operations.

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## PROCEDURES

In this document, a requirement is identified by “shall,” a good practice by “should,” permission by “may” or “can,” expectation by “will” and descriptive material by “is.”

### 1 Responsibilities

#### 1.1 Installation Director:

Shall appoint the LDEM for GSFC-Greenbelt (GB) and for GSFC-Wallops Flight Facility (WFF), with each installation LDEM acting as the Deputy for the other respective installation

#### 1.2 Lifting Device and Equipment Manager (LDEM):

##### 1.2.1 The LDEM shall

- a. Serve as the authority for the certification of LDE to which this directive is applicable; and serve as the final authority on interpretation of, and compliance with, this directive and its reference documents;
- b. Maintain oversight, for safety, use and compliance, of all LDE, including LDs brought onsite for lifting, setting/placing, and delivering equipment to center;

**Note:** The LDEM may designate categories of lifts for which their concurrence shall be obtained to verify the criticality rating for lifts designated as non-critical or critical;

- c. Certify and recertify LDE Operators and define their training and retraining requirements; and review, approve, and monitor the training courses for qualifying LDE Operators;
- d. Establish and maintain a system for frequent and periodic inspections of LDE including review of logbooks, pre-operational daily inspection forms, identification of deficiencies, and completion of corrective actions; and will ensure that certification and/or recertification tests and inspections are performed by personnel properly trained and qualified in accordance with applicable codes and standards;
- e. Verify that all applicable safety analyses or assessments (i.e. stress analysis, stability analysis, etc.) are completed in accordance with the requirements of NASA-STD 8719.9 for critical lifts;
- f. Review and concur/non-concur with safety waiver requests regarding LDE per GPR 1400.1 prior to the originator’s submittal to the appropriate chain-of- authority, for approval;
- g. Review/approve requests from LDE Owner organizations to re-rate the capacity of its LDE; and

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- h. Establish and maintain a LDE Program configuration management system; and facilitate requesting authorities regarding the need to understand the status of their LDE; and provide LDE owners with a current LDE inventory when requested.

### **1.2.2 The LDEM should:**

- a. Provide consultation to the GSFC for procurement, design, specification, testing, maintenance, operation, and modification of LDE to owners and operators; and review and concur/non-concur with specifications/designs prior to procurement of Lifting Devices (LD); and have approval authority for the re-rating of LDs per this directive;
- b. Coordinate with the Office of Human Capital Management (OHCM) to ensure all LDE Program training classes are entered in SATERN at least 30 days prior to the start of each class; and notify supervisors of civil servant employees when training and certification requirements are to be documented on the GSFC 17-112, Employee Task-Specific Training Requirements Form;
- c. Perform compliance spot checks of the LDE Program to ensure that the requirements of NASA-STD 8719.9 and this directive are being met; and
- d. On a periodic basis, analyze audit results or mishap investigations for appropriate follow up actions to include trend analysis, lessons learned, directive revision and continual improvement.

### **1.2.3 The LDEM may:**

- a. Provide resources to owners, supervisors and LSU of LDE to assist with the performance of annual proficiency reviews in regards to LDE Operator's license renewals;
- b. Provide LDE expert advice, as requested, during the investigation of any lift involved in a mishap, incident or close call to ensure compliance with this directive in accordance with NPR 8621.1;
- c. Audit executed lift procedures and associated documentation of different projects and activities under his cognizance for compliance with this directive;
- d. Designate specific critical lifts or categories of critical lifts for which his/her prior review and concurrence with the lift procedures is required; and
- e. Authorize contractor organizations to perform LDE certifications (tests and inspections) at government owned, contractor operated facilities by the applicable contractor organization provided the contractor has a test and inspection plan satisfactorily addressing GSFC requirements, including personnel qualifications; and the contractor's plan has been reviewed and approved by the LDEM.

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#### **1.2.4 The LDEM will:**

- a. For constrained lifts, review and provide concurrence with the risk assessment provided by the LSU prior to performance of the constrained lift.

### **1.3 LDE Owners:**

#### **1.3.1 LDE Owners shall:**

- a. Submit LD specifications to the LDEM for review and concurrence for applicable code compliance prior to purchase or transfer to GSFC; and should submit Lifting Equipment (LE) specifications to the LDEM for review and concurrence for applicable code compliance prior to purchase or transfer to GSFC;
- b. Notify the LDEM when rented or leased equipment is brought on center;
- c. Request that the LDEM perform the certification of new or transferred LDE from offsite locations prior to their use at GSFC;.
- d. Ensure that LDE not covered by this directive or the NASA standard complies with OSHA and the applicable NCS requirements;
- e. Provide LDE to the LSU that has been appropriately certified, well maintained and calibrated;
- f. Maintain responsibility for day-to-day operations of all LDE under their cognizance;
- g. Track LDE operator certifications to ensure that they remain current as long as the operator is required to use LDE; Civil servant records should be tracked on the appropriate task-specific training requirements on GSFC 17-112 form;
- h. Ensure that Original Equipment Manufacturer (OEM) recommended maintenance is performed on LDE and that the preoperational daily checklists conforms to OEM requirements, if applicable;
- i. Forward copies of all LDE test and inspection reports, including those for applicable off-site operations and applicable contractor installations, to the LDEM for annual re-certification and record keeping;
- j. Specify the criticality category of lifting operations to be performed by their LDE so that the LDEM may provide the requisite compliance requirements for the LDE; and
- k. Initiate repairs for LDE deficiencies found during OSHA and NASA-STD 8719.9 required tests and inspections; and coordinate outages for load testing and inspections of inventoried LDE with LDE Program/LDEM to minimize conflicts with ongoing operation.

