

Doc Para	NASA-STD-8719.9 Requirement Text	OSHA Requirement Text	ASME / ANSI / Other Requirement Text				
01.3	<p>Applicability: Compliance with this standard is mandatory for all NASA-owned and NASA contractor-supplied equipment used in support of NASA operations at NASA installations and NASA operations in host countries. The individual installation Lifting Devices and Equipment Manager (LDEM) and safety organizations are responsible for implementation and enforcement. This document establishes minimum requirements; NASA installations should assess their individual programs and develop additional requirements as needed. The need for compliance with this standard at contractor installations performing NASA work should be evaluated and made a contractual requirement where deemed necessary by the contracting officer and the responsible NASA installation/program safety office. Rented or leased LDE is exempt from this standard only by the decision of the contracting officer, the responsible NASA installation/program safety office, and the LDEM. If determined that rented or leased LDE will be used for a critical lift, this standard applies.</p>						
01.3.2	<p>Applicability: The design/hardware requirements contained in this document are applicable to new lifting devices/equipment purchased after 6 months from the issue date of this document. Existing equipment and that purchased during the first 6 months from issue of this document shall be reviewed for compliance with all design/hardware aspects of this standard within 12 months of its issue and the need to update such equipment shall be evaluated.</p>						
01.3.3	<p>Applicability: Deviations/waivers from the requirements of this document (including design/hardware requirements for both new and existing equipment) shall be approved as outlined in paragraph 1.7. The deviation/waiver documentation shall include any alternate or special criteria or procedures that will be imposed to ensure safe design and operations for those devices that do not meet the applicable requirements.</p>						
01.3.4	<p>Applicability: Portions of this standard refer to various national consensus codes/standards for equipment design/hardware requirements (e.g., ASME, CMAA, etc.). Lifting devices and equipment purchased after the initial review required in paragraph 1.3.2 shall comply with the specified codes/standards in effect at the time of manufacture. Each installation shall periodically review subsequent codes/standards and evaluate the need to update existing equipment. Based on an evaluation of NASA's overall safe lifting program and any significant changes in the consensus codes/standards, the NASA Safety and Risk Management Division with concurrence from the field installations shall decide when the next complete review (as described in paragraph 1.3.2) is warranted.</p>						

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01.4	<p>Relation to Occupational and Safety Health Administration (OSHA) Requirements: This document is not a substitute for OSHA requirements. OSHA requirements apply to all NASA operations. This document meets or exceeds Federal OSHA requirements. Some States have their own OSHA programs that must comply with Federal OSHA and may be stricter. All NASA installations are responsible for keeping up to date with the Federal and State OSHA requirements that apply to their operations. This standard contains some OSHA requirements where deemed necessary to stress the importance of the requirement, clarify the requirement, document interpretation of the requirement, and/or define NASA's program for meeting the requirement. The NASA Safety and Risk Management Division, with assistance from the field installations, shall monitor subsequent OSHA requirements for any impact on NASA's safe lifting program.</p>						
01.5.1	<p>Critical and Noncritical Lifting Operations: Critical lifts are lifts where failure/loss of control could result in loss of life, loss of or damage to flight hardware, or a lift involving special high dollar items, such as spacecraft, one-of-a-kind articles, or major facility components, whose loss would have serious programmatic or institutional impact. Critical lifts also include the lifting of personnel with a crane, lifts where personnel are required to work under a suspended load, and operations with special personnel and equipment safety concerns beyond normal lifting hazards. Personnel shall not be located under suspended or moving loads unless the operation adheres to the OSHA-approved NASA Alternate Standard for Suspended Load Operations (see Appendix A). Lifting of personnel with a crane shall be in accordance with 29 CFR 1926.550 (see Appendix C).</p>						
01.5.1.a	<p>Critical and Noncritical Lifting Operations: Each installation or program shall develop a process to identify critical lifting operations and lifting devices/equipment that must meet critical lift requirements. Input shall be gathered from facility, program, user, and assurance personnel. The results of the process shall be documented and approved, as a minimum, by the installation LDEM. (Requirement 40365)</p>						
01.5.1.b	<p>Critical and Noncritical Lifting Operations: It is NASA policy that the comprehensive safeguards outlined in this standard be provided for critical lifting operations. This includes special design features, maintenance, inspection, and test intervals for the lifting devices/equipment used to make critical lifts.</p>						
01.5.1.c	<p>Critical and Noncritical Lifting Operations: Specific written procedures shall be prepared and followed for all critical lifts. (Requirement 40367)</p>						
01.5.1.d	<p>Critical and Noncritical Lifting Operations: During critical lifts there shall be one person present (NASA or contractor) that is designated as responsible for the safety of the operations. That person may be a safety professional, a supervisor, an engineer, or a task leader. (Requirement 40368)</p>						
01.5.3	<p>Critical and Noncritical Lifting Operations: The requirements for critical and noncritical lifts outlined in this standard shall be followed unless a specific deviation/waiver is approved as outlined in paragraph 1.7. Different levels of risks associated shall be evaluated using the risk determination criteria in NPG 8715.3.</p>						

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01.6	Recordkeeping and Trend Analysis: A data collection system shall be established at each installation or location to support NASA-wide lifting device trend and data analysis. Data entered locally would typically be associated with 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. (Requirement 40371)						
01.7.1	Safety Variances: If a mandatory requirement cannot be met, a safety variance shall be prepared in accordance with NPG 8715.3. (Requirement 40373)						
01.7.2	Safety Variances: The NASA variance process does not apply to Federal and applicable State/local regulations (e.g., OSHA, Cal OSHA). Any variance of a Federal or State/local regulation must be approved by the appropriate Federal/State/local agency (e.g., NASA Alternate Safety Standard for Suspended Load Operations approved by OSHA). The NASA Safety and Risk Management Division shall review all proposed safety variances of Federal regulations before submittal for approval.						
01.7.3	Safety Variances: Example: A variance request to a requirement in this standard that uses the word shall would be routed through the Center Safety Director for concurrence and approved or denied by the Center Director. A copy would then be sent to the NASA Safety and Risk Management Division within 14 days along with detailed rationale for its approval and other documentation.						
01.8.1	Lifting Devices and Equipment Committee: NASA LDE Committee. Each installation Director shall designate in writing at least one person and an alternate, with appropriate background in lifting devices, lifting operations, lifting equipment industry standards and an understanding of lifting safety, as the installation LDEM, to participate as a member of the NASA LDE Committee. The committee is chaired by the Director, Safety and Risk Management Division, or designee, and is responsible for reviewing proposed changes to this standard and addressing general LDE safety issues. The LDEM is responsible for overall management of the installation LDE program, coordinating with appropriate personnel at their installation on lifting issues and providing the NASA LDE Committee with their installation's position on LDE issues. (Requirement 40377)						
01.8.2	Lifting Devices and Equipment Committee: Installation LDE Committee. Each installation shall establish a LDE Committee, to ensure this standard is understood and applied across other organizations at the installation and to resolve any issues and provide a forum to exchange information. The Installation LDE Committee shall be chaired by the LDEM, with representation from all organizations at the installation that are responsible for and/or involved with LDE. (Requirement 40378)						
01.9	Personnel Performing Nondestructive Testing: Personnel performing lifting devices and equipment nondestructive testing (NDT), including visual inspections, shall be qualified and certified in accordance with written practices meeting the requirements contained in American Society for Nondestructive Testing (ASNT) Recommended Practice No. SNT-TC-1A, Personnel Qualification and Certification in Nondestructive Testing. (Requirement 40379)						

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02.2.1(1)	Government Documents: Specifications, Standards, and Handbooks. The following specifications, standards, and handbooks form a part of this document to the extent specified herein. Unless otherwise specified, the issuances in effect on date of invitation for bids or request for proposal shall apply.						
02.2.2(1)	Other Government Documents, Drawings, and Publications: The following documents form a part of this document to the extent specified herein. Unless otherwise specified, the issuances in effect on date of invitation for bids or request for proposal shall apply.						
02.3(1)	Non-Government Publications: The following documents form a part of this document to the extent specified herein. Unless otherwise specified, the issuances in effect on date of invitation for bids or request for proposals shall apply.						
04.2.2.a	Labeling/Tagging of Cranes: The rated load of all cranes shall be plainly marked on each side of the crane. If the crane has more than one hoisting unit, each hoist load block shall be marked with its rated load. This marking shall be clearly legible from the ground floor (OSHA requirement for all overhead cranes). (Requirement 40485)	1910.179(b)(5) Rated load marking. The rated load of the crane shall be plainly marked on each side of the crane, and if the crane has more than one hoisting unit, each hoist shall have its rated load marked on it or its load block and this marking shall be clearly legible from the ground or floor.	SECTION 2-1.1: MARKINGS 2-1.1.1 Rated Load Markings — Crane The rated load of the crane shall be marked on each side of the crane and shall be legible from the ground or floor. 2-1.1.2 Rated Load Markings — Hoists (a) The rated load of the hoist shall be marked on the hoist or trolley unit or its load block and shall be legible from the ground or floor. (b) If the crane has more than one hoisting unit, each hoist shall have its rated load marked as per para. 2-1.1.2(a).				
04.2.2.b	Labeling/Tagging of Cranes: Cranes that have the specified design features, maintenance/inspection, and test intervals to lift critical loads shall be marked conspicuously so that the operator and assurance personnel can distinguish that the crane is qualified for critical lifts. (Requirement 40486)	Not covered in OSHA 1910.179	Critical inspection items are mentioned in ASME B30.2 but critical lift cranes are not mentioned.				
04.2.2.c	Labeling/Tagging of Cranes: A standard system of labeling shall be established and used throughout the installation. (Requirement 40487)	1910.179(b)(5) Rated load marking. The rated load of the crane shall be plainly marked on each side of the crane, and if the crane has more than one hoisting unit, each hoist shall have its rated load marked on it or its load block and this marking shall be clearly legible from the ground or floor.	Not covered in ASME B30.2				

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04.2.2.d	<p>Labeling/Tagging of Cranes: A standard lockout/tagout system shall be established and used throughout the installation to indicate equipment that is not to be used due to inspection discrepancies, ongoing maintenance operations, or other reasons. (Requirement 40488)</p>	<p>1910.179(g)(5)(ii) On cab-operated cranes a switch or circuit breaker of the enclosed type, with provision for locking in the open position, shall be provided in the leads from the runway conductors. A means of opening this switch or circuit breaker shall be located within easy reach of the operator. ..1910.179(g)(5)(iii) 1910.179(g)(5)(iii) On floor-operated cranes, a switch or circuit breaker of the enclosed type, with provision for locking in the open position, shall be provided in the leads from the runway conductors. This disconnect shall be mounted on the bridge or footwalk near the runway collectors. One of the following types of floor-operated disconnects shall be provided: 1910.179(g)(5)(iii)(a) Nonconductive rope attached to the main disconnect switch. 1910.179(g)(5)(iii)(b) An undervoltage trip for the main circuit breaker operated by an emergency stop button in the pendant pushbutton in the pendant pushbutton station. 1910.179(g)(5)(iii)(c) A main line contactor operated by a switch or pushbutton in the pendant pushbutton station. Overhead and gantry cranes. - 1910.179 Page 17 of 29 http://</p>	<p>SECTION 2-3.5: CRANE LOCKOUT/TAGOUT (a) A lockout/tagout policy and procedure shall be developed, documented, and implemented by the owner or user of overhead cranes. (b) The lockout/tagout policy and procedure shall comply with the requirements of ANSI Z244.1. 2-2.3.2 Maintenance Procedure (a) The following precautions shall be taken before performing maintenance on a crane: (4) A lockout/tagout procedure shall be performed (see para. 2-3.5.1); 2-3.1.7 Conduct of Operators, (j) The operator shall be familiar with the equipment and its proper care. If adjustments or repairs are necessary, or any defects are known, the operator shall report the same promptly to the appointed person who shall be responsible for the operation and maintenance repairs of the crane. The operator shall also notify the next operator of any remaining uncorrected defects upon changing shifts.</p>				
04.2.2.f	<p>Labeling/Tagging of Cranes: Each overhead crane shall have the directions of its bridge and trolley movements displayed on the underside of the crane. These directions shall correspond to the directions on the operator station. These markings shall be visible from the floor but are not required if the crane is at such a height the markings would be legible without unaided vision. (Requirement 40490)</p>	<p>1910.179(c)(1)(i) The general arrangement of the cab and the location of control and protective equipment shall be such that all operating handles are within convenient reach of the operator when facing the area to be served by the load hook, or while facing the direction of travel of the cab. The arrangement shall allow the operator a full view of the load hook in all positions. 1910.179(g)(3)(v) The control for the bridge and trolley travel shall be so located that the operator can readily face the direction of travel.</p>	<p>GENERAL NOTE: Markings on the crane, visible from the floor, shall indicate the direction of bridge and trolley travel corresponding to the W, X, Y, and Z designations on the transmitter. The letters used are only intended for the purpose of illustration. Designations should be selected as appropriate to each illustration.</p>				
04.2.3(1)	<p>Safety Analysis and Documentation of Cranes Used for Critical Lifts: A recognized safety hazard analysis, such as fault tree analysis, FMEA, Operating and Support Hazard Analysis (O&SHA), shall be performed on all cranes used for critical lifts. (Requirement 40491)</p>	<p>Not covered in OSHA 1910.179</p>	<p>Not covered in ASME B30.2</p>				
04.2.3(2)	<p>Safety Analysis and Documentation of Cranes Used for Critical Lifts: The analysis shall, as a minimum, determine potential sources of danger, identify failure modes, and recommend resolutions and a system of risk acceptance for those conditions found in the hardware-facility-environment-human relationship that could cause loss of life, personal injury, and loss of or damage to the crane, facility, or load. (Requirement 40492)</p>	<p>Not covered in OSHA 1910.179</p>	<p>Not covered in ASME B30.2</p>				
04.2.3(3)	<p>Safety Analysis and Documentation of Cranes Used for Critical Lifts: The analysis shall be done as part of the initial evaluation process for critical lift compliance and prior to use in a critical lift, included in the crane documentation, and updated as required to reflect any changes in operation and/or configuration. (Requirement 40493)</p>	<p>Not covered in OSHA 1910.179</p>	<p>Not covered in ASME B30.2</p>				

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04.2.4(1)	Performance: Crane service classification, load capability, and the desired control characteristics with which the crane handles the load shall be addressed for all designs. (Requirement 40494)	Not covered in OSHA 1910.179	SECTION 2-0.2: DEFINITIONS: crane service, heavy: service that involves operating at 85 to 100% of rated load or in excess of 10 lift cycles/hr as a regular specified procedure. crane service; normal: service that involves operating at less than 85% of rated load and not more than 10 lift cycles/hr except for isolated instances. crane service, severe: service that involves normal or heavy service with abnormal operating conditions.				
04.2.4(2)	Performance: Crane service classification requirements shall be based on the worst expected duty the unit will encounter. (Requirement 40495)	In CMAA?	In CMAA?				
04.2.4(3)	Performance: Operational requirements shall be considered in the design phase to ensure load and function are adequately defined and critical crane design features are incorporated on the delivered units. (Requirement 40496)	In CMAA?	In CMAA?				
04.2.5	Structural: Structural design shall be in accordance with industry standards for material selection, welding, allowable stresses, design limitations, framing, rails, wheels, and other structural elements. Refer to ASME and CMAA standards for specific design details. (Requirement 40497)	In CMAA?	In CMAA?				
04.2.6.b.01	Mechanical: The mechanical design requirements for crane components are as follows: They shall meet all applicable requirements of OSHA, ASME, and CMAA. (Requirement 40501)	1910.179(b)(2) New and existing equipment. All new overhead and gantry cranes constructed and installed on or after August 31, 1971, shall meet the design specifications of the American National Standard Safety Code for Overhead and Gantry Cranes, ANSI B30.2.0-1967, which is incorporated by reference as specified in Sec. 1910.6.	OSHA not mentioned. CMAA listed as a reference and listed several times in ASME: 2-3.2.1.1 Planned Engineered Lifts.: (2) the design of the structural, mechanical, electrical, pneumatic, and hydraulic components of the crane shall be reviewed, by means of applicable calculations for the load to be lifted, and approved by the crane manufacturer or a qualified person, in accordance with accepted crane design standards if the load to be lifted exceeds 125% of rated load, or if the frequency of planned engineered lifts exceeds two during a continuous 12-month period (3) the design of the crane-supporting structure shall be reviewed and approved by a qualified person for conformance to applicable design criteria. The crane support shall be inspected and any deterioration or damage shall be taken into consideration in design calculations for the load to be lifted.				
04.2.6.b.02	Mechanical: The mechanical design requirements for crane components are as follows: For critical lift application, speed reduction from the motor to the drum on the hoist should be achieved by enclosure in a gear case. If open gears are required, they shall be guarded with a provision for lubrication and inspection. (Requirement 40502)	Not covered in OSHA 1910.179	Not covered in ASME B30.2				
04.2.6.b.03	Mechanical: The mechanical design requirements for crane components are as follows: Gearing shall be designed and manufactured to comply with the latest AGMA gear standards. (Requirement 40503)	Not covered in OSHA 1910.179	Not covered in ASME B30.2				

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04.2.6.b.04	<p>Mechanical: The mechanical design requirements for crane components are as follows: Each hoisting unit shall be provided with at least two means of braking: a holding brake and a control brake. The torque ratings, physical characteristics, and capabilities of the brakes shall be in accordance with CMAA specifications. (Requirement 40504)</p>	<p>Brakes for hoists. 1910.179(f)(1)(i) Each independent hoisting unit of a crane shall be equipped with at least one self-setting brake, hereafter referred to as a holding brake, applied directly to the motor shaft or some part of the gear train. ..1910.179(f)(1)(ii) Each independent hoisting unit of a crane, except worm-gear hoists, the angle of whose worm is such as to prevent the load from accelerating in the lowering direction shall, in addition to a holding brake, be equipped with control braking means to prevent overspeeding. 1910.179(f)(2) Holding brakes. 1910.179(f)(2)(i) Holding brakes for hoist motors shall have not less than the following percentage of the full load hoisting torque at the point where the brake is applied. 1910.179(f)(2)(i)(a) 125 percent when used with a control braking means other than mechanical. 1910.179(f)(2)(i)(b) 100 percent when used in conjunction with a mechanical control braking means. 1910.179(f)(2)(i)(c) 100 percent each if two holding brakes are provided. 1910.179(f)(2)(ii) Holding brakes on hoists shall have ample thermal capacity for the frequency of operation required by the service. 1910.179(f)(2)(iii) Holding brakes on hoists shall be applied automatically when power is removed. 1910.179(f)(2)(iv) Where necessary holding brakes shall be provided with adjustment means to compensate for wear. 1910.179(f)(2)(v) The wearing surface of all holding-brake drums or discs shall be smooth. ..1910.179(f)(2)(vi) 1910.179(f)(2)(vi) Each independent hoisting unit of a crane handling hot metal and having power control braking means shall be equipped with at least two holding brakes. 1910.179(f)(3) Control braking means. 1910.179(f)(3)(i) A power control braking means such as regenerative, dynamic or countertorque braking, or a mechanically controlled braking means shall be capable of maintaining safe lowering speeds of rated loads. 1910.179(f)(3)(ii) The control braking means shall have ample thermal capacity for the frequency of</p>	<p>ASME: SECTION 2-1.12: BRAKES AND BRAKING MEANS 2-1.12.1 Hoist Holding Brakes (a) Each hoisting unit of the crane shall be equipped with at least one holding brake. The holding brake shall be applied to the motor shaft or a gear reducer shaft and shall have a torque rating not less than the percentage of rated load hoisting torque at the point where the brake is applied as follows: (1) 125% of rated load hoisting torque when used with a control braking means other than mechanical (2) 100% of rated load hoisting torque when used with a mechanical control braking means (3) 100% of rated load hoisting torque for each brake if two holding brakes are provided (b) Each hoisting unit of a crane that handles molten material shall be equipped with one of the following arrangements: (1) Two holding brakes shall be provided, one of which is applied to a gear reducer shaft, plus control braking means. Each holding brake shall have a torque rating not less than 100% of rated load hoisting torque at the point where the brake is applied. (2) One holding brake shall be provided if the hoisting unit has a mechanical load brake or a control braking means that provides controlled lowering of the load upon loss of power. The holding brake shall have a torque rating not less than 150% of rated load hoisting torque at the point where the brake is applied. (c) Each hoist holding brake shall have thermal capacity for the frequency of operation required by the service. (d) Hoist holding brakes shall be applied automatically when power to the brake is removed. (e) Hoist holding brakes shall be provided with means to adjust for lining wear. 2-1.12.2 Hoist Control Braking Means (a) Each hoisting unit of the crane shall be equipped with a control braking means that will control the load during lowering to a maximum speed of 120% of rated lowering speed for the load being handled. (b) Hoist control braking means can be electrical, such as regenerative, dynamic, countertorque, or eddy-current; mechanical; hydraulic; or a worm-gear hoist where the angle of the worm is such as to prevent the load from accelerating in the lowering direction.(c) Hoist control braking means shall have thermal capacity for the frequency of operation required by the service.</p>				
04.2.6.b.05(1)	<p>Mechanical: The mechanical design requirements for crane components are as follows: For cranes used for critical lifts, two holding brakes shall be provided, each capable of bringing a rated load to zero speed and holding it. (Requirement 40505)</p>	OSHA does not mention critical lift cranes	ASME does not mention critical lift cranes				

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04.2.6.b.05(2)	Mechanical: The mechanical design requirements for crane components are as follows: Holding brakes shall be applied automatically when power to the brake is removed. If the control brake and holding brake are designed to operate as a system and cannot independently stop and hold a rated load, then another means of braking is required for cranes used for critical lifts (e.g., emergency brake). (Requirement 40506)	See above 2 cells (Requirement 40504)	ASME: SECTION 2-1.12: BRAKES AND BRAKING MEANS 2-1.12.1 Hoist Holding Brakes (a) Each hoisting unit of the crane shall be equipped with at least one holding brake. The holding brake shall be applied to the motor shaft or a gear reducer shaft and shall have a torque rating not less than the percentage of rated load hoisting torque at the point where the brake is applied as follows: (1) 125% of rated load hoisting torque when used with a control braking means other than mechanical (2) 100% of rated load hoisting torque when used with a mechanical control braking means (3) 100% of rated load hoisting torque for each brake if two holding brakes are provided (b) Each hoisting unit of a crane that handles molten material shall be equipped with one of the following arrangements: (1) Two holding brakes shall be provided, one of which is applied to a gear reducer shaft, plus control braking means. Each holding brake shall have a torque rating not less than 100% of rated load hoisting torque at the point where the brake is applied. (2) One holding brake shall be provided if the hoisting unit has a mechanical load brake or a control braking means that provides controlled lowering of the load upon loss of power. The holding brake shall have a torque rating not less than 150% of rated load hoisting torque at the point where the brake is applied. (c) Each hoist holding brake shall have thermal capacity for the frequency of operation required by the service. (d) Hoist holding brakes shall be applied automatically when power to the brake is removed. (e) Hoist holding brakes shall be provided with means to adjust for lining wear. 2-1.12.2 Hoist Control Braking Means (a) Each hoisting unit of the crane shall be equipped with a control braking means that will control the load during lowering to a maximum speed of 120% of rated lowering speed for the load being handled. (b) Hoist control braking means can be electrical, such as regenerative, dynamic, countertorque, or eddy-current; mechanical; hydraulic; or a worm-gear hoist where the angle of the worm is such as to prevent the load from accelerating in the lowering direction.(c) Hoist control braking means shall have thermal capacity for the frequency of operation required by the service.				
04.2.6.b.05(3)	Mechanical: The mechanical design requirements for crane components are as follows: The brakes shall be designed so that they can be tested as required in paragraph 4.3.3.d. (Requirement 40507)	1910.179(n)(3)(vii) The operator shall test the brakes each time a load approaching the rated load is handled. The brakes shall be tested by raising the load a few inches and applying the brakes.	See above also: SECTION 2-2.2: TESTING 2-2.2.1 Operational Tests (1) Hoist the test load a distance to assure that the load is supported by the crane and held by the hoist brake(s).				
04.2.6.b.05(4)	Mechanical: The mechanical design requirements for crane components are as follows: The brake design shall provide for emergency load lowering. (Requirement 40508)	Not covered in OSHA 1910.179	Not covered in ASME B30.2				
04.2.6.b.06(1)	Mechanical: The mechanical design requirements for crane components are as follows: Worm gears shall not be used as a braking means unless the lead angle is sufficient to prevent back driving. (Requirement 40509)	1910.179(f)(1)(ii) Each independent hoisting unit of a crane, except worm-gear hoists, the angle of whose worm is such as to prevent the load from accelerating in the lowering direction shall, in addition to a holding brake, be equipped with control braking means to prevent overspeeding.	ASME: 2-1.12.2 Hoist Control Braking Means (b) Hoist control braking means can be electrical, such as regenerative, dynamic, countertorque, or eddy-current; mechanical; hydraulic; or a worm-gear hoist where the angle of the worm is such as to prevent the load from accelerating in the lowering direction.				
04.2.6.b.06(2)	Mechanical: The mechanical design requirements for crane components are as follows: The braking properties of a worm gear tend to degrade with use; the design engineer shall consider this when purchasing new equipment or in existing installations where the hoist is subject to heavy use. (Requirement 40510)	1910.179(f)(1)(ii) Each independent hoisting unit of a crane, except worm-gear hoists, the angle of whose worm is such as to prevent the load from accelerating in the lowering direction shall, in addition to a holding brake, be equipped with control braking means to prevent overspeeding.	See above also: ASME: 2-2.1.3 Periodic Inspection, (5) excessive wear of brake system parts				
04.2.6.b.07(1)	Mechanical: The mechanical design requirements for crane components are as follows: In the procurement of new lifting equipment, the use of cast iron components in the hoist load path shall be approved, as a minimum, by the LDEM and the responsible design engineering organization. (Requirement 40511)	Not covered in OSHA 1910.179	Not covered in ASME B30.2				
04.2.6.b.07(2)	Mechanical: The mechanical design requirements for crane components are as follows: The material properties of cast iron allow catastrophic failure and should not be considered as reliable as steel or cast steel. The engineer shall consider this when selecting equipment and avoid the use of load bearing cast iron materials where possible. (Requirement 40512)	Not covered in OSHA 1910.179	Not covered in ASME B30.2				

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04.2.6.b.08(1)	Mechanical: The mechanical design requirements for crane components are as follows: Safe and adequate access to crane components to inspect, service, repair, or replace equipment shall be provided for during design. (Requirement 40513)	Not covered in OSHA 1910.179	ASME: 2-1.5.3 Access to Crane Access to the cab or bridge walkway shall be by a fixed ladder, stairs, or platform. The ladder shall be in conformance with ANSI A14.3, except as modified to meet the requirements of this volume. 9 2-1.5.4 Toolbox If a receptacle is provided for the stowing of tools and oil cans, it shall be made of a noncombustible material and shall be securely fastened in the cab or on the service platform. 2-1.5.5 Fire Extinguisher A portable fire extinguisher, with a basic minimum extinguisher rating of 10 BC, shall be installed in the cab. 2-1.5.6 Lighting Cab lighting, either natural or artificial, shall provide a level of illumination that enables the operator to observe the operating controls. SECTION 2-1.6: LUBRICATION If lubrication is required, accessible means for lubrication should be provided. SECTION 2-1.7: SERVICE PLATFORMS (FOOTWALKS) 2-1.7.1 Construction of Service Platforms Service platforms, when provided with or added to the crane, and attached to the crane, shall conform to the following requirements: (a) The dimension of the working space in the vertical direction from the floor surface of the platform to the nearest overhead obstruction shall be a minimum of 48 in. (1220 mm) at the location where a person is performing a function while on the platform. (b) Crane travel shall be prohibited or restricted while a person is on a service platform and the overhead platform clearance is less than 78 in. (1 980 mm) at any location in the path of travel of the crane. (c) Service platforms shall have a clear passageway at least 18 in. (457 mm) wide, except at the bridge drive mechanism where not less than 15 in. (380 mm) of clear passageway shall be allowed. (d) The dimension of the working space in the direction of access to live (energized) electrical parts which are likely to require examination, adjustment, servicing, or maintenance while energized shall be a minimum of 30 in. (762 mm). ¹ (e) The door(s) of electrical control cabinets shall either open at least 90 deg or be removable. ¹ (f) Service platforms shall be designed to sustain a distributed load of at least 50 lb/ft ² (2 400 Pa). (g) Service platforms shall have a slip-resistant walking surface.				
04.2.6.b.08(2)	Mechanical: The mechanical design requirements for crane components are as follows: The design shall provide for visual and physical accessibility. (Requirement 40514)	..1910.179(c)(2) 1910.179(c)(2) Access to crane. Access to the cab and/or bridge walkway shall be by a conveniently placed fixed ladder, stairs, or platform requiring no step over any gap exceeding 12 inches. Fixed ladders shall be in conformance with the American National Standard Safety Code for Fixed Ladders, ANSI A14.3-1956, which is incorporated by reference as specified in Sec. 1910.6.	See above item (40513)				
04.2.6.b.09	Mechanical: The mechanical design requirements for crane components are as follows: Pneumatic cranes shall have the capability to lock out the supply air pressure to prevent unauthorized use. (Requirement 40515)	Not covered in OSHA 1910.179	Not covered in ASME B30.2				
04.2.6.b.10	Mechanical: The mechanical design requirements for crane components are as follows: Based on the sensitivity of the loads to be lifted, cranes shall have appropriate speed modes that provide for safe, smooth starting and stopping to preclude excessive "G" forces from being applied to the load. (Requirement 40516)	1910.179(n)(3)(iii) During hoisting care shall be taken that: 1910.179(n)(3)(iii)(a) There is no sudden acceleration or deceleration of the moving load.	2-3.2.3 Moving the Load (b) During lifting, care shall be taken that (1) there is no sudden acceleration or deceleration of the moving load				
04.2.6.b.11(1)	Mechanical: The mechanical design requirements for crane components are as follows: All wire rope hoists shall have not less than two wraps of hoisting rope on the drum when the hook is in its extreme low position. Drum grooves, when provided, shall be as recommended by CMAA. (Requirement 40517)	1910.179(h)(2)(iii)(a) No less than two wraps of rope shall remain on the drum when the hook is in its extreme low position.	ASME: 2-1.14.3 Ropes (c) Rope shall be secured to the drum as follows: (1) No less than two wraps of rope shall remain on the drum at each anchorage of the hoisting drum when the hook is in its extreme low position unless a lowerlimit device is provided, in which case no less than one wrap shall remain.				

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04.2.6.b.11(2)	Mechanical: The mechanical design requirements for crane components are as follows: The rope ends shall be anchored securely by a clamp or a swaged terminal in a keyhole slot, provided a keeper is used to prohibit the swage from moving out of the narrow slot. Other methods recommended by the hoist or wire rope manufacturer are acceptable if the rope termination anchor together with two wraps of rope on the drum will give an anchor system equal to or greater than the breaking strength of the wire rope. (Requirement 40518)	1910.179(h)(2)(iii)(b) Rope end shall be anchored by a clamp securely attached to the drum, or by a socket arrangement approved by the crane or rope manufacturer.	ASME: 2-1.14.3 Ropes (a) The hoisting ropes shall be of a recommended construction for crane service. The total load (rated load plus weight of load block) divided by the number of parts of line shall not exceed 20% of the minimum breaking strength of the rope. (b) Socketing shall be done in a manner recommended by the rope or fitting manufacturer or a qualified person. (c) Rope shall be secured to the drum as follows: (1) No less than two wraps of rope shall remain on the drum at each anchorage of the hoisting drum when the hook is in its extreme low position unless a lower limit device is provided, in which case no less than one wrap shall remain. (2) The rope end shall be anchored by a clamp attached to the drum, or by a socket arrangement specified by the crane or rope manufacturer. The rope clamps shall be tightened evenly to the manufacturer's recommended torque.				
04.2.6.b.12	Mechanical: The mechanical design requirements for crane components are as follows: Malleable iron clips for wire rope termination shall not be used. Forged steel wire rope clips are acceptable. (Requirement 40519)	1910.179(h)(2)(v) Rope clips attached with U-bolts shall have the U-bolts on the dead or short end of the rope. Spacing and number of all types of clips shall be in accordance with the clip manufacturer's recommendation. Clips shall be drop-forged steel in all sizes manufactured commercially. When a newly installed rope has been in operation for an hour, all nuts on the clip bolts shall be retightened.	ASME: 2-1.14.3 Ropes (e) Wire rope clips shall be drop-forged steel of the single-saddle (U-bolt) or double-saddle type. Malleable cast iron clips shall not be used. For spacing, number of clips, and torque values, refer to the clip manufacturer's recommendation. Wire rope clips attached with U-bolts shall have the U-bolt over the dead end of the rope and live rope resting in the clip saddle. Clips shall be tightened evenly to the recommended torque. After the initial load is applied to the rope, the clip nuts shall be retightened to the recommended torque to compensate for any decrease in rope diameter caused by the load. Rope clip nuts should be retightened periodically to compensate for any further decrease in rope diameter during usage.				
04.2.6.b.13(1)	Mechanical: The mechanical design requirements for crane components are as follows: Manually operated (nonpowered) hoist cranes that are off-the-shelf OEM type are acceptable for critical and noncritical lift applications. They shall comply with applicable ASME requirements. (Requirement 40520)	Not covered in OSHA 1910.179	Not covered in ASME B30.2 In B30.21 Manually Lever Operated Hoists??				
04.2.6.b.13(2)	Mechanical: The mechanical design requirements for crane components are as follows: These hoists shall be equipped with at least one self-setting brake, referred to as a holding brake, applied directly to the motor shaft or some part of the gear train. No limit switches are required if proper over-travel restraint is provided. (Requirement 40521)	Brakes for hoists. 1910.179(f)(1)(i) Each independent hoisting unit of a crane shall be equipped with at least one self-setting brake, hereafter referred to as a holding brake, applied directly to the motor shaft or some part of the gear train.	SECTION 2-1.12: BRAKES AND BRAKING MEANS 2-1.12.1 Hoist Holding Brakes (a) Each hoisting unit of the crane shall be equipped with at least one holding brake. The holding brake shall be applied to the motor shaft or a gear reducer shaft and shall have a torque rating not less than the percentage of rated load hoisting torque at the point where the brake is applied as follows: THE NO LIMIT SWITCH EXCLUSION IS NOT IN ASME.				
04.2.6.b.14	Mechanical: The mechanical design requirements for crane components are as follows: Air operated chain hoists can be equipped with over-travel protection devices instead of the hoist travel limit switches.	Not covered in OSHA 1910.179	Not covered in ASME B30.2				
04.2.6.b.15(1)	Mechanical: The mechanical design requirements for crane components are as follows: Initial and final upper limit switches (limit control valves) shall be provided and tested for critical air operated hoists as described in paragraph 4.2.7.k. (Requirement 40523)	Not covered in OSHA 1910.179	Not covered in ASME B30.2				
04.2.6.b.15(2)	Mechanical: The mechanical design requirements for crane components are as follows: The final upper limit switch (limit control valve) shall exhaust air from the crane hoist, set the brakes, and require reset at the upper limit switch (limit control valve) level. (Requirement 40524)	Not covered in OSHA 1910.179	Not covered in ASME B30.2				

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04.2.6.b.16	<p>Mechanical: The mechanical design requirements for crane components are as follows: A minimum clearance of 3 inches (7.6 cm) overhead and 2 inches (5.1 cm) laterally shall be provided and maintained between the crane and all obstructions. (Requirement 40525)</p>	<p>1910.179(b)(6)(i) Minimum clearance of 3 inches overhead and 2 inches laterally shall be provided and maintained between crane and obstructions in conformity with Crane Manufacturers Association of America, Inc, Specification No. 61, which is incorporated by reference as specified in Sec. 1910.6, (formerly the Electric Overhead Crane Institute, Inc).</p>	<p>SECTION 2-1.2: CLEARANCES 2-1.2.1 Clearance From Obstruction (a) Clearance shall be maintained between the crane and the building, as well as parallel running cranes and cranes operating at a different elevation, under all normal operating conditions. In the design of new cranes, all factors that influence clearance, such as wheel float, truss sag, bridge skewing, or trolley positions and configurations shall be considered. (b) Where passageways or walkways are provided on the structure supporting the crane, obstructions shall not be placed so that personnel will be jeopardized by movements of the crane.</p>				
04.2.6.c	<p>Mechanical: When the use of high quality, off-the-shelf, OEM type equipment is not possible due to unique design and operation requirements, then built-up type equipment must be used. These built-up cranes generally use many commercially available or made-to-order motors, brakes, couplings, gear reducers, etc. These components are then custom engineered together as an assembly mounted on custom designed and built equipment frames. In many cases, gear reducers, drums, and drive shafts are custom designed and built. Structural and mechanical parts, such as sheave pins, hook-block components, bridge girders, and bridge and trolley drives are also custom designed and built as components or assemblies. The built-up type crane should only be used where commercial equipment is not available to meet the user/operational requirements described in this paragraph. Due to the nature of its one of a kind design and construction, this type of equipment is generally more prone to break down and should be considered as less reliable than commercial equipment. These units shall meet the mechanical design requirements provided in paragraph 4.2.6.b and the following additional minimum requirements:</p>	Not covered in OSHA 1910.179	Not covered in ASME B30.2.				
04.2.6.c.1(1)	<p>Mechanical: These units shall meet the mechanical design requirements provided in paragraph 4.2.6.b and the following additional minimum requirements: Drum supporting structures should be designed so that bearings are mounted under compression to (1) minimize wearing of the bearings and (2) increase the probability of maintaining the mesh between the drum gear and the drive gear in the case of bearing failure. The structure shall be designed to preclude failure of the bearings and drum supports. (Requirement 40527)</p>	Not covered in OSHA 1910.179	Not covered in ASME B30.2.				
04.2.6.c.1(2)	<p>Mechanical: These units shall meet the mechanical design requirements provided in paragraph 4.2.6.b and the following additional minimum requirements: Pillow block bearings shall have steel, or cast steel housings (the use of cast iron is not permitted). (Requirement 40528)</p>	Not covered in OSHA 1910.179	Not covered in ASME B30.2.				
04.2.6.c.2	<p>Mechanical: These units shall meet the mechanical design requirements provided in paragraph 4.2.6.b and the following additional minimum requirements: In descending order of preference, the drum gear when used shall be integrally attached, splined, bolted with close fitting body-bound bolts to a flange on the drum, or pressed on and keyed to either the periphery of the hub or shell of the drum, or attached by other means of equal safety. (Requirement 40529)</p>	Not covered in OSHA 1910.179	Not covered in ASME B30.2.				
04.2.6.c.3(1)	<p>Mechanical: These units shall meet the mechanical design requirements provided in paragraph 4.2.6.b and the following additional minimum requirements: Couplings shall be located immediately next to bearings. (Requirement 40530)</p>	Not covered in OSHA 1910.179	Not covered in ASME B30.2.				

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04.2.6.c.3(2)	Mechanical: These units shall meet the mechanical design requirements provided in paragraph 4.2.6.b and the following additional minimum requirements: Couplings between closely spaced bearings shall be of a full flexible type with integral gear form or grids, having metal to metal contact, and shall run in oil or be lubricated as recommended by the manufacturer. (Requirement 40531)	Not covered in OSHA 1910.179	Not covered in ASME B30.2.				
04.2.6.c.3(3)	Mechanical: These units shall meet the mechanical design requirements provided in paragraph 4.2.6.b and the following additional minimum requirements: All couplings for hoists shall be pressed fit with keys. (Requirement 40532)	Not covered in OSHA 1910.179	Not covered in ASME B30.2.				
04.2.6.c.4	Mechanical: These units shall meet the mechanical design requirements provided in paragraph 4.2.6.b and the following additional minimum requirements: Each load-bearing component shall be specified or detailed to lift the maximum imposed loads resulting from zero to rated hook load with appropriate design factors. (Requirement 40533)	Not covered in OSHA 1910.179	Not covered in ASME B30.2.				
04.2.7.c(1)	Electrical: Electrical design requirements are as follows: Wiring and safety devices shall be in accordance with NFPA National Electrical Code. (Requirement 40537)	Not covered in OSHA 1910.179	SECTION 2-1.13: ELECTRICAL EQUIPMENT 2-1.13.1 General (a) Wiring and equipment shall comply with Article 610 of ANSI/NFPA No. 70, National Electrical Code.				
04.2.7.c(2)	Electrical: Electrical design requirements are as follows: Conduit and wiring shall be such that on-site work is minimized. (Requirement 40538)	Not covered in OSHA 1910.179	Not covered in ASME B30.2.				
04.2.7.c(3)	Electrical: Electrical design requirements are as follows: Hard wire conductors such as festooned cables or articulated cable carriers, instead of power or feed rails, shall be considered to provide power and control to overhead cranes handling explosives or solid propellants, or to cranes with solid state controls. (Requirement 40539)	Not covered in OSHA 1910.179	Not covered in ASME B30.2.				
04.2.7.d	Electrical: Electrical design requirements are as follows: Electrical enclosures shall provide protection for the contained equipment against environmental conditions according to the class rating established by NEMA. (Requirement 40540)	Not covered in OSHA 1910.179	Not covered in ASME B30.2.				
04.2.7.f(1)	Electrical: Electrical design requirements are as follows: Control stations shall operate on 150 volts DC, 120 volts AC, or less. (Requirement 40542)	1910.179(g)(1)(ii) The control circuit voltage shall not exceed 600 volts for a.c. or d.c. current. 1910.179(g)(1)(iii) The voltage at pendant push-buttons shall not exceed 150 volts for a.c. and 300 volts for d.c.	SECTION 2-1.13: ELECTRICAL EQUIPMENT 2-1.13.1 General (a) Wiring and equipment shall comply with Article 610 of ANSI/NFPA No. 70, National Electrical Code. (b) The control circuit voltage shall not exceed 600V for AC or DC. (c) The control circuit voltage in pendant push buttons shall not exceed 150V for AC or 300V for DC.				
04.2.7.f(2)	Electrical: Electrical design requirements are as follows: Positive detent pushbuttons or a control lever shall be used for speed control. (Requirement 40543)	1910.179(g)(3)(vii) Pushbuttons in pendant stations shall return to the "off" position when pressure is released by the crane operator.	2-1.13.3 Controllers (a) Cranes not equipped with spring-return controllers, spring-return master switches, or momentary contact push buttons, shall be provided with a device that will disconnect all motors from the line in the event of a power failure. This disconnect device shall not permit any motor to be restarted until the controller or master switch handle is brought to the off position, or a reset switch or power-on button is operated. (b) For cab- or pulpit-operated cranes, lever-operated manual controllers and master switches shall be provided with a spring-return arrangement, off-point detent, or off-point latch.				

