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CHAPTER 8.5 LIFTING OPERATIONS AND EQUIPMENT SAFETY

8.5.1. Applicability of this chapter

You are required to follow this chapter if you manage, operate, service, or maintain lifting equipment as described in paragraph 8.5.2 below. Paragraph 8.5.15 lists the responsibilities of organizational directors, program managers, contract project managers, the Center Operations Directorate, the Safety and Test Operations Division, and the program offices.

8.5.2. What this chapter covers

This chapter covers minimum safety requirements for operating any mechanical device designed for lifting or lowering, and supplements the requirements in NASA-STD 8719.9, “Standard for Lifting Devices and Equipment.” It applies to overhead and mobile cranes, powered industrial forklift trucks, manually operated material handling equipment, and commercially owned cranes used at JSC.

8.5.3. Requirements for lifting equipment and operating procedures

8.5.3.1 Lifting equipment and operating procedures shall meet the following requirements:

- a. Requirements for “noncritical lifts” in NASA-STD 8719.9, “Standard for Lifting Devices and Equipment,” and other requirements listed in this chapter as a minimum. NASA-STD 8719.9 covers requirements for design, testing, inspection, maintenance, operation, personnel certification and marking requirements for lifting devices and associated equipment used to support NASA operations.
- b. Use JSC Form 941, “Pre-Lift Checklist,” to plan and evaluate lifting operations.
- c. Use only electrically powered lifting equipment inside buildings to prevent carbon monoxide accumulations. Any proposed indoor use of combustion-engine-powered equipment requires written approval from the Safety and Test Operations Division and Occupational Health. Send a request to the Safety and Test Operations Division with rationale and proposed safeguards. Pay special attention to the outdoor placement and location of combustion-powered equipment to prevent the entrainment of carbon monoxide and other combustion products into JSC buildings, tunnel system, structures, etc.
- d. Refer to Chapter 3.6 for physical examination requirements for individuals performing lifting operations.
- e. Follow JPR 8719.2, JSC Lifting Devices and Equipment Requirements.

8.5.4. Requirements for critical lifts

8.5.4.1 Critical lifts involve lifting and lowering special high-dollar items, such as spacecraft, one-of-a-kind articles, or major facility components whose loss would have serious program impact. Critical lifts also include operations with personnel and equipment safety concerns beyond normal lifting hazards. The following requirements apply to critical lifts:

- a. Critical lifts shall follow the requirements for “critical lifts” in NASA-STD 8719.9.

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- b. Safety personnel shall monitor critical lifts to ensure they follow all of the requirements in NASA-STD 8719.9.

8.5.5. Commercially owned cranes

8.5.5.1 Commercially owned cranes are contractor- or subcontractor-owned, -rented, or -leased cranes. Critical lifts and cranes shall meet the following requirements:

- a. Follow the requirements in paragraph 8.5.4 above.
- b. Critical lift cranes shall meet OSHA requirements and ASME B30.5, "Mobile and Locomotive Cranes."
- c. Before using a crane for a lift, users shall provide the Safety and Test Operations Division with the following information:
 - (1) Type of crane and capacity.
 - (2) The kind of lift (critical or noncritical) that the crane will make.
 - (3) The item to be lifted, the weight of the item, and the location of the lift.
 - (4) The purpose of the lift (task).
 - (5) The schedule, estimated start and completion.
 - (6) Any other pertinent information to include the crane's load chart and a pre-lift checklist as described in JSC Form 941, "Pre-Lift Checklist."