**1.3.2 LDE Owners may:**

- a. Support the LSU in developing and reviewing Critical Lift Procedures prior to all critical lift operations; and certify to the LSU that all Critical Lift requirements have been met; and ensure that lift procedures and checklists, when needed are available and understood for lifting operations; and
- b. Provide or task supporting organizations or contractors to provide LDE and/or operators; and provide LDE expert advice to the LSU for all lifting operations when requested to ensure professional and safe performance of all lifting operations.

**1.3.3 LDE Owners will:**

- a. Provide LDE and LDE support to the Lifting Service User (LSU);
- b. Ensure training resources are available from the Office of Human Capital Management (OHCM) in order to ensure that LDE personnel will be properly certified by the LDEM;
- c. Determine the appropriate LD usage category, i.e., Active, Standby, or Idle based on current and projected operational requirements; and notify LDEM of any change in usage category status; and verify that deficient LDE has been appropriately removed from service;
- d. Manage and control uncertified or expired LDE by establishing administrative controls to preclude unauthorized operation. Such controls may include administratively controlling access to areas in which LDE are located, or securing LDE to all but authorized users/operators;
- e. Notify the LDEM of all LDE deficiencies and failures; and initiate the appropriate Incident/Mishap Report in accordance with GPR 8621.4; and
- f. Involve Facilities Management Division during the design and procurement of overhead cranes on Center.

**1.4 Lifting Service User (LSU):**

The LSU is ultimately responsible for the hardware being lifted and has the final approval authority in all all lifting operations.

**1.4.1 The LSU shall:**

- a. Cease lifting operations in the event of an actual or reported failure or unsafe condition and only resume operations after failures or unsafe conditions have been properly addressed and/or corrected;



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- b. Notify the LDEM and/or Safety (360/803) of all LDE, including leased/rented LDE, coming on center for projects or institutional (construction and/or maintenance) activities; and ensure all LDE associated personnel comply with OSHA and this directive;
- c. Notify the Facilities Management Division (FMD) and/or Facilities Operation Manager (FOM) of any operations that may have unusual facility hazards or safety implications; and
- d. For constrained lifts, perform a risk assessment and acknowledge and accept the risks involved. Note: A copy of this risk assessment is sent to the LDEM for review and concurrence prior to performance of the constrained lift.

#### **1.4.2 The LSU should:**

- a. Designate a Safety Representative per Section 1.5.5 of this directive;
- b. Verify that all applicable safety analysis (i.e. stability analysis, lift analysis, hazardous operating procedures, etc.) and assessments are completed and are sufficient per the requirements of NASA-STD 8719.9;
- c. Provide input to the LDE Owner and LDEM to determine lift criticality so that compliance requirements for the lifting operations can be established; and develop and approve all Critical Lift Procedure(s) and any changes made to the procedure during the lift;
- d. Develop and/or verify the availability of lifting procedures and hazardous operations procedures (HOPs) that address the safety of their personnel and hardware; and for LDE not covered by NASA-STD 8719.9, consult and follow the OEM's recommendations with documented concurrence from the applicable safety representative;
- e. Designate a person-in-charge (PIC) for all lifting operations; and select appropriate LDE based upon the maximum load it would experience in the worst case scenario during each lift; and verify that the LDE and operators have current certifications as required by NASA-STD 8719.9 and this directive for the type of lifting operations required; and
- f. Initiate a Waiver request, if NASA or GSFC requirements will not be met, in accordance with NPR 8715.3 and GPR 1400.1, as applicable.

#### **1.4.3 The LSU will:**

- a. Provide specialized LDE/fixtures and engineering support as required;
- b. Submit mobile crane lift plans to the LDEM for approval prior to the lift, which may also require Safety (Code 360/803) concurrence; and

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- c. Coordinate closely with the LDE Owners to establish control of lifting operations that affect their hardware.

## 1.5 Lift Team

### 1.5.1 Lift Team Members

Lift team members are selected by and have responsibilities assigned by the Person-In-Charge (PIC).

- a. Lift team members should participate in Pre-Lift Briefings as described in this directive; and fully understand all applicable emergency procedures and safety requirements, including Personal Protective Equipment (PPE) requirements.
- b. Critical lift teams shall, as a minimum, consist of the following members:
  - (1) Person in Charge (PIC);
  - (2) Certified LDE (Crane) Operator;
  - (3) Certified Rigger(s);
  - (4) Certified Signal Person; and
  - (5) Safety Representative
- c. The PIC may add to the lift team as appropriate to ensure a safe lift.
- d. For non-critical lifts, the rigger and designated signal person may be a single individual; and the certified LDE (crane) operator and certified rigger may be a single person.
- e. For routine non-critical lifts, a lift team may consist of only a LDE (crane) operator after a written pre-lift safety assessment, job hazard analysis, has been completed in conjunction with the operator's immediate supervisor or designee.
- f. For routine type lifts, a onetime safety assessment may be completed, and the LDE operator may also act as the PIC.
- g. If any lift team member is not satisfied that all aspects of the lift are correct and complete prior to the lift, he/she has the authority to refuse to perform the lift until all issues have been resolved. Issues that cannot be resolved onsite by discussion with the PIC and lift team members will be brought to the immediate attention of his/her supervisor or the LDEM