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04.2.7.f(3)	Electrical: Electrical design requirements are as follows: Controls shall return to the off position when the operator relieves pressure. (Requirement 40544)	1910.179(g)(3)(vi) For floor-operated cranes, the controller or controllers if rope operated, shall automatically return to the "off" position when released by the operator.	2-1.13.3 Controllers (a) Cranes not equipped with spring-return controllers, spring-return master switches, or momentary contact push buttons, shall be provided with a device that will disconnect all motors from the line in the event of a power failure. This disconnect device shall not permit any motor to be restarted until the controller or master switch handle is brought to the off position, or a reset switch or power-on button is operated. (b) For cab- or pulpit-operated cranes, lever-operated manual controllers and master switches shall be provided with a spring-return arrangement, off-point detent, or off-point latch.				
04.2.7.f(4)	Electrical: Electrical design requirements are as follows: A red, emergency stop pushbutton shall be provided to operate the mainline contactor and/or the main circuit breaker (main breaker preferred). (Requirement 40545)	1910.179(g)(5)(iii) On floor-operated cranes, a switch or circuit breaker of the enclosed type, with provision for locking in the open position, shall be provided in the leads from the runway conductors. This disconnect shall be mounted on the bridge or footwalk near the runway collectors. One of the following types of floor-operated disconnects shall be provided: 1910.179(g)(5)(iii)(a) Nonconductive rope attached to the main disconnect switch. 1910.179(g)(5)(iii)(b) An undervoltage trip for the main circuit breaker operated by an emergency stop button in the pendant pushbutton in the pendant pushbutton station. 1910.179(g)(5)(iii)(c) A main line contactor operated by a switch or pushbutton in the pendant pushbutton station.	2-1.13.5 Switches (2) an under-voltage trip for a main circuit breaker, operated by an emergency stop button in the pendant push-button station or the pulpit.				
04.2.7.f(5)	Electrical: Electrical design requirements are as follows: A positive lockout to the controls shall be provided to ensure the safety of maintenance personnel. (Requirement 40546)	Maintenance procedure. 1910.179(l)(2)(i) Before adjustments and repairs are started on a crane the following precautions shall be taken: 1910.179(l)(2)(i)(c) The main or emergency switch shall be open and locked in the open position. 1910.179(g)(5)(ii) On cab-operated cranes a switch or circuit breaker of the enclosed type, with provision for locking in the open position, shall be provided in the leads from the runway conductors. A means of opening this switch or circuit breaker shall be located within easy reach of the operator. 1910.179(g)(5)(iii) On floor-operated cranes, a switch or circuit breaker of the enclosed type, with provision for locking in the open position, shall be provided in the leads from the runway conductors. This disconnect shall be mounted on the bridge or footwalk near the runway collectors. One of the following types of floor-operated disconnects shall be provided:	2-1.1.5 Warnings (c) A safety label shall be affixed on all electrical control enclosures. The label shall be in compliance with ANSI Z535.4, and shall include, but not be limited to, information such as the following: (1) Disconnect power and lockout disconnecting means before removing cover or servicing this equipment.				

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04.2.7.g(1)	Electrical: Electrical design requirements are as follows: All cab-operated cranes with step type control shall be equipped with lever controls. (Requirement 40547)	1910.179(g)(3)(ii) Lever operated controllers shall be provided with a notch or latch which in the "off" position prevents the handle from being inadvertently moved to the "on" position. An "off" detent or spring return arrangement is acceptable.	2-1.13.3 Controllers (a) Cranes not equipped with spring-return controllers, spring-return master switches, or momentary contact push buttons, shall be provided with a device that will disconnect all motors from the line in the event of a power failure. This disconnect device shall not permit any motor to be restarted until the controller or master switch handle is brought to the off position, or a reset switch or power-on button is operated. (b) For cab- or pulpit-operated cranes, lever-operated manual controllers and master switches shall be provided with a spring-return arrangement, off-point detent, or off-point latch. (c) For cab- or pulpit-operated cranes, the manual controller or master switch operating handle shall be located within reach of the operator. (d) For cab- or pulpit-operated cranes, the movement of each operating handle should be in the same general direction as the resultant movement of the load, except as shown in Figs. 6 and 7. (e) For cab- or pulpit-operated cranes, the arrangement of manual controllers or master switches should				
04.2.7.g(2)	Electrical: Electrical design requirements are as follows: The levers shall be of the continuous effect type and provided with a deadman feature that will not unduly tire the operator during lengthy operations. (Requirement 40548)	Controllers. 1910.179(g)(3)(i) Cranes not equipped with spring-return controllers or momentary contact pushbuttons shall be provided with a device which will disconnect all motors from the line on failure of power and will not permit any motor to be restarted until the controller handle is brought to the "off" position, or a reset switch or button is operated. 1910.179(g)(3)(vi) For floor-operated cranes, the controller or controllers if rope operated, shall automatically return to the "off" position when released by the operator. 1910.179(g)(3)(vii) Pushbuttons in pendant stations shall return to the "off" position when pressure is released by the crane operator.	2-1.13.3 Controllers (a) Cranes not equipped with spring-return controllers, spring-return master switches, or momentary contact push buttons, shall be provided with a device that will disconnect all motors from the line in the event of a power failure. This disconnect device shall not permit any motor to be restarted until the controller or master switch handle is brought to the off position, or a reset switch or power-on button is operated. (b) For cab- or pulpit-operated cranes, lever-operated manual controllers and master switches shall be provided with a spring-return arrangement, off-point detent, or off-point latch.				
04.2.7.h	Electrical: Electrical design requirements are as follows: The electrical system shall be designed fail-safe to ensure that a failure of any component will not cause the crane to operate in a speed range faster than commanded. A failure that causes a speed different from that selected is acceptable provided no hazards are introduced. Failure modes that cause the bridge, trolley, or hoist to slow down or come to a safe stop are acceptable; those that could cause unplanned directional shifts, and/or loss of control are unacceptable. (Requirement 40549)	1910.179(g)(3)(viii) Automatic cranes shall be so designed that all motions shall fail-safe if any malfunction of operation occurs.	Not covered in ASME B30.2.				
04.2.7.j(1)	Electrical: Electrical design requirements are as follows: For cranes used for critical lifts, an assessment shall be performed to determine the operational needs for remote emergency stops independent from the operator controlled emergency stop. Not all cranes used for critical lifts require a remote emergency stop. Remote emergency stops are required for cranes used for critical lifts where the crane operator's view is restricted/obstructed. When provided, this independent remote emergency stop should be located such that the independent remote emergency stop operator(s) can clearly see the critical lift area(s). (Requirement 40551)	Not covered in OSHA 1910.179	Not covered in ASME B30.2.				
04.2.7.j(2)	Electrical: Electrical design requirements are as follows: The remote emergency stop circuit shall be separate from and take precedence over the operator control circuit. (Requirement 40552)	1910.179(a)(59) An "emergency stop switch" is a manually or automatically operated electric switch to cut off electric power independently of the regular operating controls. 1910.179(g)(5)(iii)(b) An undervoltage trip for the main circuit breaker operated by an emergency stop button in the pendant pushbutton in the pendant pushbutton station.	Not covered in ASME B30.2.				

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04.2.7.j(3)	Electrical: Electrical design requirements are as follows: The control, when activated, shall cause all drives to stop and the brakes to set. Hand-held remote emergency stop pendants should be standardized and should include power and circuit continuity indication. For those cranes required to make critical lifts that have not been modified to provide a remote emergency stop, handling procedures shall be developed and implemented to minimize the risk. (Requirement 40553)	See above	Not covered in ASME B30.2.				
04.2.7.k	Electrical: Electrical design requirements are as follows: For cranes used for critical lifts, dual upper limit switches are required. For electric cranes, the limit switches shall meet the following requirements:	Not covered in OSHA 1910.179	2-1.13.5 Switches (d) Power-driven hoists shall be designed and constructed so that the load block, either loaded or empty, shall not exceed the upper limit of travel. On wire-rope hoists, if a geared or other limit switch or device that operates in relation to drum turns is used, an additional limit switch or device that operates independent of drum rotations shall be provided.				
04.2.7.k.1	Electrical: Electrical design requirements are as follows: For electric cranes, the limit switches shall meet the following requirements: Initial upper limit switch electrical contacts shall be a set of normally closed contacts in the "raise" contactor circuit such that movement in the raise direction shall be precluded after the limit switch is encountered. Movement in the "lower" direction will not be inhibited. (Requirement 40555)	Not covered in OSHA 1910.179	2-1.13.5 Switches remote control station, or the pulpit. (d) Power-driven hoists shall be designed and constructed so that the load block, either loaded or empty, shall not exceed the upper limit of travel. On wire-rope hoists, if a geared or other limit switch or device that operates in relation to drum turns is used, an additional limit switch or device that operates independent of drum rotations shall be provided.				
04.2.7.k.2	Electrical: Electrical design requirements are as follows: For electric cranes, the limit switches shall meet the following requirements: Final upper limit switch electrical contacts shall be a set of normally closed electrical contacts wired into the mainline circuit, hoist power circuit, main contactor control circuit, or hoist power contactor control circuit such that all crane motion or all hoist motion shall be precluded after the limit switch is encountered. These normally closed contacts may be located in the low voltage control circuitry. (Requirement 40556)	Not covered in OSHA 1910.179	2-1.13.5 Switches remote control station, or the pulpit. (d) Power-driven hoists shall be designed and constructed so that the load block, either loaded or empty, shall not exceed the upper limit of travel. On wire-rope hoists, if a geared or other limit switch or device that operates in relation to drum turns is used, an additional limit switch or device that operates independent of drum rotations shall be provided.				
04.2.7.k.3	Electrical: Electrical design requirements are as follows: For electric cranes, the limit switches shall meet the following requirements: After a final upper limit switch has been activated, movement of the load will require action (resetting) at the final upper limit switch level. An inspection shall be made to determine the cause of failure of the initial upper limit switch. Stopping crane motion by the above design configuration may result in a hazardous suspended load condition. The crane design should include a means of detecting limit switch failure and allow for safe inspection and repair. For example, a system may be equipped with two different colored annunciator lights, one for each limit switch. A reset button may be included so that when a final upper limit switch is tripped, the load can be lowered immediately. The reset button should be secured to prevent unauthorized use. (Requirement 40557)	Not covered in OSHA 1910.179	2-1.13.5 Switches remote control station, or the pulpit. (d) Power-driven hoists shall be designed and constructed so that the load block, either loaded or empty, shall not exceed the upper limit of travel. On wire-rope hoists, if a geared or other limit switch or device that operates in relation to drum turns is used, an additional limit switch or device that operates independent of drum rotations shall be provided.				
04.2.7.k.4(1)	Electrical: Electrical design requirements are as follows: For electric cranes, the limit switches shall meet the following requirements: The initial upper limit switch shall be adjusted sufficiently low to preclude inadvertent actuation of the final upper limit switch if the hoist actuates the initial upper limit switch at full speed with no load. (Requirement 40558)	1910.179(k)(1)(ii) The trip setting of hoist limit switches shall be determined by tests with an empty hook traveling in increasing speeds up to the maximum speed. The actuating mechanism of the limit switch shall be located so that it will trip the switch, under all conditions, in sufficient time to prevent contact of the hook or hook block with any part of the trolley.	2-1.13.5 Switches remote control station, or the pulpit. (d) Power-driven hoists shall be designed and constructed so that the load block, either loaded or empty, shall not exceed the upper limit of travel. On wire-rope hoists, if a geared or other limit switch or device that operates in relation to drum turns is used, an additional limit switch or device that operates independent of drum rotations shall be provided.				

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04.2.7.k.4(2)	Electrical: Electrical design requirements are as follows: For electric cranes, the limit switches shall meet the following requirements: Similarly, the final upper limit switch shall be adjusted sufficiently low to ensure that the hoist will not two-block (or otherwise damage wire rope) if the hoist actuates the final upper limit switch at full speed with no load. (Requirement 40559)	See above	2-1.13.5 Switches remote control station, or the pulpit. (d) Power-driven hoists shall be designed and constructed so that the load block, either loaded or empty, shall not exceed the upper limit of travel. On wire-rope hoists, if a geared or other limit switch or device that operates in relation to drum turns is used, an additional limit switch or device that operates independent of drum rotations shall be provided.				
04.2.7.k.4(3)	Electrical: Electrical design requirements are as follows: For electric cranes, the limit switches shall meet the following requirements: Both limits shall be tested from slow speed to full speed to verify correct operation. It should be noted that this requirement effectively lowers the usable hook height of the hoist. (Requirement 40560)	See above	Not covered in ASME B30.2.				
04.2.7.k.4(4)	Electrical: Electrical design requirements are as follows: For electric cranes, the limit switches shall meet the following requirements: The limit switch arrangement shall be considered during new equipment design. (Requirement 40561)	Not covered in OSHA 1910.179	Not covered in ASME B30.2.				
04.2.7.L	Electrical: Electrical design requirements are as follows: For cranes used for critical lifts, lower limit switches to prevent reverse winding of the wire rope shall be provided. (Requirement 40562)	Not covered in OSHA 1910.179	Not covered in ASME B30.2.				
04.2.7.m	Electrical: Electrical design requirements are as follows: Electrical cranes shall have the capability to be locked out at the main breaker to prevent unauthorized use. (Requirement 40563)	1910.179(l)(2)(i)(c) The main or emergency switch shall be open and locked in the open position. 1910.179(g)(5)(i) The power supply to the runway conductors shall be controlled by a switch or circuit breaker located on a fixed structure, accessible from the floor, and arranged to be locked in the open position.	2-1.1.5 Warnings (c) A safety label shall be affixed on all electrical control enclosures. The label shall be in compliance with ANSI Z535.4, and shall include, but not be limited to, information such as the following: (1) Disconnect power and lockout disconnecting means before removing cover or servicing this equipment.				
04.2.7.n	Electrical: Electrical design requirements are as follows: Cranes shall be designed fail-safe in the event of a power outage. (Requirement 40564)	1910.179(a)(40) "Fail-safe" means a provision designed to automatically stop or safely control any motion in which a malfunction occurs. 1910.179(g)(3)(viii) Automatic cranes shall be so designed that all motions shall fail-safe if any malfunction of operation occurs.	2-1.12.5 Trolley and Bridge Brake Provisions, (k) When provided an emergency brake shall (1) be applied when initiated by the operator, or automatically upon loss of power 2-1.12.1 Hoist Holding Brakes, (2) One holding brake shall be provided if the hoisting unit has a mechanical load brake or a control braking means that provides controlled lowering of the load upon loss of power. The holding brake shall have a torque rating not less than 150% of rated load hoisting torque at the point where the brake is applied. (d) Hoist holding brakes shall be applied automatically when power to the brake is removed.				

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04.3(1)	<p>Testing: Three types of tests are required for cranes: proof load tests, periodic load tests, and operational tests. The proof load tests and operational tests shall be performed prior to first use for new cranes, or for existing cranes that have had modifications or alterations performed to components in the load path. This applies only to those components directly involved with the lifting or holding capability of a crane that has been repaired or altered. Repairs or alterations to nonlifting, secondary lifting, or holding components such as suspension assemblies, electrical system, crane cab, etc., do not require a load test, although a functional check should be performed to determine if the repairs or alternations are acceptable. (Requirement 40565)</p>	<p>1910.179(k)(2) Rated load test. Test loads shall not be more than 125 percent of the rated load unless otherwise recommended by the manufacturer. The test reports shall be placed on file where readily available to appointed personnel. 1910.179(b)(3) Modifications. Cranes may be modified and rerated provided such modifications and the supporting structure are checked thoroughly for the new rated load by a qualified engineer or the equipment manufacturer. The crane shall be tested in accordance with paragraph (k) (2) of this section. New rated load shall be displayed in accordance with subparagraph (5) of this paragraph.</p>	<p>2-2.2.2 Load Test (a) New, reinstalled, altered, repaired, and modified cranes should be load tested prior to initial use, as determined by a qualified person. (b) Load testing of altered, repaired, and modified cranes may be limited to the functions affected by the alteration, repair, or modification, as determined by a qualified person. (c) The replacement of load chain and rope is specifically excluded from this load test; however, an operational test of the hoist shall be made in accordance with para. 2-2.2.1(b) prior to putting the crane back in service. (d) If a load test is conducted, the load shall be not less than 100% of the rated load of the crane or hoist(s), whichever governs; or more than 125% of the rated load of the crane or hoist(s), whichever governs; unless otherwise recommended by the manufacturer or a qualified person. (e) If a load test is conducted, the person conducting the load test shall prepare a written report of the load sustained during the test and the operations performed during the test. Reports shall be placed on file. (f) If a load test is conducted, operations shall be performed as outlined below or as modified by a qualified person. (1) Hoist the test load a distance to assure that the load is supported by the crane and held by the hoist brake(s). (2) Transport the test load by means of the trolley for the full length of the bridge. (3) Transport the test load by means of the bridge for the full length of the runway in one direction with the trolley as close to the extreme right-hand end of the crane as practical, and in the other direction with the trolley as close to the left-hand end of the crane as practical. (4) Lower the test load, and stop and hold the test load with the brake(s).</p>				
04.3(2)	<p>Testing: The periodic load and operational tests shall be performed at least every 4 years. (Requirement 40566)</p>	Not covered in OSHA 1910.179	Not covered in ASME B30.2.				
04.3(3)	<p>Testing: Cranes used frequently for critical lifts shall be load tested annually. (Requirement 40567)</p>	Not covered in OSHA 1910.179	Not covered in ASME B30.2.				
04.3(4)	<p>Testing: Cranes used infrequently for critical lifts shall be load tested before the critical lift if it has been more than a year since the last test. (Requirement 40568)</p>	Not covered in OSHA 1910.179	Not covered in ASME B30.2.				
04.3(5)	<p>Testing: If a crane is upgraded (increased lifting capacity), a proof load test and an operational test shall be performed based on the upgraded rating. (Requirement 40569)</p>	Not covered in OSHA 1910.179	<p>SECTION 2-2.2: TESTING 2-2.2.1 Operational Tests (a) New, reinstalled, altered, repaired, and modified cranes shall be tested by a designated person prior to initial use to ensure compliance with this volume. (b) Tests shall include, as applicable, the following functions: (1) lifting and lowering (2) trolley travel (3) bridge travel (4) hoist-limit devices 2-2.2.2 Load Test (a) New, reinstalled, altered, repaired, and modified cranes should be load tested prior to initial use, as determined by a qualified person. (b) Load testing of altered, repaired, and modified cranes may be limited to the functions affected by the alteration, repair, or modification, as determined by a qualified person. (c) The replacement of load chain and rope is specifically excluded from this load test; however, an operational test of the hoist shall be made in accordance with para. 2-2.2.1(b) prior to putting the crane back in service. (d) If a load test is conducted, the load shall be not less than 100% of the rated load of the crane or hoist(s), whichever governs; or more than 125% of the rated load of the crane or hoist(s), whichever governs; unless otherwise recommended by the manufacturer or a qualified person.</p>				
04.3(6)	<p>Testing: All load and operational tests shall be performed by qualified personnel according to written (specific or general) technical operating procedures. (Requirement 40570)</p>	Not covered in OSHA 1910.179	SECTION 2-2.2: TESTING 2-2.2.1 Operational Tests, 2-2.2.2 Load Test THIS SECTION JUST REQUIRES THE TESTS TO BE PERFORMED. IT DOES NOT MENTION PAPER WORK. EL				

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04.3(7)	Testing: An inspection of the crane and lifting components shall be performed after each load test and prior to the crane being released for service to ensure there is no damage. (Requirement 40571)	1910.179(j)(1)(i) Initial inspection. Prior to initial use all new and altered cranes shall be inspected to insure compliance with the provisions of this section.	2-2.2.2 Load Test (a) New, reinstalled, altered, repaired, and modified cranes should be load tested prior to initial use, as determined by a qualified person.				
04.3(8)	Testing: Surface or volumetric NDT of critical components shall be used to validate the existence or absence of cracks or other load test effects indicated by this inspection. The periodic load test requirement may be fulfilled by a concurrently performed proof load test. (Requirement 40572)	Not covered in OSHA 1910.179	Not covered in ASME B30.2.				
04.3.1(1)	Testing: Proof Load Test: Before first use and after installation, all new, extensively repaired, extensively modified, or altered cranes shall undergo a proof load test with a dummy load as close as possible to, but not exceeding 1.25 times the rated capacity of the crane. A proof load test also should be performed when there is a question in design or previous testing. (Requirement 40573)	1910.179(k)(2) Rated load test. Test loads shall not be more than 125 percent of the rated load unless otherwise recommended by the manufacturer. The test reports shall be placed on file where readily available to appointed personnel.	2-2.2.2 Load Test (a) New, reinstalled, altered, repaired, and modified cranes should be load tested prior to initial use, as determined by a qualified person. (d) If a load test is conducted, the load shall be not less than 100% of the rated load of the crane or hoist(s), whichever governs; or more than 125% of the rated load of the crane or hoist(s), whichever governs; unless otherwise recommended by the manufacturer or a qualified person.				
04.3.1(2)	Testing: Proof Load Test: The load shall be lifted slowly and in an area where minimal damage will occur if the crane fails. The acceptable tolerance for proof load test accuracy is -5/+0 percent. (Requirement 40574)	Not covered in OSHA 1910.179	Not covered in ASME B30.2.				
04.3.2(1)	Testing: Periodic Load Test: Each crane shall be tested at least once every 4 years with a dummy load equal to the crane's rated capacity. (Requirement 40575)	Not covered in OSHA 1910.179	Not covered in ASME B30.2.				
04.3.2(2)	Testing: Periodic Load Test: Cranes used for critical lifts shall be load tested at least once per year. (Requirement 40576)	Not covered in OSHA 1910.179	Not covered in ASME B30.2.				
04.3.2(3)	Testing: Periodic Load Test: Cranes used infrequently for critical lifts shall be load tested before the critical lift if it has been more than a year since the last test. The acceptable tolerance for periodic load test accuracy is +5/-0 percent. (Requirement 40577)	Not covered in OSHA 1910.179	Not covered in ASME B30.2.				
04.3.3	Testing: Operational Test: Together with proof load and periodic load tests, the following shall be performed with a dummy rated load unless otherwise specified:	Not covered in OSHA 1910.179					
04.3.3.a	Testing: Operational Test: Together with proof load and periodic load tests, the following shall be performed with a dummy rated load unless otherwise specified: Load hoisting, lowering at various speeds (maximum safe movement up and down as determined by the LDEM and the responsible safety, engineering, operations, and maintenance organizations), and braking/holding mechanisms. Holding brakes shall be tested to verify stopping capabilities and demonstrate the ability to hold a rated load (see paragraph 4.3.3.d). The load should be held long enough to allow any dynamics to dampen out. (Requirement 40579)	Not covered in OSHA 1910.179	2-2.2.2 Load Test (1) Hoist the test load a distance to assure that the load is supported by the crane and held by the hoist brake(s). (2) Transport the test load by means of the trolley for the full length of the bridge. (3) Transport the test load by means of the bridge for the full length of the runway in one direction with the trolley as close to the extreme right-hand end of the crane as practical, and in the other direction with the trolley as close to the left-hand end of the crane as practical. (4) Lower the test load, and stop and hold the test load with the brake(s).				
04.3.3.b	Testing: Operational Test: Together with proof load and periodic load tests, the following shall be performed with a dummy rated load unless otherwise specified: Trolley and bridge travel (maximum safe movement in all directions with varying speeds as determined by the LDEM and the responsible safety, engineering, operations, and maintenance organizations). (Requirement 40580)	not covered in OSHA 1910.179	2-2.2.2 Load Test (2) Transport the test load by means of the trolley for the full length of the bridge. (3) Transport the test load by means of the bridge for the full length of the runway in one direction with the trolley as close to the extreme right-hand end of the crane as practical, and in the other direction with the trolley as close to the left-hand end of the crane as practical. 2-1.12.2 Hoist Control Braking Means (b) Hoist control braking means can be electrical, such as regenerative, dynamic, countertorque, or eddy-current; mechanical; hydraulic; or a worm-gear hoist where the angle of the worm is such as to prevent the load from accelerating in the lowering direction.				

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04.3.3.c	<p>Testing: Operational Test: Together with proof load and periodic load tests, the following shall be performed with a dummy rated load unless otherwise specified: All limit switches, locking devices, emergency stop switches, and other safety devices, excluding thermal overload and circuit breakers. The limit switch, emergency stop, and locking device tests except for the final upper limit switch shall be performed with no load on the hook at full speed. The final upper limit switch can be tested by manually tripping the switch and verifying that all hoist motion is precluded (see paragraph 4.5.2.c). (Requirement 40581)</p>	<p>Testing - 1910.179(k)(1) Operational tests. 1910.179(k)(1)(i) Prior to initial use all new and altered cranes shall be tested to insure compliance with this section including the following functions: ..1910.179(k)(1)(i)(a) Hoisting and lowering. 1910.179(k)(1)(i)(b) Trolley travel. 1910.179(k)(1)(i)(c) Bridge travel. 1910.179(k)(1)(i)(d) Limit switches, locking and safety devices. 1910.179(k)(1)(ii) The trip setting of hoist limit switches shall be determined by tests with an empty hook traveling in increasing speeds up to the maximum speed. The actuating mechanism of the limit switch shall be located so that it will trip the switch, under all conditions, in sufficient time to prevent contact of the hook or hook block with any part of the trolley.</p>	Not all the tests listed are covered in ASME B30.2.				
04.3.3.d	<p>Testing: Operational Test: Together with proof load and periodic load tests, the following shall be performed with a dummy rated load unless otherwise specified: Cranes used for critical lifts are required to be equipped with two holding brakes (hoist), each capable of bringing a rated load to zero speed and holding it (see paragraph 4.2.6.b(5)). If a worm gear is used as a holding brake, it shall be tested to ensure it is able to hold a static load and stop a dynamic load. The operational test must demonstrate each brake's ability to stop and hold a rated load. (Requirement 40582) This can be done in one of the following ways:</p>	Not covered in OSHA 1910.179	SECTION 2-1.12: BRAKES AND BRAKING MEANS 2-1.12.1 Hoist Holding Brakes (a) Each hoisting unit of the crane shall be equipped with at least one holding brake. The holding brake shall be applied to the motor shaft or a gear reducer shaft and shall have a torque rating not less than the percentage of rated load hoisting torque at the point where the brake is applied as follows:				
04.3.3.d.1	<p>Testing: Operational Test: Together with proof load and periodic load tests, the following shall be performed with a dummy rated load unless otherwise specified: The operational test must demonstrate each brake's ability to stop and hold a rated load. This can be done in one of the following ways: Each brake's ability to hold shall be statically tested (under no load) with 150 percent of the rated load hoisting torque at the point of brake application. (Requirement 40583)</p>	Not covered in OSHA 1910.179	SECTION 2-1.12: BRAKES AND BRAKING MEANS 2-1.12.1 Hoist Holding Brakes (1) Two holding brakes shall be provided, one of which is applied to a gear reducer shaft, plus control braking means. Each holding brake shall have a torque rating not less than 100% of rated load hoisting torque at the point where the brake is applied. (2) One holding brake shall be provided if the hoisting unit has a mechanical load brake or a control braking means that provides controlled lowering of the load upon loss of power. The holding brake shall have a torque rating not less than 150% of rated load hoisting torque at the point where the brake is applied.				
04.3.3.d.2	<p>Testing: Operational Test: Together with proof load and periodic load tests, the following shall be performed with a dummy rated load unless otherwise specified: The operational test must demonstrate each brake's ability to stop and hold a rated load. This can be done in one of the following ways: Alternately, each brake shall be tested for its ability to stop and hold a rated load in both the raising and lowering modes. (CAUTION: It must be possible to quickly reenergize the out-of-circuit brake or provide other safety measures to perform this test safely.) (Requirement 40584)</p>	Not covered in OSHA 1910.179	SECTION 2-2.2: TESTING 2-2.2.2 Load Test (4) Lower the test load, and stop and hold the test load with the brake(s).				
04.3.3.d.3	<p>Testing: Operational Test: Together with proof load and periodic load tests, the following shall be performed with a dummy rated load unless otherwise specified: The operational test must demonstrate each brake's ability to stop and hold a rated load. This can be done in one of the following ways: Other methods as approved by the LDEM with concurrence from the responsible safety, engineering, operations, and maintenance organizations. (Requirement 40585)</p>	Not covered in OSHA 1910.179	SECTION 2-2.2: TESTING 2-2.2.2 Load Test (4) Lower the test load, and stop and hold the test load with the brake(s).				

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04.3.3.e	Testing: Operational Test: Together with proof load and periodic load tests, the following shall be performed with a dummy rated load unless otherwise specified: The operational test for a modified crane can be tailored to test those portions of the equipment that were modified only if the normal periodic load and operational test interval has not expired. (Requirement 40586)	Not covered in OSHA 1910.179	SECTION 2-2.2: TESTING 2-2.2.2 Load Test (4) Lower the test load, and stop and hold the test load with the brake(s).				
04.3.4(1)	Testing: Test reports and Periodic Recertification Tags: After each test, designated personnel shall prepare written, dated, and signed test reports including procedure reference. (Requirement 40587)	Not covered in OSHA 1910.179	SECTION 2-2.2: TESTING (e) If a load test is conducted, the person conducting the load test shall prepare a written report of the load sustained during the test and the operations performed during the test. Reports shall be placed on file.				
04.3.4(2)	Testing: Test reports and Periodic Recertification Tags: Inadequacies shall be documented and, if determined to be a hazard, corrected prior to further use. (Requirement 40588)	Not covered in OSHA 1910.179	2-2.3.3 Adjustments, Repairs, and Replacements (a) Any condition disclosed by the inspections performed in accordance with the requirements of Section 2-2.1, that is determined to be a hazard to continued operation, shall be corrected by adjustment, repair, or replacement before continuing the use of the crane. (b) Adjustments, repairs, and replacements shall be performed by designated personnel. (c) Components shall be adjusted or repaired as needed. The following are examples: (1) all operating mechanisms (2) limit devices (3) control systems (4) brakes (d) Repairs or replacements shall be made as needed. The following are examples: (1) Damaged or worn hooks as described under Maintenance in ASME B30.10. Repairs by welding or reshaping are not recommended. (2) All critical parts that are cracked, broken, bent, excessively worn, or missing (3) Pitted or burned electrical contacts should be corrected only by replacement and in sets. Controller parts should be lubricated as recommended in the manual supplied with the crane. (4) Function, instruction, caution, and warning labels or plates on pendant control stations shall be kept legible. (e) If repairs of load-sustaining members are made by welding, identification of materials shall be made and appropriate welding procedures shall be followed.				
04.3.4(3)	Testing: Test reports and Periodic Recertification Tags: These reports shall be kept on file by the owner organization for a minimum of two test cycles and shall be made readily available. (Requirement 40589)	Not covered in OSHA 1910.179	2-2.1.5 Inspection Records Dated inspection reports of comparable records shall be made on critical items such as hoisting machinery, sheaves, hooks, chains, ropes, and other lifting devices as listed in para. 2-2.1.3. Records shall be placed on file. 2-2.2.2 Load Test (e) If a load test is conducted, the person conducting the load test shall prepare a written report of the load sustained during the test and the operations performed during the test. Reports shall be placed on file.				
04.3.4(4)	Testing: Test reports and Periodic Recertification Tags: Following the periodic load test, cranes shall be given a permanently affixed tag, posted on the crane or an appropriate location, identifying the equipment and stating the next required periodic load test date or load test expiration date. (Requirement 40590)	Not covered in OSHA 1910.179	Not covered in ASME B30.2.				
04.4.1(1)	Inspection: Inspections, as described below, shall be performed on all cranes and crane accessories. (Requirement 40592)	Inspection classification. 1910.179(j)(1)(i) Initial inspection. Prior to initial use all new and altered cranes shall be inspected to insure compliance with the provisions of this section. 1910.179(j)(1)(ii) Inspection procedure for cranes in regular service is divided into two general classifications based upon the intervals at which inspection should be performed. The intervals in turn are dependent upon the nature of the critical components of the crane and the degree of their exposure to wear, deterioration, or malfunction. The two general classifications are herein designated as "frequent" and "periodic" with respective intervals between inspections as defined below:					

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04.4.1(2)	Inspection: Inspections shall be performed according to this section, the manufacturers' recommendations, and ASME B30.2. (Requirement 40593)	Maintenance - 1910.179(l)(1) Preventive maintenance. A preventive maintenance program based on the crane manufacturer's recommendations shall be established.					
04.4.1(3)	Inspection: Inadequacies discovered during an inspection shall be documented and, if determined to be a hazard, tagged out and corrected prior to further use. (Requirement 40594)	Adjustments and repairs. 1910.179(l)(3)(i) Any unsafe conditions disclosed by the inspection requirements of paragraph (j) of this section shall be corrected before operation of the crane is resumed. Adjustments and repairs shall be done only by designated personnel.	2-2.3.3 Adjustments, Repairs, and Replacements (a) Any condition disclosed by the inspections performed in accordance with the requirements of Section 2-2.1, that is determined to be a hazard to continued operation, shall be corrected by adjustment, repair, or replacement before continuing the use of the crane.				
04.4.1(4)	Inspection: Inspections shall be performed by qualified personnel according to approved technical operating procedures. (Requirement 40595)	1910.179(l)(3) Adjustments and repairs. 1910.179(l)(3)(i) Any unsafe conditions disclosed by the inspection requirements of paragraph (j) of this section shall be corrected before operation of the crane is resumed. Adjustments and repairs shall be done only by designated personnel.	SECTION 2-2.1: INSPECTION 2-2.1.1 Inspection Classification (a) Initial Inspection. New, reinstalled, altered, repaired, and modified cranes shall be inspected by a designated person prior to initial use to verify compliance with applicable provisions of this volume. Inspection of altered, repaired, and modified cranes may be limited to the provisions affected by the alteration, repair, or modification, as determined by a qualified person. (b) Inspection procedure for cranes in regular service is divided into two general classifications based upon the intervals at which inspection should be performed. The intervals in turn are dependent upon the nature of the critical components of the crane and the degree of their exposure to wear, deterioration, or malfunction. The two general classifications are designated as frequent and periodic, with respective intervals between inspection defined as follows: (1) Frequent Inspection. Visual examinations by the operator or other designated personnel with records not required, as follows: (a) normal service				
04.4.2	Inspection: All new, extensively repaired, or modified cranes shall be given a daily and a periodic inspection prior to first use. For component repair on cranes, only the inspections that apply to the repaired portion need to be performed prior to first use unless a periodic inspection interval expires during the downtime (see paragraph 4.4.5). (Requirement 40596)	..1910.179(b)(3) 1910.179(b)(3) Modifications. Cranes may be modified and rerated provided such modifications and the supporting structure are checked thoroughly for the new rated load by a qualified engineer or the equipment manufacturer. The crane shall be tested in accordance with paragraph (k) (2) of this section. New rated load shall be displayed in accordance with subparagraph (5) of this paragraph. 1910.179(j)(1)(ii) Inspection procedure for cranes in regular service is divided into two general classifications based upon the intervals at which inspection should be performed. The intervals in turn are dependent upon the nature of the critical components of the crane and the degree of their exposure to wear, deterioration, or malfunction. The two general classifications are herein designated as "frequent" and "periodic" with respective intervals between inspections as defined below: 1910.179(j)(1)(ii)(a) Frequent inspection - Daily to monthly intervals.	SECTION 2-2.1: INSPECTION 2-2.1.1 Inspection Classification (a) Initial Inspection. New, reinstalled, altered, repaired, and modified cranes shall be inspected by a designated person prior to initial use to verify compliance with applicable provisions of this volume. Inspection of altered, repaired, and modified cranes may be limited to the provisions affected by the alteration, repair, or modification, as determined by a qualified person.				
04.4.3(1)	Inspection: Cranes in regular service (used at least once month) shall be inspected as required in paragraphs 4.4.4 and 4.4.5. (Requirement 40597)						
04.4.3(2)	Inspection: Idle and standby cranes shall be inspected according to paragraph 4.4.6. (Requirement 40598)						

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04.4.4	<p>Inspection: Daily Inspections: These inspections shall be performed and documented by the certified operator prior to first use each day the crane is used, and shall include the following: (Requirement 40599)</p>	<p>1910.179(j)(2)(i) All functional operating mechanisms for maladjustment interfering with proper operation. Daily. 1910.179(j)(2)(ii) Deterioration or leakage in lines, tanks, valves, drain pumps, and other parts of air or hydraulic systems. Daily. 1910.179(j)(2)(iii) Hooks with deformation or cracks. Visual inspection daily; monthly inspection with a certification record which includes the date of inspection, the signature of the person who performed the inspection and the serial number, or other identifier, of the hook inspected. For hooks with cracks or having more than 15 percent in excess of normal throat opening or more than 10< twist from the plane of the unbent hook refer to paragraph (l)(3)(iii)(a) of this section. 1910.179(j)(2)(iv) Hoist chains, including end connections, for excessive wear, twist, distorted links interfering with proper function, or stretch beyond manufacturer's recommendations. Visual inspection daily; monthly inspection with a certification record which includes the date of inspection, the signature of the person who performed the inspection and an identifier of the chain which was inspected.</p>	<p>SECTION 2-2.1: INSPECTION 2-2.1.1 Inspection Classification (1) Frequent Inspection. Visual examinations by the operator or other designated personnel with records not required, as follows: (a) normal service — monthly (b) heavy service — weekly to monthly (c) severe service — daily to weekly</p>				
04.4.4.a	<p>Inspection: Daily Inspections: These inspections shall be performed and documented by the certified operator prior to first use each day the crane is used, and shall include the following: Check operating and control mechanisms for proper function. (Requirement 40600)</p>	see above	Not covered in ASME B30.2.				
04.4.4.b	<p>Inspection: Daily Inspections: These inspections shall be performed and documented by the certified operator prior to first use each day the crane is used, and shall include the following: Without disassembling, visually inspect lines, tanks, valves, drain pumps, gear casings, and other components of fluid systems for deterioration and leaks. This applies to components that can be seen from the ground level for floor operated cranes and cab operated cranes or for which there is safe access via crane inspection walkways for cab operated cranes. (Requirement 40601)</p>	<p>1910.179(j)(2)(ii) Deterioration or leakage in lines, tanks, valves, drain pumps, and other parts of air or hydraulic systems. Daily.</p>	Not covered in ASME B30.2.				
04.4.4.c	<p>Inspection: Daily Inspections: These inspections shall be performed and documented by the certified operator prior to first use each day the crane is used, and shall include the following: Without disassembling, visually inspect all functional operating and control mechanisms, including brakes where visible, for excessive wear and contamination by excessive lubricants or foreign matter. (Requirement 40602)</p>	See cells above	Not covered in ASME B30.2.				
04.4.4.d	<p>Inspection: Daily Inspections: These inspections shall be performed and documented by the certified operator prior to first use each day the crane is used, and shall include the following: Visually inspect hooks for cracks and deformities (see Section 7). (Requirement 40603)</p>	<p>1910.179(j)(2)(iii) Hooks with deformation or cracks. Visual inspection daily; monthly inspection with a certification record which includes the date of inspection, the signature of the person who performed the inspection and the serial number, or other identifier, of the hook inspected. For hooks with cracks or having more than 15 percent in excess of normal throat opening or more than 10< twist from the plane of the unbent hook refer to paragraph (l)(3)(iii)(a) of this section.</p>	Not covered in ASME B30.2.				