8.5.6. Requirements for powered industrial forklift trucks

8.5.6.1 Forklift operators shall follow these requirements:

- a. Make sure forklift trucks meet the design and construction requirements established in ASME B56.1, "Safety Standard for High Lift and Low Lift Trucks," and in 29 CFR 1910.178, "Powered Industrial Trucks." Chapter 12 of NASA-STD 8719.9 lists safe operating requirements for powered industrial trucks (forklifts).
- b. Inspect the forklift per paragraph 12.4 of NASA-STD 8719.9 and document periodic inspections per subparagraph 12.4.7.
- c. Whenever possible, use non-CO-producing equipment such as electric-powered equipment, lifts, or forklifts inside enclosed or semi-enclosed areas. Never allow CO-producing motors to idle in enclosed or semi-enclosed areas. The Safety and Test Operations Division and the Space Medicine Operations Division shall approve any proposed indoor use of combustion-engine-powered equipment. If approval is granted, the Space Medicine Operations Division may require CO monitoring and exhaust ventilation. Additionally, if approval is granted, coordinate with the facility manager for work scheduling and occupant notifications and with the Fire Protection Services for Fire Alarm Outages where engine exhaust could activate smoke detectors. Pay special attention to the outdoor placement and location of combustion-powered equipment to prevent the entrainment of CO and other combustion products into JSC buildings, tunnel system, structures, etc.
- d. Charge batteries only in well-ventilated areas meeting ASME B56.1 and NFPA 505. Keep vent caps in place to avoid electrolyte spray when charging batteries of electric forklifts. Make sure

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vent caps are functioning.

e. Operators using forklift extensions shall:

- (1) Follow ASME B56.1.
- (2) Use only manufacturer-approved extensions.
- (3) Follow the manufacturer's recommendations.
- (4) Uniquely identify the extensions.
- (5) Use only a professionally modified forklift's load chart.

8.5.7. Requirements for other lifting equipment

8.5.7.1 Users of other lifting equipment shall:

- a. Use other lifting equipment such as low-lift pallet trucks, hand trucks, man lifts, aerial platforms, and dollies only for the purpose intended by the manufacturer.
- b. Never operate this equipment unless trained and certified by the proper authority.
- c. Follow the manufacturer's instructions and the appropriate chapters of NASA-STD 8719.9.

8.5.8. Possible issues during lifting operations

Lifting operations handling any of the materials on this list shall follow the requirements referenced before the lifting operation begins.

<i>For handling and storing . . .</i>	<i>Follow this standard . . .</i>
Hazardous materials	Chapter 5.1, "Fire Safety," and Part 9, "Safety and Health Practices for Hazardous Materials."
Flammable liquids and gases	Safety Data Sheets and other procedures found in Chapter 5.1.
Cryogenic materials	Chapter 6.4, "Cryogenic Materials and Gases: How to Work with Them Safely."
Explosives and propellants	Chapter 9.5, "Explosives and Propellants Safety," and Chapter 9.1, "Hazardous Materials Safety and Health." Appropriate paragraphs of NASA-STD 8719.9.

8.5.9. Requirements for slings and rigging equipment

Slings and rigging equipment shall meet the requirements in NASA-STD 8719.9. These include testing, inspection, and supporting documentation as required in Chapter 14 of the standard.

8.5.10. Precautions for moving or operating a mobile crane

8.5.10.1 Employees in charge of moving or operating a mobile crane shall follow these requirements as well as the requirements in NASA-STD 8719.9, Chapter 5:

- a. Determine the path of travel and inspect it for hazards before the operation begins. Make sure clearances along the path of travel are adequate. Pay special attention to the following:

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- (1) Power lines – keep them clear of the crane at all times.
- (2) Personnel or objects in the crane’s path of travel.
- (3) Weight limits for the roadway or bridges.
- b. Appoint a person responsible for determining and controlling the safety of the operation. These responsibilities include positioning of the crane and the load, boom extension and radius, ground support, travel route, and speed of movement.
- c. Hold a pre-departure crew safety meeting. Discuss the route and any hazards or conditions the crane might encounter, such as: proximity of overhead power lines, close vertical or horizontal clearances, speed limits, planned stops, escort positions, and other special instructions. Make sure no one other than required operating personnel are permitted on the equipment being moved.
- d. Make sure safe load capacities, operating speeds, and other essential data are posted in or on equipment being driven or transported.
- e. Take these actions when moving a crane:
 - (1) Place flags and warning signs on the crane or vehicle before moving it with a secondary vehicle.
 - (2) Avoid sudden starts and stops.
 - (3) Stop if you encounter overhead power lines that appear to be too close and make sure you can clear them safely with a 10-foot space or a verified de-energized line. Note that the clearance distance will change as a function of the line voltage. Ten feet is for than 50,000 volts or less. Treat all overhead lines as energized until certain it is safe to proceed.
- f. Maintain at least a 2-foot clearance between the crane boom or jib and nearby walls, overhead trestles, columns, or other structures.