### 1.5.2 Person-In-Charge (PIC):

The PIC is designated by the LSU or owner of the hardware being lifted and has overall responsibility to manage and conduct the lifting operation. The PIC:

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- a. Shall assign responsibilities to each individual member of the lift team and ensure all team members have the required current certifications.
- b. Shall identify and safely secure the operating envelope prior to operations and verify that all personnel within the operating envelope area have the appropriate PPE prior to commencing lifting operations.
- c. The PIC will not perform rigging activities or hands-on operation of LDEs while acting as the PIC of critical lifting operations.
- d. Will conduct a pre-lift briefing with all the required participants in accordance with the guidelines in this directive, which includes instructing team members in the proper preparation, rigging, lifting, and final positioning of the load.
- e. Will verify that adequate communication processes are in place for the lifting operations, especially between the signal person and LDE operator.

### 1.5.3 Certified LDE Operator:

LDE Operators are certified by the LDEM in accordance with the NASA-STD 8719.9. The Certified LDE Operator shall:

- a. Be certified by the LDEM in accordance with the NASA-STD 8719.9;
- b. Verify that the LDE operational requirements for the type of lifting devices and/or equipment being used comply with NASA-STD 8719.9 and that the certification status of the LDE is current in accordance with NASA-STD 8719.9, OEM recommendations, GSFC procedures and this directive before commencing lifting operations;
- c. Ensure that the LDE pre-operational daily inspection has been satisfactorily completed and that all LDE pre-operational daily inspection checklists have been filled out prior to commencing lifting operations each day;
- d. Log all pre-operational daily inspection checklists into the LDE log book; and if any critical deficiencies that may affect the safe operation of the LDE have been noted, the LDE operator shall immediately secure the LDE and notify his/her immediate supervisor; and the LDEM will also be notified promptly; and
- e. Verify that the weight of the load being lifted is within the Safe Working Load (SWL) of the LDE; and ensure stability of the load by verifying its center-of-gravity in relation to the location of the lifting points; and that the load is rigged correctly and safely prior to performing the lift.

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#### 1.5.4 Certified Rigger/Signal Person:

The Rigger/Signal Person is certified by the LDEM in accordance with the NASA-STD 8719.9. The Certified Rigger/Signal person shall:

- a. Verify that all tools, equipment, rigging gear, etc. are adequate and appropriately certified for lifting operations.

#### 1.5.5 Safety Representative:

The Safety Representative is designated by the LSU to make responsible judgments concerning personnel, equipment, or systems safety in support of critical lift operations; to work with the PIC and lift team to ensure the safety of the lifting operation; and to verify that the lifting operation adheres to safety requirements of this directive and all applicable NASA, OSHA, and GSFC safety regulations. The Safety Representative:

- a. Shall review and approve or concur with all critical lift procedures.

**Note:** For lifts that have been determined to be non-critical, the safety representative approval is optional.

- b. Shall verify that Incident/Mishap/Hazard Reports are initiated and submitted in accordance with the requirements of NPR 8621.1 and GPR 8621.4
- c. Should review and concur/non-concur with project-initiated safety waiver/variance requests in accordance with NPR 8709.20, NPR 8715.3 and GPR 1400.1 prior to submittal to the LDEM.
- d. May provide input to the LSU organization to identify the lifting operations as critical or non-critical;
- e. Will ensure adequate control over the area/envelope prior to proceeding with the lifting operation and during lifting operations; and give concurrence to open the controlled area once the lifting operations have been completed.

### 1.6 Institutional Support

#### 1.6.1 Facilities Management Division (FMD) will:

- a. Adhere to applicable LDE Owner and LSU requirements for non-critical operations, by appointing a PIC;
- b. Notify the LDEM, in writing, of any planned LDE acquisition, installation, modification/upgrade or removal as part of a FMD project; and

- c. Provide all new LDE designs and specifications, including alteration plans to existing LDE, to the LDEM for review and approval prior to contract award.

**1.6.2 Facilities Operations Manager (FOM) shall:**

- a. Notify the building occupants of potential safety hazards in regards to the use of LDE in and around facilities under their cognizance. When notified by the LDE Owner or LSU of a lifting operation with unusual hazards or safety implications (i.e., potential to affect occupants beyond the immediate lift area), the FOM will review the proposed lifting operation(s) and concur prior to commencing lifting operations.

**1.6.3 Safety Division (GB, Code 360/WFF, Code 803) shall:**

- a. Notify the LDEM if lifting activities are not in compliance with OSHA and NASA-STD 8719.9.

**1.6.4 Medical/Environmental Management Division/Code 250 shall:**

- a. Provide medical expertise for the establishment of LDE operator medical examination criteria using applicable NPR 1800.1 requirements.

**1.6.5 Office of Human Capital Management (OHCM):**

- a. Coordinates with the LDEM to document training offerings and registering participants in SATERN.

**1.6.6** The responsible Contracting Officer and the Project Manager (PM)/Lifting Service User (LSU) shall apply requirements of this directive to contractor, tenant, or customer if non-NASA lifting operations place NASA personnel, facilities, or other property at risk through incorporation into their respective contracts.

**1.6.7** Supervisors, project managers, or designees shall ensure that LDE personnel (i.e. lift-team members) are qualified to perform their role safely and effectively, based on training, prior experience, and physical abilities-including proper manual lifting techniques.