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04.4.4.e	Inspection: Daily Inspections: These inspections shall be performed and documented by the certified operator prior to first use each day the crane is used, and shall include the following: Visually (without climbing up to bridge) inspect rope reeving for proper travel and drum lay, and inspect wire rope for obvious kinks, deformation, wire clips, and/or damage. (Requirement 40604)	1910.179(j)(2)(iv) Hoist chains, including end connections, for excessive wear, twist, distorted links interfering with proper function, or stretch beyond manufacturer's recommendations. Visual inspection daily; monthly inspection with a certification record which includes the date of inspection, the signature of the person who performed the inspection and an identifier of the chain which was inspected.	Not covered in ASME B30.2.				
04.4.4.f	Inspection: Daily Inspections: These inspections shall be performed and documented by the certified operator prior to first use each day the crane is used, and shall include the following: Visually inspect hoist chains for excessive wear or distortion. (Requirement 40605)	See above	Not covered in ASME B30.2.				
04.4.5	Inspection: Formal Periodic Inspections: These inspections shall be performed at varying intervals, depending on activity, severity of service, environment, and criticality. (Requirement 40606)	1910.179(j)(3) Periodic inspection. Complete inspections of the crane shall be performed at intervals as generally defined in paragraph (j)(1)(ii)(b) of this section, depending upon its activity, severity of service, and environment, or as specifically indicated below. These inspections shall include the requirements of paragraph (j)(2) of this section and in addition, the following items. Any deficiencies such as listed shall be carefully examined and determination made as to whether they constitute a safety hazard: 1910.179(j)(2) Frequent inspection. The following items shall be inspected for defects at intervals as defined in paragraph (j)(1)(ii) of this section or as specifically indicated, including observation during operation for any defects which might appear between regular inspections. All deficiencies such as listed shall be carefully examined and determination made as to whether they constitute a safety hazard:	2-2.1.3 Periodic Inspection (a) Adesignated person shall determine whether conditions found during inspection constitute a hazard and whether disassembly is required for additional inspection. (b) The inspection shall include the items listed in para. 2-2.1.2(c) and the following items, as applicable: (1) deformed, cracked, or corroded members (2) loose or missing bolts, nuts, pins, or rivets (3) cracked or worn sheaves and drums (4) worn, cracked, or distorted parts such as pins, bearings, wheels, shafts, gears, rollers, locking and clamping devices, bumpers, and stops (5) excessive wear of brake system parts (6) excessive wear of drive chain sprockets and excessive drive chain stretch (7) deterioration of controllers, master switches, contacts, limit switches, and push-button stations, but not limited to these items (8) wind indicators for proper operation (9) gasoline, diesel, electric, or other power plants for proper operation (10) motion-limit devices that interrupt power or cause a warning to be activated for proper performance. Each motion shall be inched or operated at low speed into the limit device with no load on the crane (11) rope reeving for compliance with crane manufacturer's design (12) all function, instruction, caution, and warning labels or plates for legibility and replacement				
04.4.5.a	Inspection: Formal Periodic Inspections: Monthly Inspections (Frequent Inspections). At least once per month: (Requirement 40607)	1910.179(j)(1)(ii)(a) Frequent inspection - Daily to monthly intervals. 1910.179(j)(2)(iii) Hooks with deformation or cracks. Visual inspection daily; monthly inspection with a certification record which includes the date of inspection, the signature of the person who performed the inspection and the serial number, or other identifier, of the hook inspected. For hooks with cracks or having more than 15 percent in excess of normal throat opening or more than 10° twist from the plane of the unbent hook refer to paragraph (l)(3)(iii)(a) of this section. 1910.179(j)(2)(iv) Hoist chains, including end connections, for excessive wear, twist, distorted links interfering with proper function, or stretch beyond manufacturer's recommendations. Visual inspection daily; monthly inspection with a certification record which includes the date of inspection, the signature of the person who performed the inspection and an identifier of the chain which was inspected.	SECTION 2-2.1: INSPECTION 2-2.1.1 Inspection Classification (1) Frequent Inspection. Visual examinations by the operator or other designated personnel with records not required, as follows: (a) normal service — monthly (b) heavy service — weekly to monthly (c) severe service — daily to weekly				
04.4.5.a.1	Inspection: Formal Periodic Inspections: Monthly Inspections (Frequent Inspections). At least once per month: Perform daily inspection requirements described in paragraph 4.4.4. (Requirement 40608)	See above	See above				
04.4.5.a.2	Inspection: Formal Periodic Inspections: Monthly Inspections (Frequent Inspections). At least once per month: Inspect for wear, twist, distortion, or stretch of hoist chains. (Requirement 40609)	1910.179(j)(2)(iv) Hoist chains, including end connections, for excessive wear, twist, distorted links interfering with proper function, or stretch beyond manufacturer's recommendations. Visual inspection daily; monthly inspection with a certification record which includes the date of inspection, the signature of the person who performed the inspection and an identifier of the chain which was inspected.	2-2.1.5 Inspection Records Dated inspection reports of comparable records shall be made on critical items such as hoisting machinery, sheaves, hooks, chains, ropes, and other lifting devices as listed in para. 2-2.1.3. Records shall be placed on file.				

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04.4.5.a.3	<p>Inspection: Formal Periodic Inspections: Monthly Inspections (Frequent Inspections). At least once per month: Perform a thorough inspection of all ropes paying particular attention to the signs of deterioration and damage outlined in paragraph 4.5.3.c. (Requirement 40610)</p>	<p>Rope inspection. - 1910.179(m)(1) Running ropes. A thorough inspection of all ropes shall be made at least once a month and a certification record which includes the date of inspection, the signature of the person who performed the inspection and an identifier for the ropes which were inspected shall be kept on file where readily available to appointed personnel. Any deterioration, resulting in appreciable loss of original strength, shall be carefully observed and determination made as to whether further use of the rope would constitute a safety hazard. Some of the conditions that could result in an appreciable loss of strength are the following: 1910.179(m)(1)(i) Reduction of rope diameter below nominal diameter due to loss of core support, internal or external corrosion, or wear of outside wires. 1910.179(m)(1)(ii) A number of broken outside wires and the degree of distribution or concentration of such broken wires. 1910.179(m)(1)(iii) Worn outside wires. 1910.179(m)(1)(iv) Corroded or broken wires at end connections. 1910.179(m)(1)(v) Corroded, cracked, bent, worn, or improperly applied end connections. 1910.179(m)(1)(vi) Severe kinking, crushing, cutting, or unstranding. 1910.179</p>	<p>SECTION 2-2.4: ROPE INSPECTION, REPLACEMENT, AND MAINTENANCE 2-2.4.1 Rope Inspection (a) Frequent Inspection (1) All ropes should be visually inspected by the operator or other designated person at the start of each shift. These visual observations should be concerned with discovering gross damage, such as listed below, that may be a hazard. (a) distortion of the rope, such as kinking, crushing, unstranding, birdcaging, main strand displacement, or core protrusion (b) general corrosion (c) broken or cut strands (d) number, distribution, and type of visible broken wires [see paras. 2-2.4.2(b)(1), (2), and (3) for further guidance] (2) When such damage is discovered, the rope shall either be removed from service or given an inspection, as detailed in para. 2-2.4.1(b). (b) Periodic Inspection (1) The inspection frequency shall be determined by a qualified person and shall be based on such factors as expected rope life, as determined by experience on the particular installation or similar installations; severity of environment; percentage of capacity lifts; frequency rates of operation; and exposure to shock loads. Inspections need not be at equal calendar intervals and should be more frequent as the rope approaches the end of its</p>				
04.4.5.a.4	<p>Inspection: Formal Periodic Inspections: Monthly Inspections (Frequent Inspections). At least once per month: Inspect for visible deformation or cracks in hooks (see Section 7). (Requirement 40611)</p>	<p>1910.179(j)(2)(iii) Hooks with deformation or cracks. Visual inspection daily; monthly inspection with a certification record which includes the date of inspection, the signature of the person who performed the inspection and the serial number, or other identifier, of the hook inspected. For hooks with cracks or having more than 15 percent in excess of normal throat opening or more than 10° twist from the plane of the unbent hook refer to paragraph (l)(3)(iii)(a) of this section.</p>	<p>2-2.1.2 Frequent Inspection (4) hooks and hook latches (if used) in accordance with ASME B30.10</p>				
04.4.5.b	<p>Inspection: Formal Periodic Inspections: Annual Inspections (Periodic Inspections). At least once per year, inspect for: (Requirement 40612)</p>						
04.4.5.b.01	<p>Inspection: Formal Periodic Inspections: Annual Inspections (Periodic Inspections). At least once per year, inspect for: Requirements for monthly inspections (frequent inspections) described in paragraph 4.4.5.a. (Requirement 40613)</p>						
04.4.5.b.02	<p>Inspection: Formal Periodic Inspections: Annual Inspections (Periodic Inspections). At least once per year, inspect for: Deformed, cracked, or corroded members and welds and loose bolts or rivets in crane structure and runway. Various methods of nondestructive testing such as ultrasonics, radiography, magnetic particle, or liquid penetrant, shall be used as needed. (Requirement 40614)</p>	<p>1910.179(j)(3)(i) Deformed, cracked, or corroded members. 1910.179(j)(3)(ii) Loose bolts or rivets.</p>	<p>(2) Periodic Inspection. Visual inspection of the equipment in place by a designated person making records of apparent external conditions to provide the basis for a continuing evaluation, as follows: (a) normal service — yearly 2-2.1.3 Periodic Inspection (a) A designated person shall determine whether conditions found during inspection constitute a hazard and whether disassembly is required for additional inspection. (b) The inspection shall include the items listed in para. 2-2.1.2(c) and the following items, as applicable: (1) deformed, cracked, or corroded members (2) loose or missing bolts, nuts, pins, or rivets (3) cracked or worn sheaves and drums (4) worn, cracked, or distorted parts such as pins, bearings, wheels, shafts, gears, rollers, locking and clamping devices, bumpers, and stops (5) excessive wear of brake system parts</p>				

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04.4.5.b.03	Inspection: Formal Periodic Inspections: Annual Inspections (Periodic Inspections). At least once per year, inspect for: Cracked or worn sheaves and drums. (Requirement 40615)	1910.179(j)(3) Periodic inspection. Complete inspections of the crane shall be performed at intervals as generally defined in paragraph (j)(1)(ii)(b) of this section, depending upon its activity, severity of service, and environment, or as specifically indicated below.... 1910.179(j)(3)(iii) Cracked or worn sheaves and drums.	See above item (3) (Requirement 40614)				
04.4.5.b.04	Inspection: Formal Periodic Inspections: Annual Inspections (Periodic Inspections). At least once per year, inspect for: Wear or cracks in pins, bearings, shafts, gears, followers, and locking and clamping devices. Surface or volumetric NDT shall be used to validate the existence or absence of cracks indicated by this inspection. (Requirement 40616)	1910.179(j)(3) Periodic inspection. Complete inspections of the crane shall be performed at intervals as generally defined in paragraph (j)(1)(ii)(b) of this section, depending upon its activity, severity of service, and environment, or as specifically indicated below.... 1910.179(j)(3)(iv) Worn, cracked or distorted parts such as pins, bearings, shafts, gears, rollers, locking and clamping devices.	See item 2 cells above (Requirement 40614)				
04.4.5.b.05	Inspection: Formal Periodic Inspections: Annual Inspections (Periodic Inspections). At least once per year, inspect for: Wear in brake and clutch system parts, linings, pawls, and ratchets that are readily accessible without major disassembly beyond an acceptable limit. Major teardown to inspect such parts should be based on a frequency consistent with gearbox lubrication analysis and other manufacturers' recommended maintenance programs for these components. (Requirement 40617)	Periodic inspection. Complete inspections of the crane shall be performed at intervals as generally defined in paragraph (j)(1)(ii)(b) of this section, depending upon its activity, severity of service, and environment, or as specifically indicated below....1910.179(j)(3)(v) Excessive wear on brake system parts, linings, pawls, and ratchets.	See item (5) 3 cells above (Requirement 40614)				
04.4.5.b.06	Inspection: Formal Periodic Inspections: Annual Inspections (Periodic Inspections). At least once per year, inspect for: Inadequacies in load and other indicators over full range. (Requirement 40618)	??	??				
04.4.5.b.07	Inspection: Formal Periodic Inspections: Annual Inspections (Periodic Inspections). At least once per year, inspect for: Wear in chain drive sprockets and stretch in the chain beyond an acceptable limit. (Requirement 40619)	1910.179(j)(3)(viii) Excessive wear of chain drive sprockets and excessive chain stretch.	(2) Periodic Inspection. Visual inspection of the equipment in place by a designated person making records of apparent external conditions to provide the basis for a continuing evaluation, as follows: (a) normal service — yearly 2-2.1.3 Periodic Inspection (6) excessive wear of drive chain sprockets and excessive drive chain stretch				
04.4.5.b.08	Inspection: Formal Periodic Inspections: Annual Inspections (Periodic Inspections). At least once per year, inspect for: Gasoline, diesel, electric, or other power plants for proper performance or noncompliance with applicable safety requirements. (Requirement 40620)	1910.179(j)(3)(vii) Gasoline, diesel, electric, or other powerplants for improper performance or noncompliance with applicable safety requirements.	(2) Periodic Inspection. Visual inspection of the equipment in place by a designated person making records of apparent external conditions to provide the basis for a continuing evaluation, as follows: (a) normal service — yearly 2-2.1.3 Periodic Inspection (9) gasoline, diesel, electric, or other power plants for proper operation				
04.4.5.b.09	Inspection: Formal Periodic Inspections: Annual Inspections (Periodic Inspections). At least once per year, inspect for: Evidence of a malfunction in travel, steering, braking, and locking devices. (Requirement 40621)	Not covered in OSHA 1910.179	SECTION 2-2.1: INSPECTION 2-2.1.1 Inspection Classification 2-2.1.3 Periodic Inspection (4) worn, cracked, or distorted parts such as pins, bearings, wheels, shafts, gears, rollers, locking and clamping devices, bumpers, and stops				
04.4.5.b.10	Inspection: Formal Periodic Inspections: Annual Inspections (Periodic Inspections). At least once per year, inspect for: Evidence of a malfunction in any safety device. (Requirement 40622)	1910.179(j)(3) Periodic inspection. Complete inspections of the crane shall be performed at intervals as generally defined in paragraph (j)(1)(ii)(b) of this section, depending upon its activity, severity of service, and environment, or as specifically indicated below. These inspections shall include the requirements of paragraph (j)(2) of this section and in addition, the following items. Any deficiencies such as listed shall be carefully examined and determination made as to whether they constitute a safety hazard: 1910.179(k)(1)(i) Prior to initial use all new and altered cranes shall be tested to insure compliance with this section including the following functions: 1910.179(k)(1)(i)(d) Limit switches, locking and safety devices. 1910.179(l)(2)(ii) After adjustments and repairs have been made the crane shall not be operated until all guards have been reinstalled, safety devices	Inspection required for specific items. There is not a statement requiring inspection for malfunction of any safety device.				

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04.4.5.b.11	Inspection: Formal Periodic Inspections: Annual Inspections (Periodic Inspections). At least once per year, inspect for: Pitting or other signs of deterioration in electrical apparatus. Special attention shall be given to feed rails. (Requirement 40623)	1910.179(j)(3) Periodic inspection. Complete inspections of the crane shall be performed at intervals as generally defined in paragraph (j)(1)(ii)(b) of this section, depending upon its activity, severity of service, and environment, or as specifically indicated below. These inspections shall include the requirements of paragraph (j)(2) of this section and in addition, the following items. Any deficiencies such as listed shall be carefully examined and determination made as to whether they constitute a safety hazard: 1910.179(j)(3)(x) Electrical apparatus, for signs of pitting or any deterioration of controller contactors, limit switches and pushbutton stations.	SECTION 2-2.2: TESTING 2-2.2.1 Operational Tests; 2-2.3.3 Adjustments, Repairs, and Replacements; (3) Pitted or burned electrical contacts should be corrected only by replacement and in sets. Controller parts should be lubricated as recommended in the manual supplied with the crane.; 2-2.1.3 Periodic Inspection; (7) deterioration of controllers, master switches, contacts, limit switches, and push-button stations, but not limited to these items				
04.4.5.b.12	Inspection: Formal Periodic Inspections: Annual Inspections (Periodic Inspections). At least once per year, inspect for: Evidence of overheating. (Requirement 40624)	Not covered in OSHA 1910.179	Not covered in ASME B30.2.				
04.4.6	Inspection: Idle and Standby Cranes: Idle and standby cranes shall be inspected prior to first use according to the requirements of paragraphs 4.4.4 and 4.4.5 unless these daily inspections and formal periodic inspections were performed at required intervals and recorded during the idle/standby period. (Requirement 40625)	1910.179(j)(4)(i) A crane which has been idle for a period of 1 month or more, but less than 6 months, shall be given an inspection conforming with requirements of paragraph (j)(2) of this section and paragraph (m)(2) of this section before placing in service. 1910.179(j)(4)(ii) A crane which has been idle for a period of over 6 months shall be given a complete inspection conforming with requirements of paragraphs (j)(2) and (3) of this section and paragraph (m)(2) of this section before placing in service. 1910.179(m)(2) Other ropes. All rope which has been idle for a period of a month or more due to shutdown or storage of a crane on which it is installed shall be given a thorough inspection before it is used. This inspection shall be for all types of deterioration and shall be performed by an appointed person whose approval shall be required for further use of the rope. A certification record shall be available for inspection which includes the date of inspection, the signature of the person who performed the inspection and an identifier for the rope which was inspected.	2-2.1.4 Cranes Not in Regular Service (a) A crane that is used in infrequent service, which has been idle for a period of 1 month or more, but less than 1 year, shall be inspected before being placed in service in accordance with the requirements listed in para. 2-2.1.2.; 2-2.1.2 Frequent Inspection (a) Frequent inspection shall include observations during operation. (b) Adesignated person shall determine whether conditions found during the inspection constitute a hazard and whether a more detailed inspection is required. (c) The following items shall be inspected: (1) operating mechanisms for proper operation, proper adjustment, and unusual sounds (2) upper-limit device(s) in accordance with para. 2-3.2.4(a) (3) tanks, valves, pumps, lines, and other parts of air or hydraulic systems for leakage; (4) hooks and hook latches (if used) in accordance with ASME B30.10 (5) hoist ropes and end connections in accordance with para. 2-2.4.1(a) (6) rope of proper spooling onto the drum(s) and sheave(s)				
04.4.7(1)	Inspection: Inspection Reports: After each formal periodic inspection, qualified, authorized personnel shall prepare written, dated, and signed inspection reports. (Requirement 40626)	1910.179(f)(1)(ii) Each independent hoisting unit of a crane, except worm-gear hoists, the angle of whose worm is such as to prevent the load from accelerating in the lowering direction shall, in addition to a holding brake, be equipped with control braking means to prevent overspeeding.	2-2.1.5 Inspection Records Dated inspection reports of comparable records shall be made on critical items such as hoisting machinery, sheaves, hooks, chains, ropes, and other lifting devices as listed in para. 2-2.1.3. Records shall be placed on file.; 2-2.2.2 Load Test; (e) If a load test is conducted, the person conducting the load test shall prepare a written report of the load sustained during the test and the operations performed during the test. Reports shall be placed on file.				
04.4.7(2)	Inspection: Inspection Reports: These reports shall include procedure reference and adequacy of the crane/crane components. (Requirement 40627)	Adjustments and repairs. 1910.179(l)(3)(i) Any unsafe conditions disclosed by the inspection requirements of paragraph (j) of this section shall be corrected before operation of the crane is resumed. Adjustments and repairs shall be done only by designated personnel.	SECTION 2-2.1: INSPECTION 2-2.1.1 Inspection Classification; (b) Inspection procedure for cranes in regular service is divided into two general classifications based upon the intervals at which inspection should be performed. The intervals in turn are dependent upon the nature of the critical components of the crane and the degree of their exposure to wear, deterioration, or malfunction. The two general classifications are designated as frequent and periodic, with respective intervals between inspection defined as follows:				

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04.4.7(3)	Inspection: Inspection Reports: Inadequacies shall be documented and, if determined to be a hazard, corrected prior to further use. (Requirement 40628)	Adjustments and repairs. 1910.179(l)(3)(i) Any unsafe conditions disclosed by the inspection requirements of paragraph (j) of this section shall be corrected before operation of the crane is resumed. Adjustments and repairs shall be done only by designated personnel.	Very similar to line 122, Doc. Para. 04.4.1(3) "Inspection: Inadequacies discovered during an inspection shall be documented and, if determined to be a hazard, tagged out and corrected prior to further use. (Requirement 40594)"				
04.4.7(4)	Inspection: Inspection Reports: These reports shall be filed and be made readily available by the organizational element responsible for crane inspection. (Requirement 40629)	Adjustments and repairs. 1910.179(l)(3)(i) Any unsafe conditions disclosed by the inspection requirements of paragraph (j) of this section shall be corrected before operation of the crane is resumed. Adjustments and repairs shall be done only by designated personnel.	2-2.1.5 Inspection Records Dated inspection reports of comparable records shall be made on critical items such as hoisting machinery, sheaves, hooks, chains, ropes, and other lifting devices as listed in para. 2-2.1.3. Records shall be placed on file. 2-2.2.2 Load Test (e) If a load test is conducted, the person conducting the load test shall prepare a written report of the load sustained during the test and the operations performed during the test. Reports shall be placed on file.				
04.5(1)	Maintenance: A maintenance program based on manufacturers' recommendations, integrating proactive, reactive, preventive, and predictive maintenance shall be established to increase the probability the crane will function in the required manner over its design life cycle with a minimum of maintenance. (Requirement 40630)	Maintenance - 1910.179(l)(1) Preventive maintenance. A preventive maintenance program based on the crane manufacturer's recommendations shall be established.	SECTION 2-2.3: MAINTENANCE 2-2.3.1 Preventive Maintenance (a) A preventive maintenance program should be established. The program should be based on the recommendations outlined in the crane manufacturer's manual and, when appropriate, additional recommendations outlined by a qualified person based upon review of the crane application and operation. Dated records should be placed on file. (b) Replacement parts shall be at least equal to the original manufacturer's specifications.				
04.5(2)	Maintenance: The program shall include procedures and a scheduling system for normal periodic maintenance items, adjustments, replacements, and repairs. (Requirement 40631)	not covered in OSHA 1910.179	ASME B30.2 does not mention scheduling maintenance.				
04.5(3)	Maintenance: The program also shall ensure that records are kept and unsafe test and inspection discrepancies are documented and corrected. (Requirement 40632)	Not covered in OSHA 1910.179	See 158 above. Doc. Para 04.5(1) (Requirement 40630)				
04.5(4)	Maintenance: Any crane found in an unsafe operating condition shall be tagged out and removed from service until repaired. (Requirement 40633)	Adjustments and repairs. 1910.179(l)(3)(i) Any unsafe conditions disclosed by the inspection requirements of paragraph (j) of this section shall be corrected before operation of the crane is resumed. Adjustments and repairs shall be done only by designated personnel.	Very similar to line 122, Doc. Para. 04.4.1(3) "Inspection: Inadequacies discovered during an inspection shall be documented and, if determined to be a hazard, tagged out and corrected prior to further use. (Requirement 40594)"				
04.5(5)	Maintenance: All repairs shall be made by qualified personnel in accordance with the manufacturers' instructions. (Requirement 40634)	Adjustments and repairs. 1910.179(l)(3)(i) Any unsafe conditions disclosed by the inspection requirements of paragraph (j) of this section shall be corrected before operation of the crane is resumed. Adjustments and repairs shall be done only by designated personnel.	2-2.3.3 Adjustments, Repairs, and Replacements (a) Any condition disclosed by the inspections performed in accordance with the requirements of Section 2-2.1, that is determined to be a hazard to continued operation, shall be corrected by adjustment, repair, or replacement before continuing the use of the crane. (b) Adjustments, repairs, and replacements shall be performed by designated personnel.				
04.5.1	Maintenance: Maintenance Procedures: Before maintenance, adjustments, repairs, and replacements are initiated, the following safety precautions shall be taken: (Requirement 40635)						
04.5.1.a	Maintenance: Maintenance Procedures: Before maintenance, adjustments, repairs, and replacements are initiated, the following safety precautions shall be taken: Move crane to an area where maintenance will not interfere with other operations. (Requirement 40636)	Maintenance procedure. 1910.179(l)(2)(i) Before adjustments and repairs are started on a crane the following precautions shall be taken: 1910.179(l)(2)(i)(a) The crane to be repaired shall be run to a location where it will cause the least interference with other cranes and operations in the area.	2-2.3.2 Maintenance Procedure (a) The following precautions shall be taken before performing maintenance on a crane: (1) The crane shall be moved to a location where it will cause the least interference with other cranes and operations in the area. (2) If a load is attached				

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04.5.1.b	Maintenance: Maintenance Procedures: Before maintenance, adjustments, repairs, and replacements are initiated, the following safety precautions shall be taken: Turn off all controls, move main or emergency switch to OPEN, and lock and tag switch in OPEN position unless it is necessary to have power on to perform the maintenance task. (Requirement 40637)	1910.179(l)(2)(i) Before adjustments and repairs are started on a crane the following precautions shall be taken: 1910.179(l)(2)(i)(b) All controllers shall be at the off position. 1910.179(l)(2)(i)(c) The main or emergency switch shall be open and locked in the open position.	2-3.1.7 Conduct of Operators; (n) Before the operator performs any maintenance work on the crane, the operator shall lock and tag the main switch (crane disconnect) (see para. 2-2.3.2) in the deenergized position. SECTION 2-3.5: CRANE LOCKOUT/TAGOUT (a) A lockout/tagout policy and procedure shall be developed, documented, and implemented by the owner or user of overhead cranes.				
04.5.1.c	Maintenance: Maintenance Procedures: Before maintenance, adjustments, repairs, and replacements are initiated, the following safety precautions shall be taken: If other cranes are operating on the same runway as the crane being repaired, ensure that proximity limit switches are operating on all cranes or that an observer is stationed to prevent interference with other cranes. (Requirement 40638)	Maintenance procedure. 1910.179(l)(2)(i) Before adjustments and repairs are started on a crane the following precautions shall be taken: 1910.179(l)(2)(i)(e) Where other cranes are in operation on the same runway, rail stops or other suitable means shall be provided to prevent interference with the idle crane.	2-2.3.2 Maintenance Procedure, (6) If the runway remains energized, stops or a signalperson(s), located full-time at a visual vantage point for observing the approach of an active crane(s), shall be provided to prohibit contact by the active crane(s) with the idle crane, with persons performing maintenance, and with equipment used in performing the maintenance. (3) If the runway remains energized, stops or a signalperson(s), located full-time at a visual vantage point for observing the approach of an active crane(s), shall be provided to prohibit contact by the active crane(s) with persons performing maintenance and with equipment used in performing the maintenance. SECTION 2-3.5: CRANE LOCKOUT/TAGOUT, (c) The policy shall give consideration to the following areas: (1) single-crane runways (2) multiple-crane runways				
04.5.1.d	Maintenance: Maintenance Procedures: Before maintenance, adjustments, repairs, and replacements are initiated, the following safety precautions shall be taken: Cranes shall not be operated until all safety devices have been activated and tested/adjusted if involved in the maintenance action. (Requirement 40639)	Maintenance procedure. 1910.179(l)(2)(i) Before adjustments and repairs are started on a crane the following precautions shall be taken: 1910.179(l)(2)(ii) After adjustments and repairs have been made the crane shall not be operated until all guards have been reinstalled, safety devices reactivated and maintenance equipment removed.	Not covered in ASME B30.2.				
04.5.2	Maintenance: Adjustments: Based upon the manufacturer's documentation and/or experience, adjustments shall be made to ensure that all crane components function properly, paying particular attention to: (Requirement 40640)	1910.179(l)(3)(i) Any unsafe conditions disclosed by the inspection requirements of paragraph (j) of this section shall be corrected before operation of the crane is resumed. Adjustments and repairs shall be done only by designated personnel. 1910.179(l)(3)(ii) Adjustments shall be maintained to assure correct functioning of components. The following are examples: 1910.179(l)(3)(ii)(a) All functional operating mechanisms. 1910.179(l)(3)(ii)(b) Limit switches. 1910.179(l)(3)(ii)(c) Control systems. 1910.179(l)(3)(ii)(d) Brakes. 1910.179(l)(3)(ii)(e)	SECTION 2-2.3: MAINTENANCE 2-2.3.1 Preventive Maintenance (a) A preventive maintenance program should be established. The program should be based on the recommendations outlined in the crane manufacturer's manual and, when appropriate, additional recommendations outlined by a qualified person based upon review of the crane application and operation. Dated records should be placed on file. (b) Replacement parts shall be at least equal to the original manufacturer's specifications.				

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04.5.2.a	Maintenance: Adjustments: Based upon the manufacturer's documentation and/or experience, adjustments shall be made to ensure that all crane components function properly, paying particular attention to: Brakes. Appropriate precautions shall be taken by inspectors, repair personnel, and others who may be potentially exposed to airborne dust fibers from any asbestos friction materials present in crane braking mechanisms. (Requirement 40641)	Not covered in OSHA 1910.179	2-2.3.3 Adjustments, Repairs, and Replacements (a) Any condition disclosed by the inspections performed in accordance with the requirements of Section 2-2.1, that is determined to be a hazard to continued operation, shall be corrected by adjustment, repair, or replacement before continuing the use of the crane. (b) Adjustments, repairs, and replacements shall be performed by designated personnel. (c) Components shall be adjusted or repaired as needed. The following are examples: (1) all operating mechanisms (2) limit devices (3) control systems (4) brakes ASBESTOS NOT MENTIONED IN ASME B30.2				
04.5.2.b	Maintenance: Adjustments: Based upon the manufacturer's documentation and/or experience, adjustments shall be made to ensure that all crane components function properly, paying particular attention to: Control system.	1910.179(l)(3)(i) Any unsafe conditions disclosed by the inspection requirements of paragraph (j) of this section shall be corrected before operation of the crane is resumed. Adjustments and repairs shall be done only by designated personnel. 1910.179(l)(3)(ii) Adjustments shall be maintained to assure correct functioning of components. The following are examples: 1910.179(l)(3)(ii)(c) Control systems.	2-2.3.3 Adjustments, Repairs, and Replacements (a) Any condition disclosed by the inspections performed in accordance with the requirements of Section 2-2.1, that is determined to be a hazard to continued operation, shall be corrected by adjustment, repair, or replacement before continuing the use of the crane. (b) Adjustments, repairs, and replacements shall be performed by designated personnel. (c) Components shall be adjusted or repaired as needed. The following are examples: (1) all operating mechanisms (2) limit devices (3) control systems (4) brakes				
04.5.2.c	Maintenance: Adjustments: Based upon the manufacturer's documentation and/or experience, adjustments shall be made to ensure that all crane components function properly, paying particular attention to: Limit Switches.	1910.179(l)(3)(i) Any unsafe conditions disclosed by the inspection requirements of paragraph (j) of this section shall be corrected before operation of the crane is resumed. Adjustments and repairs shall be done only by designated personnel. 1910.179(l)(3)(ii) Adjustments shall be maintained to assure correct functioning of components. The following are examples: 1910.179(l)(3)(ii)(b) Limit switches.	2-2.3.3 Adjustments, Repairs, and Replacements (a) Any condition disclosed by the inspections performed in accordance with the requirements of Section 2-2.1, that is determined to be a hazard to continued operation, shall be corrected by adjustment, repair, or replacement before continuing the use of the crane. (b) Adjustments, repairs, and replacements shall be performed by designated personnel. (c) Components shall be adjusted or repaired as needed. The following are examples: (1) all operating mechanisms (2) limit devices (3) control systems (4) brakes				
04.5.2.c.1	Maintenance: Adjustments: Based upon the manufacturer's documentation and/or experience, adjustments shall be made to ensure that all crane components function properly, paying particular attention to: Limit switches: The hoist initial upper limit switch shall be verified by running the empty hook at full speed into the limit switch. It is recommended that the switch be verified at slow speed prior to adjustment. (Requirement 40644)	1910.179(l)(3)(i) Any unsafe conditions disclosed by the inspection requirements of paragraph (j) of this section shall be corrected before operation of the crane is resumed. Adjustments and repairs shall be done only by designated personnel. 1910.179(l)(3)(ii) Adjustments shall be maintained to assure correct functioning of components. The following are examples: 1910.179(k)(1)(ii) The trip setting of hoist limit switches shall be determined by tests with an empty hook traveling in increasing speeds up to the maximum speed. The actuating mechanism of the limit switch shall be located so that it will trip the switch, under all conditions, in sufficient time to prevent contact of the hook or hook block with any part of the trolley.	2-2.3.3 Adjustments, Repairs, and Replacements (a) Any condition disclosed by the inspections performed in accordance with the requirements of Section 2-2.1, that is determined to be a hazard to continued operation, shall be corrected by adjustment, repair, or replacement before continuing the use of the crane. (b) Adjustments, repairs, and replacements shall be performed by designated personnel. (c) Components shall be adjusted or repaired as needed. The following are examples: (1) all operating mechanisms (2) limit devices (3) control systems (4) brakes SECTION 2-2.2: TESTING; 2-2.2.1 Operational Tests; (4) hoist-limit devices (a) the trip setting of hoist-limit devices shall be determined by tests with an empty hook comprising a series of runs, each at increasing hook speed up to the maximum speed, unless the hoist has only a single speed				

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04.5.2.c.2	Maintenance: Adjustments: Based upon the manufacturer's documentation and/or experience, adjustments shall be made to ensure that all crane components function properly, paying particular attention to: Limit switches: For cranes used for critical lifts, the final upper limit switch shall be independently verified and adjusted as described above at installation and after modifications that could affect switch operation. The switch can be tested periodically by manually tripping it and verifying that all hoist motion is precluded. (Requirement 40645)	1910.179(l)(3)(ii) Adjustments shall be maintained to assure correct functioning of components. The following are examples: 1910.179(l)(3)(ii)(a) All functional operating mechanisms. 1910.179(l)(3)(ii)(b) Limit switches. 1910.179(j)(3) Periodic inspection.....1910.179(j)(3)(x) Electrical apparatus, for signs of pitting or any deterioration of controller contactors, limit switches and pushbutton stations.	2-2.3.3 Adjustments, Repairs, and Replacements (a) Any condition disclosed by the inspections performed in accordance with the requirements of Section 2-2.1, that is determined to be a hazard to continued operation, shall be corrected by adjustment, repair, or replacement before continuing the use of the crane. (b) Adjustments, repairs, and replacements shall be performed by designated personnel. (c) Components shall be adjusted or repaired as needed. The following are examples: (1) all operating mechanisms (2) limit devices (3) control systems (4) brakes				
04.5.2.d	Maintenance: Adjustments: Based upon the manufacturer's documentation and/or experience, adjustments shall be made to ensure that all crane components function properly, paying particular attention to: Power Plants. (Requirement 40646)	Adjustments and repairs. 1910.179(l)(3)(i) Any unsafe conditions disclosed by the inspection requirements of paragraph (j) of this section shall be corrected before operation of the crane is resumed. Adjustments and repairs shall be done only by designated personnel. 1910.179(l)(3)(ii) Adjustments shall be maintained to assure correct functioning of components. The following are examples: 1910.179(l)(3)(ii)(e) Power plants.	2-2.1.3 Periodic Inspection (a) A designated person shall determine whether conditions found during inspection constitute a hazard and whether disassembly is required for additional inspection. (b) The inspection shall include the items listed in para. 2-2.1.2(c) and the following items, as applicable: (9) gasoline, diesel, electric, or other power plants for proper operation				
04.5.2.e	Maintenance: Adjustments: Based upon the manufacturer's documentation and/or experience, adjustments shall be made to ensure that all crane components function properly, paying particular attention to: Critical operating mechanisms and safety devices. (Requirement 40647)	Adjustments and repairs. 1910.179(l)(3)(i) Any unsafe conditions disclosed by the inspection requirements of paragraph (j) of this section shall be corrected before operation of the crane is resumed. Adjustments and repairs shall be done only by designated personnel. 1910.179(l)(3)(ii) Adjustments shall be maintained to assure correct functioning of components. The following are examples: 1910.179(l)(3)(ii)(a) All functional operating mechanisms. 1910.179(j)(2)(i) All functional operating mechanisms for maladjustment interfering with proper operation. Daily. 1910.179(j)(2)(vi) All functional operating mechanisms for excessive wear of components.	2-2.3.3 Adjustments, Repairs, and Replacements (a) Any condition disclosed by the inspections performed in accordance with the requirements of Section 2-2.1, that is determined to be a hazard to continued operation, shall be corrected by adjustment, repair, or replacement before continuing the use of the crane. (b) Adjustments, repairs, and replacements shall be performed by designated personnel. (c) Components shall be adjusted or repaired as needed. The following are examples: (1) all operating mechanisms (2) limit devices (3) control systems (4) brakes				
04.5.3.a	Maintenance: Repair/Replacements: For repair/replacement requirements for crane hooks with deformation or cracks, see Section 7. If repaired, crane hooks shall be proof load tested using the associated crane proof load value. (Requirement 40649)	1910.179(l)(3)(iii)(a) Crane hooks showing defects described in paragraph (j)(2)(iii) of this section shall be discarded. Repairs by welding or reshaping are not generally recommended. If such repairs are attempted they shall only be done under competent supervision and the hook shall be tested to the load requirements of paragraph (k)(2) of this section before further use. 1910.179(j)(2)(iii) Hooks with deformation or cracks. Visual inspection daily; monthly inspection with certification record which includes the date of inspection, the signature of the person who performed the inspection and the serial number, or other identifier, of the hook inspected. For hooks with cracks or having more than 15 percent in excess of normal throat opening or more than 10° twist from the plane of the unbent hook refer to paragraph (l)(3)(iii)(a) of this section.	2-2.3.3 Adjustments, Repairs, and Replacements; (1) Damaged or worn hooks as described under Maintenance in ASME B30.10. Repairs by welding or reshaping are not recommended.				