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8.5.11. Requirements for working under a suspended load

8.5.11.1 OSHA requirements prohibit putting people under suspended loads. The Department of Labor approved an alternate standard for NASA to allow employees to work under suspended loads if certain conditions are met. However, putting workers under suspended loads is discouraged unless absolutely necessary to fulfill NASA's mission. This includes multiple load lifts (Christmas tree loads) because this practice requires personnel to work under or near suspended loads. The following requirements apply:

- a. Employees shall follow the requirements in Appendix A of NASA-STD 8719.9 if working under a suspended load is necessary.
- b. Approval from the Director, Safety and Mission Assurance, is required for any work under a suspended load. To get approval, send a request and all documentation required by Appendix A of NASA-STD 8719.9 to the Safety and Test Operations Division.

8.5.12. Relief from lifting requirements

To get relief from any lifting requirement, including equipment design requirements, submit a request as described in Chapter 1.3, "Written Safety and Health Program." The Safety and Mission Assurance Office will forward the request to the Center Director or NASA Headquarters as needed. Paragraph 1.5 of NASA-STD 8719.9 lists NASA's policy for getting relief from lifting requirements. JSC's Center Director may approve some requests to NASA-STD 8719.9.

8.5.13. Training and certification requirements for operating lifting equipment

Operators and crew members shall meet the training and certification requirements in NASA-STD 8719.9 and Chapter 5.8, "Hazardous Operations: Safe Practice and Certification." You may arrange safety-related training through the JSC Safety Learning Center or arrange training on your own as described in Chapter 4.1, "Safety and Health Training." Consult your organization's policies and processes for certification.

8.5.14. Other requirements

8.5.14.1 Crane operators and crew members shall follow these requirements as well as this chapter:

- a. NASA-STD 8719.9.
- b. 29 CFR 1910 Subpart N, "Material Handling and Storage."

8.5.15. Other responsibilities for lifting operations and equipment safety

- a. JSC's Center Director, per JPR 8719.2, is responsible for appointing a Lifting Devices and Equipment Manager who meets the qualifications in paragraph 8.5 of NPR 8715.1.
- b. JSC's Lifting Devices and Equipment Manager shall fulfill the responsibilities in paragraphs 2.6.3 and 2.6.4 and chapter 8 of NPR 8715.1 as well as the responsibilities in JPR 8719.2.
- c. As a director, program manager, or contract project manager, you are responsible for:
 - (1) Evaluating all lifting operations in your organization and making informed decisions on the risks they pose.

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- (2) Determining which lifting operations in your organization are critical. You may delegate the authority for determining critical lifts, but you shall do it in writing.
- d. The Center Operations Directorate is responsible for:
- (1) Preparing and maintaining up-to-date lists of all overhead cranes and fixed hoists.
 - (2) Developing detailed inspection and test procedures, and test criteria for each item listed.
 - (3) Carrying out a program to periodically inspect existing and permanently installed handling and lifting equipment.
 - (4) Supervising the adjustment or modification of all cranes and hoists.
 - (5) Keeping inspection and recertification records as described in this chapter.
 - (6) Keeping records of all material-handling equipment used for critical lifts as defined in NASA-STD 8719.9.
 - (7) Evaluating the adequacy of newly purchased handling and lifting equipment for permanent installation. This includes coordinating a review of design specifications, manufacturing controls, and operational acceptance testing to make sure the equipment satisfies NASA-STD 8719.9.
 - (8) Developing processes to identify critical lifting operations, lifting devices, and equipment that shall meet critical lift requirements. Obtaining input from facility, program, user, safety, and quality assurance personnel. Documenting the results of the process and having it approved as a minimum, by the Director, Safety and Mission Assurance.
 - (9) Making sure JSC has documentation, procedures, and controls in place to ensure leased, owned, or rented special-purpose mobile equipment is adequate for its intended use and meets applicable requirements.
- e. The Safety and Test Operations Division is responsible for reviewing lifting operations and certifications to ensure all requirements are being met.
- f. Program offices are responsible for making sure contracts require contractor-directed lifting operations to meet NASA-STD 8719.9.