## **2 LDE Certification**

All LDE will be used consistent with its intended purpose per OEM recommendations. The use of LDE that is contrary to OEM instructions or recommendations is not permitted, unless approved by the LDEM and complies with NASA-STD 8719.9, OSHA, and the applicable NCS.

The use of uncertified LDE for lifting operations is not permitted.

## 2.1 Items Subject to LDE Program Certification

LDE shall be traceable to a credible source, such as its OEM or a valid cognizant engineering source.

LDE equipment subject to formal certification includes, but is not limited to, the following items<sup>1,2</sup>:

- a) Overhead and Gantry Cranes (Top Running Bridge, Single or Multiple Girder, Top Running Trolley Hoist, and Jib Cranes)
- b) Mobile Cranes
- c) Base Mounted Drum Hoists
- d) Monorails and Under hung Cranes and Hoists
- e) Manually Operated Hoisting Devices
- f) Special Hoist-Supported Personnel Lifting Devices
- g) Precision Below the Hook Load Positioning Devices (i.e. Hydra-Sets)
- h) Crane Hooks
- i) Wire Rope Slings
- j) Alloy Steel Chain Slings
- k) Metal Mesh Slings
- l) Synthetic Slings
- m) Structural Slings (below the hook lifting devices)
- n) Specialized Lifting Equipment (LE) Assemblies
- o) Shackles, Turnbuckles, Swivel Joints, Connecting Links, and other lifting hardware components
- p) Load Measuring Devices<sup>3</sup>
- q) Mobile Aerial Platforms (MAP) including attachments
- r) Powered Industrial Trucks (PIT) including fork extensions and attachments
- s) Jacks (critical) (excluding aircraft jacks)
- t) Portable Automotive Lifting Devices (PALD)<sup>4</sup>

### Notes:

- (1) LDE items not included in this list may be included at the discretion of the LDEM.
- (2) Rented/Leased LDE used strictly for construction and maintenance activities are exempt from meeting GSFC LDE Certification requirements.
- (3) Load Measuring Devices will be verified by the LSU for structural integrity in the load path. Calibration of these devices will be the owner's responsibility.
- (4) PALDs that are used for non-critical lift applications are exempt from meeting GSFC LDE Certification requirements.

## 2.2 LDE Certification Requirements

The certification requirements below are in addition to or are clarifications of the standards specified in the NASA-STD 8719.9 and applicable GSFC directives, NCS and OSHA standards.

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- 2.2.1** LDE shall be certified and recertified by the LDEM in accordance with the NASA-STD 8719.9 and this directive; Re-certification will also be based upon verification and acceptance of design safety factors, load testing, inspections and nondestructive testing reports, as applicable.
- 2.2.2** Specialized Lifting Equipment (LE) Assemblies: the LDEM shall certify/re-certify LE assemblies in accordance with the NASA STD 8719.9, GSFC procedures and this directive.
- a. Altered LE assemblies may not be re-certified as a system unless specifically exempted by an waiver which has been reviewed and approved in accordance with this directive. Alterations include the modification, addition, replacement, or deletion of components from the original certified configuration. Replacement of identical, individually certified and tagged components of equal or greater load ratings that do not adversely affect the original load path is permissible without having to recertify the LE assembly
  - b. All components comprising a critical LE assembly will be uniquely identified and controlled, and should not be interchanged for use elsewhere.
- 2.2.3** Contractor Organizations: The LDEM may authorize the applicable contractor organization to perform LDE certifications (tests and inspections) at government owned, contractor operated facilities by the applicable contractor organization provided the contractor has a test and inspection plan satisfactorily addressing GSFC requirements, including personnel qualifications; and the contractor's plan has been reviewed and approved by the LDEM.
- 2.2.4** LDE Test and Inspection Reports: LDE test and inspection reports are forwarded to the LDEM for annual re-certification and record keeping.
- 2.2.5** Criticality Category (Critical or Non-Critical): The owning organizations shall specify the criticality category of lifting operations to be performed by the LDE so that the LDEM may provide the requisite compliance requirements for the LDE.
- 2.2.6** Load Testing: New or modified LDE shall be proof load tested in accordance with NASA-STD 8719.9; and for periodic recertification, be load tested in accordance with NASA-STD 8719.9.
- a. Load test shall be done in accordance with OEM instructions and the applicable NCS and OSHA standards. Where no specific OEM guidance is provided, only 100% of the rated capacity will be used.
  - b. Approved test weights or calibrated load cells and test equipment shall be used for all LDE load-testing activities.
  - c. Fixed anchorages shall not be used without a valid engineering analysis approved by the LDEM.



**2.2.7 Nondestructive Testing (NDT) Inspection:** All NDT inspections required by NASA-STD 8719.9 shall be performed in accordance with the applicable NASA and NCS standards.

**2.2.8 LDE (cranes and hoists) Usage Status and Inspection Requirements:** Inspection requirements are based on the usage categories of LDs. Inspection requirements and intervals are defined by NASA-STD 8719.9, OSHA and GSFC LDE Program approved procedures.

- a. Active LDE (cranes and hoists) – are available for unlimited daily use and required inspections shall be performed and recorded at the required intervals.
- b. Standby /Idle (cranes and hoists) – when not in use will be secured to prevent unauthorized operation; LD operation shall be resumed only after required inspections are performed and recorded.