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04.5.3.b(1)	<p>Maintenance: Repair/Replacements: Structural members that are cracked, bent, broken, excessively worn, or corroded shall be evaluated by the responsible engineering organization to determine if they should be replaced or repaired. Use proper material and weld/repair procedures according to manufacturers' specifications and ANSI/AWS D14.1. (Requirement 40650)</p>	<p>1910.179(j)(3) Periodic inspection. Complete inspections.... 1910.179(j)(3)(i) Deformed, cracked, or corroded members. 1910.179(l)(3)(iii) Repairs or replacements shall be provided promptly as needed for safe operation. The following are examples: 1910.179(l)(3)(iii)(c) All critical parts which are cracked, broken, bent, or excessively worn.</p>	<p>2-2.3.3 Adjustments, Repairs, and Replacements (a) Any condition disclosed by the inspections performed in accordance with the requirements of Section 2-2.1, that is determined to be a hazard to continued operation, shall be corrected by adjustment, repair, or replacement before continuing the use of the crane. (b) Adjustments, repairs, and replacements shall be performed by designated personnel. (c) Components shall be adjusted or repaired as needed. The following are examples: (1) all operating mechanisms (d) Repairs or replacements shall be made as needed. The following are examples: (1) Damaged or worn hooks as described under Maintenance in ASME B30.10. Repairs by welding or reshaping are not recommended. (2) All critical parts that are cracked, broken, bent, excessively worn, or missing; (e) If repairs of load-sustaining members are made by welding, identification of materials shall be made and appropriate welding procedures shall be followed.</p>				
04.5.3.b(2)	<p>Maintenance: Repair/Replacements: Any structural repairs/replacements shall be performed with the proper approval/concurrences required by OSHA, the applicable ASME standards, and the manufacturers' requirements. Procedures will be conducted by properly qualified personnel. (Requirement 40651)</p>	<p>Not covered in OSHA 1910.179</p>	<p>2-2.3.3 Adjustments, Repairs, and Replacements (a) Any condition disclosed by the inspections performed in accordance with the requirements of Section 2-2.1, that is determined to be a hazard to continued operation, shall be corrected by adjustment, repair, or replacement before continuing the use of the crane. (b) Adjustments, repairs, and replacements shall be performed by designated personnel. (e) If repairs of load-sustaining members are made by welding, identification of materials shall be made and appropriate welding procedures shall be followed.</p>				
04.5.3.c	<p>Maintenance: Repair/Replacements: The need to replace wire rope shall be determined by a certified or otherwise qualified person based on an evaluation of inspection results. Any of the following signs of deterioration and damage are sufficient reasons for rejection of the rope (see Wire Rope Users Manual for additional information on wire rope inspections): (Requirement 40652)</p>	<p>1910.179(m)(1) Running ropes. A thorough inspection of all ropes shall be made at least once a month and a certification record which includes the date of inspection, the signature of the person who performed the inspection and an identifier for the ropes which were inspected shall be kept on file where readily available to appointed personnel. Any deterioration, resulting in appreciable loss of original strength, shall be carefully observed and determination made as to whether further use of the rope would constitute a safety hazard. Some of the conditions that could result in an appreciable loss of strength are the following: 1910.179(m)(1)(vi) Severe kinking, crushing, cutting, or unstranding.</p>					

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04.5.3.c.1	Maintenance: Repair/Replacements: Any of the following signs of deterioration and damage are sufficient reasons for rejection of the rope (see Wire Rope Users Manual for additional information on wire rope inspections): In running ropes, twelve randomly distributed broken wires in one rope lay or four broken wires in one strand in one lay or one valley break. (Requirement 40653)	Running ropes. A thorough inspection of all ropes shall be made at least once a month and a certification record which includes the date of inspection, the signature of the person who performed the inspection and an identifier for the ropes which were inspected shall be kept on file where readily available to appointed personnel. Any deterioration, resulting in appreciable loss of original strength, shall be carefully observed and determination made as to whether further use of the rope would constitute a safety hazard. Some of the conditions that could result in an appreciable loss of strength are the following: 1910.179(m)(1)(ii) A number of broken outside wires and the degree of distribution or concentration of such broken wires. 1910.179(m)(1)(iii) Worn outside wires. 1910.179(m)(1)(iv) Corroded or broken wires at end connections. 1910.179(m)(1)(v) Corroded, cracked, bent, worn, or improperly applied end connections. 1910.179(m)(1)(vi) Severe kinking, crushing, cutting, or unstranding.	2-2.4.2 Rope Replacement (1) in running ropes, twelve randomly distributed broken wires in one lay or four broken wires in one strand in one lay, except as noted in para. 2-2.4.2(b)(2)				
04.5.3.c.2	Maintenance: Repair/Replacements: Any of the following signs of deterioration and damage are sufficient reasons for rejection of the rope (see Wire Rope Users Manual for additional information on wire rope inspections): Individual outside wires with wear of 1/3 the original diameter. (Requirement 40654)	See above	2-2.4.2 Rope Replacement; (4) wear of one-third the original diameter of outside individual wires				
04.5.3.c.3	Maintenance: Repair/Replacements: Any of the following signs of deterioration and damage are sufficient reasons for rejection of the rope (see Wire Rope Users Manual for additional information on wire rope inspections): Kinking, crushing, bird caging, or any other damage resulting in distortion. (Requirement 40655)	See above	2-2.4.2 Rope Replacement; (5) kinking, crushing, birdcaging, or any other damage resulting in distortion of the rope structure				
04.5.3.c.4	Maintenance: Repair/Replacements: Any of the following signs of deterioration and damage are sufficient reasons for rejection of the rope (see Wire Rope Users Manual for additional information on wire rope inspections): Evidence of heat damage. (Requirement 40656)	Not covered in OSHA 1910.179	2-2.4.2 Rope Replacement; (6) evidence of heat damage from any cause				
04.5.3.c.5	Maintenance: Repair/Replacements: Any of the following signs of deterioration and damage are sufficient reasons for rejection of the rope (see Wire Rope Users Manual for additional information on wire rope inspections): End connectors that are cracked, deformed, or with evidence of rope pullout. (Requirement 40657)	1910.179(m)(1)(v) Corroded, cracked, bent, worn, or improperly applied end connections.	Not covered in ASME B30.2.				
04.5.3.c.6	Maintenance: Repair/Replacements: Any of the following signs of deterioration and damage are sufficient reasons for rejection of the rope (see Wire Rope Users Manual for additional information on wire rope inspections): Corrosion (internal or external) that results in reduction of rope diameter, or at end connectors. (Requirement 40658)	1910.179(m)(1)(v) Corroded, cracked, bent, worn, or improperly applied end connections. 1910.179(m)(1)(i) Reduction of rope diameter below nominal diameter due to loss of core support, internal or external corrosion, or wear of outside wires.	2-2.4.2 Rope Replacement; (b) reduction of rope diameter below nominal diameter due to loss of core support, internal or external corrosion, or wear of outside wires				
04.5.3.c.7	Maintenance: Repair/Replacements: Any of the following signs of deterioration and damage are sufficient reasons for rejection of the rope (see Wire Rope Users Manual for additional information on wire rope inspections): Reductions of nominal diameter (measured with a caliper or go/no-go gage) of more than: (Requirement 40659)	1910.179(m)(1)(i) Reduction of rope diameter below nominal diameter due to loss of core support, internal or external corrosion, or wear of outside wires.	2-2.4.2 Rope Replacement; (7) reductions from nominal diameter greater than those listed below; Maximum Allowable Reduction From Rope Diameter Nominal Diameter Up to 5/16 in. (8 mm) 1/64 in. (0.4 mm) Over 5/16 in. to 1/2 in. (13 mm) 1/32 in. (0.8 mm) Over 1/2 in. to 3/4 in. (19 mm) 3/64 in. (1.2 mm) Over 3/4 in. to 1 1/8 in. (29 mm) 1/16 in. (1.6 mm) Over 1 1/8 in. to 1 1/2 in. (38 mm) 3/32 in. (2.4 mm)				
04.5.3.c.7.a	Maintenance: Repair/Replacements: Any of the following signs of deterioration and damage are sufficient reasons for rejection of the rope (see Wire Rope Users Manual for additional information on wire rope inspections): Reductions of nominal diameter (measured with a caliper or go/no-go gage) of more than: 1/64 inch (0.4 mm) for diameters of rope up to 5/16 inch (8.0 mm). (Requirement 40660)	1910.179(m)(1)(i) Reduction of rope diameter below nominal diameter due to loss of core support, internal or external corrosion, or wear of outside wires.	See above				

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04.5.3.c.7.b	Maintenance: Repair/Replacements: Any of the following signs of deterioration and damage are sufficient reasons for rejection of the rope (see Wire Rope Users Manual for additional information on wire rope inspections): Reductions of nominal diameter (measured with a caliper or go/no-go gage) of more than: 1/32 inch (0.8 mm) for diameters 3/8 inch (9.5 mm) to 1/2 inch (13.0 mm). (Requirement 40661)	1910.179(m)(1)(i) Reduction of rope diameter below nominal diameter due to loss of core support, internal or external corrosion, or wear of outside wires.	See above				
04.5.3.c.7.c	Maintenance: Repair/Replacements: Any of the following signs of deterioration and damage are sufficient reasons for rejection of the rope (see Wire Rope Users Manual for additional information on wire rope inspections): Reductions of nominal diameter (measured with a caliper or go/no-go gage) of more than: 3/64 inch (1.2 mm) for diameters 9/16 inch (14.5 mm) through 3/4 inch (19.0 mm). (Requirement 40662)	1910.179(m)(1)(i) Reduction of rope diameter below nominal diameter due to loss of core support, internal or external corrosion, or wear of outside wires.	See above				
04.5.3.c.7.d	Maintenance: Repair/Replacements: Any of the following signs of deterioration and damage are sufficient reasons for rejection of the rope (see Wire Rope Users Manual for additional information on wire rope inspections): Reductions of nominal diameter (measured with a caliper or go/no-go gage) of more than: 1/16 inch (1.6 mm) for diameters 7/8 inch (22.0 mm) through 1-1/8 inches (29.0 mm). (Requirement 40663)	1910.179(m)(1)(i) Reduction of rope diameter below nominal diameter due to loss of core support, internal or external corrosion, or wear of outside wires.	See above				
04.5.3.c.7.e	Maintenance: Repair/Replacements: Any of the following signs of deterioration and damage are sufficient reasons for rejection of the rope (see Wire Rope Users Manual for additional information on wire rope inspections): Reductions of nominal diameter (measured with a caliper or go/no-go gage) of more than: 3/32 inch (2.4 mm) for diameters greater than 1-1/8 inches (29.0 mm). (Requirement 40664)	1910.179(m)(1)(i) Reduction of rope diameter below nominal diameter due to loss of core support, internal or external corrosion, or wear of outside wires.	See above				
04.5.3.d	Maintenance: Repair/Replacements: If replaced, the new rope shall be proof load tested using the associated crane proof load value. (Requirement 40665)	Not covered in OSHA 1910.179	2-2.2.2 Load Test (a) New, reinstalled, altered, repaired, and modified cranes should be load tested prior to initial use, as determined by a qualified person. (b) Load testing of altered, repaired, and modified cranes may be limited to the functions affected by the alteration, repair, or modification, as determined by a qualified person. (c) The replacement of load chain and rope is specifically excluded from this load test; however, an operational test of the hoist shall be made in accordance with para. 2-2.2.1(b) prior to putting the crane back in service. (d) If a load test is conducted, the load shall be not less than 100% of the rated load of the crane or hoist(s), whichever governs; or more than 125% of the rated load of the crane or hoist(s), whichever governs; unless otherwise recommended by the manufacturer or a qualified person.				
04.6.1(1)	Personnel Certification: Program: Only certified (licensed) and trained operators shall be authorized to use/operate cranes. (Requirement 40667)	Not covered in OSHA 1910.179	SECTION 2-3.1: QUALIFICATIONS FOR AND CONDUCT OF OPERATORS 2-3.1.1 Operators of Cab-Operated and Pulpit-Operated Cranes (a) Cranes shall be operated only by the following qualified personnel: (1) designated persons (2) trainees under the direct supervision of a designated person (3) maintenance and test personnel, when it is necessary in the performance of their duties (b) No one other than personnel specified in para. 2-3.1.1(a) shall enter a crane cab or pulpit, with the exception of persons such as oilers and supervisors, whose duties require them to do so, and then only in the performance of their duties and with the				

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04.6.1(2)	Personnel Certification: Program: A training, examination, and licensing program shall be established or made available. (Requirement 40668)	Not covered in OSHA 1910.179	2-3.1.2 Qualifications for Operators of Cab-Operated and Pulpit-Operated Cranes (a) Operators shall be required by the employer to pass a written or oral examination and a practical operating examination unless able to furnish satisfactory evidence of qualifications and experience. Qualifications shall be limited to the specific type of equipment for which the operator is being examined.; 2-3.1.4 Qualifications for Operators of Floor-Operated Cranes Personnel shall be required by the employer to pass a practical operating examination. Qualifications shall be limited to the specific type of equipment for which the operator is being examined.				
04.6.1(3)	Personnel Certification: Program: 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. The operator certification program will be reviewed at least annually to assure that the contents, training material, testing, and examination elements are up-to-date with current methods and techniques; and that any "lessons-learned" are adequately addressed. (Requirement 40669)	Not covered in OSHA 1910.179	Not covered in ASME B30.2.				
04.6.1(4)	Personnel Certification: Program: Riggers (see Section 10) and personnel performing NDT (see paragraph 1.9) shall be certified in their discipline. (Requirement 40670)	Not covered in OSHA 1910.179	Not covered in ASME B30.2.				
04.6.1(5)	Personnel Certification: Program: Training shall be provided to observers and flagmen. (Requirement 40671)	Not covered in OSHA 1910.179	Not covered in ASME B30.2.				
04.6.1(6)	Personnel Certification: Program: All participants in the lifting operation shall have clearly defined roles and responsibilities. (Requirement 40672)	Not covered in OSHA 1910.179	Not covered in ASME B30.2.				
04.6.2	Personnel Certification: Levels: Two levels of operator training and proficiency will be established. Operations where critical lifts are involved will require a more rigid operator certification program than those operations that involve more routine lifts that do not involve critical hardware or unique hazards. (Requirement 40673)	Not covered in OSHA 1910.179	Not covered in ASME B30.2.				
04.6.2.a	Personnel Certification: Levels: Noncritical Lifts. The certification program for noncritical lift operators shall include the following: (Requirement 40674)	Not covered in OSHA 1910.179					
04.6.2.a.1.a	Personnel Certification: Levels: Noncritical Lifts. The certification program for noncritical lift operators shall include the following: Training: Classroom training in safety, lifting equipment emergency procedures, general performance standards, requirements, pre-operational checks, and safety-related defects and symptoms (for initial certification and as needed). (Requirement 40676)	Not covered in OSHA 1910.179	SECTION 2-3.1: QUALIFICATIONS FOR AND CONDUCT OF OPERATORS; THESE ITEMS NOT FULLY COVERED IN ASME B30.2				
04.6.2.a.1.b	Personnel Certification: Levels: Noncritical Lifts. The certification program for noncritical lift operators shall include the following: Training: Hands-on training (for initial certification and as needed). (Requirement 40677)	Not covered in OSHA 1910.179	SECTION 2-3.1: QUALIFICATIONS FOR AND CONDUCT OF OPERATORS 2-3.1.1 Operators of Cab-Operated and Pulpit-Operated Cranes (a) Cranes shall be operated only by the following qualified personnel: (1) designated persons (2) trainees under the direct supervision of a designated person				
04.6.2.a.1.c	Personnel Certification: Levels: Noncritical Lifts. The certification program for noncritical lift operators shall include the following: Training: An annual review of the items in paragraph 4.6.2.a(1) above. (This may be conducted informally by local supervisory personnel.) (Requirement 40678)	not covered in OSHA 1910.179	Not covered in ASME B30.2.				

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04.6.2.a.2.a	Personnel Certification: Levels: Noncritical Lifts. The certification program for noncritical lift operators shall include the following: Examination: Physical examination (criteria to be determined by the cognizant medical official and should comply with ASME B30.2). (Requirement 40680)	not covered in OSHA 1910.179	2-3.1.2 Qualifications for Operators of Cab-Operated and Pulpit-Operated Cranes (a) Operators shall be required by the employer to pass a written or oral examination and a practical operating examination unless able to furnish satisfactory evidence of qualifications and experience. Qualifications shall be limited to the specific type of equipment for which the operator is being examined. (b) Operators and operator trainees shall meet the following physical qualifications: (1) have vision of at least 20/30 Snellen in one eye, and 20/50 Snellen in the other, with or without corrective lenses. (2) be able to distinguish colors, regardless of position of colors, if color differentiation is required for operation. (3) be able to hear, with or without hearing aid, adequately for a specific operation. (4) have sufficient strength, endurance, agility, coordination, and speed of reaction to meet the demands of equipment operation. (5) not have evidence of physical defects, or emotional instability that could render a hazard to the operator or others, or which, in the opinion of the examiner, could interfere with the operator's performance. Evidence of such conditions may be cause for disqualification. In such cases, specialized clinical or medical judgments and tests may be required. (6) not have evidence of being subject to seizures or loss of physical control. Evidence of such conditions shall be reason for disqualification. Specialized medical tests may be				
04.6.2.a.2.b	Personnel Certification: Levels: Noncritical Lifts. The certification program for noncritical lift operators shall include the following: Examination: Written examination. (Requirement 40681)	not covered in OSHA 1910.179	2-3.1.2 Qualifications for Operators of Cab-Operated and Pulpit-Operated Cranes (a) Operators shall be required by the employer to pass a written or oral examination and a practical operating examination unless able to furnish satisfactory evidence of qualifications and experience. Qualifications shall be limited to the specific type of equipment for which the operator is being examined.				
04.6.2.a.2.c	Personnel Certification: Levels: Noncritical Lifts. The certification program for noncritical lift operators shall include the following: Examination: Operational demonstration (for initial certification only). (Requirement 40682)	not covered in OSHA 1910.179	2-3.1.2 Qualifications for Operators of Cab-Operated and Pulpit-Operated Cranes (a) Operators shall be required by the employer to pass a written or oral examination and a practical operating examination unless able to furnish satisfactory evidence of qualifications and experience. Qualifications shall be limited to the specific type of equipment for which the operator is being examined.				
04.6.2.a.2.d	Personnel Certification: Levels: Noncritical Lifts. The certification program for noncritical lift operators shall include the following: Examination: Proficiency examination for recertification. (Requirement 40683)	not covered in OSHA 1910.179	Not covered in ASME B30.2.				
04.6.2.a.3.a(1)	Personnel Certification: Levels: Noncritical Lifts. The certification program for noncritical lift operators shall include the following: Licensing/Operator Certification: An organizational element shall be designated to issue operator licenses/operator certification. (Requirement 40685)	not covered in OSHA 1910.179	SECTION 2-3.1: QUALIFICATIONS FOR AND CONDUCT OF OPERATORS 2-3.1.1 Operators of Cab-Operated and Pulpit-Operated Cranes (a) Cranes shall be operated only by the following qualified personnel: (1) designated persons (2) trainees under the direct supervision of a designated person (3) maintenance and test personnel, when it is necessary in the performance of their duties (b) No one other than personnel specified in para. 2-3.1.1(a) shall enter a crane cab or pulpit, with the exception of persons such as oilers and supervisors, whose duties require them to do so, and then only in the performance of their duties and with the knowledge of the operator or other appointed person.				
04.6.2.a.3.a(2)	Personnel Certification: Levels: Noncritical Lifts. The certification program for noncritical lift operators shall include the following: Licensing/Operator Certification: Provisions shall be made to revoke licenses for negligence, violations of safety requirements, or failure to meet medical standards. (Requirement 40686)	not covered in OSHA 1910.179	Not covered in ASME B30.2.				

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04.6.2.a.3.a(3)	Personnel Certification: Levels: Noncritical Lifts. The certification program for noncritical lift operators shall include the following: Licensing/Operator Certification: Provisions shall be made for periodic checks of operators to verify they have licenses in their possession. (Requirement 40687)	Not covered in OSHA 1910.179	Not covered in ASME B30.2.				
04.6.2.a.3.a(4)	Personnel Certification: Levels: Noncritical Lifts. The certification program for noncritical lift operators shall include the following: Licensing/Operator Certification: The licenses shall indicate the type of crane the holder is qualified to operate. Alternately, the organizational element may elect to maintain a master list of licensed operators instead of issuing individual licenses, providing copies of the list are readily available to assurance and supervisory personnel at the work site. (Requirement 40688)	Not covered in OSHA 1910.179	Not covered in ASME B30.2.				
04.6.2.a.3.b	Personnel Certification: Levels: Noncritical Lifts. The certification program for noncritical lift operators shall include the following: Licensing/Operator Certification: Renewal of all licenses shall require demonstration of proficiency or approval of supervision that proficiency is adequate and current. Licenses or certifications will expire at least every 4 years. Renewal procedures will be established by each licensing organization but, as a minimum, will include items in paragraphs 4.6.2.a.(1) and 4.6.2.a.(2). (Requirement 40689)	Not covered in OSHA 1910.179	Not covered in ASME B30.2.				
04.6.2.b	Personnel Certification: Levels: Critical Lifts. Besides the training, examination, licensing, and renewal requirements for noncritical lifts, operators that are being certified to perform critical lifts must be trained in the specific hazards and special procedures associated with the lift. Operators also must demonstrate proficiency and operating finesse with the crane using a test load as appropriate for the initial certification or alternately be directly supervised by a certified operator during the first initial lifting period. The licenses will indicate specific cranes for which the operator is certified. (Requirement 40690)	Not covered in OSHA 1910.179	Not covered in ASME B30.2.				
04.7(1)	Operations: Cranes shall be operated according to this section, the manufacturers' recommendations, and ASME B30.2. (Requirement 40691)	Not covered in OSHA 1910.179	Not covered in ASME B30.2.				
04.7(2)	Operations: The following practices shall be followed for crane operations: (Requirement 40692)						
04.7.a(1)	Operations: The following practices shall be followed for crane operations: General operating procedures describing crane operation, emergency steps, communication requirements, and special requirements including checklists and inspection requirements shall be prepared, approved, and followed for each crane. There must be a formal system for review, approval, and update to maintain valid operating procedures. (Requirement 40693)	Not covered in OSHA 1910.179	Not covered in ASME B30.2.				
04.7.a(2)	Operations: The following practices shall be followed for crane operations: Emergency procedures shall be developed for contingency actions such as power loss, brake failure, or other emergencies (also, see paragraph 1.5.1.c). (Requirement 40694)	Not covered in OSHA 1910.179	Not covered in ASME B30.2.				
04.7.aa(1)	Operations: The following practices shall be followed for crane operations: Crane crew discipline shall be maintained at all times during a crane operation. (Requirement 40695)	Not covered in OSHA 1910.179	2-3.1.7 Conduct of Operators LOTS OF REQUIREMENTS A-Q				
04.7.aa(2)	Operations: The following practices shall be followed for crane operations: There shall be no eating, drinking, or rowdiness during crane operation. (Requirement 40696)	Not covered in OSHA 1910.179	Not covered in ASME B30.2.				

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04.7.ab	Operations: The following practices shall be followed for crane operations: Outdoor hoisting operations should not commence if winds are above 20 knots (23 mph, 37 km/hr) steady state or if gusts exceed 35 knots (40 mph, 65 km/hr). Consideration shall also be given to sail area and weather conditions such as lightning or snow before commencing operations. (Requirement 40697)	1910.179(b)(4) Wind indicators and rail clamps. Outdoor storage bridges shall be provided with automatic rail clamps. A wind-indicating device shall be provided which will give a visible or audible alarm to the bridge operator at a predetermined wind velocity. If the clamps act on the rail heads, any beads or weld flash on the rail heads shall be ground off. 1910.179(j)(3) Periodic inspection. 1910.179(j)(3)(vi) Load, wind, and other indicators over their full range, for any significant inaccuracies. Why are wind limitations listed for overhead cranes which are normally inside? EL	SECTION 2-1.3: GENERAL CONSTRUCTION — RUNWAYS AND SUPPORTING STRUCTURE 2-1.3.1 Foundations and Anchorages; (g) A wind-indicating device shall be provided for all outdoor cranes. The device shall be mounted on the crane or the crane runway structure and shall give a visible and audible alarm to the crane operator at a predetermined wind velocity. A single wind-indicating device may serve as an alarm for more than one crane.; 2-3.1.7 Conduct of Operators; (m) When the wind-indicating device of a cab-operated outdoor crane gives the alarm, crane operation shall be discontinued and the crane shall be prepared and stored for excessive wind conditions.				
04.7.ac	Operations: The following practices shall be followed for crane operations: A carbon dioxide, dry chemical, or equivalent fire extinguisher shall be kept in the cab or in the immediately available vicinity of the crane. (Requirement 40698)	1910.179(c)(3) Fire extinguisher. Carbon tetrachloride extinguishers shall not be used. 1910.179(o)(3) Fire extinguishers. The employer shall insure that operators are familiar with the operation and care of fire extinguishers provided.	SECTION 2-1.5: CABS — NORMAL OR SKELETON (IF PROVIDED); 2-1.5.2 Cab Construction; 2-1.5.5 Fire Extinguisher A portable fire extinguisher, with a basic minimum extinguisher rating of 10 BC, shall be installed in the cab.; 2-3.4.3 Fire Extinguishers Operators shall be familiar with the location, operation, and care of fire extinguishers provided (see para. 2-1.5.5).				
04.7.ad	Operations: The following practices shall be followed for crane operations: Wire rope should be used in accordance with the Wire Rope Users Manual. (Requirement 40699)	Not covered in OSHA 1910.179	Not covered in ASME B30.2.				
04.7.b(1)	Operations: The following practices shall be followed for crane operations: Operations shall be analyzed for hazards. (Requirement 40700)	Not covered in OSHA 1910.179	Not covered in ASME B30.2.				
04.7.b(2)	Operations: The following practices shall be followed for crane operations: The analysis shall consider the environment in which the operation occurs, hazards associated with crane maintenance, and, in general, a safety analysis of the equipment, facility, load, human factors, and interfaces as a whole in support of the lifting operation. (Requirement 40701)	Not covered in OSHA 1910.179	Not covered in ASME B30.2.				
04.7.c	Operations: The following practices shall be followed for crane operations: Methods and procedures shall be developed for lowering a load in the event of crane failure or other contingencies. These should be demonstrated and verified if practical. (Requirement 40702)	Not covered in OSHA 1910.179	Not covered in ASME B30.2.				
04.7.d	Operations: The following practices shall be followed for crane operations: A crane shall not be loaded beyond its rated load (capacity) except for required testing. (Requirement 40703)	1910.179(k)(2) Rated load test. Test loads shall not be more than 125 percent of the rated load unless otherwise recommended by the manufacturer. The test reports shall be placed on file where readily available to appointed personnel. 1910.179(n)(1) Size of load. The crane shall not be loaded beyond its rated load except for test purposes as provided in paragraph (k) of this section.	2-3.2.1 Load Weight (a) The crane shall not be loaded in excess of its rated load except for test purposes, as provided in para. 2-2.2.2, or for planned engineered lifts, as provided in para. 2-3.2.1.1.; 2-3.2.1.1 Planned Engineered Lifts. Lifts in excess of the rated load may be required from time to time on a limited basis for specific purposes such as new construction or major repairs. Every planned engineered lift exceeding the rated load shall be treated as a special and separate event. Limitations and planned requirements shall be applicable, as follows: (b) When planned engineered lifts are made, the load shall not exceed 125% of the crane load rating, except as provided in para. 2-3.2.1.1(d). (d) The crane manufacturer shall be consulted if the planned engineered lift exceeds 125% of rated load or if the frequency of planned engineered lifts exceeds two during a continuous 12-month period.				

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04.7.e(1)	Operations: The following practices shall be followed for crane operations: Cranes shall not be used to load test items such as slings, platforms, or lifting fixtures unless specifically identified to do so based on a specified percentage of rated load, and a safety analysis approved by the LDEM and the responsible safety, engineering, operations, and maintenance organizations. (Requirement 40704)	Not covered in OSHA 1910.179	Not covered in ASME B30.2.				
04.7.e(2)	Operations: The following practices shall be followed for crane operations: Test procedures shall be approved by the responsible safety, engineering, operations, and maintenance organizations. This is to ensure that the crane is not damaged due to sudden unloading should the test article fail. (Requirement 40705)	Not covered in OSHA 1910.179	Not covered in ASME B30.2.				
04.7.e(3)	Operations: The following practices shall be followed for crane operations: Appendix D, crane/hoist requirements to load test other lifting equipment, shall be followed. (Requirement 40706)	Not covered in OSHA 1910.179	Not covered in ASME B30.2.				
04.7.f	Operations: The following practices shall be followed for crane operations: Cranes shall not be used for side pulls unless specifically designed to do so. (Requirement 40707)	1910.179(n)(3)(iv) Cranes shall not be used for side pulls except when specifically authorized by a responsible person who has determined that the stability of the crane is not thereby endangered and that various parts of the crane will not be overstressed.	2-3.2.3 Moving the Load; (c) Cranes shall not be used for side pulls, except when specifically authorized by a qualified person who has determined that (1) the various parts of the crane will not be overstressed (2) the hoist rope will not bear or rub against other members of the crane, such as the girders or trolley frame, except members specifically designed for such contact (3) such side pulls will not cause the hoist rope to be pulled out of the sheaves or across drum grooves (4) such side pulls will not result in excessive swinging of the load block or load				
04.7.g(1)	Operations: The following practices shall be followed for crane operations: There shall be a system for documenting crane problems/discrepancies. (Requirement 40708)	1910.179(l)(3)(i) Any unsafe conditions disclosed by the inspection requirements of paragraph (j) of this section shall be corrected before operation of the crane is resumed. Adjustments and repairs shall be done only by designated personnel.	2-2.3.3 Adjustments, Repairs, and Replacements (a) Any condition disclosed by the inspections performed in accordance with the requirements of Section 2-2.1, that is determined to be a hazard to continued operation, shall be corrected by adjustment, repair, or replacement before continuing the use of the crane. (b) Adjustments, repairs, and replacements shall be performed by designated personnel.;				
04.7.g(2)	Operations: The following practices shall be followed for crane operations: Prior to an operation, the operator shall review any previously noted problems/discrepancies to determine possible impact on planned activity. (Requirement 40709)	Not covered in OSHA 1910.179	2-3.1.7 Conduct of Operators, (j) The operator shall be familiar with the equipment and its proper care. If adjustments or repairs are necessary, or any defects are known, the operator shall report the same promptly to the appointed person who shall be responsible for the operation and maintenance repairs of the crane. The operator shall also notify the next operator of any remaining uncorrected defects upon changing shifts.				
04.7.h(1)	Operations: The following practices shall be followed for crane operations: The operator shall ensure that the crane is within inspection and testing intervals by examination of the periodic recertification test tags and/or documentation. (Requirement 40710)	Not covered in OSHA 1910.179	Not covered in ASME B30.2.				
04.7.h(2)	Operations: The following practices shall be followed for crane operations: The operator shall adhere to all tags placed on the crane controls. (Requirement 40711)	Not covered in OSHA 1910.179	Not covered in ASME B30.2.				

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04.7.i(1)	Operations: The following practices shall be followed for crane operations: Before each lift or series of lifts, the operator shall perform a pre-operational check to demonstrate operational readiness. If controls do not operate properly, the operator is responsible for notifying the supervisor. (Requirement 40712)	1910.179(j)(2) Frequent inspection. The following items shall be inspected for defects at intervals as defined in paragraph (j)(1)(ii) of this section or as specifically indicated, including observation during operation for any defects which might appear between regular inspections. All deficiencies such as listed shall be carefully examined and determination made as to whether they constitute a safety hazard: 1910.179(j)(2)(i) All functional operating mechanisms for maladjustment interfering with proper operation. Daily. 1910.179(j)(2)(ii) Deterioration or leakage in lines, tanks, valves, drain pumps, and other parts of air or hydraulic systems. Daily.	2-3.1.7 Conduct of Operators, (o) All controls shall be tested by the operator before beginning a new shift. If any controls do not operate properly, they should be adjusted or repaired before operations are begun.				
04.7.i(2)	Operations: The following practices shall be followed for crane operations: Repairs and adjustments shall be made before operations begin. (Requirement 40713)	See above	2-3.1.7 Conduct of Operators, (o) All controls shall be tested by the operator before beginning a new shift. If any controls do not operate properly, they should be adjusted or repaired before operations are begun.				
04.7.j(1)	Operations: The following practices shall be followed for crane operations: The operator shall establish safety zones before initiating operations. Safety zones should have appropriate barriers (rope, cones, or other) established prior to lift. Personnel on the crane should be minimized during crane movement. (Requirement 40714)	1910.179(l)(2)(i)(a) The crane to be repaired shall be run to a location where it will cause the least interference with other cranes and operations in the area.	Not covered in ASME B30.2.				
04.7.j(2)	Operations: The following practices shall be followed for crane operations: Any personnel on the crane shall be made aware of and avoid pinch points at their respective location. (Requirement 40715)	Not covered in OSHA 1910.179	Not covered in ASME B30.2.				
04.7.k(1)	Operations: The following practices shall be followed for crane operations: Before each lift or series of lifts, the operator shall functionally test proper operation of the upper limit switch with no load on the hook. (Requirement 40716)	1910.179(n)(4) Hoist limit switch. 1910.179(n)(4)(i) At the beginning of each operator's shift, the upper limit switch of each hoist shall be tried out under no load. Extreme care shall be exercised; the block shall be "inched" into the limit or run in at slow speed. If the switch does not operate properly, the appointed person shall be immediately notified.	2-3.2.4 Hoist-Limit Devices (Switches) (a) Prior to the initial use of any hoist during each shift, the operator shall verify operation of the upper limit device under no-load conditions. If more than one upper-limit device is present, only the operation of the primary upper-limit device need be verified. Care shall be exercised; the block shall be inched into the limit or run in at slow speed. If the device does not operate properly, the operator shall immediately notify the appointed person.				
04.7.k(2)	Operations: The following practices shall be followed for crane operations: Upper limit switches shall not be used as operating controls. (Requirement 40717)	1910.179(n)(4)(ii) The hoist limit switch which controls the upper limit of travel of the load block shall never be used as an operating control.	2-3.2.4 Hoist-Limit Devices (Switches) (b) The hoist-limit device that controls the upper limit of travel of the load block shall not be used as an operating control in normal operation unless additional means are provided to prevent damage from overtravel.				
04.7.L(1)	Operations: The following practices shall be followed for crane operations: Before starting to hoist, the following conditions shall be noted: the hoist rope shall not be kinked, (Requirement 40718)	1910.179(n)(3)(ii) Before starting to hoist the following conditions shall be noted: 1910.179(n)(3)(ii)(a) Hoist rope shall not be kinked.	2-3.2.3 Moving the Load (a) The appointed person directing the lift shall ascertain that (3) the hoist rope is not kinked 2-1.1.5 Warnings (a) Floor-operated and remote-operated cranes shall have a safety label or labels affixed to the pendant station, portable operating station, or load block. The label or labels shall be in compliance with ANSI Z535.4, and shall include, but not be limited to, cautionary language against (3) operating hoist with twisted, kinked , or damaged chain or rope (b) Cab-operated and pulpit-operated cranes shall have a safety label or labels affixed in the cab or pulpit. The label or labels shall be in compliance with ANSI Z535.4, and shall include, but not be limited to, cautionary language against (3) operating hoist with twisted, kinked , or damaged chain or rope				

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04.7.L(2)	Operations: The following practices shall be followed for crane operations: Before starting to hoist, the following conditions shall be noted: multiple part ropes shall not be twisted around each other, (Requirement 40719)	1910.179(n)(3)(ii)(b) Multiple part lines shall not be twisted around each other.	2-3.2.3 Moving the Load (a) The appointed person directing the lift shall ascertain that (3) the hoist rope is not kinked (4) multiple part lines are not twisted around each other				
04.7.L(3)	Operations: The following practices shall be followed for crane operations: Before starting to hoist, the following conditions shall be noted: and the hook shall be centered over the load in such a manner as to prevent swinging or side pulls. (Requirement 40720)	1910.179(n)(3)(ii)(c) The hook shall be brought over the load in such a manner as to prevent swinging. 1910.179(a)(54) "Side pull" means that portion of the hoist pull acting horizontally when the hoist lines are not operated vertically.	2-1.1.5 Warnings (a) Floor-operated and remote-operated cranes shall have a safety label or labels affixed to the pendant station, portable operating station, or load block. The label or labels shall be in compliance with ANSI Z535.4, and shall include, but not be limited to, cautionary language against (2) operating hoist when load is not centered under hoist; (b) Cab-operated and pulpit-operated cranes shall have a safety label or labels affixed in the cab or pulpit. The label or labels shall be in compliance with ANSI Z535.4, and shall include, but not be limited to, cautionary language against (1) lifting more than rated load (2) operating hoist when load is not centered under hoist 2-3.2.3 Moving the Load (a) The appointed person directing the lift shall ascertain that (5) the hook is brought over the load in such a manner as to minimize swinging				
04.7.m(1)	Operations: The following practices shall be followed for crane operations: The operator shall know the weight of the working load. (Requirement 40721)	1910.179(n)(3)(vii) The operator shall test the brakes each time a load approaching the rated load is handled. The brakes shall be tested by raising the load a few inches and applying the brakes.	2-3.2.1 Load Weight (a) The crane shall not be loaded in excess of its rated load except for test purposes, as provided in para. 2-2.2.2, or for planned engineered lifts, as provided in para. 2-3.2.1.1. (b) The combined load applied to more than one hoisting unit shall not exceed the rated load of the crane when the crane has more than one hoisting unit.				
04.7.m(2)	Operations: The following practices shall be followed for crane operations: When raising loads that approach 75% of the rated capacity of the crane, the operator shall test the holding brakes. (Requirement 40722)	1910.179(n)(3)(vii) The operator shall test the brakes each time a load approaching the rated load is handled. The brakes shall be tested by raising the load a few inches and applying the brakes.	SECTION 2-3.2: HANDLING THE LOAD 2-3.2.1 Load Weight 2-3.2.1.1 Planned Engineered Lifts. (6) The operator shall test the crane at the planned engineered load by lifting the load a short distance and setting the brakes. The lift shall only be continued if the brakes stop and hold the load. Any failure to hold the load shall be corrected before proceeding with the lift.; 2-2.2.2 Load Test, (1) Hoist the test load a distance to assure that the load is supported by the crane and held by the hoist brake(s). 2-3.2.3 Moving the Load, (g) The operator shall check the hoist brake(s) at least once each shift if a load approaching the rated load is to be handled. This shall be done by lifting the load a short distance and applying the brake(s).				
04.7.m(3)	Operations: The following practices shall be followed for crane operations: The brakes shall be tested by raising the load minimally above the surface and holding the load with the brake. The load should be held long enough to allow any dynamics to dampen out. (Requirement 40723)	1910.179(n)(3)(vii) The operator shall test the brakes each time a load approaching the rated load is handled. The brakes shall be tested by raising the load a few inches and applying the brakes.	See above				
04.7.n(1)	Operations: The following practices shall be followed for crane operations: If radio communications are to be used, operators and/or lift supervisors shall test the communication system prior to each operation. (Requirement 40724)	Not covered in OSHA 1910.179	Not covered in ASME B30.2.				
04.7.n(2)	Operations: The following practices shall be followed for crane operations: Operations shall stop immediately upon communication loss and shall not continue until communication is restored. (Requirement 40725)	Not covered in OSHA 1910.179	Not covered in ASME B30.2.				

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04.7.o(1)	Operations: The following practices shall be followed for crane operations: If hand signals are required, only standard signals shall be used according to Appendix B. (Requirement 40726)	Not covered in OSHA 1910.179	Fig. 10 Standard Hand Signals for Controlling Overhead and Gantry Cranes				
04.7.o(2)	Operations: The following practices shall be followed for crane operations: Hand signals shall be posted in a conspicuous location. (Requirement 40727)	Not covered in OSHA 1910.179	SECTION 2-3.3: SIGNALS 2-3.3.1 Standard Signals (c) Hand signals shall be posted conspicuously and should be as illustrated in Fig. 10.				
04.7.q	Operations: The following practices shall be followed for crane operations: If there is a slack rope condition, it shall be determined that the rope is properly seated on the drum and in the sheaves before starting the hoist. (Requirement 40729)	Not covered in OSHA 1910.179	2-3.2.3 Moving the Load (a) The appointed person directing the lift shall ascertain that, (6) the rope is seated in the drum grooves and in the sheaves, if there is or has been a slack rope condition				
04.7.r	Operations: The following practices shall be followed for crane operations: During hoisting, care shall be taken that there is no sudden acceleration or deceleration of the moving load and that the load does not contact any obstructions. (Requirement 40730)	1910.179(n)(3)(iii) During hoisting care shall be taken that: 1910.179(n)(3)(iii)(a) There is no sudden acceleration or deceleration of the moving load.	2-3.2.3 Moving the Load (a) The appointed person directing the lift shall ascertain that, (1) there is no sudden acceleration or deceleration of the moving load (2) the load does not contact any obstructions				
04.7.s(1)	Operations: The following practices shall be followed for crane operations: Loads shall be secured, balanced, and controlled with proper slings. (Requirement 40731)	1910.179(n)(3) Moving the load. 1910.179(n)(3)(i) The load shall be well secured and properly balanced in the sling or lifting device before it is lifted more than a few inches.	2-3.2.3 Moving the Load (a) The appointed person directing the lift shall ascertain that (2) the load is secured, balanced , and positioned in the hook, sling, or lifting device before the load is lifted more than a few inches (millimeters)				
04.7.s(2)	Operations: The following practices shall be followed for crane operations: The use of tag lines to keep the load stabilized shall be required whenever load swinging is anticipated to be a viable hazard. (Requirement 40732)	not covered in OSHA 1910.179	Not covered in ASME B30.2.				
04.7.s(3)	Operations: The following practices shall be followed for crane operations: Tag line personnel shall take care not to impart undesirable motion to the load. (Requirement 40733)	not covered in OSHA 1910.179	Not covered in ASME B30.2.				
04.7.t(1)	Operations: The following practices shall be followed for crane operations: Person(s) shall not ride the hook or load at anytime. (Requirement 40734)	1910.179(n)(3)(v) While any employee is on the load or hook, there shall be no hoisting, lowering, or traveling.	2-1.1.5 Warnings (a) Floor-operated and remote-operated cranes shall have a safety label or labels affixed to the pendant station, portable operating station, or load block. The label or labels shall be in compliance with ANSI Z535.4, and shall include, but not be limited to, cautionary language against (5) lifting people; (b) Cab-operated and pulpit-operated cranes shall have a safety label or labels affixed in the cab or pulpit. The label or labels shall be in compliance with ANSI Z535.4, and shall include, but not be limited to, cautionary language against (5) lifting people				
04.7.t(2)	Operations: The following practices shall be followed for crane operations: If conventional means of reaching a worksite such as an aerial platform, ladder, stairs, or scaffold would be more hazardous or not possible because of structural design or worksite conditions, 29 CFR 1926.550 and ASME B30.23 shall be followed for lifting of personnel with a crane, which is considered a critical lift (see Appendix C).	not covered in OSHA 1910.179	Not covered in ASME B30.2.				

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04.7.u	Operations: The following practices shall be followed for crane operations: Personnel shall not be located under suspended or moving loads unless the operation adheres to the OSHA-approved NASA Alternate Standard for Suspended Load Operations (see Appendix A). (Requirement 40736)	1910.179(n)(3)(vi) The employer shall require that the operator avoid carrying loads over people.	2-1.1.5 Warnings (a) Floor-operated and remote-operated cranes shall have a safety label or labels affixed to the pendant station, portable operating station, or load block. The label or labels shall be in compliance with ANSI Z535.4, and shall include, but not be limited to, cautionary language against (6) lifting loads over people; (b) Cab-operated and pulpit-operated cranes shall have a safety label or labels affixed in the cab or pulpit. The label or labels shall be in compliance with ANSI Z535.4, and shall include, but not be limited to, cautionary language against (6) lifting loads over people				
04.7.v	Operations: The following practices shall be followed for crane operations: The load shall not be lowered below the point where less than two full wraps of rope remain on the hoist drum. (Requirement 40737)	1910.179(h)(2)(iii) Rope shall be secured to the drum as follows: 1910.179(h)(2)(iii)(a) No less than two wraps of rope shall remain on the drum when the hook is in its extreme low position.	ASME: 2-1.14.3 Ropes (c) Rope shall be secured to the drum as follows: (1) No less than two wraps of rope shall remain on the drum at each anchorage of the hoisting drum when the hook is in its extreme low position unless a lowerlimit device is provided, in which case no less than one wrap shall remain. ; 2-3.2.3 Moving the Load, (h) The load shall not be lowered below the point where two wraps of rope remain on each anchorage of the hoisting drum unless a lower-limit device is provided, in which case, no less than one wrap shall remain.				
04.7.w	Operations: The following practices shall be followed for crane operations: A responsible person shall be in charge of the operation and shall instruct all personnel involved in the proper positioning, rigging, and moving to be done. (Requirement 40738)	1910.179(n)(3)(ix) When two or more cranes are used to lift a load one qualified responsible person shall be in charge of the operation. He shall analyze the operation and instruct all personnel involved in the proper positioning, rigging of the load, and the movements to be made.	2-3.2.3 Moving the Load (a) The appointed person directing the lift shall ascertain that....				
04.7.x(1)	Operations: The following practices shall be followed for crane operations: An operator shall be at the crane controls at all times while a load is suspended (OSHA requirement). (Requirement 40739)	1910.179(n)(3)(x) The employer shall insure that the operator does not leave his position at the controls while the load is suspended.	2-3.2.3 Moving the Load, (j) The operator shall not leave the position at the controls while the load is suspended over an area accessible to people. 2-3.1.7 Conduct of Operators, (f) Before leaving a cab-operated crane unattended, the operator shall land any attached load, place controllers in the off position, and deenergize the main switch (crane disconnect) of the specific crane. If all cranes on the runway are to be unattended for a period longer than one shift, the runway disconnect switch shall also be deenergized.				
04.7.x(2)	Operations: The following practices shall be followed for crane operations: Due to the length of some NASA operations, an operator change may be required while a load is suspended. This shall be accomplished via a procedure designed for the specific crane and operation, ensuring that the crane controls are manned at all times. (Requirement 40740)	1910.179(n)(3)(x) The employer shall insure that the operator does not leave his position at the controls while the load is suspended.	See above				
04.7.y(1)	Operations: The following practices shall be followed for crane operations: Hands shall be free from encumbrances while personnel are using crane ladders. (Requirement 40741)	1910.179(o)(1) Ladders. 1910.179(o)(1)(i) The employer shall insure that hands are free from encumbrances while personnel are using ladders.	SECTION 2-3.4: MISCELLANEOUS 2-3.4.1 Ladders (a) Hands shall be free from encumbrances while personnel are using ladders.				
04.7.y(2)	Operations: The following practices shall be followed for crane operations: Articles that are too large to be carried in pockets or belts shall be lifted and lowered by handline. (Requirement 40742)	..1910.179(o)(1)(ii) 1910.179(o)(1)(ii) Articles which are too large to be carried in pockets or belts shall be lifted and lowered by hand line.	SECTION 2-3.4: MISCELLANEOUS 2-3.4.1 Ladders (a) Hands shall be free from encumbrances while personnel are using ladders. (b) Articles that are too large to be carried in pockets or tool belts shall be lifted and lowered by hand line.				

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04.7.z(1)	Operations: The following practices shall be followed for crane operations: Necessary clothing and personal belongings in crane cab shall be stored so as not to interfere with access or operations. (Requirement 40743)	Cabs. 1910.179(o)(2)(i) Necessary clothing and personal belongings shall be stored in such a manner as not to interfere with access or operation.	2-3.4.2 Cabs (a) Necessary clothing and personal belongings shall be stored in a manner that does not interfere with access or operation.				
04.7.z(2)	Operations: The following practices shall be followed for crane operations: Tools, oil can, waste, extra fuses, and other necessary articles shall be stored properly and shall not be permitted to lie loose in the cab or on the crane. (Requirement 40744)	1910.179(o)(2)(ii) Tools, oil cans, waste, extra fuses, and other necessary articles shall be stored in the tool box, and shall not be permitted to lie loose in or about the cab.	2-3.4.2 Cabs (b) Tools, oil cans, rags, and other necessary articles shall be stored in a fire-resistant container and shall not be permitted to lie loose in or around the cab.				
04.7.z(3)	Operations: The following practices shall be followed for crane operations: Operators shall be familiar with the operation and care of the fire extinguisher provided. (Requirement 40745)	1910.179(o)(3) Fire extinguishers. The employer shall insure that operators are familiar with the operation and care of fire extinguishers provided.	2-3.4.3 Fire Extinguishers Operators shall be familiar with the location, operation, and care of fire extinguishers provided (see para. 2-1.5.5).				
04.8.1	Special Criteria: Handling Explosives or Electro-Explosive Devices (EED's). Special precautions shall be taken while handling explosives or EED's. (Requirement 40747)	Not covered in OSHA 1910.179	Not covered in ASME B30.2.				
04.8.1.a(1)	Special Criteria: Handling Explosives or Electro-Explosive Devices (EED's). Special precautions shall be taken while handling explosives or EED's: DOT-packaged explosives shall be handled in accordance with approved hazardous operating procedures. (Requirement 40748)	Not covered in OSHA 1910.179	Not covered in ASME B30.2.				
04.8.1.a(2)	Special Criteria: Handling Explosives or Electro-Explosive Devices (EED's). Special precautions shall be taken while handling explosives or EED's: Barricades and warning signs shall be erected to control access. (Requirement 40749)	Not covered in OSHA 1910.179	Not covered in ASME B30.2.				
04.8.1.b(1)	Special Criteria: Handling Explosives or Electro-Explosive Devices (EED's). Special precautions shall be taken while handling explosives or EED's: Explosives and EED's that are not within DOT-approved containers shall be handled in accordance with approved hazardous operations procedures. (Requirement 40750)	Not covered in OSHA 1910.179	Not covered in ASME B30.2.				
04.8.1.b(2)	Special Criteria: Handling Explosives or Electro-Explosive Devices (EED's). Special precautions shall be taken while handling explosives or EED's: In addition to system configuration controls, these procedures shall ensure the following requirements are met: (Requirement 40751)	Not covered in OSHA 1910.179	Not covered in ASME B30.2.				
04.8.1.b.1	Special Criteria: Handling Explosives or Electro-Explosive Devices (EED's). Special precautions shall be taken while handling explosives or EED's: In addition to system configuration controls, these procedures shall ensure the following requirements are met: Voltage checks on crane hooks that will handle explosives or EED's shall be performed prior to the start of operations; all crane motions shall be checked. (Requirement 40752)	Not covered in OSHA 1910.179	Not covered in ASME B30.2.				
04.8.1.b.2(1)	Special Criteria: Handling Explosives or Electro-Explosive Devices (EED's). Special precautions shall be taken while handling explosives or EED's: In addition to system configuration controls, these procedures shall ensure the following requirements are met: For static sensitive systems, the crane hook shall be connected to facility ground before connecting to explosives or EED's. (Requirement 40753)	Not covered in OSHA 1910.179	Not covered in ASME B30.2.				

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04.8.1.b.2(2)	Special Criteria: Handling Explosives or Electro-Explosive Devices (EED's). Special precautions shall be taken while handling explosives or EED's: In addition to system configuration controls, these procedures shall ensure the following requirements are met: Electrical grounding of the hook and load shall be accomplished prior to lifting operations. If a ground connection must be disconnected to facilitate operations, an alternate ground should be connected prior to disconnecting the existing ground. The final attachment/detachment must be at least 10 feet (3 m) from exposed propellant grain, explosives, or EED's. (Requirement 40754)	Not covered in OSHA 1910.179	Not covered in ASME B30.2.				
04.8.1.b.3	Special Criteria: Handling Explosives or Electro-Explosive Devices (EED's). Special precautions shall be taken while handling explosives or EED's: In addition to system configuration controls, these procedures shall ensure the following requirements are met: The danger potential for radio transmissions near explosives shall be evaluated prior to the operation. (Requirement 40755)	Not covered in OSHA 1910.179	Not covered in ASME B30.2.				
04.8.1.b.4	Special Criteria: Handling Explosives or Electro-Explosive Devices (EED's). Special precautions shall be taken while handling explosives or EED's: In addition to system configuration controls, these procedures shall ensure the following requirements are met: Personnel limits, protective clothing, warning signs and barricades shall be used as required. (Requirement 40756)	Not covered in OSHA 1910.179	Not covered in ASME B30.2.				
04.8.1.b.5	Special Criteria: Handling Explosives or Electro-Explosive Devices (EED's). Special precautions shall be taken while handling explosives or EED's: In addition to system configuration controls, these procedures shall ensure the following requirements are met: Safety surveillance requirements shall be followed. (Requirement 40757)	Not covered in OSHA 1910.179	Not covered in ASME B30.2.				
04.8.2	Special Criteria: Policy shall be developed and enforced for crane operation during electrical storms. Operations are generally permitted without restriction within enclosed metal or framed buildings that are properly grounded. Restrictions are necessary for outside operations or for those that cannot tolerate power failure/loss. (Requirement 40758)						
05.2.2.a	Safety and Design Aspects: Labeling/Tagging of Mobile Cranes and Derricks: The minimum radius/maximum load capacity of the crane/derrick shall be clearly marked to be legible from the operator's or user's position. For cranes/derricks with separate lifting systems of different ratings, the markings will indicate the lifting capabilities of each system (e.g., main hook, whip hook, and auxiliary hook). (Requirement 40764)	1910.180(c)(2) "Load rating chart." A substantial and durable rating chart with clearly legible letters and figures shall be provided with each crane and securely fixed to the crane cab in a location easily visible to the operator while seated at his control station.	5-1.7.6 Load Hook, Ball Assemblies, and Load Blocks Load hooks, ball assemblies, and load blocks shall be of sufficient weight to overhaul the line from the highest hook position for boom or boom and jib lengths, and the number of parts of line in use. All hook and ball assemblies and load blocks shall be labeled with their rated capacity and weight. Hooks shall be equipped with latches unless the application makes the use of a latch impractical. When provided, the latch shall bridge the throat opening of the hook for the purpose of retaining slings or other lifting devices under slack conditions (refer to ASME B30.10).				
05.2.2.b	Safety and Design Aspects: Labeling/Tagging of Mobile Cranes and Derricks: Mobile cranes and derricks that have the specified design features, maintenance/inspection, and test intervals to lift critical loads shall be marked conspicuously so that the operator and assurance personnel can distinguish that the crane/derrick is qualified for critical lifts. (Requirement 40765)	No requirement	No requirement				
05.2.2.c	Safety and Design Aspects: Labeling/Tagging of Mobile Cranes and Derricks: A standard system of labeling shall be established and used throughout the installation. (Requirement 40766)	No requirement	No requirement				

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05.2.2.d	Safety and Design Aspects: Labeling/Tagging of Mobile Cranes and Derricks: A standard lockout/tagout system shall be established and used throughout the installation to indicate equipment that is not to be used due to inspection discrepancies, ongoing maintenance operations, or other reasons. (Requirement 40767)	The control of hazardous energy (lockout/tagout). - 1910.147	No requirement				
05.2.2.e	Safety and Design Aspects: Labeling/Tagging of Mobile Cranes and Derricks: Certification/recertification tags are required as described in paragraph 5.3.4. (Requirement 40768)	1910.180(d)(6) "Inspection records." Certification records which include the date of inspection, the signature of the person who performed the inspection and the serial number, or other identifier, of the crane which was inspected shall be made monthly on critical items in use such as brakes, crane hooks, and ropes. This certification record shall be kept readily available.	No requirement				
05.2.3(1)	Safety and Design Aspects: Safety Analysis and Documentation of Mobile Cranes and Derricks Used for Critical Lifts: A recognized safety hazard analysis such as fault tree analysis, FMEA, O&SHA shall be performed on all mobile cranes and derricks used for critical lifts. (Requirement 40769)	No requirement	No requirement				
05.2.3(2)	Safety and Design Aspects: Safety Analysis and Documentation of Mobile Cranes and Derricks Used for Critical Lifts: The analysis shall, as a minimum, determine potential sources of danger, identify failure modes, and recommend resolutions and a system of risk acceptance for those conditions found in the hardware-facility-environment-human relationship that could cause loss of life, personal injury, and loss of or damage to the crane/derrick, facility, or load. (Requirement 40770)	No requirement	No requirement				
05.2.3(3)	Safety and Design Aspects: Safety Analysis and Documentation of Mobile Cranes and Derricks Used for Critical Lifts: The analysis shall be done as part of the initial evaluation process for critical lift compliance and prior to use in a critical lift, included in the equipment documentation, and updated as required to reflect any changes in operation and/or configuration. (Requirement 40771)	No requirement	No requirement				
05.2.4(1)	Safety and Design Aspects: Performance: Load capability and the desired controlled characteristics with which the crane/derrick handles the load shall be addressed for all designs. (Requirement 40772)	No requirement	No requirement				
05.2.4(2)	Safety and Design Aspects: Performance: Operational requirements shall be considered in the design phase to ensure load and function are adequately defined and critical crane/derrick design features are incorporated on the delivered units. (Requirement 40773)	No requirement	No requirement				
05.2.5	Safety and Design Aspects: Structural: Structural design shall be in accordance with industry standards for material selection, welding, allowable stresses, design limitations, framing, wheels, and other structural elements. Refer to ASME and PCSA standards for specific design details. (Requirement 40774)	1910.180(b)(2) "New and existing equipment." All new crawler, locomotive, and truck cranes constructed and utilized on or after August 31, 1971, shall meet the design specifications of the American National Standard Safety Code for Crawler, Locomotive, and Truck Cranes, ANSI B30.5-1968, which is incorporated by reference as specified in Sec. 1910.6. Crawler, locomotive, and truck cranes constructed prior to August 31, 1971, should be modified to conform to those design specifications by February 15, 1972, unless it can be shown that the crane cannot feasibly or economically be altered and that the crane substantially complies with the requirements of this section.	ASME B30.5 General				
05.2.6	Safety and Design Aspects: Mechanical: The mechanical design requirements for mobile crane and derrick components are as follows: (Requirement 40775)	See Above	ASME B30.5 General				

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05.2.6.a	Safety and Design Aspects: Mechanical: The mechanical design requirements for mobile crane and derrick components are as follows: They shall meet all applicable requirements of OSHA, ASME, and PCSA. (Requirement 40776)	See Above	ASME B30.5 General				
05.2.6.b	Safety and Design Aspects: Mechanical: The mechanical design requirements for mobile crane and derrick components are as follows: The drum gear shall be pressed on and keyed to either the periphery of the hub or shell of the drum, bolted with close fitting milled body bolts to a flange on the drum, or attached by other means of equal safety. (Requirement 40777)	No requirement	AGMA?				
05.2.6.c	Safety and Design Aspects: Mechanical: The mechanical design requirements for mobile crane and derrick components are as follows: Gearing shall be designed and manufactured to comply with the latest AGMA gear standards. (Requirement 40778)	No requirement	AGMA?				
05.2.6.d(1)	Safety and Design Aspects: Mechanical: The mechanical design requirements for mobile crane and derrick components are as follows: Couplings shall be located immediately adjacent to bearings. (Requirement 40779)	No requirement	AGMA?				
05.2.6.d(2)	Safety and Design Aspects: Mechanical: The mechanical design requirements for mobile crane and derrick components are as follows: Couplings between closely spaced bearings shall be of the full flexible type with internal gear form or grids, having metal-to-metal contact, and shall run in oil or be lubricated as recommended by the manufacturer. (Requirement 40780)	No requirement	AGMA?				
05.2.6.d(3)	Safety and Design Aspects: Mechanical: The mechanical design requirements for mobile crane and derrick components are as follows: All couplings for hoists shall be pressed fit with keys. (Requirement 40781)	No requirement	No requirement				
05.2.6.e	Safety and Design Aspects: Mechanical: The mechanical design requirements for mobile crane and derrick components are as follows: The rated load of a hoisting rope shall not exceed the rope's breaking strength divided by 3.5. (Requirement 40782)	No requirement	5-1.7.1 Rope Design Factors (a) For supporting rated loads and for supporting the boom and working attachments at recommended travel or transit positions and boom lengths, (1) the design factor for live or running ropes that wind on drums or travel over sheaves shall not be less than 3.5. (2) the design factor for boom pendants or standing ropes shall not be less than 3.0.				
05.2.6.f(1)	Safety and Design Aspects: Mechanical: The mechanical design requirements for mobile crane and derrick components are as follows: Hoists shall be provided with at least two means of braking: a holding brake and a control brake. (Requirement 40783)	No requirement	No requirement				
05.2.6.f(2)	Safety and Design Aspects: Mechanical: The mechanical design requirements for mobile crane and derrick components are as follows: The torque ratings, physical characteristics, and capabilities of the brakes shall be in accordance with industry standards. (Requirement 40784)	No requirement	ASME B30.5 General?				
05.2.6.g(1)	Safety and Design Aspects: Mechanical: The mechanical design requirements for mobile crane and derrick components are as follows: For mobile cranes and derricks used for critical lifts, two holding brakes shall be provided, each capable of bringing a rated load to zero speed and holding it. (Requirement 40785)	No requirement	No requirement				
05.2.6.g(2)	Safety and Design Aspects: Mechanical: The mechanical design requirements for mobile crane and derrick components are as follows: The brakes shall be designed so that they can be tested as required in paragraph 5.3.3.f. This may be accomplished by the following means: (Requirement 40786)	No requirement	No requirement				

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05.2.6.g.1(1)	Safety and Design Aspects: Mechanical: The mechanical design requirements for mobile crane and derrick components are as follows: The brakes shall be designed so that they can be tested as required in paragraph 5.3.3.f. This may be accomplished by the following means: When brakes and clutches are used to control the motion of the hoist drum, two independent means of braking shall be provided: a service brake and an emergency brake. (Requirement 40787)	No requirement	No requirement				
05.2.6.g.1(2)	Safety and Design Aspects: Mechanical: The mechanical design requirements for mobile crane and derrick components are as follows: The brakes shall be designed so that they can be tested as required in paragraph 5.3.3.f. This may be accomplished by the following means: The service brake shall be capable of functioning with power, and the emergency brake shall set in the event of a power failure. (Requirement 40788)	No requirement	No requirement				
05.2.6.g.2	Safety and Design Aspects: Mechanical: The mechanical design requirements for mobile crane and derrick components are as follows: The brakes shall be designed so that they can be tested as required in paragraph 5.3.3.f. This may be accomplished by the following means: For load hoists equipped with a mechanically linked hydraulic motor/brake combination, the use of a counterbalance valve that locks the hydraulic fluid when the valve is in the neutral position is an acceptable braking means. If a free fall clutch is present in the hoist design between the hydraulic motor and planetary disc, then a second, independent holding or control brake is required. (Requirement 40789)	No requirement	No requirement				
05.2.6.h	Safety and Design Aspects: Mechanical: The mechanical design requirements for mobile crane and derrick components are as follows: A positive ratchet and pawl shall be provided on all boom hoist drum(s). (Requirement 40790)	1910.180(h)(3)(xvii) When a crane is to be operated at a fixed radius, the boom-hoist pawl or other positive locking device shall be engaged.	(p) When a crane is to be operated with the boom at a fixed angle, the boom-hoist pawl or other positive holding device shall be engaged. (c) On rope boom support machines, a braking mechanism and a ratchet and pawl or other locking device shall be provided to prevent inadvertent lowering of the boom.				
05.2.6.i	Safety and Design Aspects: Mechanical: The mechanical design requirements for mobile crane and derrick components are as follows: Mobile cranes and derricks with booms shall be equipped with a boom angle indicator, where applicable, to assist the operator in ensuring that the crane/derrick is not loaded beyond the rated load for any given configuration. (Requirement 40791)	No requirement	(c) A boom angle or radius indicator readable from the operator's station shall be provided.				
05.2.6.j(1)	Safety and Design Aspects: Mechanical: The mechanical design requirements for mobile crane and derrick components are as follows: Safe and adequate access to components to inspect, service, repair, or replace equipment shall be provided for during design. (Requirement 40792)	No requirement	No requirement				
05.2.6.j(2)	Safety and Design Aspects: Mechanical: The mechanical design requirements for mobile crane and derrick components are as follows: The design shall provide for visual and physical accessibility. (Requirement 40793)	No requirement	No requirement				
05.2.6.k(1)	Safety and Design Aspects: Mechanical: The mechanical design requirements for mobile crane and derrick components are as follows: All wire rope hoists shall be designed to have not less than two wraps of hoisting rope on the drum when the hook is in its extreme low position. (Requirement 40794)	1910.180(h)(3)(x) Neither the load nor the boom shall be lowered below the point where less than two full wraps of rope remain on their respective drums.	(i) Neither the load nor the boom shall be lowered below the point where less than two full wraps of rope remain on their respective drums.				
05.2.6.k(2)	Safety and Design Aspects: Mechanical: The mechanical design requirements for mobile crane and derrick components are as follows: Drum grooves shall be provided as recommended by PCSA Standards No. 4 and No. 5. (Requirement 40795)	No requirement	PCSA #4, #5				

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05.2.6.k(3)	Safety and Design Aspects: Mechanical: The mechanical design requirements for mobile crane and derrick components are as follows: The rope ends shall be anchored securely by a clamp or a swaged terminal in a keyhole slot, provided a keeper is used to prohibit the swage from moving out of the narrow slot. Other methods recommended by the hoist or wire rope manufacturer are acceptable if the rope termination anchor together with two wraps of rope on the drum will give an anchor system equal to or greater than the breaking strength of the wire rope. (Requirement 40796)	No requirement	(1) The boom hoist drum shall have sufficient rope capacity to operate the boom in all positions, from the lowest permissible to the highest recommended, when using the manufacturer's recommended reeving and rope size. No less than two full wraps of rope shall remain on the drum with the boom point lowered to the level of the crane-supporting surface. The drum end of the rope shall be anchored to the drum by an arrangement specified by the crane or rope manufacturer.				
05.2.6.L	Safety and Design Aspects: Mechanical: The mechanical design requirements for mobile crane and derrick components are as follows: Each load bearing component shall be designed to sustain the maximum imposed loads with appropriate design factors. (Requirement 40797)	No requirement	ASME B30.5 General				
05.2.7	Safety and Design Aspects: Electrical: Electrical design requirements are as follows: (Requirement 40798)	No requirement	No requirement				
05.2.7.a	Safety and Design Aspects: Electrical: Electrical design requirements are as follows: Wiring and safety devices shall be in accordance with the NFPA National Electrical Code. (Requirement 40799)	No requirement	NFPA NEC General				
05.2.7.b	Safety and Design Aspects: Electrical: Electrical design requirements are as follows: Electrical enclosures shall provide protection for the contained equipment against environmental conditions. (Requirement 40800)	No requirement	NFPA NEC General				
05.2.7.c	Safety and Design Aspects: Electrical: Electrical design requirements are as follows: In addition to overload protection required by the National Electrical Code, undervoltage and phase reversal should be considered. (Requirement 40801)	No requirement	NFPA NEC General				
05.2.7.d	Safety and Design Aspects: Electrical: Electrical design requirements are as follows: The electrical system shall be designed fail-safe to ensure that a failure of any component will not cause the crane/derrick to operate in a speed range faster than commanded. A failure that would cause the crane/derrick to go to a slower speed is acceptable as long as the stop function is still available. Failure modes that could cause unplanned directional shifts and/or loss of control are unacceptable. (Requirement 40802)	No requirement	NFPA NEC General				
05.2.7.e	Safety and Design Aspects: Electrical: Electrical design requirements are as follows: Provisions for grounding the hook are required for handling explosives, solid propellants, flammables, or any other load that requires a nonelectrical or static-free environment. See paragraph 5.8 for handling explosives or EED's. (Requirement 40803)	No requirement	NFPA NEC General				
05.2.7.f	Safety and Design Aspects: Electrical: Electrical design requirements are as follows: Mobile crane anti-two-blocking features shall be in accordance with ASME B30.5. (Requirement 40804)	No requirement	5-1.9.9.1 Two-blocking Features (a) Telescopic boom cranes shall be equipped with an anti-two-block device or a two-block damage prevention feature for all points of two-blocking (i.e., jibs, extensions; see Section IV, New and Existing Installations). (b) Lattice boom cranes shall be equipped with an anti-two-block device or a two-block warning feature that functions for all points of two-blocking (see Section IV, New and Existing Installations).				

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05.3(1)	Testing: Three types of tests are required for mobile cranes and derricks: proof load tests, periodic load tests, and operational tests. The proof load tests and operational tests shall be performed prior to first use for new, extensively repaired, or altered cranes and derricks. This applies only to those components directly involved with the lifting or holding capability of a crane/derrick that has been repaired or altered. Repairs or alterations to nonlifting, secondary lifting, or holding components such as suspension assemblies, electrical system, or crane cab do not require a load test, although a functional check should be performed to determine if the repairs or alterations are acceptable. (Requirement 40805)	Initial proof load test only.	Initial proof load test only.				
05.3(2)	Testing: The periodic load and operational tests shall be performed at least every 4 years. (Requirement 40806)	No requirement	No requirement				
05.3(3)	Testing: Cranes and derricks used frequently for critical lifts shall be load tested annually. (Requirement 40807)	No requirement	No requirement				
05.3(4)	Testing: Cranes and derricks used infrequently for critical lifts shall be load tested before the critical lift if it has been more than a year since the last test. (Requirement 40808)	No requirement	No requirement				
05.3(5)	Testing: If a crane/derrick is upgraded, a proof load test and an operational test shall be performed based on the upgraded rating. (Requirement 40809)	1910.180(e)(2)(iii) Where rerating is necessary: 1910.180(e)(2)(iii)(a) Crawler, truck, and wheel-mounted cranes shall be tested in accordance with SAE Recommended Practice, Crane Load Stability Test Code J765 (April 1961). 1910.180(e)(2)(iii)(c) Rerating test report shall be readily available. 1910.180(e)(2)(iv) No cranes shall be rerated in excess of the original load ratings unless such rating changes are approved by the crane manufacturer or final assembler.	5-2.2.2 Rated Load Test (a) Prior to initial use, all cranes in which load-sustaining parts have been altered, replaced, or repaired should be load tested by, or under the direction of, a qualified person. (b) Where rerating is necessary: (1) Crawler and wheel-mounted cranes shall be tested in accordance with paras. 5-1.1.1(a) and 5-1.1.1(c) for load ratings where stability governs. Ratings governed by structural competence shall be established by the manufacturer or a qualified person and tested to 110% of the rating. (2) Locomotive cranes shall be tested in accordance with paras. 5-1.1.1(a) and 5-1.1.1(b) of this volume. (3) The rerating test report shall be made available. (4) Nocrane shall be rerated in excess of the original load ratings unless such rating changes are approved by the crane manufacturer or a qualified person.				
05.3(6)	Testing: All load and operational tests shall be performed by qualified personnel according to written (specific or general) technical operating procedures. (Requirement 40810)	1910.180(b)(3) "Designated personnel." Only designated personnel shall be permitted to operate a crane covered by this section.	5-2.2.2 Rated Load Test (a) Prior to initial use, all cranes in which load-sustaining parts have been altered, replaced, or repaired should be load tested by, or under the direction of, a qualified person.				
05.3(7)	Testing: An inspection of the crane/derrick and lifting components shall be performed after each load test and prior to the crane/derrick being released for service to ensure there is no damage. (Requirement 40811)	No requirement	No requirement				
05.3(8)	Testing: Surface or volumetric NDT of critical components shall be used to validate the existence or absence of cracks or other load test effects indicated by this inspection. The periodic load test requirement may be fulfilled by a concurrently performed proof load test. (Requirement 40812)	No requirement	No requirement				

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05.3.1(1)	Testing: Proof Load Test: Before first use, all new, extensively repaired, extensively modified, or altered cranes and derricks shall undergo a proof load test. A proof load test also should be performed when there is a question in design or previous testing. (Requirement 40813)	1910.180(e)(2)(ii) Test loads shall not exceed 110 percent of the rated load at any selected working radius.	5-2.2.2 Rated Load Test (a) Prior to initial use, all cranes in which load-sustaining parts have been altered, replaced, or repaired should be load tested by, or under the direction of, a qualified person. The replacement of the rope is specifically excluded from this requirement. However, a functional test of the crane under a normal operating load should be made prior to putting the crane back in service. (1) Test loads shall not exceed 110% of the manufacturer's load rating.				
05.3.1(2)	Testing: Proof Load Test: Mobile cranes and derricks shall be tested at the minimum practical working radius (and maximum working radius for new cranes and derricks only), without interfering with crane structure with a load as close as possible to, but not exceeding 1.10 times the rated load at the given radius. (Requirement 40814)	1910.180(e)(2)(ii) Test loads shall not exceed 110 percent of the rated load at any selected working radius.	5-2.2.2 Rated Load Test (a) Prior to initial use, all cranes in which load-sustaining parts have been altered, replaced, or repaired should be load tested by, or under the direction of, a qualified person. The replacement of the rope is specifically excluded from this requirement. However, a functional test of the crane under a normal operating load should be made prior to putting the crane back in service. (1) Test loads shall not exceed 110% of the manufacturer's load rating.				
05.3.1(3)	Testing: Proof Load Test: The load shall be lifted slowly and in an area where minimal damage will occur if the crane/derrick fails. Proof load tests conducted by the manufacturer prior to delivery are acceptable if the necessary load test papers are provided to verify the extent and thoroughness of the test on that specific item. The acceptable tolerance for proof load test accuracy is -5/+0 percent. (Requirement 40815)	No requirement	5-2.2.1 Operational Tests (a) Each new production crane shall be tested by the manufacturer to the extent necessary to ensure compliance with the operational requirements of this section, including for functions such as the following: (1) load lifting and lowering mechanisms (2) boom lifting and lowering mechanisms (3) boom extension and retraction mechanism (4) swinging mechanism (5) travel mechanism (6) safety devices (7) operational aids (b) Where the complete production crane is not supplied by one manufacturer, such tests shall be conducted at final assembly. (c) Operational crane test results shall be made available.				
05.3.2(1)	Testing: Periodic Load Test: Each mobile crane/derrick shall be tested at least once every 4 years with a dummy load equal to the rated capacity of the crane/derrick at the minimum practical working radius, without interfering with crane structure, according to the manufacturer's load chart. (Requirement 40816)	No requirement	No requirement				
05.3.2(2)	Testing: Periodic Load Test: Cranes/derricks used for critical lifts shall be load tested at least once per year. (Requirement 40817)	No requirement	No requirement				
05.3.2(3)	Testing: Periodic Load Test: Cranes/derricks used infrequently for critical lifts shall be load tested prior to the critical lift if it has been over a year since the last load test. (Requirement 40818)	No requirement	No requirement				
05.3.2(4)	Testing: Periodic Load Test: A periodic load test shall be performed after each boom change (when boom disassembly/assembly is required) if the crane/derrick is to be used for critical lifts. The acceptable tolerance for periodic load test accuracy is +5/0 percent. (Requirement 40819)	No requirement	No requirement				

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05.3.3	<p>Testing: Operational Test: Together with proof load and periodic load tests, the following shall be performed with a dummy rated load, unless otherwise specified, and as determined by the LDEM and the responsible safety, engineering, operations, and maintenance organizations: (Requirement 40820)</p>	<p>"Operational tests."</p> <p>1910.180(e)(1)(i)</p> <p>In addition to prototype tests and quality-control measures, each new production crane shall be tested by the manufacturer to the extent necessary to insure compliance with the operational requirements of this paragraph including functions such as the following:</p> <p>1910.180(e)(1)(i)(a)</p> <p>Load hoisting and lowering mechanisms.</p> <p>1910.180(e)(1)(i)(b)</p> <p>Boom hoisting and lower mechanisms.</p> <p>..1910.180(e)(1)(i)(c)</p> <p>1910.180(e)(1)(i)(c)</p> <p>Swinging mechanism.</p> <p>1910.180(e)(1)(i)(d)</p> <p>Travel mechanism.</p> <p>1910.180(e)(1)(i)(e)</p> <p>Safety devices.</p> <p>1910.180(e)(1)(ii)</p> <p>Where the complete production crane is not supplied by one manufacturer such tests shall be conducted at final assembly.</p> <p>1910.180(e)(1)(iii)</p>	<p>5-2.2.1 Operational Tests</p> <p>(a) Each new production crane shall be tested by the manufacturer to the extent necessary to ensure compliance with the operational requirements of this section, including for functions such as the following:</p> <p>(1) load lifting and lowering mechanisms</p> <p>(2) boom lifting and lowering mechanisms</p> <p>(3) boom extension and retraction mechanism</p> <p>(4) swinging mechanism</p> <p>(5) travel mechanism</p> <p>(6) safety devices</p> <p>(7) operational aids</p> <p>(b) Where the complete production crane is not supplied by one manufacturer, such tests shall be conducted at final assembly.</p> <p>(c) Operational crane test results shall be made available.</p>				
05.3.3.a	<p>Testing: Operational Test: Together with proof load and periodic load tests, the following shall be performed with a dummy rated load, unless otherwise specified, and as determined by the LDEM and the responsible safety, engineering, operations, and maintenance organizations: Load hoisting, lowering at various speeds with the boom at the minimum radius (maximum safe movement up and down as determined by the LDEM and the responsible safety, engineering, operations, and maintenance organizations), and braking/holding mechanisms. Holding brakes shall be tested to verify stopping capabilities and demonstrate the ability to hold a rated load (see paragraph 5.3.3.f). The load should be held long enough to allow any dynamics to dampen out. (Requirement 40821)</p>	See Above	See Above				
05.3.3.b	<p>Testing: Operational Test: Together with proof load and periodic load tests, the following shall be performed with a dummy rated load, unless otherwise specified, and as determined by the LDEM and the responsible safety, engineering, operations, and maintenance organizations: Boom hoisting and lowering through full safe operating range as determined by the LDEM and the responsible safety, engineering, operations, and maintenance organizations. (Requirement 40822)</p>	See Above	See Above				
05.3.3.c	<p>Testing: Operational Test: Together with proof load and periodic load tests, the following shall be performed with a dummy rated load, unless otherwise specified, and as determined by the LDEM and the responsible safety, engineering, operations, and maintenance organizations: Swinging and traveling mechanisms. (Requirement 40823)</p>	See Above	See Above				

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05.3.3.d	Testing: Operational Test: Together with proof load and periodic load tests, the following shall be performed with a dummy rated load, unless otherwise specified, and as determined by the LDEM and the responsible safety, engineering, operations, and maintenance organizations: Boom extension and retraction mechanism on telescoping boom cranes. (Requirement 40824)	See Above	See Above				
05.3.3.e	Testing: Operational Test: Together with proof load and periodic load tests, the following shall be performed with a dummy rated load, unless otherwise specified, and as determined by the LDEM and the responsible safety, engineering, operations, and maintenance organizations: All limit switches, locking devices, emergency stop switches, boom angle indicators, and other safety devices, excluding thermal overload and circuit breakers. The limit switch tests shall be performed with no load on the hook. (Requirement 40825)	See Above	See Above				
05.3.3.f	Testing: Operational Test: Together with proof load and periodic load tests, the following shall be performed with a dummy rated load, unless otherwise specified, and as determined by the LDEM and the responsible safety, engineering, operations, and maintenance organizations: Cranes and derricks used for critical lifts are required to be equipped with two holding brakes (hoist), each capable of bringing a rated load to zero speed and holding it (see paragraph 5.2.6.g). If a worm gear is used as a holding brake, it shall be tested to ensure it is able to hold a static load and stop a dynamic load. The operational test must demonstrate each brake's ability to stop and hold a rated load. This can be done in one of the following ways: (Requirement 40826)	See Above	See Above				
05.3.3.f.1	Testing: Operational Test: Together with proof load and periodic load tests, the following shall be performed with a dummy rated load, unless otherwise specified, and as determined by the LDEM and the responsible safety, engineering, operations, and maintenance organizations: The operational test must demonstrate each brake's ability to stop and hold a rated load. This can be done in one of the following ways: Each brake's ability to hold shall be statically tested (under no load) with 150 percent of the rated load hoisting torque at the point of brake application. (Requirement 40827)	See Above	See Above				
05.3.3.f.2	Testing: Operational Test: Together with proof load and periodic load tests, the following shall be performed with a dummy rated load, unless otherwise specified, and as determined by the LDEM and the responsible safety, engineering, operations, and maintenance organizations: The operational test must demonstrate each brake's ability to stop and hold a rated load. This can be done in one of the following ways: Alternately, each brake shall be tested for its ability to stop and hold a rated load in both the raising and lowering modes. (CAUTION: It must be possible to quickly reenergize the out-of-circuit brake or provide other safety measures to perform this test safely.) (Requirement 40828)	See Above	See Above				
05.3.3.f.3	Testing: Operational Test: Together with proof load and periodic load tests, the following shall be performed with a dummy rated load, unless otherwise specified, and as determined by the LDEM and the responsible safety, engineering, operations, and maintenance organizations: The operational test must demonstrate each brake's ability to stop and hold a rated load. This can be done in one of the following ways: Other methods may be used as approved by the LDEM with concurrence from the responsible safety, engineering, operations, and maintenance organizations. (Requirement 40829)	See Above	See Above				

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05.3.3.g	Testing: Operational Test: Together with proof load and periodic load tests, the following shall be performed with a dummy rated load, unless otherwise specified, and as determined by the LDEM and the responsible safety, engineering, operations, and maintenance organizations: The operational test for a modified crane/derrick can be tailored to test only those portions of the equipment that were modified, only if the periodic load and operational test interval has not expired. After a boom change on a crane/derrick used for critical lifts, the operational test does not have to include verification of each brake (paragraph 5.3.3.f) if it has been less than a year since the brakes were tested with a load equal to or greater than the maximum capacity of the crane/derrick with the new boom. (Requirement 40830)	See Above	See Above				
05.3.4(1)	Testing: Test Reports and Periodic Recertification Tags: After each test, designated personnel shall prepare written, dated, and signed test reports including procedure reference. (Requirement 40831)	1910.180(e)(1)(iii) Certified production-crane test results shall be made available. 1910.180(e)(2) "Rated load test." 1910.180(e)(2)(i) Written reports shall be available showing test procedures and confirming the adequacy of repairs or alterations.	(c) Operational crane test results shall be made available.				
05.3.4(2)	Testing: Test Reports and Periodic Recertification Tags: Inadequacies shall be documented and, if determined to be a hazard, corrected prior to further use. (Requirement 40832)	No requirement	No requirement				
05.3.4(3)	Testing: Test Reports and Periodic Recertification Tags: These reports shall be kept on file by the owner organization for a minimum of two test cycles and shall be made readily available. (Requirement 40833)	1910.180(e)(2)(i) Written reports shall be available showing test procedures and confirming the adequacy of repairs or alterations.	(c) Operational crane test results shall be made available.				
05.3.4(4)	Testing: Test Reports and Periodic Recertification Tags: Following the periodic load test, mobile cranes/derricks shall be given a permanently affixed tag, posted on the crane/derrick or an appropriate location, identifying the equipment and stating the next required periodic load test date or load test expiration date. (Requirement 40834)	No requirement	No requirement				

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05.4.1(1)	Inspection: Inspections, as described below, shall be performed on all mobile cranes/derricks and accessories. (Requirement 40836)	1910.180(d) "Inspection classification" - 1910.180(d)(1) "Initial inspection." Prior to initial use all new and altered cranes shall be inspected to insure compliance with provisions of this section. ..1910.180(d)(2) 1910.180(d)(2) "Regular inspection." Inspection procedure for cranes in regular service is divided into two general classifications based upon the intervals at which inspection should be performed. The intervals in turn are dependent upon the nature of the critical components of the crane and the degree of their exposure to wear, deterioration, or malfunction. The two general classifications are herein designated as "frequent" and "periodic", with respective intervals between inspections as defined below:	5-2.1.1 Inspection Classification (a) Initial Inspection. Prior to initial use, all new and altered cranes shall be inspected by a qualified person to verify compliance with the provisions of this volume. (b) Regular Inspection. Inspection procedure for cranes in regular service is divided into two general classifications based on the intervals at which inspection should be performed. The intervals depend on the nature of the critical components of the crane and the degree of their exposure to wear, deterioration, or malfunction. The two general classifications are herein designated as frequent and periodic, with respective intervals between inspections as defined.				
05.4.1(2)	Inspection: Inspections shall be performed according to this section, the manufacturers' recommendations, and ASME B30.5. (Requirement 40837)	No requirement	ASME B30.5 General				
05.4.1(3)	Inspection: Inadequacies discovered during an inspection shall be documented and, if determined to be a hazard, tagged out and corrected prior to further use. (Requirement 40838)	No requirement	5-2.1.5 Inspection Records Dated records for periodic inspections shall be made on critical items such as brakes, crane hooks, ropes, hydraulic and pneumatic cylinders, and hydraulic and pneumatic relief pressure valves. Records should be kept where they are available to appointed personnel.				
05.4.1(4)	Inspection: Inspections shall be performed by qualified personnel according to approved technical operating procedures. (Requirement 40839)	No requirement	(a) Initial Inspection. Prior to initial use, all new and altered cranes shall be inspected by a qualified person to verify compliance with the provisions of this volume.				
05.4.2	Inspection: All new, extensively repaired, or modified mobile cranes and derricks shall be given a daily and a periodic inspection prior to first use. For component repair on cranes/derricks, only the inspections that apply to the repaired portion need to be performed prior to first use unless a periodic inspection interval expires during the downtime (see paragraph 5.4.5). (Requirement 40840)	1910.180(d)(1) "Initial inspection." Prior to initial use all new and altered cranes shall be inspected to insure compliance with provisions of this section.	(a) Initial Inspection. Prior to initial use, all new and altered cranes shall be inspected by a qualified person to verify compliance with the provisions of this volume.				