**2.2.9 Re-Rating LDE:**

- a. Re-rating of LDEs to a higher capacity than the OEM rated capacity is not permitted.
- b. Down-rating LDE capacity for reasons involving operational efficiency, adverse operating conditions and limitations of the supporting structures are permissible with LDEM approval.
- c. Down-rating LDE may also be accomplished administratively (not requiring re-inspection or load test) if the LDEs certification is current and with LDEM approval. The new down rated capacity shall be displayed with proper tags and markings.

**2.2.10 Transfer of LDE:** Certification documentation (including OEM documentation) will accompany all LDE permanently transferred to GSFC to be reviewed and approved by the LDEM for LDE program compliance.

**2.2.11 LDE Certification Tagging:** Tagging will be performed in accordance with GSFC LDE program tagging procedures.

- a. Once the required frequent or periodic inspections, load test, post-load test NDT inspections and engineering analysis (i.e. stress, stability analysis, etc.) and other documentation (i.e. assembly drawings, OEM documentation, etc.) have been reviewed and approved by the LDEM, certification tags will be issued for all LDE by the LDE support services contractor or the LDEM.
- b. A single certification tag may be applied to a LE assembly where the individual items are marked, tethered (color coding at lifting equipment attachment points), or otherwise controlled as an assembly, and there are no plans to disassemble or rearrange the configuration of the assembly.
- c. Individual certification tags may also be applied to each component of a LE assembly that may potentially be disassembled; or where the individual items of the assembly are not color-coded,



tethered, or otherwise controlled as an assembly. The assembly may be load tested as a unit or each component load tested individually.

- d. One certification tag per configuration will be applied to a LE assembly where the configuration may be rearranged for different applications. The assembly shall be load tested in all applicable configurations; Note: the number of tags used may vary depending upon the similarities among the different load tested configurations.
- e. LE components may be individually tagged after load test and post-load test NDT inspection has been performed on each component.
- f. LDE tags will indicate the next recertification and load test dates and unless otherwise indicated, typically expire on the last day of the month, one year from the month in which the tag was issued.

### **3 Personnel Qualification and Certification Requirements**

#### **3.1 NDT Personnel**

Personnel performing NDT shall meet the training requirements of NASA-STD 8719.9.

#### **3.2 LDE Operators**

- 3.2.1** LDE operators shall obtain formal training in the appropriate LDE operations as specified in NASA-STD 8719.9.
- 3.2.2** LDE operators shall be required to pass an applicable medical examination every 2 years in accordance with NPR 1800.1 or other medical exam approved by the GSFC medical director.
- 3.2.3** Practical/hands-on training in LDE operations and rigging shall be completed under the direction of a licensed LDE operator.
- 3.2.4** When using LDE requiring fall protection (i.e. boom lifts, etc), proof of successful completion of an approved fall protection training course in accordance with GPR 8715.8 will be required.
- 3.2.5** Upon satisfactory completion of the required classroom training and proficiency demonstration, the LDE operator will be certified for the type of LDE he/she has received training on. The LDE operator's license may specify the type of LDE the operator is qualified for.
- 3.2.6** LDE operator's with prior LDE training and experience may be evaluated for certification by the LDEM on a case by case basis. At the discretion of the LDEM, LDE Operators may be required to pass a GSFC LDE written examination.
- 3.2.7** LDE Licenses and Training Requirements:

- a. Apprentice Crane Operator License: The apprentice will be certified as a non-critical crane operator/rigger upon satisfactory completion of the required training specified below:
    - (1) Non-critical crane operator introductory training class;
    - (2) Minimum of 40 hours of non-critical lift hands-on training which is to include 20 hours of non-critical lift rigging (verified by supervisor);
    - (3) Non-critical crane operator refresher training class; and
    - (4) Satisfactory demonstration of hands-on proficiency.
  - b. Non-Critical Crane Operator/Rigger License requirements: The non-critical crane operator will be certified in accordance with the NASA-STD 8719.9 to operate non-critical cranes only and as a non-critical rigger.
  - c. Critical Crane Operator/Rigger License requirements: The critical crane operator will be certified to operate both non-critical and critical cranes and perform critical rigging upon satisfactory completion of the required training and criteria specified below:
    - (1) Hold current license as a non-critical crane operator (exceptions to this requirement may be granted at the discretion of the LDEM);
    - (2) Minimum of 40 hours of critical lift hands-on training which is to include 20 hours of critical lift rigging (verified by supervisor); and
    - (3) Complete the critical lift crane operator training class.
  - d. MAP and PIT Operator License requirements: MAP and PIT operators will be certified in accordance with the NASA-STD 8719.9. The license may indicate the specific type of equipment the operator is qualified to operate.
- 3.2.8** LDE Operator Recertification: LDE operators will be recertified every 4 years with the exception of PITs- every 3 years and critical cranes- every 2 years in accordance with the NASA-STD 8719.9 and when the following requirements are met:
- a. Attend the specific LDE training class including passing a written examination;
  - b. Demonstrate satisfactory hands-on proficiency;
  - c. Show evidence of successfully completing a medical examination in accordance with NPR 1800.1; and
  - d. The operator's supervisor will need to provide documentation verifying the satisfactory review of the operator's training and hands-on proficiency annually as long as it remains a requirement in the NASA-STD 8719.9.
- 3.2.9** Reciprocity with Licensing Authorities: At the LDEM's discretion, a temporary LDE Operator's License may be issued to personnel on temporary assignment to GSFC provided that the candidate:

- a. Possesses a valid LDE operator's license or equivalent issued by another *Licensing Authority* in compliance with requirements contained in NASA-STD 8719.9;
- b. The candidate's license or equivalent remains valid for the duration of the candidate's assignment at GSFC; and
- c. Temporary LDE Operator Licenses will be valid for the duration of the candidate's assignment at GSFC, and shall not exceed 90 days. Thereafter, a GSFC LDE operator's License will be required.

**3.2.10 License Revocation:** The LDEM may exercise the right to revoke LDE Operator's Licenses for any of the following reasons:

- a. Failure to meet LDE Program-required training;
- b. Failure of supervisor or designee to provide annual documentation on reviewing of training and proficiency per NASA-STD 8719.9;
- c. Failure to meet medical examination requirements per NPR 1800.1;
- d. Violations or noncompliance with any of the safety requirements in documented procedures; or
- e. Recommendations by an appointed panel of inquiry or Mishap Investigation Board.

Revoked operator licenses will be returned to the LDEM immediately, and may be reinstated upon satisfactory completion of applicable refresher training or other remedial action deemed appropriate by the LDEM.

**3.2.11 License extensions** may be granted, up to 90 days maximum, to allow for project demands and class scheduling flexibility. To be eligible for a license extension the operator must request the extension prior to the expiration date of the license and have a current medical examination. Extensions will not be granted if the license or medical examination has expired.

## **4 LDE Operations**

### **4.1 Lifting Operations Requirements**

**4.1.1 A Pre-Lift Briefing** will be performed for all lifting activities regardless of familiarization or experience of those performing the task or operation. The pre-lift briefing is aimed at ensuring the safety and coordination of the personnel and equipment involved.

- a. The pre-lift briefing should be conducted prior to beginning lifting operations and involve all personnel having a role in the operation.

**Note:** For routine operations under paragraph 1.5.1 e, the briefing may be performed verbally with the operator's immediate supervisor, or designee.

- b. If a new or different lift team members arrive after the lift has begun, such as when a shift change occurs, the incoming personnel should be sufficiently briefed to ensure they fully understand their roles, the tasks to be performed, and all relevant elements of the pre-lift briefing. This is

accomplished by halting the operation at a safe point and conducting a new briefing with all personnel involved.

**4.1.2** Institutional Lifts may involve the use of LDE or be a manual lift performed as part of the facilities operations, maintenance, or construction activities of GSFC. An institutional lift may be classified as critical or non-critical depending on the hardware, lift complexity or hazards involved in the lift operation.

**4.1.3** Personnel Lift and Suspended Load Operations involving the lifting of personnel with a crane, and lifts where personnel are required to work under a suspended load shall be defined as critical lifts and will be done in accordance with the requirements of NASA-STD 8719.9.

**4.1.4** Manual Lifts may range in complexity from handling a lightweight item of equipment to supporting an item of space flight hardware while LDE is repositioned. Certain manual lifts may be determined to be critical by the LDE Owner or LSU.

a. If a manual lift is determined to be a critical lift, the following safe lifting and handling load limits will apply:

- (1) 35 lbs. (15.8 kg) of manageable shape and size for one person
- (2) 75 lbs. (34 kg) of manageable shape and size for two people
- (3) 100 lbs. (45.4 kg) of manageable shape and size for three people

b. No critical manual lift will be performed for a load exceeding *100 lbs* unless written concurrence from a qualified safety representative has been obtained.

**4.1.5** Constrained Lifts present additional risk/hazards to personnel. If not controlled properly, lifting constrained loads can result in an inadvertent sudden increase in the loading on LDE and the hardware component being lifted due to sudden binding and/or friction between components during the lift. This can quickly result in exceeding the safe working load capacity of the LDE and also over stress and damage the hardware or equipment being lifted.

a. Constrained lifts shall only be conducted with the concurrence of the LDEM.

b. Constrained lifts should be treated as critical lifts for flight projects, thus requiring a written procedure.

c. Constrained lifts involving institutional lifts, the LDEM should be consultant for criticality determination.

## **4.2 Documentation Requirements**

Lift procedures shall be developed for all crane lifts, with the exception of non-critical overhead crane operations.

- 4.2.1** Written non-critical lift procedures should be kept available in the work area and may be generic based on the type of lift or LDE specific. The procedures should include, but are not be limited to, LDE operating instructions, operator certification or training requirements, equipment certification requirements, rigging instructions, pre-lift briefing and other information needed to ensure safe performance of lifting operations in order to eliminate or minimize risk to personnel and equipment/hardware.
- 4.2.2** Critical lift procedures shall be written procedures developed as required per NASA-STD 8719.9 for each critical lifting operation.
- a. Critical lift procedures are the responsibility of the LSU, and as a minimum be reviewed and approved by the LSU, Safety Representative and PIC.
  - b. The critical lifting procedure will contain a list of all LDE (slings, hoist rings, shackles, turnbuckles, spreader bars, lifting assemblies, Hydra Set, load-measuring devices, and any other hardware components) used in the lifting operation; and the following information will be included in the procedure for each item attached in the load path: SWL, certification expiration date, and LDE Program device number.
  - c. Coordination for directing the lifting operation will be delineated in the Critical Lift Procedure and emphasized in the pre-lift briefing. Any transfer of a designated lift team member's (signal person) responsibility for directing the lifting operation will be identified in the Critical Lift Procedure and emphasized in the pre-lift briefing.
- 4.2.3** Institutional lift procedures will be developed by the LSU or PIC and be adequate for the complexity of the lift.