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05.4.3	<p>Inspection: Mobile cranes and derricks in regular service (used at least once a month) shall be inspected as required in paragraphs 5.4.4 and 5.4.5. Idle and standby cranes shall be inspected according to paragraph 5.4.6. (Requirement 40841)</p>	<p>1910.180(d)(5)</p> <p>"Cranes not in regular use."</p> <p>1910.180(d)(5)(i)</p> <p>A crane which has been idle for a period of one month or more, but less than 6 months, shall be given an inspection conforming with requirements of paragraph (d)(3) of this section and paragraph (g)(2)(ii) of this section before placing in service.</p> <p>..1910.180(d)(5)(ii)</p> <p>1910.180(d)(5)(ii)</p> <p>A crane which has been idle for a period of six months shall be given a complete inspection conforming with requirements of paragraphs (d) (3) and (4) of this section and paragraph (g)(2)(ii) of this section before placing in service.</p> <p>1910.180(d)(5)(iii)</p> <p>Standby cranes shall be inspected at least semiannually in accordance with requirements of paragraph (d)(3) of this section and paragraph (g)(2)(ii) of this section. Such cranes which are exposed to adverse environment should be inspected more frequently.</p>	<p>5-2.1.4 Cranes Not in Regular Use</p> <p>(a) A crane that has been idle for a period of 1 month or more, but less than 6 months, shall be given an inspection by a qualified person conforming with the requirements of paras. 5-2.1.2 and 5-2.4.2(a) before being placed in service.</p> <p>(b) A crane that has been idle for a period of over 6 months shall be given a complete inspection by a qualified person conforming with the requirements of paras. 5-2.1.2, 5-2.1.3, and 5-2.4.2 before being placed in service.</p> <p>(c) Standby cranes shall be inspected by a qualified person at least semiannually in accordance with the requirements of paras. 5-2.1.2 and 5-2.4.2(a). Cranes that are exposed to adverse environmental conditions should be inspected more frequently.</p>				
05.4.4	<p>Inspection: Daily Inspections. These inspections shall be performed and documented prior to first use each day the crane/derrick is used, and shall include the following: (Requirement 40842)</p>	<p>1910.180(d)(3)</p> <p>"Frequent inspection." Items such as the following shall be inspected for defects at intervals as defined in paragraph (d)(2)(i) of this section or as specifically indicated including observation during operation for any defects which might appear between regular inspections. Any deficiencies such as listed shall be carefully examined and determination made as to whether they constitute a safety hazard:</p> <p>1910.180(d)(3)(i)</p> <p>All control mechanisms for maladjustment interfering with proper operation: Daily.</p> <p>1910.180(d)(3)(ii)</p> <p>All control mechanisms for excessive wear of components and contamination by lubricants or other foreign matter.</p> <p>1910.180(d)(3)(iii)</p> <p>All safety devices for malfunction.</p> <p>1910.180(d)(3)(iv)</p> <p>Deterioration or leakage in air or hydraulic systems: Daily.</p> <p>..1910.180(d)(3)(v)</p> <p>1910.180(d)(3)(v)</p> <p>Crane hooks with deformations or cracks. For hooks with cracks or having more than 15 percent in excess of normal throat opening or more than 10 deg. twist from the plane of the unbent hook.</p> <p>1910.180(d)(3)(vi)</p>	<p>5-2.1.2 Frequent Inspection</p> <p>Items such as the following shall be inspected by a designated person for defects at intervals as defined in para. 5-2.1.1(b)(1) or as specifically indicated by the manufacturer, including observation during operation for any deficiencies that might appear between regular inspections. Any deficiencies shall be carefully examined and a determination made as to whether they constitute a hazard.</p> <p>(a) All control mechanisms for maladjustment interfering with proper operation: daily, when used.</p> <p>(b) All control mechanisms for excessivewear of components and contamination by lubricants or other foreign matter.</p> <p>(c) Operational aids for malfunction: daily, when used.</p> <p>(d) All hydraulic hoses, particularly those that flex in normal operation of crane functions, should be visually inspected once every working day, when used.</p> <p>(e) Hooks and latches for deformation, chemical damage, cracks, and wear (refer to ASME B30.10).</p> <p>(f) Rope reeving for compliance with crane manufacturer's specifications.</p> <p>23</p> <p>(g) Electrical apparatus for malfunctioning, signs of excessive deterioration, dirt, and moisture accumulation.</p> <p>(h) Hydraulic system for proper oil level: daily, when used.</p> <p>(i) Tires for recommended inflation pressure.</p>				

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05.4.4.a	Inspection: Daily Inspections. These inspections shall be performed and documented prior to first use each day the crane/derrick is used, and shall include the following: Check operating and control mechanisms for proper function. (Requirement 40843)	See Above	See Above				
05.4.4.b	Inspection: Daily Inspections. These inspections shall be performed and documented prior to first use each day the crane/derrick is used, and shall include the following: Without disassembling, visually inspect lines, tanks, valves, drain pumps, gear casings, and other components of fluid systems for deterioration and leaks. This applies to components that can be seen from the ground level or for which there is safe access via inspection walkways. (Requirement 40844)	See Above	See Above				
05.4.4.c	Inspection: Daily Inspections. These inspections shall be performed and documented prior to first use each day the crane/derrick is used, and shall include the following: Without disassembling, inspect all functional operating and control mechanisms, including brakes where visible, for excessive wear and contamination by excessive lubricants or foreign matter. (Requirement 40845)	See Above	See Above				
05.4.4.d	Inspection: Daily Inspections. These inspections shall be performed and documented prior to first use each day the crane/derrick is used, and shall include the following: Inspect hooks for cracks and deformities (see Section 7). (Requirement 40846)	See Above	See Above				
05.4.4.e	Inspection: Daily Inspections. These inspections shall be performed and documented prior to first use each day the crane/derrick is used, and shall include the following: Inspect rope reeving for proper travel and drum lay. (Requirement 40847)	See Above	See Above				
05.4.4.f	Inspection: Daily Inspections. These inspections shall be performed and documented prior to first use each day the crane/derrick is used, and shall include the following: Inspect hoist chains for excessive wear or distortion. (Requirement 40848)	See Above	See Above				
05.4.5	Inspection: Formal Periodic Inspections. These inspections shall be performed at varying intervals, depending on activity, severity of service, environment, and criticality. (Requirement 40849)	<p>"Inspection classification" -</p> <p>1910.180(d)(1)</p> <p>"Initial inspection." Prior to initial use all new and altered cranes shall be inspected to insure compliance with provisions of this section.</p> <p>..1910.180(d)(2)</p> <p>1910.180(d)(2)</p> <p>"Regular inspection." Inspection procedure for cranes in regular service is divided into two general classifications based upon the intervals at which inspection should be performed. The intervals in turn are dependent upon the nature of the critical components of the crane and the degree of their exposure to wear, deterioration, or malfunction. The two general classifications are herein designated as "frequent" and "periodic", with respective intervals between inspections as defined below:</p> <p>1910.180(d)(2)(i)</p> <p>Frequent inspection: Daily to monthly intervals.</p> <p>1910.180(d)(2)(ii)</p> <p>Periodic inspection: 1- to 12- month intervals, or as specifically recommended by the manufacturer.</p>	<p>5-2.1.1 Inspection Classification</p> <p>(a) Initial Inspection. Prior to initial use, all new and altered cranes shall be inspected by a qualified person to verify compliance with the provisions of this volume.</p> <p>(b) Regular Inspection. Inspection procedure for cranes in regular service is divided into two general classifications based on the intervals at which inspection should be performed. The intervals depend on the nature of the critical components of the crane and the degree of their exposure to wear, deterioration, or malfunction. The two general classifications are herein designated as frequent and periodic, with respective intervals between inspections as defined.</p> <p>(1) Frequent Inspection. Daily to monthly intervals by a designated person.</p> <p>(2) Periodic Inspection. One- to 12-month intervals, or as specifically recommended by the manufacturer or a qualified person.</p>				

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05.4.5.a.1	<p>Inspection: Formal Periodic Inspections: Monthly Inspections (Frequent Inspections). At least once per month: Perform daily inspection requirements described in paragraph 5.4.4. (Requirement 40851)</p>	<p>1910.180(d)(3)</p> <p>"Frequent inspection." Items such as the following shall be inspected for defects at intervals as defined in paragraph (d)(2)(i) of this section or as specifically indicated including observation during operation for any defects which might appear between regular inspections. Any deficiencies such as listed shall be carefully examined and determination made as to whether they constitute a safety hazard:</p> <p>1910.180(d)(3)(i)</p> <p>All control mechanisms for maladjustment interfering with proper operation: Daily.</p> <p>1910.180(d)(3)(ii)</p> <p>All control mechanisms for excessive wear of components and contamination by lubricants or other foreign matter.</p> <p>1910.180(d)(3)(iii)</p> <p>All safety devices for malfunction.</p> <p>1910.180(d)(3)(iv)</p> <p>Deterioration or leakage in air or hydraulic systems: Daily.</p> <p>..1910.180(d)(3)(v)</p> <p>1910.180(d)(3)(v)</p> <p>Crane hooks with deformations or cracks. For hooks with cracks or having more than 15 percent in excess of normal throat opening or more than 10 deg. twist from the plane of the unbent hook.</p> <p>1910.180(d)(3)(vi)</p>	<p>5-2.4.2 Inspection</p> <p>(a) Frequent Inspection</p> <p>(1) All running ropes in service should be visually inspected once each working day. A visual inspection shall consist of observation of all rope that can reasonably be expected to be in use during the day's operations. These visual observations should be concerned with discovering gross damage that may be an immediate hazard, including the following:</p> <p>(a) distortion of the rope such as kinking, crushing, unstranding, birdcaging, main strand displacement, or core protrusion. Loss of rope diameter in a short rope length or unevenness of outer strands should provide evidence that the rope or ropes must be replaced.</p> <p>(b) general corrosion.</p> <p>(c) broken or cut strands.</p> <p>(d) number, distribution, and type of visible broken wires [see paras. 5-2.4.3(b)(1), (2), and (7) for further guidance].</p> <p>(e) core failure in rotation-resistant ropes (see Fig. 15). When such damage is discovered, the rope shall be either removed from service or given an inspection as detailed in para. 5-2.4.2(b).</p> <p>(2) Care shall be taken when inspecting sections of rapid deterioration such as flange points, crossover points, and repetitive pickup points on drums.</p> <p>(3) Care shall be taken when inspecting certain ropes such as the following:</p> <p>(a) rotation-resistant ropes, because of their higher susceptibility to damage and increased deterioration when working on equipment with limited design parameters. The internal deterioration of rotation-resistant ropes may not be readily observable.</p> <p>(b) boom hoist ropes, because of the difficulties of inspection and the important nature of these ropes.</p>				
05.4.5.a.2	<p>Inspection: Formal Periodic Inspections: Monthly Inspections (Frequent Inspections). At least once per month: Inspect for excessive wear in brake (hoist and boom) and clutch system parts, linings, pawls, and ratchets without major disassembly. (Requirement 40852)</p>	See Above	See Above				
05.4.5.a.3	<p>Inspection: Formal Periodic Inspections: Monthly Inspections (Frequent Inspections). At least once per month: Perform a thorough inspection of all ropes paying particular attention to the signs of deterioration and damage outlined in paragraph 5.5.3. (Requirement 40853)</p>	See Above	See Above				
05.4.5.a.4	<p>Inspection: Formal Periodic Inspections: Monthly Inspections (Frequent Inspections). At least once per month: Inspect for visible deformation or cracks in hooks (see Section 7). (Requirement 40854)</p>	See Above	See Above				

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05.4.5.b.01	Inspection: Formal Periodic Inspections: Annual Inspections (Periodic Inspections). At least once per year, inspect for: Requirements for monthly inspections (frequent inspections) described in paragraph 5.4.5.a. (Requirement 40856)	<p>1910.180(d)(4)</p> <p>"Periodic inspection." Complete inspections of the crane shall be performed at intervals as generally defined in paragraph (d)(2)(ii) of this section depending upon its activity, severity of service, and environment, or as specifically indicated below. These inspections shall include the requirements of paragraph (d)(3) of this section and in addition, items such as the following. Any deficiencies such as listed shall be carefully examined and determination made as to whether they constitute a safety hazard:</p> <p>1910.180(d)(4)(i)</p> <p>Deformed, cracked, or corroded members in the crane structure and boom.</p> <p>1910.180(d)(4)(ii)</p> <p>Loose bolts or rivets.</p> <p>1910.180(d)(4)(iii)</p> <p>Cracked or worn sheaves and drums.</p> <p>..1910.180(d)(4)(iv)</p> <p>1910.180(d)(4)(iv)</p> <p>Worn, cracked, or distorted parts such as pins, bearings, shafts, gears, rollers and locking devices.</p> <p>1910.180(d)(4)(v)</p> <p>Excessive wear on brake and clutch system parts, linings, pawls, and ratchets.</p> <p>1910.180(d)(4)(vi)</p>	<p>(b) Periodic Inspection</p> <p>(1) The inspection frequency shall be determined by a qualified person and shall be based on such factors as expected rope life as determined by experience on the particular installation or similar installations, severity of environment, percentage of capacity lifts, frequency rates of operation, and exposure to shock loads. Inspections need not be at equal calendar intervals and should be more frequent as the rope approaches the end of its useful life. This inspection shall be performed at least annually.</p> <p>(2) Periodic inspections shall be performed by a qualified person. This inspection shall cover the entire length of the rope. Only the surface wires of the rope need be inspected. No attempt should be made to open the rope. Any deterioration resulting in an appreciable loss of original strength, such as the conditions described below, shall be noted and determination made as to whether further use of the rope would constitute a hazard.</p> <p>(a) points listed in para. 5-2.4.2(a)</p> <p>(b) reduction of rope diameter below nominal diameter due to loss of core support, internal or external corrosion, or wear of outside wires</p> <p>(c) severely corroded or broken wires at end connections</p> <p>(d) severely corroded, cracked, bent, worn, or improperly applied end connections</p> <p>(3) Care shall be taken when inspecting sections of rapid deterioration, such as the following:</p> <p>(a) sections in contact with saddles, equalizer sheaves, or other sheaves where rope travel is limited</p> <p>(b) sections of the rope at or near terminal ends where corroded or broken wires may protrude</p>				
05.4.5.b.02	Inspection: Formal Periodic Inspections: Annual Inspections (Periodic Inspections). At least once per year, inspect for: Deformed, cracked, or corroded members and welds and loose bolts or rivets in crane structure. Various methods of NDT such as ultrasonics, radiography, magnetic particle, liquid penetrant, etc., shall be used as needed. (Requirement 40857)						
05.4.5.b.03	Inspection: Formal Periodic Inspections: Annual Inspections (Periodic Inspections). At least once per year, inspect for: Cracked or worn sheaves and drums. (Requirement 40858)	See Above	See Above				
05.4.5.b.04	Inspection: Formal Periodic Inspections: Annual Inspections (Periodic Inspections). At least once per year, inspect for: Excessive wear or cracks in pins, bearings, shafts, gears, followers, and locking and clamping devices. Surface or volumetric NDT shall be used to validate the existence or absence of cracks indicated by this inspection. (Requirement 40859)	See Above	See Above				
05.4.5.b.05	Inspection: Formal Periodic Inspections: Annual Inspections (Periodic Inspections). At least once per year, inspect for: Significant inadequacies in load, wind, boom, angle, and other indicators over full range. (Requirement 40860)	See Above	See Above				
05.4.5.b.06	Inspection: Formal Periodic Inspections: Annual Inspections (Periodic Inspections). At least once per year, inspect for: Excessive wear in chain drive sprockets and stretch in the chain. (Requirement 40861)	See Above	See Above				

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05.4.5.b.07	Inspection: Formal Periodic Inspections: Annual Inspections (Periodic Inspections). At least once per year, inspect for: Abnormal performance in power plant(s) and compliance with applicable safety requirements, such as locations of guards on belts. (Requirement 40862)	See Above	See Above				
05.4.5.b.08	Inspection: Formal Periodic Inspections: Annual Inspections (Periodic Inspections). At least once per year, inspect for: Evidence of a malfunction in travel, steering, braking, and locking devices. (Requirement 40863)	See Above	See Above				
05.4.5.b.09	Inspection: Formal Periodic Inspections: Annual Inspections (Periodic Inspections). At least once per year, inspect for: Evidence of a malfunction in any safety device. (Requirement 40864)	See Above	See Above				
05.4.5.b.10	Inspection: Formal Periodic Inspections: Annual Inspections (Periodic Inspections). At least once per year, inspect for: Evidence of overheating. (Requirement 40865)	See Above	See Above				
05.4.6	Inspection: Idle and Standby Cranes/Derricks. Idle and standby cranes/derricks shall be inspected prior to first use according to the requirements of paragraphs 5.4.4 and 5.4.5 unless these monthly and annual inspections were performed at required intervals and recorded during the idle/standby period. (Requirement 40866)	1910.180(d)(5) "Cranes not in regular use." 1910.180(d)(5)(i) A crane which has been idle for a period of one month or more, but less than 6 months, shall be given an inspection conforming with requirements of paragraph (d)(3) of this section and paragraph (g)(2)(ii) of this section before placing in service. ..1910.180(d)(5)(ii) 1910.180(d)(5)(ii) A crane which has been idle for a period of six months shall be given a complete inspection conforming with requirements of paragraphs (d) (3) and (4) of this section and paragraph (g)(2)(ii) of this section before placing in service. 1910.180(d)(5)(iii) Standby cranes shall be inspected at least semiannually in accordance with requirements of paragraph (d)(3) of this section and paragraph (g)(2)(ii) of this section. Such cranes which are exposed to adverse environment should be inspected more frequently.	5-2.1.4 Cranes Not in Regular Use (a) A crane that has been idle for a period of 1 month or more, but less than 6 months, shall be given an inspection by a qualified person conforming with the requirements of paras. 5-2.1.2 and 5-2.4.2(a) before being placed in service. (b) A crane that has been idle for a period of over 6 months shall be given a complete inspection by a qualified person conforming with the requirements of paras. 5-2.1.2, 5-2.1.3, and 5-2.4.2 before being placed in service. (c) Standby cranes shall be inspected by a qualified person at least semiannually in accordance with the requirements of paras. 5-2.1.2 and 5-2.4.2(a). Cranes that are exposed to adverse environmental conditions should be inspected more frequently.				
05.4.7(1)	Inspection: Inspection Reports: After each formal periodic inspection, qualified, authorized personnel shall prepare written, dated, and signed inspection reports. (Requirement 40867)	1910.180(d)(6) "Inspection records." Certification records which include the date of inspection, the signature of the person who performed the inspection and the serial number, or other identifier, of the crane which was inspected shall be made monthly on critical items in use such as brakes, crane hooks, and ropes. This certification record shall be kept readily available.	5-2.1.5 Inspection Records Dated records for periodic inspections shall be made on critical items such as brakes, crane hooks, ropes, hydraulic and pneumatic cylinders, and hydraulic and pneumatic relief pressure valves. Records should be kept where they are available to appointed personnel.				
05.4.7(2)	Inspection: Inspection Reports: These reports shall include procedure reference and adequacy of the crane/crane components. (Requirement 40868)	See Above	See Above				
05.4.7(3)	Inspection: Inspection Reports: Inadequacies shall be documented and, if determined to be a hazard, corrected prior to further use. (Requirement 40869)	See Above	See Above				

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05.4.7(4)	Inspection: Inspection Reports: These reports shall be filed and made readily available by the organizational element responsible for inspection. (Requirement 40870)	See Above	See Above				
05.5(1)	Maintenance: A maintenance program based on manufacturers' recommendations, integrating proactive, reactive, preventive, and predictive maintenance shall be established to increase the probability the mobile crane/derrick will function in the required manner over its design life cycle with a minimum of maintenance. (Requirement 40871)	No Requirement	SECTION 5-2.3: MAINTENANCE 5-2.3.1 Preventive Maintenance (a) A preventive maintenance program shall be established and should be based on the recommendations outlined in the crane manufacturer's manual. If a qualified person determines it is appropriate, the program should also include that individual's additional recommendations based on a review of the crane application and operations. Dated records should be placed on file. (b) It is recommended that replacement parts be obtained from the original equipment manufacturer.				
05.5(2)	Maintenance: The program shall include procedures and a scheduling system for normal periodic maintenance items, adjustments, replacements, and repairs. (Requirement 40872)	No Requirement	See Above				
05.5(3)	Maintenance: The program shall also ensure that records are kept and unsafe test and inspection discrepancies are documented and corrected. (Requirement 40873)	No Requirement	See Above				
05.5(4)	Maintenance: Any mobile crane or derrick found in an unsafe operating condition shall be tagged out and removed from service until repaired. (Requirement 40874)	No Requirement	No requirement				
05.5(5)	Maintenance: All repairs shall be made by qualified personnel in accordance with the manufacturers' instructions. (Requirement 40875)	No Requirement	5-2.3.3 Adjustments and Repairs (a) Any hazardous conditions disclosed by the inspection requirements of Section 5-2.1 shall be corrected before operation of the crane is resumed. Adjustments and repairs shall be done only by designated personnel. (b) Adjustments shall be made within the manufacturer's specified tolerances to maintain correct functioning of components.				
05.5.1	Maintenance: Maintenance Procedures. Before maintenance, adjustments, repairs, and replacements are initiated, the following safety precautions shall be taken: (Requirement 40876)	No requirement	5-2.3.2 Maintenance Procedure (a) Before adjustments and repairs are started on a crane, the following precautions shall be taken as applicable: (1) Place crane where it will cause the least interference with other equipment or operations in the area. (2) Set all controls in the off position and ensure all operating features are secured from inadvertent motion by brakes, pawls, or other means. (3) Render starting means inoperative. (4) Stop power plant or disconnect at power takeoff. (5) Lower the boom to the ground, if possible, or otherwise secure against dropping. (6) Lower the lower load block to the ground or otherwise secure against dropping. (7) Relieve hydraulic oil pressure from all hydraulic circuits before loosening or removing hydraulic components. (b) "Warning" or "Out of Order" signs shall be placed on the crane controls. For locomotive cranes, blue flag protection shall be employed. Signs or flags shall be removed only by authorized personnel. (c) After adjustments and repairs have been made, the crane shall not be returned to service until all guards have been reinstalled, trapped air removed from the hydraulic system, safety devices reactivated, and maintenance equipment removed.				
05.5.1.a	Maintenance: Maintenance Procedures. Before maintenance, adjustments, repairs, and replacements are initiated, the following safety precautions shall be taken: Move to an area where maintenance will not interfere with other operations. (Requirement 40877)	No requirement	See Above				

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05.5.1.b	Maintenance: Maintenance Procedures. Before maintenance, adjustments, repairs, and replacements are initiated, the following safety precautions shall be taken: Cranes/derricks shall not be operated until all safety devices have been activated and tested/adjusted if involved in the maintenance action. (Requirement 40878)	No requirement	See Above				
05.5.2	Maintenance: Adjustments. Based upon the manufacturer's documentation and/or experience, adjustments shall be made to ensure that all components function properly, paying particular attention to: (Requirement 40879)	1910.180(f) "Maintenance procedure" - "General." After adjustments and repairs have been made the crane shall not be operated until all guards have been reinstalled, safety devices reactivated, and maintenance equipment removed.	5-2.3.3 Adjustments and Repairs (a) Any hazardous conditions disclosed by the inspection requirements of Section 5-2.1 shall be corrected before operation of the crane is resumed. Adjustments and repairs shall be done only by designated personnel. (b) Adjustments shall be made within the manufacturer's specified tolerances to maintain correct functioning of components. The following are examples: (1) functional operating mechanisms (2) operational aids (3) pneumatic, electronic, hydraulic, and mechanical control systems (4) power plants (5) braking systems (c) Repairs or replacements shall be provided as needed for operation. The following are examples: (1) critical parts of functional operating mechanisms that are cracked, broken, corroded, bent, or excessively worn. (2) critical parts of the crane structure that are cracked, bent, broken, or excessively corroded. (3) damaged or worn hooks as described under Maintenance in ASME B30.10. Repairs by welding or reshaping are not recommended. (d) Replacement parts or repairs shall have at least the original design factor. (e) Instructions shall be provided by the manufacturer for the removal of air from hydraulic circuits.				
05.5.2.a	Maintenance: Adjustments. Based upon the manufacturer's documentation and/or experience, adjustments shall be made to ensure that all components function properly, paying particular attention to: Brakes. Appropriate precautions shall be taken by inspectors, repair personnel, and others who may be potentially exposed to airborne dust fibers from any asbestos friction materials present in braking mechanisms. (Requirement 40880)	No requirement	See Above				
05.5.2.b	Maintenance: Adjustments. Based upon the manufacturer's documentation and/or experience, adjustments shall be made to ensure that all components function properly, paying particular attention to: Control system. (Requirement 40881)	No requirement	See Above				
05.5.2.c	Maintenance: Adjustments. Based upon the manufacturer's documentation and/or experience, adjustments shall be made to ensure that all components function properly, paying particular attention to: Power plants. (Requirement 40882)	No requirement	See Above				
05.5.2.d	Maintenance: Adjustments. Based upon the manufacturer's documentation and/or experience, adjustments shall be made to ensure that all components function properly, paying particular attention to: Critical operating mechanisms and safety devices. (Requirement 40883)	No requirement	See Above				
05.5.2.e	Maintenance: Adjustments. Based upon the manufacturer's documentation and/or experience, adjustments shall be made to ensure that all components function properly, paying particular attention to: Operator mechanical and electrical controls. (Requirement 40884)	No requirement	See Above				
05.5.3	Maintenance: Repairs/Replacements. Repairs/replacements shall be promptly provided for safe operation. (Requirement 40885)	No requirement	See Above				

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05.5.3.a	Maintenance: Repairs/Replacements: For repair/replacement requirements for hooks with deformation or cracks, see Section 7. If repaired, hooks shall be proof load tested using the associated mobile crane/derrick minimum working radius proof load value. (Requirement 40886)	1910.180(d)(3)(v) Crane hooks with deformations or cracks. For hooks with cracks or having more than 15 percent in excess of normal throat opening or more than 10 deg. twist from the plane of the unbent hook.	See ASME B30.10 requirements				
05.5.3.b(1)	Maintenance: Repairs/Replacements: Structural members that are cracked, bent, broken, excessively worn, or corroded shall be evaluated by the responsible engineering organization to determine if they should be repaired or replaced. Proper material and weld/repair procedures will be used according to ANSI/AWS D14.1 and manufacturer specifications. (Requirement 40887)	No requirement	(c) Repairs or replacements shall be provided as needed for operation. The following are examples: (1) critical parts of functional operating mechanisms that are cracked, broken, corroded, bent, or excessively worn. (2) critical parts of the crane structure that are cracked, bent, broken, or excessively corroded.				
05.5.3.b(2)	Maintenance: Repairs/Replacements: Any structural repairs/replacements shall be performed with the proper approval/concurrences required by OSHA, the applicable ASME standards, and the manufacturers' requirements. Procedures will be conducted by properly qualified personnel. (Requirement 40888)	No requirement	5-2.3.3 Adjustments and Repairs (a) Any hazardous conditions disclosed by the inspection requirements of Section 5-2.1 shall be corrected before operation of the crane is resumed. Adjustments and repairs shall be done only by designated personnel. (b) Adjustments shall be made within the manufacturer's specified tolerances to maintain correct functioning of components.				
05.5.3.c	Maintenance: Repairs/Replacements: The need to replace wire rope shall be determined by a certified or otherwise qualified person based on an evaluation of inspection results. Any of the following signs of deterioration and damage are sufficient reasons for rejection of the rope (see Wire Rope Users Manual for additional information on wire rope inspections): (Requirement 40889)	1910.180(g) "Rope inspection." - 1910.180(g)(1) "Running ropes." A thorough inspection of all ropes in use shall be made at least once a month and a certification record which includes the date of inspection, the signature of the person who performed the inspection and an identifier for the ropes shall be prepared and kept on file where readily available. All inspections shall be performed by an appointed or authorized person. Any deterioration, resulting in appreciable loss of original strength shall be carefully observed and determination made as to whether further use of the rope would constitute a safety hazard. Some of the conditions that could result in an appreciable loss of strength are the following:	5-2.4.3 Rope Replacement (a) No precise rules can be given for determination of the exact time for rope replacement since many variable factors are involved. Once a rope reaches any one of the specified removal criteria, it may be allowed to operate to the end of the work shift, based on the judgment of a qualified person. The rope shall be replaced after that work shift, at the end of the day, or at the latest time prior to the equipment being used by the next work shift. (b) Removal criteria for rope replacement shall be as follows:				

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05.5.3.c.1	<p>Maintenance: Repairs/Replacements: Any of the following signs of deterioration and damage are sufficient reasons for rejection of the rope (see Wire Rope Users Manual for additional information on wire rope inspections): In running ropes, six randomly distributed broken wires in one rope lay or three broken wires in one strand in one lay or one valley break. In rotation resistant ropes, two randomly distributed broken wires in thirty rope diameters. In standing ropes, more than two broken wires in one lay in sections beyond end connections or any broken wires at an end connection. (Requirement 40890)</p>	<p>1910.180(g)(1)(i) 1910.180(g)(1)(i) Reduction of rope diameter below nominal diameter due to loss of core support, internal or external corrosion, or wear of outside wires. 1910.180(g)(1)(ii) A number of broken outside wires and the degree of distribution of concentration of such broken wires. 1910.180(g)(1)(iii) Worn outside wires. 1910.180(g)(1)(iv) Corroded or broken wires at end connections. 1910.180(g)(1)(v) Corroded, cracked, bent, worn, or improperly applied end connections. 1910.180(g)(1)(vi) Severe kinking, crushing, cutting, or unstranding.</p>	<p>(b) Removal criteria for rope replacement shall be as follows: (1) Broken Wires (a) in running ropes, six randomly distributed broken wires in one lay or three broken wires in one strand in one lay. (b) in rotation-resistant ropes, two randomly distributed broken wires in six rope diameters or four randomly distributed broken wires in 30 rope diameters. For special conditions relating to rotation-resistant rope, refer to para. 5-3.2.1.1(d)(1)(b). (2) one outer wire broken at the point of contact with the core of the rope that has worked its way out of the rope structure and protrudes or loops out from the rope structure. Additional inspection of this section is required. (3) wear of one-third the original diameter of outside individual wires. (4) kinking, crushing, birdcaging, or any other damage resulting in distortion of the rope structure. (5) evidence of any heat damage from any cause. (6) reductions from nominal diameter of more than the following: (a) 1/64 in. (0.4 mm) for diameters up to and including 5/16 in. (8.0 mm) (b) 1/32 in. (0.8 mm) for diameters from 3/8 in. (9.5 mm) to and including 1/2 in. (13.0 mm) (c) 3/64 in. (1.2 mm) for diameters from 9/16 in. (14.5 mm) to and including 3/4 in. (19.0 mm) (d) 1/16 in. (1.6 mm) for diameters from 7/8 in. (22.0 mm) to and including 1 1/8 in. (29.0 mm) (e) 3/32 in. (2.4 mm) for diameters from 1 1/4 in. (32.0 mm) to and including 1 1/2 in. (38.0 mm) (7) in standing ropes, more than two broken wires in one lay in sections beyond end connections or more than one broken wire at an end connection. (c) Broken wire removal criteria cited in this volume apply to wire rope operating on steel sheaves and drums. The user shall contact the sheave, drum, or crane manufacturer,</p>				
05.5.3.c.2	<p>Maintenance: Repairs/Replacements: Any of the following signs of deterioration and damage are sufficient reasons for rejection of the rope (see Wire Rope Users Manual for additional information on wire rope inspections): Individual outside wires with wear of 1/3 the original diameter. (Requirement 40891)</p>	See Above	See Above				
05.5.3.c.3	<p>Maintenance: Repairs/Replacements: Any of the following signs of deterioration and damage are sufficient reasons for rejection of the rope (see Wire Rope Users Manual for additional information on wire rope inspections): Kinking, crushing, bird caging, or any other damage resulting in distortion. (Requirement 40892)</p>	See Above	See Above				
05.5.3.c.4	<p>Maintenance: Repairs/Replacements: Any of the following signs of deterioration and damage are sufficient reasons for rejection of the rope (see Wire Rope Users Manual for additional information on wire rope inspections): Evidence of heat damage. (Requirement 40893)</p>	See Above	See Above				
05.5.3.c.5	<p>Maintenance: Repairs/Replacements: Any of the following signs of deterioration and damage are sufficient reasons for rejection of the rope (see Wire Rope Users Manual for additional information on wire rope inspections): End connectors that are cracked, deformed, or with evidence of rope pullout. (Requirement 40894)</p>	See Above	See Above				
05.5.3.c.6	<p>Maintenance: Repairs/Replacements: Any of the following signs of deterioration and damage are sufficient reasons for rejection of the rope (see Wire Rope Users Manual for additional information on wire rope inspections): Corrosion (internal or external) that results in reduction of rope diameter, or at end connectors. (Requirement 40895)</p>	See Above	See Above				

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05.5.3.c.7.a	Maintenance: Repairs/Replacements: Any of the following signs of deterioration and damage are sufficient reasons for rejection of the rope (see Wire Rope Users Manual for additional information on wire rope inspections): Reductions of nominal diameter (measured with a caliper or go/no-go gage) of more than: 1/64 inch (0.4 mm) for diameters of rope up to 5/16 inch (8.0 mm). (Requirement 40897)	See Above	See Above				
05.5.3.c.7.b	Maintenance: Repairs/Replacements: Any of the following signs of deterioration and damage are sufficient reasons for rejection of the rope (see Wire Rope Users Manual for additional information on wire rope inspections): Reductions of nominal diameter (measured with a caliper or go/no-go gage) of more than: 1/32 inch (0.8 mm) for diameters 3/8 inch (9.5 mm) to 1/2 inch (13.0 mm). (Requirement 40898)	See Above	See Above				
05.5.3.c.7.c	Maintenance: Repairs/Replacements: Any of the following signs of deterioration and damage are sufficient reasons for rejection of the rope (see Wire Rope Users Manual for additional information on wire rope inspections): Reductions of nominal diameter (measured with a caliper or go/no-go gage) of more than: 3/64 inch (1.2 mm) for diameters 9/16 inch (14.5 mm) through 3/4 inch (19.0 mm). (Requirement 40899)	See Above	See Above				
05.5.3.c.7.d	Maintenance: Repairs/Replacements: Any of the following signs of deterioration and damage are sufficient reasons for rejection of the rope (see Wire Rope Users Manual for additional information on wire rope inspections): Reductions of nominal diameter (measured with a caliper or go/no-go gage) of more than: 1/16 inch (1.6 mm) for diameters 7/8 inch (22.0 mm) through 1-1/8 inches (29.0 mm). (Requirement 40900)	See Above	See Above				
05.5.3.c.7.e	Maintenance: Repairs/Replacements: Any of the following signs of deterioration and damage are sufficient reasons for rejection of the rope (see Wire Rope Users Manual for additional information on wire rope inspections): Reductions of nominal diameter (measured with a caliper or go/no-go gage) of more than: 3/32 inch (2.4 mm) for diameters greater than 1-1/8 inches (29.0 mm). (Requirement 40901)	See Above	See Above				
05.5.3.d	Maintenance: Repairs/Replacements: Any of the following signs of deterioration and damage are sufficient reasons for rejection of the rope (see Wire Rope Users Manual for additional information on wire rope inspections): If replaced, the new rope shall be proof load tested using the associated mobile crane/derrick minimum working radius proof load value. (Requirement 40902)	See Above	See Above				

Doc Para	NASA-STD-8719.9 Requirement Text	OSHA Requirement Text	ASME / ANSI / Other Requirement Text				
05.6.1(1)	<p>Personnel Certification: Only certified (licensed) and trained operators shall be authorized to use/operate mobile cranes and derricks. (Requirement 40904)</p>	<p>1910.180(b)(3)</p> <p>"Designated personnel." Only designated personnel shall be permitted to operate a crane covered by this section.</p>	<p>5-3.1.1 Operators</p> <p>(a) Cranes shall be operated only by the following personnel:</p> <p>(1) those who have met the requirements of paras. 5-3.1.2(a) through (c).</p> <p>(2) those who have met the requirements of para. 5-3.1.2(d) and who are training for the type of crane being operated. While operating the crane, the trainee must be under the direct supervision of a designated, qualified operator.</p> <p>(3) maintenance personnel who have completed all operator trainee qualification requirements. Operation by these persons shall be limited to those crane functions necessary to perform maintenance on the crane or to verify the performance of the crane after maintenance has been performed.</p> <p>(4) inspectors who have completed all operator trainee qualification requirements. Operation by these persons shall be limited to those crane functions necessary to accomplish the inspection.</p>				
05.6.1(2)	<p>Personnel Certification: A training, examination, and licensing program shall be established or made available. (Requirement 40905)</p>	<p>No Requirement</p>	<p>(b) Operator requirements shall include, but not be limited to, the following:</p> <p>(1) evidence of successfully passing a physical examination as defined in para. 5-3.1.2(a)</p> <p>(2) satisfactory completion of a written examination covering operational characteristics, controls, and emergency control skills, such as response to fire, power line contact, loss of stability, or control malfunction, as well as characteristic and performance questions appropriate to the crane type for which qualification is being sought</p> <p>(3) demonstrated ability to read, write, comprehend, and use arithmetic and a load/capacity chart, in the language of the crane manufacturer's operation and maintenance instruction materials</p> <p>(4) satisfactory completion of a combination written and verbal test on load/capacity chart usage that covers a selection of the configurations (the crane may be equipped to handle) for the crane type for which qualification is being sought</p> <p>(5) satisfactory completion of an operation test demonstrating proficiency in handling the specific crane type, including both prestart and poststart inspection, maneuvering skills, shutdown, and securing procedures</p> <p>(6) demonstrated understanding of the applicable sections of the B30 Standard and federal, state, and local requirements</p>				
05.6.1(3)	<p>Personnel Certification: For those NASA installations that do not have a training program, all operators shall be trained and certified by a recognized certification organization that normally performs this function. The operator certification program will be reviewed at least annually to assure that the contents, training material, testing, and examination elements are up-to-date with current methods and techniques; and that any "lessons-learned" are adequately addressed. (Requirement 40906)</p>	<p>No Requirement</p>	<p>No requirement</p>				
05.6.1(4)	<p>Personnel Certification: Riggers (see Section 10) and personnel performing NDT (see paragraph 1.9) shall be certified in their discipline. (Requirement 40907)</p>	<p>No requirement</p>	<p>No requirement</p>				
05.6.1(5)	<p>Personnel Certification: Training shall be provided to observers and flagmen. (Requirement 40908)</p>	<p>No requirement</p>	<p>No requirement</p>				
05.6.1(6)	<p>Personnel Certification: All participants in the lifting operation shall have clearly defined roles and responsibilities. (Requirement 40909)</p>	<p>No requirement</p>	<p>No requirement</p>				

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05.6.2	Personnel Certification: Levels: Two levels of operator training and proficiency will be established. Operations where critical lifts are involved will require a more rigid operator certification program than those operations that involve more routine lifts that do not involve critical hardware or unique hazards. (Requirement 40910)	No requirement	No requirement				
05.6.2.a	Personnel Certification: Levels: Noncritical Lifts. The certification program for noncritical lift operators shall include the following: (Requirement 40911)	No requirement	No requirement				
05.6.2.a.1.a	Personnel Certification: Levels: Noncritical Lifts. The certification program for noncritical lift operators shall include the following: Training: Classroom training in safety, lifting equipment emergency procedures, general performance standards, requirements, pre-operational checks, and safety-related defects and symptoms (for initial certification and as needed). (Requirement 40913)	No requirement	(b) Operator requirements shall include, but not be limited to, the following: (1) evidence of successfully passing a physical examination as defined in para. 5-3.1.2(a) (2) satisfactory completion of a written examination covering operational characteristics, controls, and emergency control skills, such as response to fire, power line contact, loss of stability, or control malfunction, as well as characteristic and performance questions appropriate to the crane type for which qualification is being sought (3) demonstrated ability to read, write, comprehend, and use arithmetic and a load/capacity chart, in the language of the crane manufacturer's operation and maintenance instruction materials (4) satisfactory completion of a combination written and verbal test on load/capacity chart usage that covers a selection of the configurations (the crane may be equipped to handle) for the crane type for which qualification is being sought (5) satisfactory completion of an operation test demonstrating proficiency in handling the specific crane type, including both prestart and poststart inspection, maneuvering skills, shutdown, and securing procedures (6) demonstrated understanding of the applicable sections of the B30 Standard and federal, state, and local requirements				
05.6.2.a.1.b	Personnel Certification: Levels: Noncritical Lifts. The certification program for noncritical lift operators shall include the following: Training: Hands-on training (for initial certification and as needed). (Requirement 40914)	No requirement	See Above				
05.6.2.a.1.c	Personnel Certification: Levels: Noncritical Lifts. The certification program for noncritical lift operators shall include the following: Training: An annual review of the items in paragraph 5.6.2.a(1) above. (This may be conducted informally by local supervisory personnel.) (Requirement 40915)	No requirement	(c) Operators who have successfully qualified for a specific crane type shall be required to be requalified if supervision deems it necessary.				
05.6.2.a.2.a	Personnel Certification: Levels: Noncritical Lifts. The certification program for noncritical lift operators shall include the following: Examination: Physical examination (criteria to be determined by the cognizant medical official and should comply with ASME B30.5). (Requirement 40917)	No requirement	See above				
05.6.2.a.2.b	Personnel Certification: Levels: Noncritical Lifts. The certification program for noncritical lift operators shall include the following: Examination: Written examination. (Requirement 40918)	No requirement	See above				
05.6.2.a.2.c	Personnel Certification: Levels: Noncritical Lifts. The certification program for noncritical lift operators shall include the following: Examination: Operational demonstration (for initial certification only). (Requirement 40919)	No requirement	See above				

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05.6.2.a.2.d	Personnel Certification: Levels: Noncritical Lifts. The certification program for noncritical lift operators shall include the following: Examination: Proficiency examination for recertification. (Requirement 40920)	No requirement	(c) Operators who have successfully qualified for a specific crane type shall be required to be requalified if supervision deems it necessary. Requalification shall include, but not be limited to, the following: (1) evidence of successfully passing a current physical examination as defined in para. 5-3.1.2(a) (2) satisfactory completion of a written examination covering operational characteristics, controls, and emergency control skills, such as response to fire, power line contact, loss of stability, or control malfunction, as well as characteristic and performance stability questions appropriate to the crane type for which requalification is being sought (3) demonstrated ability to read, write, comprehend, and use arithmetic and a load/capacity chart, in the language of the crane manufacturer's operation and maintenance instruction materials (4) satisfactory completion of a combination written and verbal test on load/capacity chart usage that covers a selection of the configurations (the crane may be equipped to handle) for the crane type for which requalification is being sought (5) satisfactory completion of an operation test demonstrating proficiency in handling the specific crane type for which requalification is being sought, including both prestart and poststart inspections, maneuvering skills, shutdown, and securing procedures (6) demonstrated understanding of the applicable sections of the B30 Standard and federal, state, and local safety requirements				
05.6.2.a.3.a(1)	Personnel Certification: Levels: Noncritical Lifts. The certification program for noncritical lift operators shall include the following: Licensing: An organizational element shall be designated to issue operator licenses. (Requirement 40922)	No requirement	No requirement				
05.6.2.a.3.a(2)	Personnel Certification: Levels: Noncritical Lifts. The certification program for noncritical lift operators shall include the following: Licensing: Provisions shall be made to revoke licenses for negligence, violations of safety requirements, or failure to meet medical standards. (Requirement 40923)	No requirement	No requirement				
05.6.2.a.3.a(3)	Personnel Certification: Levels: Noncritical Lifts. The certification program for noncritical lift operators shall include the following: Licensing: Provisions shall be made for periodic checks of operators to verify they have licenses in their possession. (Requirement 40924)	No requirement	No requirement				
05.6.2.a.3.a(4)	Personnel Certification: Levels: Noncritical Lifts. The certification program for noncritical lift operators shall include the following: Licensing: The licenses shall indicate the type of crane/derrick the holder is qualified to operate. Alternately, the organizational element may elect to maintain a master list of licensed operators instead of issuing individual licenses, providing copies of the list are readily available to assurance and supervisory personnel at the work site. (Requirement 40925)	No requirement	No requirement				
05.6.2.a.3.b	Personnel Certification: Levels: Noncritical Lifts. The certification program for noncritical lift operators shall include the following: Licensing/Operator Certification: Renewal of all licenses shall require demonstration of proficiency or approval of supervision that proficiency is adequate and current. Licenses or certifications will expire at least every 4 years. Renewal procedures will be established by each licensing organization but, as a minimum, will include items in paragraphs 5.6.2.a.(1) and 5.6.2.a.(2). (Requirement 40926)	No requirement	No requirement				

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05.6.2.b	Personnel Certification: Levels: Critical Lifts. Besides the training, examination, licensing, and renewal requirements for noncritical lifts, operators that are being certified to perform critical lifts must be trained in the specific hazards and special procedures associated with the lift. Operators must also demonstrate proficiency and operating finesse with the crane/derrick using a test load for the initial certification or alternately be immediately supervised by a certified operator during the first initial lifting period. The licenses will indicate specific cranes/derrick for which the operator is certified. (Requirement 40927)	No requirement	No requirement				
05.7(1)	Operations: Cranes/derricks shall be operated according to this section, the manufacturers' recommendations, and ASME B30.5. (Requirement 40928)	No Requirement	ASME B30.5 General				
05.7(2)	Operations: The following practices shall be followed for crane/derrick operations: (Requirement 40929)	No Requirement	ASME B30.5 General				
05.7.a	Operations: The following practices shall be followed for crane/derrick operations: The operator is responsible for being totally familiar with the information contained in the crane/derrick operating manual and load chart. The operator must understand the correct meaning of all notes and warnings and be able to calculate or determine the crane's/derrick's actual net capacity for every possible machine configuration. (Requirement 40930)	No Requirement	No Requirement				
05.7.aa(1)	Operations: The following practices shall be followed for crane/derrick operations: Hands shall be free from encumbrances while personnel are using crane/derrick ladders. (Requirement 40931)	No Requirement	No Requirement				
05.7.aa(2)	Operations: The following practices shall be followed for crane/derrick operations: Articles that are too large to be carried in pockets or belts shall be lifted and lowered by handline. (Requirement 40932)	No Requirement	No Requirement				
05.7.ab(1)	Operations: The following practices shall be followed for crane/derrick operations: Necessary clothing and personal belongings in cabs shall be stored so as not to interfere with access or operations. (Requirement 40933)	1910.180(i)(3) "Cabs." 1910.180(i)(3)(i) Necessary clothing and personal belongings shall be stored in such a manner as to not interfere with access or operation.	5-3.4.7 Cabs (a) Necessary clothing and personal belongings shall be stored in such a manner as to not interfere with access or operation.				
05.7.ab(2)	Operations: The following practices shall be followed for crane/derrick operations: Tools, oil can, waste, extra fuses, and other necessary articles shall be stored properly and shall not be permitted to lie loose in the cab or on the crane. (Requirement 40934)	1910.180(i)(3)(ii) Tools, oil cans, waste, extra fuses, and other necessary articles shall be stored in the tool box, and shall not be permitted to lie loose in or about the cab.	(b) Tools, oil cans, waste, and other necessary articles shall be stored in the toolbox, and shall not be permitted to lie loose in or about the cab.				
05.7.ab(3)	Operations: The following practices shall be followed for crane/derrick operations: Operators shall be familiar with the operation and care of the fire extinguishers provided. (Requirement 40935)	1910.180(i)(5)(ii) Operating and maintenance personnel shall be made familiar with the use and care of the fire extinguishers provided.	5-3.4.9 Fire Extinguishers (a) A portable fire extinguisher, with a basic minimum extinguisher rating of 10 BC, shall be installed in the cab or at the machinery housing. (b) Operating and maintenance personnel shall be familiar with the use and care of the fire extinguishers provided.				
05.7.ac(1)	Operations: The following practices shall be followed for crane/derrick operations: Crane/derrick crew discipline shall be maintained at all times during an operation. (Requirement 40936)	No requirement	No requirement				
05.7.ac(2)	Operations: The following practices shall be followed for crane/derrick operations: There shall be no eating, drinking, or rowdiness during crane/derrick operation. (Requirement 40937)	No requirement	5-3.1.3 Conduct of Operators (a) The operator shall not engage in any practice that will divert his/her attention while operating the crane.				

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05.7.ad(1)	Operations: The following practices shall be followed for crane/derrick operations: Mobile cranes shall be level. (Requirement 40938)	1910.180(h)(3) "Moving the load." 1910.180(h)(3)(i) The employer shall assure that: ..1910.180(h)(3)(i)(a) 1910.180(h)(3)(i)(a) The crane is level and where necessary blocked properly.	5-3.2.1.5 Moving the Load (a) The person directing the lift shall see that (1) the crane is level and, where necessary, blocked.				
05.7.ad(2)	Operations: The following practices shall be followed for crane/derrick operations: When the load to be handled and the operating radius require the use of outriggers, or any time when outriggers are used, the outrigger beams shall be fully extended or deployed per load rating chart specifications. (Requirement 40939)	No requirement	When partially extended outriggers are used, the following requirements, when applicable, shall be met: (1) Crane operation with partially extended outriggers shall only be undertaken if approved by the crane manufacturer. (2) Outriggers shall be set at equal positions that correspond to the load/capacity charts supplied by the manufacturer for those positions. Only the load chart(s) corresponding to the outrigger positions shall be used for operation. (3) When situations arise where outriggers must be set at unequal positions that correspond to the load/capacity charts supplied by the manufacturer (see Fig. 16), the load/capacity charts corresponding with the individual quadrants of operation shall be used. The manufacturer or qualified person shall be consulted to determine if any capacity reductions, special operating procedures, or limitations are required.				
05.7.ad(3)	Operations: The following practices shall be followed for crane/derrick operations: Additionally, the outriggers shall be set to remove the machine weight from wheels if required by the OEM per load rating chart. (Requirement 40940)	No requirement	(h) Any time outriggers are used, the outriggers shall be extended or deployed per the crane manufacturer's load/capacity chart specifications and set to remove the machine weight from the wheels, except for locomotive cranes.				
05.7.ad(4)	Operations: The following practices shall be followed for crane/derrick operations: Blocking under outrigger beams is not permitted. (Requirement 40941)	No Requirement	5-3.4.6 Footing Firm footing under both crawler tracks, all tires, or individual outrigger pads should be level within 1%. Where such a footing is not otherwise supplied, it should be provided by timbers, cribbing, or other structural members to distribute the load so as not to exceed the allowable bearing capacity of the underlying material.				
05.7.ad(5)	Operations: The following practices shall be followed for crane/derrick operations: Blocking under outrigger floats, when used, shall be strong enough to prevent crushing, bending, or shear failure and of sufficient thickness, width, and length as to completely support the float, transmit the load to the supporting surface, and prevent shifting or toppling under load. (Requirement 40942)	1910.180(h)(3)(ix) Outriggers shall be used when the load to be handled at that particular radius exceeds the rated load without outriggers as given by the manufacturer for that crane. Where floats are used they shall be securely attached to the outriggers. Wood blocks used to support outriggers shall: 1910.180(h)(3)(ix)(a) Be strong enough to prevent crushing. 1910.180(h)(3)(ix)(b) Be free from defects. 1910.180(h)(3)(ix)(c) Be of sufficient width and length to prevent shifting or toppling under load.	5-3.4.6 Footing Firm footing under both crawler tracks, all tires, or individual outrigger pads should be level within 1%. Where such a footing is not otherwise supplied, it should be provided by timbers, cribbing, or other structural members to distribute the load so as not to exceed the allowable bearing capacity of the underlying material.				

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05.7.ae	Operations: The following practices shall be followed for crane/derrick operations: On truck mounted cranes, loads shall not be lifted over the front area except as approved by the crane manufacturer. (Requirement 40943)	1910.180(h)(3)(vii) On truck-mounted cranes, no loads shall be lifted over the front area except as approved by the crane manufacturer.	(f) On wheel-mounted cranes, no loads shall be lifted over the front area, except as specified by the crane manufacturer.				
05.7.af(1)	Operations: The following practices shall be followed for crane/derrick operations: Outriggers shall be used when the load to be handled at a particular radius exceeds rated load without outriggers, as specified by the crane manufacturer's load chart. (Requirement 40944)	1910.180(h)(3)(ix) Outriggers shall be used when the load to be handled at that particular radius exceeds the rated load without outriggers as given by the manufacturer for that crane. Where floats are used they shall be securely attached to the outriggers.	(h) Any time outriggers are used, the outriggers shall be extended or deployed per the crane manufacturer's load/capacity chart specifications and set to remove the machine weight from the wheels, except for locomotive cranes. [For locomotive cranes, refer to para. 5-3.2.1.5(j).] When partially extended outriggers are used, the following requirements, when applicable, shall be met: (1) Crane operation with partially extended outriggers shall only be undertaken if approved by the crane manufacturer.				
05.7.af(2)	Operations: The following practices shall be followed for crane/derrick operations: Floats, where used, shall be securely attached to the outriggers. (Requirement 40945)	1910.180(h)(3)(ix) Outriggers shall be used when the load to be handled at that particular radius exceeds the rated load without outriggers as given by the manufacturer for that crane. Where floats are used they shall be securely attached to the outriggers.	5-1.9.3 Outriggers (a) Means shall be provided to hold all outriggers in the retracted position while traveling and in the extended position when set for operating. (b) Power-actuated jacks, where used, shall be provided with the means (such as integral load hold check valves on hydraulic cylinders, mechanical locks, etc.) to prevent loss of support under load. (c) Means shall be provided for fastening outrigger floats to outriggers when in use.				
05.7.ag	Operations: The following practices shall be followed for crane/derrick operations: Neither the load nor the boom shall be lowered below the point where less than two full wraps of rope remain on the respective drums. (Requirement 40946)	1910.180(h)(3)(x) Neither the load nor the boom shall be lowered below the point where less than two full wraps of rope remain on their respective drums.	(i) Neither the load nor the boom shall be lowered below the point where less than two full wraps of rope remain on their respective drums.				

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05.7.ah(1)		<p>1910.180(h)(3)(xiii)</p> <p>In transit the following additional precautions shall be exercised:</p> <p>1910.180(h)(3)(xiii)(a)</p> <p>The boom shall be carried in line with the direction of motion.</p> <p>1910.180(h)(3)(xiii)(b)</p> <p>The superstructure shall be secured against rotation, except when negotiating turns when there is an operator in the cab or the boom is supported on a dolly.</p> <p>1910.180(h)(3)(xiii)(c)</p> <p>The empty hook shall be lashed or otherwise restrained so that it cannot swing freely.</p> <p>..1910.180(h)(3)(xiv)</p> <p>1910.180(h)(3)(xiv)</p> <p>Before traveling a crane with load, a designated person shall be responsible for determining and controlling safety. Decisions such as position of load, boom location, ground support, travel route, and speed of movement shall be in accord with his determinations.</p> <p>1910.180(h)(3)(xv)</p> <p>A crane with or without load shall not be traveled with the boom so high that it may bounce back over the cab.</p> <p>1910.180(h)(3)(xvi)</p> <p>When rotating the crane, sudden starts and stops shall be avoided. Rotational speed shall be such that the load does not</p>	<p>(l) While in transit, the following additional precautions shall be exercised:</p> <p>(1) The boom should be carried in line with the direction of motion.</p> <p>(2) The superstructure shall be secured against rotation (or the boom placed in a boom rack mounted on the carrier), except when negotiating turns when there is an operator in the cab or the boom is supported on a dolly.</p> <p>(3) The empty hook shall be lashed or otherwise restrained so that it cannot swing freely.</p> <p>(m) Before traveling a crane with a load, it shall be determined that this practice is not prohibited by the manufacturer. If not, a designated person shall be responsible for the operation. Decisions such as the necessity to reduce crane ratings, load position, boom location, ground support, travel route, and speed of movement shall be in accordance with that person's determination. Specified tire pressure shall be maintained. The boom should be carried in line with the direction of travel. Sudden starts and stops should be avoided. Tag or restraint lines should be used to control swinging of the load.</p> <p>(n) A crane with or without a load shall not be traveled with the boom so high that it may bounce back over the cab.</p> <p>(o) When rotating the crane, sudden starts and stops shall be avoided. Rotational speed shall be such that the load does not swing out beyond the radius at which it can be controlled. A tag or restraint line shall be used when rotation of the load is hazardous.</p> <p>32</p> <p>(p) When a crane is to be operated with the boom at a fixed angle, the boom-hoist pawl or other positive holding device shall be engaged.</p> <p>(q) Use of Winch Heads</p> <p>(1) Fiber and wire rope shall not be handled on a winch head without the knowledge of the operator.</p> <p>(2) While a winch head is being used, the operator</p>				
05.7.ah(2)	Operations: The following practices shall be followed for crane/derrick operations: For mobile cranes in transit, the following precautions shall be taken: boom shall be stowed/carried in line with direction of motion,	See Above	See Above				
05.7.ah(3)	Operations: The following practices shall be followed for crane/derrick operations: For mobile cranes in transit, the following precautions shall be taken: and hook shall be lashed or otherwise restrained so that it cannot swing freely while in transit or moving. (Requirement 40949)	See Above	See Above				
05.7.ai	Operations: The following practices shall be followed for crane/derrick operations: When traveling a mobile crane with a load, a person shall be designated responsible for determining and controlling safety and making decisions as to position of load, boom location, ground support, travel route, and speed of movement. (Requirement 40950)	See Above	See Above				
05.7.aj	Operations: The following practices shall be followed for crane/derrick operations: A mobile crane with or without a load shall not be traveled with the boom so high that it may bounce back over the cab. (Requirement 40951)	See Above	See Above				
05.7.ak(1)	Operations: The following practices shall be followed for crane/derrick operations: When rotating cranes/derricks, sudden starts and stops shall be avoided. (Requirement 40952)	See Above	See Above				
05.7.ak(2)	Operations: The following practices shall be followed for crane/derrick operations: Speed shall be such that the load does not swing out beyond radii at which it can be controlled. (Requirement 40953)	See Above	See Above				

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05.7.ak(3)	Operations: The following practices shall be followed for crane/derrick operations: A tag line shall be used when rotation of load is hazardous. (Requirement 40954)	See Above	See Above				
05.7.aL	Operations: The following practices shall be followed for crane/derrick operations: Ropes shall not be handled on a winch head without the knowledge of the operator. (Requirement 40955)	See Above	See Above				
05.7.am	Operations: The following practices shall be followed for crane/derrick operations: While a winch head is being used, the operator shall be within convenient reach of the power unit control lever. (Requirement 40956)	See Above	See Above				
05.7.an	Operations: The following practices shall be followed for crane/derrick operations: If the load must remain suspended for any considerable length of time, the operator shall hold the drum from rotating in the lowering direction by activating the positive control lever of the operator's station. (Requirement 40957)	1910.180(h)(4)(iii) If the load must remain suspended for any considerable length of time, the operator shall hold the drum from rotating in the lowering direction by activating the positive controllable means of the operator's station.	(c) If the load hoist mechanism is not equipped with an automatic brake and the load must remain suspended for any considerable length of time, the operator shall hold the drum from rotating in the lowering direction by activating the device specified in para. 5-1.3.2(a)(4). ((4) A means controllable from the operator's station shall be provided to hold the drum from rotating in the lowering direction and be capable of holding the rated load without further action by the operator. Foot-operated brakes having a continuous mechanical linkage between the actuating and braking means, capable of transmitting full braking force, and equipped with a positive mechanical means to hold the linkage in the applied position, meet this requirement.)				
05.7.ao(1)	Operations: The following practices shall be followed for crane/derrick operations: Mobile cranes shall not be operated without the full amount of ballast or counterweight in place as specified by the manufacturer. (Requirement 40958)	1910.180(i)(2) "Ballast or counterweight." Cranes shall not be operated without the full amount of any ballast or counterweight in place as specified by the maker, but truck cranes that have dropped the ballast or counterweight may be operated temporarily with special care and only for light loads without full ballast or counterweight in place. The ballast or counterweight in place specified by the manufacturer shall not be exceeded.	5-3.4.2 Ballast or Counterweight Cranes shall not be operated without the ballast or counterweight being in place as specified by the crane manufacturer. Under specific conditions, such as during crane assembly or unusual boom configurations, the crane manufacturer's recommendations for the amount of ballast or counterweight shall be adhered to. The maximum ballast or counterweight approved by the manufacturer for use on a given machine shall not be exceeded. Unauthorized addition of ballast or counterweight constitutes a hazard in two ways.				
05.7.ao(2)	Operations: The following practices shall be followed for crane/derrick operations: The ballast or counterweight, as specified by the manufacturer, shall not be exceeded. (Requirement 40959)	See Above	See Above				
05.7.ap	Operations: The following practices shall be followed for crane/derrick operations: Refueling with small portable containers shall be done with Underwriter's Laboratories or Factory Mutual Laboratories approved (or equivalent) safety type can equipped with an automatic closing cap and flame arrestor. (Requirement 40960)	1910.180(i)(4) "Refueling." 1910.180(i)(4)(i) Refueling with small portable containers shall be done with an approved safety type can equipped with an automatic closing cap and flame arrestor. Refer to 1910.155(c)(3) for definition of approved. 1910.180(i)(4)(ii) Machines shall not be refueled with the engine running.	5-3.4.8 Refueling (a) When refueling with gasoline using a portable container, it shall be a safety-type can equipped with an automatic closing cap and a flame arrestor. (b) Machines shall not be refueled while the engine is running. (c) Smoking or open flames shall be prohibited in the refueling area.				
05.7.aq	Operations: The following practices shall be followed for crane/derrick operations: Machines shall not be fueled with engines running. (Requirement 40961)	See Above	See Above				

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05.7.ar	<p>Operations: The following practices shall be followed for crane/derrick operations: A carbon dioxide, dry chemical, or equivalent fire extinguisher shall be kept in the cab or vicinity of the crane/derrick. (Requirement 40962)</p>	<p>1910.180(i)(5)</p> <p>"Fire extinguishers."</p> <p>1910.180(i)(5)(i)</p> <p>A carbon dioxide, dry chemical, or equivalent fire extinguisher shall be kept in the cab or vicinity of the crane.</p> <p>1910.180(i)(5)(ii)</p> <p>Operating and maintenance personnel shall be made familiar with the use and care of the fire extinguishers provided.</p>	<p>5-3.4.9 Fire Extinguishers</p> <p>(a) A portable fire extinguisher, with a basic minimum extinguisher rating of 10 BC, shall be installed in the cab or at the machinery housing.</p> <p>(b) Operating and maintenance personnel shall be familiar with the use and care of the fire extinguishers provided.</p>				
05.7.as	<p>Operations: The following practices shall be followed for crane/derrick operations: Except where the electrical distribution and transmission lines have been deenergized and visibly grounded at the point of work, or where insulating barriers, not a part of or an attachment to the crane, have been erected to prevent physical contact with power lines, mobile cranes shall be operated in accordance with the following: (Requirement 40963)</p>	<p>1910.180(j)</p> <p>"Operations near overhead lines" -</p> <p>1910.180(j)(1)</p> <p>For operations near overhead electric lines, see 1910.333(c)(3).</p>	<p>5-3.4.5 Operating Near Electric Power Lines</p> <p>5-3.4.5.1 General. This volume recognizes that operating mobile cranes where they can become electrified from electric power lines is an extremely hazardous practice. It is advisable to perform the work so there is no possibility of the crane, load line, or load becoming a conductive path. [See Fig. 18, sketches (a) and (b).] Cranes shall not be used to handle materials stored under electric power lines unless any combination of boom, load, load line, or machine component cannot enter the prohibited zone. Operating mobile cranes where they can become electrified with electric power lines is not recommended unless there is no less hazardous way to perform the job.</p> <p>Any overhead wire shall be considered to be an energized line unless and until the person owning such line or the electrical utility authorities indicate that it is not an energized line. Crane operators shall not rely on the coverings of wires for their protection. Four conditions to consider when operating a mobile crane near electric power lines are the following:</p>				
05.7.as.1	<p>Operations: The following practices shall be followed for crane/derrick operations: Except where the electrical distribution and transmission lines have been deenergized and visibly grounded at the point of work, or where insulating barriers, not a part of or an attachment to the crane, have been erected to prevent physical contact with power lines, mobile cranes shall be operated in accordance with the following: For lines rated 50kV or below, minimum clearance between lines and any part of crane or load shall be 10 feet (3 m). (Requirement 40964)</p>	<p>1910.333(c)(3)(iii)</p> <p>"Vehicular and mechanical equipment."</p> <p>1910.333(c)(3)(iii)(A)</p> <p>Any vehicle or mechanical equipment capable of having parts of its structure elevated near energized overhead lines shall be operated so that a clearance of 10 ft. (305 cm) is maintained. If the voltage is higher than 50kV, the clearance shall be increased 4 in. (10 cm) for every 10kV over that voltage. However, under any of the following conditions, the clearance may be reduced:</p> <p>1910.333(c)(3)(iii)(A)(1)</p> <p>If the vehicle is in transit with its structure lowered, the clearance may be reduced to 4 ft. (122 cm). If the voltage is higher than 50kV, the clearance shall be increased 4 in. (10 cm) for every 10 kV over that voltage.</p>	<p>Table 2 Required Clearance for Normal Voltage in Operation Near High-Voltage Power Lines and Operation in Transit With No Load and Boom or Mast Lowered</p> <p>Minimum Required Normal Voltage, kV Clearance, (Phase to Phase) ft (m) [Note (1)]</p> <p>Operation Near High-Voltage Power Lines to 50 10 (3.05)</p> <p>Over 50 to 200 15 (4.60)</p> <p>Over 200 to 350 20 (6.10)</p> <p>Over 350 to 500 25 (7.62)</p> <p>Over 500 to 750 35 (10.67)</p> <p>Over 750 to 1,000 45 (13.72)</p> <p>Operation in Transit With No Load and Boom or Mast Lowered to 0.75 4 (1.22)</p> <p>Over 0.75 to 50 6 (1.83)</p> <p>Over 50 to 345 10 (3.05)</p> <p>Over 345 to 750 16 (4.87)</p> <p>Over 750 to 1,000 20 (6.10)</p> <p>NOTE:</p> <p>(1) Environmental conditions such as fog, smoke, or precipitation may require increased clearances.</p>				

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05.7.as.2	<p>Operations: The following practices shall be followed for crane/derrick operations: Except where the electrical distribution and transmission lines have been deenergized and visibly grounded at the point of work, or where insulating barriers, not a part of or an attachment to the crane, have been erected to prevent physical contact with power lines, mobile cranes shall be operated in accordance with the following: For lines rated over 50kV, minimum clearance between lines and any part of crane or load shall be 10 feet (3 m) plus 0.4 inch (10 mm) for each 1kV over 50kV, or twice the length of the line insulator, but never less than 10 feet (3 m). (Requirement 40965)</p>	<p>1910.333(c)(3)(iii)</p> <p>"Vehicular and mechanical equipment."</p> <p>1910.333(c)(3)(iii)(A)</p> <p>Any vehicle or mechanical equipment capable of having parts of its structure elevated near energized overhead lines shall be operated so that a clearance of 10 ft. (305 cm) is maintained. If the voltage is higher than 50kV, the clearance shall be increased 4 in. (10 cm) for every 10kV over that voltage. However, under any of the following conditions, the clearance may be reduced:</p> <p>1910.333(c)(3)(iii)(A)(1)</p> <p>If the vehicle is in transit with its structure lowered, the clearance may be reduced to 4 ft. (122 cm). If the voltage is higher than 50kV, the clearance shall be increased 4 in. (10 cm) for every 10 kV over that voltage.</p>	<p>Table 2 Required Clearance for Normal Voltage in Operation Near High-Voltage Power Lines and Operation in Transit With No Load and Boom or Mast Lowered</p> <p>Minimum Required Normal Voltage, kV Clearance, (Phase to Phase) ft (m) [Note (1)]</p> <p>Operation Near High-Voltage Power Lines to 50 10 (3.05)</p> <p>Over 50 to 200 15 (4.60)</p> <p>Over 200 to 350 20 (6.10)</p> <p>Over 350 to 500 25 (7.62)</p> <p>Over 500 to 750 35 (10.67)</p> <p>Over 750 to 1,000 45 (13.72)</p> <p>Operation in Transit With No Load and Boom or Mast Lowered to 0.75 4 (1.22)</p> <p>Over 0.75 to 50 6 (1.83)</p> <p>Over 50 to 345 10 (3.05)</p> <p>Over 345 to 750 16 (4.87)</p> <p>Over 750 to 1,000 20 (6.10)</p> <p>NOTE:</p> <p>(1) Environmental conditions such as fog, smoke, or precipitation may require increased clearances.</p>				
05.7.as.3	<p>Operations: The following practices shall be followed for crane/derrick operations: Except where the electrical distribution and transmission lines have been deenergized and visibly grounded at the point of work, or where insulating barriers, not a part of or an attachment to the crane, have been erected to prevent physical contact with power lines, mobile cranes shall be operated in accordance with the following: The crane shall be positioned to preclude the boom or load from contacting or falling across the power line(s) in the even of crane failure. (Requirement 40966)</p>	<p>No requirement</p>	<p>No requirement</p>				
05.7.as.4(1)	<p>Operations: The following practices shall be followed for crane/derrick operations: Except where the electrical distribution and transmission lines have been deenergized and visibly grounded at the point of work, or where insulating barriers, not a part of or an attachment to the crane, have been erected to prevent physical contact with power lines, mobile cranes shall be operated in accordance with the following: In transit, with no load and boom lowered, the clearance between lines and any part of crane shall be a minimum of 4 feet (1.2 m), for lines rated 0.75kV or below. (Requirement 40967)</p>	<p>1910.333(c)(3)(iii)(A)(1)</p> <p>If the vehicle is in transit with its structure lowered, the clearance may be reduced to 4 ft. (122 cm). If the voltage is higher than 50kV, the clearance shall be increased 4 in. (10 cm) for every 10 kV over that voltage</p>	<p>Table 2 Required Clearance for Normal Voltage in Operation Near High-Voltage Power Lines and Operation in Transit With No Load and Boom or Mast Lowered</p> <p>Minimum Required Normal Voltage, kV Clearance, (Phase to Phase) ft (m) [Note (1)]</p> <p>Operation Near High-Voltage Power Lines to 50 10 (3.05)</p> <p>Over 50 to 200 15 (4.60)</p> <p>Over 200 to 350 20 (6.10)</p> <p>Over 350 to 500 25 (7.62)</p> <p>Over 500 to 750 35 (10.67)</p> <p>Over 750 to 1,000 45 (13.72)</p> <p>Operation in Transit With No Load and Boom or Mast Lowered to 0.75 4 (1.22)</p> <p>Over 0.75 to 50 6 (1.83)</p> <p>Over 50 to 345 10 (3.05)</p> <p>Over 345 to 750 16 (4.87)</p> <p>Over 750 to 1,000 20 (6.10)</p> <p>NOTE:</p> <p>(1) Environmental conditions such as fog, smoke, or precipitation may require increased clearances.</p>				

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05.7.as.4(2)	<p>Operations: The following practices shall be followed for crane/derrick operations: Except where the electrical distribution and transmission lines have been deenergized and visibly grounded at the point of work, or where insulating barriers, not a part of or an attachment to the crane, have been erected to prevent physical contact with power lines, mobile cranes shall be operated in accordance with the following: For lines rated over 0.75kV, the clearance shall be 4 feet (1.2 m) plus 0.17 inch (4.3 mm) for each 1kV over 0.75kV. Refer to ASME B30.5 for more details. (Requirement 40968)</p>	<p>1910.333(c)(3)(iii)(A)</p> <p>Any vehicle or mechanical equipment capable of having parts of its structure elevated near energized overhead lines shall be operated so that a clearance of 10 ft. (305 cm) is maintained. If the voltage is higher than 50kV, the clearance shall be increased 4 in. (10 cm) for every 10kV over that voltage.</p>	<p>Table 2 Required Clearance for Normal Voltage in Operation Near High-Voltage Power Lines and Operation in Transit With No Load and Boom or Mast Lowered Minimum Required Normal Voltage, kV Clearance, (Phase to Phase) ft (m) [Note (1)] Operation Near High-Voltage Power Lines to 50 10 (3.05) Over 50 to 200 15 (4.60) Over 200 to 350 20 (6.10) Over 350 to 500 25 (7.62) Over 500 to 750 35 (10.67) Over 750 to 1,000 45 (13.72) Operation in Transit With No Load and Boom or Mast Lowered to 0.75 4 (1.22) Over 0.75 to 50 6 (1.83) Over 50 to 345 10 (3.05) Over 345 to 750 16 (4.87) Over 750 to 1,000 20 (6.10) NOTE: (1) Environmental conditions such as fog, smoke, or precipitation may require increased clearances.</p>				
05.7.as.5	<p>Operations: The following practices shall be followed for crane/derrick operations: Except where the electrical distribution and transmission lines have been deenergized and visibly grounded at the point of work, or where insulating barriers, not a part of or an attachment to the crane, have been erected to prevent physical contact with power lines, mobile cranes shall be operated in accordance with the following: Clearance observers shall be provided with an acceptable means of giving a warning in time for operators to react to insufficient clearance. (Requirement 40969)</p>	No requirement	<p>5-3.4.5.3 Crane Operation Within the Erected/Fully Extended Boom Length of the Prohibited Zone, With the Power Lines Energized. (d) A qualified signal person(s), whose sole responsibility is to verify that the required clearance is maintained, shall be in constant contact with the crane operator.</p>				
05.7.as.6	<p>Operations: The following practices shall be followed for crane/derrick operations: Except where the electrical distribution and transmission lines have been deenergized and visibly grounded at the point of work, or where insulating barriers, not a part of or an attachment to the crane, have been erected to prevent physical contact with power lines, mobile cranes shall be operated in accordance with the following: Crane boom tips shall have two red flags, minimum of 12 inches (30.5 cm) x 12 inches (30.5 cm) each. (Requirement 40970)</p>	No Requirement	No requirement				
05.7.at(1)	<p>Operations: The following practices shall be followed for crane/derrick operations: Before starting operation near electrical lines, the organization responsible for the lines shall be notified and provided with all pertinent information. (Requirement 40971)</p>	<p>1910.333(c)(3)</p> <p>"Overhead lines." if work is to be performed near overhead lines, the lines shall be deenergized and grounded, or other protective measures shall be provided before work is started. If the lines are to be deenergized, arrangements shall be made with the person or organization that operates or controls the electric circuits involved to deenergize and ground them. If protective measures, such as guarding, isolating, or insulating, are provided, these precautions shall prevent employees from contacting such lines directly with any part of their body or indirectly through conductive materials, tools, or equipment.</p>	<p>5-3.4.5.2 Crane Operation Near De-energized and Grounded Electric Power Lines. This is the preferred condition under which the operation can be performed. The hazard of injury or death due to electrocution has been removed. The following steps shall be taken to ensure de-energization of the power lines: (a) The power company or owner of the power lines shall de-energize the lines.</p>				

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05.7.at(2)	Operations: The following practices shall be followed for crane/derrick operations: The responsible organization's cooperation shall be requested. (Requirement 40972)	No requirement	<p>5-3.4.5.2 Crane Operation Near De-energized and Grounded Electric Power Lines. This is the preferred condition under which the operation can be performed. The hazard of injury or death due to electrocution has been removed.</p> <p>The following steps shall be taken to ensure de-energization of the power lines:</p> <p>(a) The power company or owner of the power lines shall de-energize the lines.</p> <p>5-3.4.5.3 Crane Operation Within the Erected/Fully Extended Boom Length of the Prohibited Zone, With the Power Lines Energized. The following steps shall be taken to minimize the hazard of electrocution or serious injury as a result of contact between the energized power lines and the crane, load line, or load [see Fig. 18, sketch (c)].</p> <p>(a) An on-site meeting between project management and a qualified representative of the owner of the lines or a designated representative of the electrical utility shall take place to establish</p>				
05.7.au	Operations: The following practices shall be followed for crane/derrick operations: Any overhead wire shall be considered an energized line unless and until the person responsible for such line or the electrical utility authorities indicate that it is not an energized line. (Requirement 40973)	No requirement	<p>Any overhead wire shall be considered to be an energized line unless and until the person owning such line or the electrical utility authorities indicate that it is not an energized line. Crane operators shall not rely on the coverings of wires for their protection. Four conditions to consider when operating a mobile crane near electric power lines are the following:</p> <p>(a) power lines de-energized and grounded as in para. 5-3.4.5.2</p> <p>(b) power lines energized, crane operating less than the erected/fully extended boom length away as in para. 5-3.4.5.3 [see Fig. 18, sketch (c)]</p> <p>(c) power lines energized, crane within prohibited zone as in para. 5-3.4.5.4</p> <p>(d) crane in transit, no load, and boom lowered as in para. 5-3.4.5.5</p>				
05.7.av	Operations: The following practices shall be followed for crane/derrick operations: Outdoor hoisting operations should not commence if winds are above 20 knots (23 mph, 37 km/hr) steady state or if gusts exceed 35 knots (40 mph, 65 km/hr). Consideration shall also be given to sail area and weather conditions such as lightning, or snow before commencing operations. (Requirement 40974)	<p>1910.180(c)(1)(iv)</p> <p>The effectiveness of these preceding stability factors will be influenced by such additional factors as freely suspended loads, track, wind, or ground conditions, condition and inflation of rubber tires, boom lengths, proper operating speeds for existing conditions, and, in general, careful and competent operation. All of these shall be taken into account by the user.</p>	No requirement.				

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05.7.aw	Operations: The following practices shall be followed for crane/derrick operations: Cranes/derricks left outdoors shall be secured by the operator when operations are complete. (Requirement 40975)	No requirement	(e) Before leaving the crane unattended, the operator shall (1) land any load, bucket, lifting magnet, or other device (2) disengage the master clutch (3) set travel, swing, boom brakes, and other locking devices (4) put controls in the off or neutral position (5) secure the crane against accidental travel (6) stop the engine (7) An exception to (6) above may exist when crane operation is frequently interrupted during a shift and the operator must leave the crane. Under these circumstances, the engine may remain running and the following conditions [including those in paras. 5-3.1.3(e)(1) through (e)(5)] shall apply: (a) The operator shall be situated where unauthorized entry of the crane can be observed. (b) The crane shall be located within an area protected from unauthorized entry. (8) When a local weather storm warning exists, consideration shall be given to the recommendations of the manufacturer for securing the crane.				
05.7.ax	Operations: The following practices shall be followed for crane/derrick operations: Wire rope should be used in accordance with the Wire Rope Users Manual. (Requirement 40976)	No requirement	No requirement				
05.7.b(1)	Operations: The following practices shall be followed for crane/derrick operations: General operating procedures describing operation, emergency steps, communication requirements, and special requirements shall be prepared, approved, and followed for each crane/derrick. There must be a formal system for review, approval, and update to maintain valid operating procedures. (Requirement 40977)	No requirement	No requirement				
05.7.b(2)	Operations: The following practices shall be followed for crane/derrick operations: Emergency procedures shall be developed for contingency actions such as power loss, brake failure, or other emergencies (also, see paragraph 1.5.1.c). (Requirement 40978)	No requirement	No requirement				
05.7.c(1)	Operations: The following practices shall be followed for crane/derrick operations: Operations shall be analyzed for hazards. (Requirement 40979)	No requirement	No requirement				
05.7.c(2)	Operations: The following practices shall be followed for crane/derrick operations: The analysis shall consider the environment in which the operation occurs, hazards associated with crane/derrick maintenance, and, in general, a safety analysis of the equipment, facility, load, human factors, and interfaces as a whole in support of the lifting operation. (Requirement 40980)	No requirement	No requirement				
05.7.d(1)	Operations: The following practices shall be followed for crane/derrick operations: Appropriate load charts shall be located in the crane/derrick cab, if so equipped. (Requirement 40981)	1910.180(c)(2) "Load rating chart." A substantial and durable rating chart with clearly legible letters and figures shall be provided with each crane and securely fixed to the crane cab in a location easily visible to the operator while seated at his control station.	5-1.1.3 Load Rating Chart (a) A durable rating chart(s) with legible letters and figures shall be provided with each crane and attached in a location accessible to the operator while at the controls.				
05.7.d(2)	Operations: The following practices shall be followed for crane/derrick operations: Otherwise, the load charts shall be kept in a central, easily accessible place. (Requirement 40982)	No requirement	No requirement				
05.7.d(3)	Operations: The following practices shall be followed for crane/derrick operations: Mobile cranes and derricks shall not be operated without an appropriate load chart. (Requirement 40983)	No specific requirement - implied above	No specific requirement - implied above				

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05.7.e	Operations: The following practices shall be followed for crane/derrick operations: For critical lifts, the load shall not exceed 75 percent of the crane's/derrick's rated capacity. (Requirement 40984)	No Requirement	No Requirement				
05.7.f	Operations: The following practices shall be followed for crane/derrick operations: Methods shall be developed and demonstrated for lowering a load in the event of crane/derrick failure or other contingencies. These should be demonstrated and verified if practical. (Requirement 40985)	No Requirement	No Requirement				
05.7.g	Operations: The following practices shall be followed for crane/derrick operations: A crane/derrick shall not be loaded beyond its rated load (capacity) except for required testing. (Requirement 40986)	1910.180(h)(1)(i) No crane shall be loaded beyond the rated load, except for test purposes as provided in paragraph (e) of this section.	5-3.2.1 Handling the Load 5-3.2.1.1 Size of Load (a) No crane shall be loaded beyond the specifications of the load rating chart, except for test purposes as provided in Section 5-2.2.				
05.7.h(1)	Operations: The following practices shall be followed for crane/derrick operations: Cranes/derricks shall not be used to load test items such as slings, platforms, or lifting fixtures unless specifically identified to do so based on a specified percentage of rated load, and a safety analysis approved by the LDEM and the responsible safety, engineering, operations, and maintenance organizations. (Requirement 40987)	No Requirement	No Requirement				
05.7.h(2)	Operations: The following practices shall be followed for crane/derrick operations: Test procedures shall be approved by the responsible safety, engineering, operations, and maintenance organizations. This is to ensure that the crane/derrick is not damaged due to sudden unloading should the test article fail. Appendix D, crane/hoist requirements to load test other lifting equipment, shall be followed. (Requirement 40988)	No Requirement	No Requirement				
05.7.i(1)	Operations: The following practices shall be followed for crane/derrick operations: Cranes/derricks shall not be side loaded, used to drag loads sideways, or used to pull loads unless specifically designed to do so by the OEM as indicated in the load chart. (Requirement 40989)	1910.180(h)(3)(iv) Side loading of booms shall be limited to freely suspended loads. Cranes shall not be used for dragging loads sideways.	(d) Side loading of booms shall be limited to freely suspended loads. Cranes shall not be used for dragging loads sideways.				
05.7.i(2)	Operations: The following practices shall be followed for crane/derrick operations: Side loading of the boom shall be limited to freely suspended loads. (Requirement 40990)	1910.180(h)(3)(iv) Side loading of booms shall be limited to freely suspended loads. Cranes shall not be used for dragging loads sideways.	(d) Side loading of booms shall be limited to freely suspended loads. Cranes shall not be used for dragging loads sideways.				
05.7.j(1)	Operations: The following practices shall be followed for crane/derrick operations: There shall be a system for documenting crane/derrick problems/discrepancies. (Requirement 40991)	No requirement	No requirement				
05.7.j(2)	Operations: The following practices shall be followed for crane/derrick operations: Prior to an operation, the operator shall review any previously noted problems/discrepancies to determine possible impact on planned activity. (Requirement 40992)	No requirement	No requirement				
05.7.k(1)	Operations: The following practices shall be followed for crane/derrick operations: The operator shall ensure that the crane/derrick is within inspection and testing intervals by examination of the periodic recertification tags and/or documentation. (Requirement 40993)	No requirement	No requirement				
05.7.k(2)	Operations: The following practices shall be followed for crane/derrick operations: The operator shall adhere to all tags placed on the crane controls. (Requirement 40994)	No requirement	No requirement				

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05.7.L(1)	Operations: The following practices shall be followed for crane/derrick operations: Before each lift or series of lifts, the operator shall perform a pre-operational check to demonstrate operational readiness. If controls do not operate properly, the operator is responsible for notifying the supervisor. (Requirement 40995)	No requirement	(i) The operator shall be familiar with the equipment and its proper care. If adjustments or repairs are necessary, the operator shall promptly report this to the appointed person and shall also notify the next operator. (j) All controls shall be tested by the operator at the start of a new shift. If any controls fail to operate properly, they shall be adjusted or repaired before operations are begun.				
05.7.L(2)	Operations: The following practices shall be followed for crane/derrick operations: Repairs and adjustments shall be made before operations begin. (Requirement 40996)	1910.180(f) "Maintenance procedure" - "General." After adjustments and repairs have been made the crane shall not be operated until all guards have been reinstalled, safety devices reactivated, and maintenance equipment removed.	(c) After adjustments and repairs have been made, the crane shall not be returned to service until all guards have been reinstalled, trapped air removed from the hydraulic system, safety devices reactivated, and maintenance equipment removed.				
05.7.m	Operations: The following practices shall be followed for crane/derrick operations: The operator and ground lead man shall establish appropriate safety zones before initiating operations. Safety zones should have appropriate barriers (rope, cones, or other) established prior to lift. (Requirement 40997)	No Requirements	No Requirements				
05.7.n	Operations: The following practices shall be followed for crane/derrick operations: Before starting to hoist, the following conditions shall be noted: the hoist rope shall not be kinked, multiple part ropes shall not be twisted around each other, and the hook shall be centered over the load to prevent swinging. (Requirement 40998)	1910.180(h)(3)(ii) Before starting to hoist, the following conditions shall be noted: 1910.180(h)(3)(ii)(a) Hoist rope shall not be kinked. 1910.180(h)(3)(ii)(b) Multiple part lines shall not be twisted around each other. 1910.180(h)(3)(ii)(c) The hook shall be brought over the load in such a manner as to prevent swinging.	(b) Before starting to lift, the following conditions should be noted: (1) The hoist rope shall not be kinked. (2) Multiple-part lines shall not be twisted around each other. (3) The hook shall be brought over the load in such a manner as to minimize swinging.				
05.7.o(1)	Operations: The following practices shall be followed for crane/derrick operations: The operator shall know the weight of the working load. (Requirement 40999)	1910.180(h)(1)(ii) When loads which are limited by structural competence rather than by stability are to be handled, it shall be ascertained that the weight of the load has been determined within plus or minus 10 percent before it is lifted.	(c) When loads that are not accurately known are to be lifted, the designated person responsible for supervising the lifting operations shall ascertain that the weight of the load does not exceed the crane ratings at the maximum radius at which the load is to be handled.				
05.7.o(2)	Operations: The following practices shall be followed for crane/derrick operations: When raising loads that approach 75% of the rated capacity of the crane, the operator shall test the holding brakes. (Requirement 41000)	1910.180(h)(3)(viii) The operator shall test the brakes each time a load approaching the rated load is handled by raising it a few inches and applying the brakes.	(g) The operator shall test the brakes each time a load approaching the rated load is handled by lifting it a few inches and applying the brakes.				
05.7.o(3)	Operations: The following practices shall be followed for crane/derrick operations: The brakes shall be tested by raising the load minimally above the surface and holding the load with the brake. The load should be held long enough to allow any dynamics to dampen out. (Requirement 41001)	1910.180(h)(3)(viii) The operator shall test the brakes each time a load approaching the rated load is handled by raising it a few inches and applying the brakes.	(g) The operator shall test the brakes each time a load approaching the rated load is handled by lifting it a few inches and applying the brakes.				
05.7.p(1)	Operations: The following practices shall be followed for crane/derrick operations: If radio communications are to be used, operators and/or lift supervisors shall test the communication system prior to each operation. (Requirement 41002)	No requirement	(a) Telephones, radios, or equivalent, if used, shall be tested before lifting operations begin. If the system is battery powered, extra batteries should be available at the job site.				