## 5 Waivers

If the requirements of this directive cannot be met, a waiver request shall be prepared in accordance with GPR 1400.1.

## Appendix A – Definitions

Most of the terms used in this directive are defined in NASA-STD-8719.9 or NASA-STD-8709.22. Those that are critical and/or unique to this document are listed below.

- A.1 Apprentice LDE Crane Operator License** – A LDE crane operator’s license that allows the inexperienced operator to gain practical/hands-on training in non-critical crane and rigging operations under the direction of a licensed crane operator / rigger.
- A.2 Certification/Recertification** – A process performed, to the satisfaction of the LDEM, that leads to the initial or continuation of certification that a specific LDE is safe to use within specified OEM limitations and/or LDE program certification parameters; and may include but is not limited to LDE compliance and documentation reviews involving load tests, operational tests, inspections, nondestructive testing, OEM documents and engineering analyses.
- A.3 Constrained Lift** – Any lift where the load is not free to move (such that a larger than planned movement of the LDE can result in greater than planned stresses on the load and the LDE). An example would be a lifting/handling operation where a crane or hoist is required to relieve just enough of the weight of its load in order to remove and/or release the attachment fasteners. Common constrained lift situations include off-loading the weight of a piece of flight hardware attached to a handling/holding fixture, mating or de-mating flight hardware components, removing chiller end caps or any other type of lifting operation that a potential for binding exist. Constrained lifts are considered critical.
- A.4 Criticality** – A term that refers to the lift category classification: critical or non-critical.
- A.5 Critical Lift** – A lift where failure/loss of control could result in loss of life, major injury, loss of or damage to hardware or other items such as spacecraft, one-of-a-kind articles, or major facility components whose loss or damage would have serious programmatic or institutional impact. Examples may include a constrained lift, lifting below the center of gravity, or lifting in areas with a tight tolerance.
- A.6 Critical Lift Crane Operator/Rigger License** – A license authorizing the LDE operator to operate the type of cranes specified on the license for both non-critical and critical lifts.
- A.7 Critical Lift Procedure/Plan** – A specific written step-by-step procedure/plan to be followed by the lift team to perform a critical lift operation. The procedure also defines the roles and responsibilities of all lift team members, and pertinent items to be verified prior to the lift.
- A.8 Hazardous Operating Procedures (HOP)** – Detailed, documented procedures listing step-by-step functions or tasks to be performed on a system or equipment to ensure safe and efficient operations. A HOP may address such topics as special precautions, start and stop times or conditions, necessary sequences of steps, approving official(s), etc.
- A.9 Installation Director** – Person in charge of respective site location, commonly referred to as the Center Director
- A.10 Institutional Lift** – A lift performed as part of the facilities operations, maintenance, or construction activities of GSFC, such as lifting a section of pipe or moving a pallet of office supplies and does not involve flight hardware.
- A.11 LDE Documentation** – Files that are maintained by the LDE Owner or LDEM that contain the necessary information to assure compliance with the applicable code or standard (typically including, but not limited to, manufacturer’s/fabricator’s documents, field test data, safety



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analyses, results of engineering analyses, repair history, facility descriptions, record of all safety variances, re-rating, and correspondence for the purpose of certification.

- A.12 LDE Operator Certification** – The documented status of LDE operators (Crane Operator, MAP Operator, and PIT Operator) validating that they are trained and qualified in accordance with NASA-STD 8719.9 and certified by the LDEM.
- A.13 LDE Owner** – For the purposes of this directive the “LDE Owner” includes Division Offices, Program/Project Offices, etc. who are the assigned custodian of LDE property.
- A.14 LDE Program** – An established GSFC program that provides certification and recertification expertise, management, and oversight for LDE and LDE personnel.
- A.15 Lift Analysis** – An analysis performed to determine the maximum load the LDE is expected to experience during the worst case lift and may also include a stress and stability analysis.
- A.16 Lift Categories (Criticality)** – Lifts are classified in two categories: critical or non-critical.
- A.17 Lifting Devices (LD)** – Machines such as overhead and gantry cranes (including top running, monorail, under hung, and jib cranes), mobile cranes and derricks, gantries, hoists and winches, special hoist-supported personnel lifting devices, Hydra Sets, mobile aerial platforms, powered industrial trucks, and jacks.
- A.18 Lifting Devices and Equipment (LDE)** – The collective term that includes both Lifting Devices (LD) and Lifting Equipment (LE).
- A.19 Lifting Equipment (LE)** – Below the hook lifting devices such as slings and sling assemblies, strong backs, spreader bars, shackles, load-measuring devices, and other hardware components used to attach the load(s) to the lifting device(s).
- A.20 Lifting Service User (LSU)** – The recipient of the lifting services being provided. Typically the owner of the hardware being lifted or handled, represented by the Program/ Project Manager (for institutional, facilities, or flight) or their designated representative.
- A.21 Load Positioning Device** – A below-the-hook lifting device used for precision load positioning (i.e. Hydra-Set ®).
- A.22 Manual Lift** – A lift where a person lifts and/or moves an item without the use of LDE (other than handles, etc. provide to facilitate manual lifting).
- A.23 Non-Critical Lift** – Lting operations governed by standard industry rules and practices except as supplemented with unique NASA testing, operations, maintenance, inspection, and personnel licensing requirements contained in NASA-STD 8719.9 and this directive.
- A.24 Non-Critical Lift Procedures** – A specific procedure/plan to be followed by the lift team to perform a non-critical lift operation.
- A.25 Periodic Inspection/ Load Testing** – Predetermined LDE inspection and testing intervals (annual and monthly), which are typically mandated by OSHA and/or NASA.
- A.26 Pre-Lift Briefing** – A briefing of involved personnel held prior to the commencement of a critical lift or other designated lift.
- A.27 Pre-Use Daily Inspection/ Checklist** – An inspection and operational check performed on LDE on a daily basis and recorded on a checklist prior to commencing operations.
- A.28 Privatization Clauses** – Contractual language dealing with government out sourcing of services or functions to private firms.
- A.29 Stability Analysis** – An engineering evaluation process of calculating the location of the Center of Gravity (CG) of a load or mass in relation to the location of its reaction points (i.e. lifting points, support base). A satisfactory evaluation (i.e. CG located below and within the lift points,

etc.) with adequate safety margins will ensure that a load or mass will remain stable when placed on a supporting base or when lifted or handled by LDE. The analysis includes consideration of lateral loads which may be imparted by movement of the LDE or the load.

- A.30 Stress Analysis** – An engineering discipline covering methods to determine the stresses and strains in materials and structures subjected to forces or loads in order to ensure its satisfactory strength or load carrying capacity. The analysis includes consideration of the static and dynamic distribution of the stresses among the lift points. A positive margin on safety factors of *three* on yield strength and *five* on ultimate strength must be demonstrated for all LDE designs.
- A.31 Support-Services Contractor** – Services acquired by contract from non-governmental sources to support an organization’s mission, management, policy, or program or project management and administration
- A.32 Tenant** – A non-NASA entity or organization that has obtained GSFC’s permission to reside on the Center.
- A.33 Waiver** – A written authorization to depart from a specific established requirement or directive.



## Appendix B – Acronyms

<b>ANSI</b>	American National Standards Institute
<b>CG</b>	Center of Gravity
<b>FMD</b>	Facilities Management Division
<b>GB</b>	Greenbelt
<b>GPR</b>	Goddard Procedural Requirements
<b>GSFC</b>	Goddard Space Flight Center
<b>HQ</b>	NASA Headquarters
<b>HOP</b>	Hazardous Operating Procedures
<b>KG</b>	Kilograms
<b>LBS.</b>	Pounds
<b>LD</b>	Lifting Device (cranes, hoist, etc.)
<b>LDE</b>	Lifting Devices and Equipment
<b>LDEC</b>	LDE Committee
<b>LDEM</b>	LDE Manager
<b>LE</b>	Lifting Equipment (below the hook rigging gear and hardware, etc)
<b>LSU</b>	Lifting Service User
<b>MAP</b>	Mobile Aerial Platform (Manlifts, Scissor Lifts, Boom Lifts)
<b>NASA</b>	National Aeronautics & Space Administration
<b>NCS</b>	National Consensus Standard
<b>NDT</b>	Nondestructive Testing
<b>NPR</b>	NASA Procedural Requirements
<b>OEM</b>	Original Equipment Manufacturer
<b>OHCM</b>	Office of Human Capital and Management
<b>OSHA</b>	Occupational Safety and Health Administration (29 CFR 1910, 29 CFR 1926)
<b>PALD</b>	Portable Automotive Lifting Devices
<b>PIC</b>	Person-In-Charge
<b>PM</b>	Program/Project Manager
<b>PPE</b>	Personal Protective Equipment
<b>PIT</b>	Powered Industrial Truck (Fork-Lifts)
<b>SATERN</b>	System for Administration, Training and Educational Resources, for NASA
<b>STD</b>	Standard
<b>SWL</b>	Safe Working Load
<b>WFF</b>	Wallops Flight Facility

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### Change History Log

<u>Revision</u>	<u>Effective Date</u>	<u>Description of Changes</u>
Baseline	11/23/04	Initial Release
Baseline	10/27/05	Administratively changed to reflect responsible office change from Code 540, Mechanical Systems Division, to Code 250, Safety and Environmental Division.
A	05/08/09	Responsible office was changed from Code 250, Safety and Environmental Division, to Code 540, Mechanical Systems Division. Revised nomenclature to be consistent with latest HQ requirements in Paragraph 4. Added Paragraph 5, LDE Committee. General editorial changes for consistency with GPR 8834.1.
B	5/29/12	Added GID changes; Under Section 1, changed Occupational Safety to Code 350; under P.1 reflected that this directive is implementing the NASA Standard; under P.2a added additional references; reworded Section 1.2 to reflect current contract; ; Section 1.4 added to reflect owners responsible to control LDE; Section 1.4 added to reflect NASA Standard; Section 1.8 added to give LDE operator authority; Section 2.1.2.3 wording added for ANSI requirements; Section 2.4.2 changed to optional; Section 3.2.3 period of recertification changed to reflect NASA Standard. A note was added to Section 3.6 License Revocation. All definitions and acronyms were moved to the end of the document.
C	4/28/15	GPR 8719.1B and GPR 8834.1B were combined to eliminate redundancy between the two documents and the NASA LDE standard. Title changed to reflect this change. Responsible office was changed from Code 540, Mechanical Systems Division to Code 360 Safety Division.