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05.7.p(2)	Operations: The following practices shall be followed for crane/derrick operations: Operations shall stop immediately upon communication loss and shall not continue until communication is restored. (Requirement 41003)	No requirement	SECTION 5-3.3: SIGNALS 5-3.3.1 General (a) Communication between the crane operator and the signal person shall be maintained continuously during all crane movements. If at any time communication is disrupted, the operator shall stop all crane movements until communication is restored and a proper signal is given and understood.				
05.7.q(1)	Operations: The following practices shall be followed for crane/derrick operations: If hand signals are required, only standard signals shall be used according to Appendix B. (Requirement 41004)	No requirement	5-3.3.2 Standard Signals Standard signals to the operator shall be in accordance with the standards prescribed in para. 5-3.3.4 or para. 5-3.3.5. Signals shall be discernible or audible at all times. No response shall be made unless signals are clearly understood.				
05.7.q(2)	Operations: The following practices shall be followed for crane/derrick operations: Hand signals shall be posted in a conspicuous location. (Requirement 41005)	No requirement	5-3.3.4 Standard Hand Signals Hand signals shall be as shown in Fig. 17 and shall be posted conspicuously at the job site.				
05.7.s	Operations: The following practices shall be followed for crane/derrick operations: If there is a slack rope condition, it shall be determined that the rope is properly seated on the drum and in the sheaves before starting the hoist. (Requirement 41007)	No requirement	(4) If there is a slack rope condition, it shall be determined that the rope is seated on the drum and in the sheaves as the slack is removed.				
05.7.t	Operations: The following practices shall be followed for crane/derrick operations: During hoisting, care shall be taken that there is no sudden acceleration or deceleration of the moving load and that the load does not contact any obstructions. (Requirement 41008)	1910.180(h)(3)(iii) During hoisting care shall be taken that: 1910.180(h)(3)(iii)(a) There is no sudden acceleration or deceleration of the moving load. 1910.180(h)(3)(iii)(b) The load does not contact any obstructions.	(c) During lifting operations, care shall be taken that (1) there is no sudden acceleration or deceleration of the moving load. (2) load, boom, or other parts of the machine do not contact any obstruction.				
05.7.u(1)	Operations: The following practices shall be followed for crane/derrick operations: Load shall be secured, balanced, and kept under control with proper slings. The use of tag lines to keep the load stabilized may be required. (Requirement 41009)	1910.180(h)(3)(xvi) When rotating the crane, sudden starts and stops shall be avoided. Rotational speed shall be such that the load does not swing out beyond the radii at which it can be controlled. A tag or restraint line shall be used when rotation of the load is hazardous.	o) When rotating the crane, sudden starts and stops shall be avoided. Rotational speed shall be such that the load does not swing out beyond the radius at which it can be controlled. A tag or restraint line shall be used when rotation of the load is hazardous.				
05.7.u(2)	Operations: The following practices shall be followed for crane/derrick operations: Tag line personnel shall take care not to impart undesirable motion to the load. (Requirement 41010)	No requirement	No requirement				
05.7.v(1)	Operations: The following practices shall be followed for crane/derrick operations: Person(s) shall not ride the hook or load at anytime. (Requirement 41011)	1910.180(h)(3)(v) No hoisting, lowering, swinging, or traveling shall be done while anyone is on the load or hook.	(r) Personnel shall not be permitted to ride the bare hook or a load of material suspended from the hook.				
05.7.v(2)	Operations: The following practices shall be followed for crane/derrick operations: If conventional means of reaching a worksite such as an aerial platform, ladder, stairs, or scaffold, would be more hazardous or not possible because of structural design or worksite conditions, 29 CFR 1926.550 and ASME B30.23 shall be followed for lifting of personnel with a crane, which is considered a critical lift (see Appendix C). (Requirement 41012)	29 CFR 1926.550	ASME B30.23				

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05.7.w	Operations: The following practices shall be followed for crane/derrick operations: Personnel shall not be located under suspended or moving loads unless the operation adheres to the OSHA-approved NASA Alternate Standard for Suspended Load Operations (see Appendix A).	1910.180(h)(3)(vi) The operator should avoid carrying loads over people. 1910.180(h)(4)(ii) No person should be permitted to stand or pass under a load on the hook.	b) No person should be permitted to stand or pass under a suspended load.				
05.7.x	Operations: The following practices shall be followed for crane/derrick operations: The load shall not be lowered below the point where less than two full wraps of rope remain on the host drum. (Requirement 41014)	1910.180(h)(3)(x) Neither the load nor the boom shall be lowered below the point where less than two full wraps of rope remain on their respective drums.	(i) Neither the load nor the boom shall be lowered below the point where less than two full wraps of rope remain on their respective drums.				
05.7.y	Operations: The following practices shall be followed for crane/derrick operations: A responsible person shall be in charge of the operation and shall instruct all personnel involved in the proper positioning, rigging, and moving to be done. (Requirement 41015)	1910.180(h)(3)(xii) When two or more cranes are used to lift one load, one designated person shall be responsible for the operation. He shall be required to analyze the operation and instruct all personnel involved in the proper positioning, rigging of the load, and the movements to be made.	(k) When two or more cranes are used to lift one load, one designated person shall be responsible for the operation. That person shall analyze the operation and instruct all personnel involved in the proper positioning, rigging of the load, and the movements to be made. Decisions such as the necessity to reduce crane ratings, load position, boom location, ground support, and speed of movement shall be in accordance with this analysis.				
05.7.z(1)	Operations: The following practices shall be followed for crane/derrick operations: An operator shall be at the crane/derrick controls at all times while a load is suspended (OSHA requirement). (Requirement 41016)	1910.180(h)(4)(i) The operator shall not be permitted to leave his position at the controls while the load is suspended.	(e) Before leaving the crane unattended, the operator shall (1) land any load, bucket, lifting magnet, or other device (2) disengage the master clutch (3) set travel, swing, boom brakes, and other locking devices (4) put controls in the off or neutral position (5) secure the crane against accidental travel (6) stop the engine (7) An exception to (6) above may exist when crane operation is frequently interrupted during a shift and the operator must leave the crane. Under these circumstances, the engine may remain running and the following conditions [including those in paras. 5-3.1.3(e)(1) through (e)(5)] shall apply: (a) The operator shall be situated where unauthorized entry of the crane can be observed. (b) The crane shall be located within an area protected from unauthorized entry. (8) When a local weather stormwarning exists, consideration shall be given to the recommendations of the manufacturer for securing the crane.				
05.7.z(2)	Operations: The following practices shall be followed for crane/derrick operations: Due to the length of some NASA operations, an operator change may be required while a load is suspended. This shall be accomplished via a procedure designed for the specific crane/derrick and operation, ensuring that the crane controls are manned at all times. (Requirement 41017)	No requirement	No requirement				
05.8.1	Special Criteria: Handling Explosives or Electro-Explosive Devices (EED's). Special precautions shall be taken while handling explosives of EED's. (Requirement 41019)	No requirement	No requirement				
05.8.1.a(1)	Special Criteria: Handling Explosives or Electro-Explosive Devices (EED's): DOT-packaged explosives shall be handled in accordance with approved hazardous operating procedures. (Requirement 41020)	No requirement	No requirement				
05.8.1.a(2)	Special Criteria: Handling Explosives or Electro-Explosive Devices (EED's): Barricades and warning signs shall be erected to control access. (Requirement 41021)	No requirement	No requirement				

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05.8.1.b(1)	Special Criteria: Handling Explosives or Electro-Explosive Devices (EED's): Explosives and EED's that are not within DOT-approved containers shall be handled in accordance with approved hazardous operations procedures. (Requirement 41022)	No requirement	No requirement				
05.8.1.b(2)	Special Criteria: Handling Explosives or Electro-Explosive Devices (EED's): In addition to system configuration controls, these procedures shall ensure the following requirements are met: (Requirement 41023)	No requirement	No requirement				
05.8.1.b.1(1)	Special Criteria: Handling Explosives or Electro-Explosive Devices (EED's): In addition to system configuration controls, these procedures shall ensure the following requirements are met: Voltage checks on crane hooks that will handle explosives or EED's shall be performed prior to the start of operations;	No requirement	No requirement				
05.8.1.b.1(2)	Special Criteria: Handling Explosives or Electro-Explosive Devices (EED's): In addition to system configuration controls, these procedures shall ensure the following requirements are met: all crane motions shall be checked. (Requirement 41025)	No requirement	No requirement				
05.8.1.b.2(1)	Special Criteria: Handling Explosives or Electro-Explosive Devices (EED's): In addition to system configuration controls, these procedures shall ensure the following requirements are met: For static sensitive systems, the crane hook shall be connected to facility ground before connecting to explosives or EED's. (Requirement 41026)	No requirement	No requirement				
05.8.1.b.2(2)	Special Criteria: Handling Explosives or Electro-Explosive Devices (EED's): In addition to system configuration controls, these procedures shall ensure the following requirements are met: Electrical grounding of the hook and load shall be accomplished prior to lifting operations. If a ground connection must be disconnected to facilitate operations, an alternate ground should be connected prior to disconnecting the existing ground. The final attachment/detachment must be at least 10 feet from exposed propellant grain, explosives or EED's.	No requirement	No requirement				
05.8.1.b.3	Special Criteria: Handling Explosives or Electro-Explosive Devices (EED's): In addition to system configuration controls, these procedures shall ensure the following requirements are met: The danger potential for radio transmissions near explosives shall be evaluated prior to the operation. (Requirement 41028)	No requirement	No requirement				
05.8.1.b.4	Special Criteria: Handling Explosives or Electro-Explosive Devices (EED's): In addition to system configuration controls, these procedures shall ensure the following requirements are met: Personnel limits, protective clothing, warning signs and barricades shall be used as required. (Requirement 41029)	No requirement	No requirement				
05.8.1.b.5	Special Criteria: Handling Explosives or Electro-Explosive Devices (EED's): In addition to system configuration controls, these procedures shall ensure the following requirements are met: Safety surveillance requirements shall be followed. (Requirement 41030)	No requirement	No requirement				
05.8.2	Special Criteria: Policy shall be developed and enforced for crane/derrick operation during electrical storms. Operations are generally permitted without restriction within enclosed metal or framed buildings that are properly grounded. Restrictions are necessary for outside operations or for those that cannot tolerate power failure/loss. (Requirement 41031)	No requirement	No requirement				
06.2.2.a	Safety and Design Aspects: Labeling/Tagging of Hoists and Winches: The hoist's or winch's rated capacity shall be marked on it or its load block. This marking shall be clearly legible from the ground floor. (Requirement 41037)	No requirements specific to hoists only.	ASME B30.16 SECTION 16-1.1: MARKING 16-1.1.1 Rated Load The rated load of the hoist shall be marked on the hoist or its load block and shall be legible from the ground or floor.				

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06.2.2.b	Safety and Design Aspects: Labeling/Tagging of Hoists and Winches: Hoists and winches that have the specified design features, maintenance/inspection, and test intervals to lift critical loads shall be marked conspicuously so that the operator and assurance personnel can distinguish that the hoist or winch is qualified for critical lifts. (Requirement 41038)	No requirements specific to hoists only.	No requirement				
06.2.2.c	Safety and Design Aspects: Labeling/Tagging of Hoists and Winches:A standard system of labeling shall be established and used throughout the installation. (Requirement 41039)	No requirements specific to hoists only.	No requirement				
06.2.2.d	Safety and Design Aspects: Labeling/Tagging of Hoists and Winches: A standard lockout/tagout system shall be established and used throughout the installation to indicate equipment that is not to be used due to inspection discrepancies, ongoing maintenance operations, or other reason. (Requirement 41040)	No requirements specific to hoists only.	30.16 (c) A label shall be affixed on all electrical control enclosures. The label shall be in compliance with ANSI Z535.4, and shall include, but not be limited to, information such as: (1) "DISCONNECT POWER AND LOCKOUT/TAGOUT DISCONNECTING MEANS BEFORE REMOVING COVER OR SERVICING THIS EQUIPMENT" (2) "DO NOT OPERATE WITHOUT COVER IN PLACE"				
06.2.2.e	Safety and Design Aspects: Labeling/Tagging of Hoists and Winches: Certification/recertification tags are required as described in paragraph 6.3.4. (Requirement 41041)	No requirements specific to hoists only.	No requirement				
06.2.3(1)	Safety and Design Aspects: Safety Analysis and Documentation for Hoists and Winches used for Critical Lifts: A recognized safety hazard analysis such as fault tree analysis, FMEA, O&SHA shall be performed on all hoists and winches used for critical lifts. (Requirement 41042)	No requirements specific to hoists only.	No requirement				
06.2.3(2)	Safety and Design Aspects: Safety Analysis and Documentation for Hoists and Winches used for Critical Lifts: The analysis shall, as a minimum, determine potential sources of danger, identify failure modes, and recommend resolutions and a system of risk acceptance for those conditions found in the hardware-facility-environment-human relationship that could cause loss of life, personal injury, and loss of or damage to the hoist, winch, facility, or load. (Requirement 41043)	No requirements specific to hoists only.	No requirement				
06.2.3(3)	Safety and Design Aspects: Safety Analysis and Documentation for Hoists and Winches used for Critical Lifts: The analysis shall be done as part of the initial evaluation process for critical lift compliance and prior to use in a critical lift, included in the hoist or winch documentation, and updated as required to reflect any changes in operation and/or configuration. (Requirement 41044)	No requirements specific to hoists only.	No requirement				
06.2.4(1)	Safety and Design Aspects: Performance: Duty cycle, load capability, and the desired control characteristics with which the hoist or winch handles the load shall be addressed for all designs. (Requirement 41045)	No requirements specific to hoists only.	SECTION 16-1.2: CONSTRUCTION 16-1.2.1 Mechanical Design (a) The hoist and appurtenances shall be designed to withstand all stresses imposed under normal operating conditions while handling loads within the rated load (capacity). (b) Load				
06.2.4(2)	Safety and Design Aspects: Performance: Duty cycle requirements shall be based on the worst expected duty the unit will encounter. (Requirement 41046)	No requirements specific to hoists only.	No requirement				
06.2.4(3)	Safety and Design Aspects: Performance: Operational requirements shall be considered in the design phase to ensure load and function are adequately defined and critical hoist design features are incorporated on the delivered units. Environmental conditions must also be considered. (Requirement 41047)	No requirements specific to hoists only.	No requirement				

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06.2.5	Safety and Design Aspects: Structural: Structural design shall be in accordance with industry standards for material selection, welding, allowable stresses, design limitations, framing, wheels, and other structural elements. Refer to CMAA standards for specific design details. (Requirement 41048)	No requirements specific to hoists only.	No requirement				
06.2.6.b.03(1)	Safety and Design Aspects: Mechanical: The mechanical design requirements for hoist and winch components are as follows: For powered (electric and air) hoists and winches used for critical lifts, two holding brakes shall be provided, each capable of bringing a rated load to zero speed and holding it. (Requirement 41054)	No requirements specific to hoists only.	(4) Electric-powered hoists that handle molten material shall be equipped with one of the following arrangements: (a) Two holding brakes shall be provided, one of which is applied to a gear reducer shaft, plus control braking means. Each holding brake shall have a torque rating not less than 100% of rated load hoisting torque at the point where the brake is applied. (b) One holding brake shall be provided if the hoisting unit has a mechanical load brake or a control braking means that provides controlled lowering of the load upon loss of power. The holding brake shall have a torque rating not less than 150% of rated load hoisting torque at the point where the brake is applied.				
06.2.6.b.03(2)	Safety and Design Aspects: Mechanical: The mechanical design requirements for hoist and winch components are as follows: Holding brakes shall be applied automatically when power to the brake is removed. If the control brake and holding brake are designed to operate as a system and cannot independently stop and hold a rated load, then another means of braking is required (e.g., emergency brake). (Requirement 41055)	No requirements specific to hoists only.	Definition: brake, holding: a friction brake for a hoist that is automatically applied and prevents motion when power is off.				
06.2.6.b.03(3)	Safety and Design Aspects: Mechanical: The mechanical design requirements for hoist and winch components are as follows: The brakes shall be designed so that they can be tested as required in paragraph 6.3.3.e. (Requirement 41056)	No requirements specific to hoists only.	(2) Operation of brake(s) shall be tested. (b) If a load test is conducted, the test load shall not be less than 100% of the rated load of the hoist or more than 125% of the rated load of the hoist unless otherwise recommended by the hoist manufacturer or a qualified person.				
06.2.6.b.03(4)	Safety and Design Aspects: Mechanical: The mechanical design requirements for hoist and winch components are as follows: The brake design shall provide for emergency load lowering. (Requirement 41057)	No requirements specific to hoists only.	(b) One holding brake shall be provided if the hoisting unit has a mechanical load brake or a control braking means that provides controlled lowering of the load upon loss of power.				
06.2.6.b.04	Safety and Design Aspects: Mechanical: The mechanical design requirements for hoist and winch components are as follows: For critical lift application, speed reduction from the motor to the drum on the hoist should be achieved by enclosure in a gear case. If open gears are required, they shall be guarded with a provision for lubrication and inspection. (Requirement 41058)	No requirements specific to hoists only.	30.7 (a) Exposed moving parts (such as gears, set screws, projecting keys, chains, chain sprockets, and reciprocating or rotating parts), which might constitute a hazard under normal operating conditions, shall be guarded.				
06.2.6.b.05(1)	Safety and Design Aspects: Mechanical: The mechanical design requirements for hoist and winch components are as follows: All wire rope hoists and winches shall have not less than two wraps of hoisting rope on the drum when the hook is in its extreme low position. (Requirement 41059)	No requirements specific to hoists only.	30.7 (b) Ropes shall be of a length for the entire range of movement specified for the application, with no less than two full wraps of rope on the drum at all times.				
06.2.6.b.05(2)	Safety and Design Aspects: Mechanical: The mechanical design requirements for hoist and winch components are as follows: Drum grooves, when provided, shall be as recommended by CMAA. (Requirement 41060)	No requirements specific to hoists only.	No requirement.				
06.2.6.b.05(3)	Safety and Design Aspects: Mechanical: The mechanical design requirements for hoist and winch components are as follows: The rope ends shall be anchored securely by a clamp or a swaged terminal in a keyhole slot, provided a keeper is used to prohibit the swage from moving out of the narrow slot. Other methods recommended by the hoist or wire rope manufacturer are acceptable if the rope termination anchor together with two wraps of rope on the drum will give an anchor system equal to or greater than the breaking strength of the wire rope. (Requirement 41061)	No requirements specific to hoists only.	30.7 (2) Each drum end of the rope shall be anchored by a clamp attached to the drum, or by a socket arrangement approved by the hoist or rope manufacturer, providing for attachment of rope to the drum.				

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06.2.6.b.06(1)	Safety and Design Aspects: Mechanical: The mechanical design requirements for hoist and winch components are as follows: Safe and adequate access to hoist and winch components to inspect, service, repair, or replace equipment shall be provided for during design. (Requirement 41062)	No requirements specific to hoists only.	16-1.2.16 Lubrication If lubrication is required, accessible means for lubrication should be provided.				
06.2.6.b.06(2)	Safety and Design Aspects: Mechanical: The mechanical design requirements for hoist and winch components are as follows: The design shall provide for visual and physical accessibility. (Requirement 41063)	No requirements specific to hoists only.	No requirement				
06.2.6.b.07(1)	Safety and Design Aspects: Mechanical: The mechanical design requirements for hoist and winch components are as follows: Manually operated (nonpowered), off-the-shelf OEM type hoists and winches are acceptable for critical and noncritical lift applications. They shall comply with applicable ASME requirements. (Requirement 41064)	No requirements specific to hoists only.	No requirement				
06.2.6.b.07(2)	Safety and Design Aspects: Mechanical: The mechanical design requirements for hoist and winch components are as follows: These hoists shall be equipped with at least one self-setting brake, referred to as a holding brake, applied directly to the motor shaft or some part of the gear train. No limit switches are required if proper over-travel restraint is provided. (Requirement 41065)	No requirements specific to hoists only.	30.7 (c) When a hoist is to be operated from a remote location, a self-setting brake shall be provided to prevent drum rotation in the event of power failure. This requirement does not apply to hoists where brakes are manually applied through mechanical linkages and the operator is at the control position. 30.16 (4) Electric-powered hoists that handle molten material shall be equipped with one of the following arrangements: (a) Two holding brakes shall be provided, one of which is applied to a gear reducer shaft, plus control braking means. Each holding brake shall have a torque rating not less than 100% of rated load hoisting torque at the point where the brake is applied. (b) One holding brake shall be provided if the hoisting unit has a mechanical load brake or a control braking means that provides controlled lowering of the load upon loss of power. The holding brake shall have a torque rating not less than 150% of rated load hoisting torque at the point where the brake is applied.				
06.2.6.b.08	Safety and Design Aspects: Mechanical: The mechanical design requirements for hoist and winch components are as follows: Air operated chain hoists and winches can be equipped with over-travel protection devices instead of the hoist travel limit switches.	No requirements specific to hoists only.	16-1.2.14 Overtravel Protection (Electric- or Air-Powered Hoists Only) The hoist shall be so designed and constructed that the load hook, either loaded or empty, shall not exceed the upper limit of travel. On wire-rope hoists, if a geared or other lift-limiting device that operates in relation to drum turns is used, an additional lift-limiting device that operates independently of drum rotations shall be provided.				
06.2.6.b.09(1)	Safety and Design Aspects: Mechanical: The mechanical design requirements for hoist and winch components are as follows: Initial and final upper limit switches (limit control valves) shall be provided and tested for air-operated hoists and winches as described in paragraph 6.2.7.i. (Requirement 41067)	No requirements specific to hoists only.	16-1.2.14 Overtravel Protection (Electric- or Air-Powered Hoists Only) The hoist shall be so designed and constructed that the load hook, either loaded or empty, shall not exceed the upper limit of travel. On wire-rope hoists, if a geared or other lift-limiting device that operates in relation to drum turns is used, an additional lift-limiting device that operates independently of drum rotations shall be provided.				
06.2.6.b.09(2)	Safety and Design Aspects: Mechanical: The mechanical design requirements for hoist and winch components are as follows: The final upper limit switch (limit control valve) shall exhaust air from the hoist or winch, set the brakes, and require reset at the upper limit switch (limit control valve) level. (Requirement 41068)	No requirements specific to hoists only.	No requirement.				

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06.2.6.b.10(1)	Safety and Design Aspects: Mechanical: The mechanical design requirements for hoist and winch components are as follows: Worm gears shall not be used as a holding brake unless the lead angle is sufficient to prevent back driving. Worm gears used as a brake for air and electric powered hoists may be considered as a second holding brake. (Requirement 41069)	No requirements specific to hoists only.	No requirement.				
06.2.6.b.10(2)	Safety and Design Aspects: Mechanical: The mechanical design requirements for hoist and winch components are as follows: The braking properties of a worm gear tend to degrade with use; the design engineer shall consider this when purchasing new equipment or in existing installations where the hoist is subject to heavy use.	No requirements specific to hoists only.	No requirement.				
06.2.6.b.11(1)	Safety and Design Aspects: Mechanical: The mechanical design requirements for hoist and winch components are as follows: In the procurement of new lifting equipment, the use of cast iron components in the hoist or winch load path shall be approved, as a minimum, by the LDEM and the responsible design engineering organization. (Requirement 41071)	No requirements specific to hoists only.	No requirement.				
06.2.6.b.11(2)	Safety and Design Aspects: Mechanical: The mechanical design requirements for hoist and winch components are as follows: The material properties of cast iron allow catastrophic failure and should not be considered as reliable as steel or cast steel. The engineer shall consider this when selecting equipment and avoid the use of load bearing cast iron materials where possible.	No requirements specific to hoists only.	No requirement.				
06.2.6.b.12	Safety and Design Aspects: Mechanical: The mechanical design requirements for hoist and winch components are as follows: Gearing shall be designed and manufactured to comply with the latest AGMA gear standards. (Requirement 41073)	No requirements specific to hoists only.	No requirement.				
06.2.6.b.13	Safety and Design Aspects: Mechanical: The mechanical design requirements for hoist and winch components are as follows: Each load-bearing component shall be specified or detailed to lift the maximum imposed loads resulting from zero to rated hook load with appropriate design factors.	No requirements specific to hoists only.	SECTION 16-1.2: CONSTRUCTION 16-1.2.1 Mechanical Design (a) The hoist and appurtenances shall be designed to withstand all stresses imposed under normal operating conditions while handling loads within the rated load (capacity). SECTION 7-1.2: CONSTRUCTION 7-1.2.1 General Hoists shall be designed and constructed to: meet all stresses imposed on their frames and components under normal operating conditions, when properly installed, and with handling loads not exceeding the manufacturer's load ratings. Welding shall conform to recommended practices of ANSI/AWS D14.3.				
06.2.6.c	Safety and Design Aspects: Mechanical: When the use of high quality, off-the-shelf, OEM type equipment is not possible due to unique design and operation requirements, then built-up type equipment must be used. These built-up hoists/winches generally use many commercially available or made-to-order motors, brakes, couplings, gear reducers, etc. These components are then custom engineered together as an assembly mounted on custom designed and built equipment frames. In many cases, gear reducers, drums, and drive shafts are custom designed and built. Structural and mechanical parts, such as sheave pins, hook-block components, bridge girders, and bridge and trolley drives are also custom designed and built as components or assemblies. The built-up type crane should only be used where commercial equipment is not available to meet the user/operational requirements described in this paragraph. Due to the nature of its one of a kind design and construction, this type of equipment is generally more prone to break down and should be considered as less reliable than commercial equipment. These units shall meet the mechanical design requirements provided in paragraph 6.2.6.b. (Requirement 41075)	No requirements specific to hoists only.	No requirement.				

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06.2.7.a	Electrical: Electrical Design Requirements are as follows: The use of high quality, off-the-shelf, OEM type equipment is acceptable for critical and noncritical lift applications if it meets all user requirements and the requirements of this document.	No requirements specific to hoists only.	No requirement.				
06.2.7.b	Electrical: Electrical Design Requirements are as follows: When the use of high quality, off-the-shelf, OEM type equipment is not possible due to unique design and operation requirements, then built-up type equipment must be used. This built-up equipment generally uses many commercially available or made-to-order components which are then custom engineered together as an assembly. Built-up equipment should only be used where commercial equipment is not available to meet the user/operational requirements. Due to the nature of its one of a kind design and construction, this type of equipment is generally more prone to break down and should be considered less reliable than commercial equipment.	No requirements specific to hoists only.	No requirement.				
06.2.7.c	Electrical: Electrical Design Requirements are as follows: Wiring and safety devices shall be in accordance with the NFPA National Electrical Code. (Requirement 41079)	No requirements specific to hoists only.	16-1.2.2 Electrical Design (Electric-Powered Hoists Only) (a) Electrical construction shall comply with Article 610 of ANSI/NFPA 70. (b) Unless otherwise specified, control enclosures shall be NEMA type 1, general purpose for indoor application in accordance with ANSI/NEMA No. ICS6. (c) Electrical equipment shall be so located or enclosed that live parts will not be exposed to inadvertent contact under normal operating conditions. (d) Enclosures for resistors (if required) shall provide means for heat dissipation and shall be installed to minimize the accumulation of combustible matter. Provision shall be made to prevent broken resistor parts or molten metal from falling onto operator, other personnel, or combustible materials.				
06.2.7.d	Electrical: Electrical Design Requirements are as follows: Electrical enclosures shall provide protection for the contained equipment against environmental conditions as required by NEMA. (Requirement 41080)	No requirements specific to hoists only.	See Above				
06.2.7.e	Electrical: Electrical Design Requirements are as follows: In addition to overload protection required by the National Electrical Code, undervoltage and phase reversal should be considered. (Requirement 41081)	No requirements specific to hoists only.	No requirement				
06.2.7.f(1)	Electrical: Electrical Design Requirements are as follows: For powered hoists and winches used for critical lifts, an assessment shall be performed to determine the operational needs for remote emergency stops independent from the operator controlled emergency stop. Not all hoists and winches used for critical lifts require a remote emergency stop. Remote emergency stops are required for hoists and winches used for critical lifts where the operator's view is restricted/obstructed. When provided, this independent remote emergency stop should be located such that the independent remote emergency stop operator(s) can clearly see the critical lift area(s). (Requirement 41082)	No requirements specific to hoists only.	No requirement				
06.2.7.f(2)	Electrical: Electrical Design Requirements are as follows: The remote emergency stop circuit shall be separate from and take precedence over the operator control circuit. (Requirement 41083)	No requirements specific to hoists only.	No requirement				

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06.2.7.f(3)	Electrical: Electrical Design Requirements are as follows: The control, when activated, shall cause all drives to stop and the brakes to set. Hand-held remote emergency stop pendants should be standardized and should include power and circuit continuity indication. For those hoists and winches required to make critical lifts that have not been modified to provide a remote emergency stop, handling procedures shall be developed and implemented to minimize the risk. (Requirement 41084)	No requirements specific to hoists only.	No requirement				
06.2.7.g(1)	Electrical: Electrical Design Requirements are as follows: Electrical control stations shall operate on 150 volts DC, 120 volts AC, or less. (Requirement 41085)	No requirements specific to hoists only.	16-1.2.3 Controls (Electric- or Air-Powered Hoists Only) (c) The voltage at pendant push-button station of electric-powered hoists shall not exceed 150 V for AC or 300 V for DC.				
06.2.7.g(2)	Electrical: Electrical Design Requirements are as follows: Positive detent pushbuttons or a control lever shall be used for speed control. (Requirement 41086)	No requirements specific to hoists only.	No requirement				
06.2.7.g(3)	Electrical: Electrical Design Requirements are as follows: Controls shall return to the off position when the operator relieves pressure. (Requirement 41087)	No requirements specific to hoists only.	16-1.2.3 Controls (Electric- or Air-Powered Hoists Only) (a) Controls, except in automatic cycling operation, shall return to the off position when released, and hook motion shall stop.				
06.2.7.g(4)	Electrical: Electrical Design Requirements are as follows: A red, emergency stop pushbutton shall be provided to operate the mainline contactor, main circuit breaker, or pneumatic source (main breaker preferred). A dump valve is acceptable for the emergency stop for a pneumatic hoist. (Requirement 41088)	No requirements specific to hoists only.	No requirement				
06.2.7.h	Electrical: Electrical Design Requirements are as follows: The electrical system shall be designed fail-safe to ensure that a failure of any component will not cause the hoist or winch to operate in a speed range faster than commanded. A failure that causes a speed different from that selected is acceptable provided no hazards are introduced. Failure modes that cause the hoist or winch to slow down or come to a safe stop are acceptable; those that could cause unplanned directional shifts, and/or loss of control are unacceptable. (Requirement 41089)	No requirements specific to hoists only.	No requirement				
06.2.7.i	Electrical: Electrical Design Requirements are as follows: For hoists and winches used for critical lifts (except manual), dual upper limit switches are required. For electric hoists and winches, the limit switches shall meet the following requirements:	No requirements specific to hoists only.	No requirement				
06.2.7.i.1	Electrical: Electrical Design Requirements are as follows: For hoists and winches used for critical lifts (except manual), dual upper limit switches are required. For electric hoists and winches, the limit switches shall meet the following requirements: Initial upper limit switch electrical contacts shall be a set of normally closed contacts in the "raise" contactor circuit such that movement in the raise direction shall be precluded after the limit switch is encountered. Movement in the "lower" direction will not be inhibited. (Requirement 41091)	No requirements specific to hoists only.	No requirement				
06.2.7.i.2	Electrical: Electrical Design Requirements are as follows: For hoists and winches used for critical lifts (except manual), dual upper limit switches are required. For electric hoists and winches, the limit switches shall meet the following requirements: Final upper limit switch electrical contacts shall be a set of normally closed electrical contacts wired into the mainline circuit, hoist or winch power circuit, main contactor control circuit, or hoist/winch power contactor control circuit such that all hoist or winch motion shall be precluded after the limit switch is encountered. These normally closed contacts may be located in the low voltage circuitry. (Requirement 41092)	No requirements specific to hoists only.	No requirement				

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06.2.7.i.3	Electrical: Electrical Design Requirements are as follows: For hoists and winches used for critical lifts (except manual), dual upper limit switches are required. For electric hoists and winches, the limit switches shall meet the following requirements: After a final upper limit switch has been activated, movement of the load will require action (resetting) at the final upper limit switch level. An inspection shall be made to determine the cause of failure of the initial upper limit switch. Stopping hoist motion by the above design configuration may result in a hazardous suspended load condition. The hoist design should include a means of detecting limit switch failure and allow for safe inspection and repair. For example, a system may be equipped with two different colored annunciator lights, one for each limit switch. A reset button may be included so that when a final upper limit switch is tripped, the load can be lowered immediately. The reset button should be secured to prevent unauthorized use. (Requirement 41093)	No requirements specific to hoists only.	No requirement				
06.2.7.i.4(1)	Electrical: Electrical Design Requirements are as follows: For hoists and winches used for critical lifts (except manual), dual upper limit switches are required. For electric hoists and winches, the limit switches shall meet the following requirements: The initial upper limit switch shall be adjusted sufficiently low to preclude inadvertent actuation of the final upper limit switch if the hoist actuates the initial switch at full speed with no load. (Requirement 41094)	No requirements specific to hoists only.	No requirement				
06.2.7.i.4(2)	Electrical: Electrical Design Requirements are as follows: For hoists and winches used for critical lifts (except manual), dual upper limit switches are required. For electric hoists and winches, the limit switches shall meet the following requirements: Similarly, the final upper limit shall be adjusted sufficiently low to ensure that the hoist or winch will not two-block (or otherwise damage wire rope) if the hoist or winch actuates the final switch at full speed with no load. (Requirement 41095)	No requirements specific to hoists only.	No requirement				
06.2.7.i.4(3)	Electrical: Electrical Design Requirements are as follows: For hoists and winches used for critical lifts (except manual), dual upper limit switches are required. For electric hoists and winches, the limit switches shall meet the following requirements: Both limits shall be tested from slow speed to full speed to verify correct operation. It should be noted that this requirement effectively lowers the usable hook height of the hoist. The limit switch arrangement needs to be considered during new equipment design. (Requirement 41096)	No requirements specific to hoists only.	No requirement				
06.2.7.j	Electrical: Electrical Design Requirements are as follows: Provisions for grounding the hook are required for handling explosives, solid propellants, flammables, or any other load that requires a nonelectrical or static-free environment. See paragraph 6.8 for handling explosives or EED's.	No requirements specific to hoists only.	No requirement				
06.2.7.k	Electrical: Electrical Design Requirements are as follows: For hoists and winches used for critical lifts, lower limit switches to prevent reverse winding of the wire rope shall be provided.	No requirements specific to hoists only.	No requirement				
06.2.7.L	Electrical: Electrical Design Requirements are as follows: Electrical hoists and winches shall have the capability to be locked out at the main breaker to prevent unauthorized use. (Requirement 41099)	No requirements specific to hoists only.	7-2.3.2 Maintenance Procedure (a) Before adjustments and repairs are started on a hoist, the following precautions shall be taken, as applicable: (1) if electrically powered, the main or emergency switch locked in the open position (2) the power plant stopped or disconnected				

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06.2.7.m	Electrical: Electrical Design Requirements are as follows: Hoists and winches shall be designed fail-safe in the event of a power outage. (Requirement 41100)	No requirements specific to hoists only.	30.16 (b) Electric-Powered Hoist (1) Under normal operating conditions with rated load and test conditions with test loads up to 125% of rated load, the braking system shall perform the following functions: (a) stop and hold the load hook when controls are released (b) limit the speed of load during lowering, with or without power, to a maximum speed of 120% of rated lowering speed for the load being handled (c) stop and hold the load hook in the event of a complete power failure 30.7 (b) Electric motor operated hoists shall be provided with a device that will disconnect all motors from the line on failure of power, and will not permit any motor to be restarted until the controller handle is brought to the off position, or a reset switch or button is operated.				
06.3(1)	Testing: Three types of tests are required on hoists: proof load tests, periodic load tests, and operational tests. The proof load tests and operational tests shall be performed prior to first use for new, extensively repaired, or altered hoists and winches. (Requirement 41101)	No requirements specific to hoists only.	Load (proof) test and operational tests prior to first use or after modification only...				
06.3(2)	Testing: The periodic load and operational tests shall be performed at least every 4 years. (Requirement 41102)	No requirements specific to hoists only.	No requirement				
06.3(3)	Testing: For hoists and winches used for critical lifts, these tests shall be based on frequency of usage. (Requirement 41103)	No requirements specific to hoists only.	No requirement				
06.3(4)	Testing: Hoists and winches used frequently for critical lifts shall be load tested annually. (Requirement 41104)	No requirements specific to hoists only.	No requirement				
06.3(5)	Testing: Hoists and winches used infrequently for critical lifts shall be load tested before each critical lift if it has been more than one year since the last test. (Requirement 41105)	No requirements specific to hoists only.	No requirement				
06.3(6)	Testing: If a hoist or winch is upgraded, a proof load test and an operational test shall be performed based on the upgraded rating. (Requirement 41106)	No requirements specific to hoists only.	B30.16 (e) Modifications to upgrade, rerate, or modernize hoist equipment shall be as authorized only by the original equipment manufacturer or a qualified person.				
06.3(7)	Testing: All load and operational tests shall be performed by qualified personnel according to written (specific or general) technical operating procedures. (Requirement 41107)	No requirements specific to hoists only.	No Requirement				
06.3(8)	Testing: An inspection shall be performed after each load test and prior to the hoist being released for service to ensure there is no damage. (Requirement 41108)	No requirements specific to hoists only.	No Requirement				
06.3(9)	Testing: Surface or volumetric NDT shall be used to validate the existence or absence of cracks or other load test effects indicated by this inspection. (Requirement 41109)	No requirements specific to hoists only.	No Requirement				

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06.3.1	Testing: Proof Load Test. Before first use and after installation, all new, extensively repaired, modified, or altered hoists and winches shall undergo a proof load test with a dummy load as close as possible to, but not exceeding 125 percent of the rated load. The acceptable tolerance for proof load test accuracy is -5/+0 percent. (Requirement 41110)	No requirements specific to hoists only.	7-2.2.2 Load Test (a) New Hoists. All new hoists shall be tested by the manufacturer. The load test shall not be less than 110% of the rated load nor more than 125% of the rated load. A written report of the test should be prepared and placed on file. (b) Altered, Modified, Reinstalled, and Repaired Hoists (1) Prior to initial use, altered, modified, reinstalled, or repaired hoists shall be functionally tested. A written report of the test should be prepared and placed on file. A qualified person shall determine the need for a load test. (2) The load test, if made, shall consist of the following as minimum requirements: (a) The test load shall not be less than 110% of the rated load nor more than 125% of the rated load, unless otherwise recommended by the manufacturer. (b) The test load shall be hoisted a vertical distance to assure that the load is supported by the hoist and held by the hoist brake(s). (c) The test load shall be lowered, stopped, and held with the brake(s).				
06.3.2(1)	Testing: Periodic Load Test. All hoists and winches shall be tested at least once every 4 years with a dummy load equal to the hoist's/winch's rated capacity. (Requirement 41111)	No requirements specific to hoists only.	No requirement				
06.3.2(2)	Testing: Periodic Load Test: Platform hoists shall be tested using the attached platform only. (Requirement 41112)	No requirements specific to hoists only.	No requirement				
06.3.2(3)	Testing: Periodic Load Test: Hoists and winches used for critical lifts shall be load tested at least once per year. (Requirement 41113)	No requirements specific to hoists only.	No requirement				
06.3.2(4)	Testing: Periodic Load Test: Hoists and winches used infrequently for critical lifts shall be load tested before each critical lift if it has been over one year since the last test. The acceptable tolerance for periodic load test accuracy is +5/-0 percent. The periodic load test can be fulfilled by a concurrently performed proof load test. (Requirement 41114)	No requirements specific to hoists only.	No requirement				
06.3.3	Testing: Operational Test. Together with proof load and periodic load tests, the following shall be performed with a dummy rated load unless otherwise specified (platform hoists shall be operationally tested using the attached platform only): (Requirement 41115)	No requirements specific to hoists only.	No requirement				
06.3.3.c	Testing: Operational Test. Together with proof load and periodic load tests, the following shall be performed with a dummy rated load unless otherwise specified (platform hoists shall be operationally tested using the attached platform only): Determine trip setting of limit switches and limiting devices by tests under no load conditions. Conduct tests first by hand, if practical, and then under the slowest speed obtainable. Test with increasing speeds up to the maximum speed. Locate actuating mechanisms so that they will trip the switches or limiting devices in time to stop motion without damaging the hoist or winch.	No requirements specific to hoists only.	30.16 (3) Trip-setting of limit devices shall be determined by tests under no-load conditions. Tests shall be conducted first by hand, if practical, and then under slowest speed obtainable. Test with increasing speeds up to maximum speed. Actuating mechanisms shall be located so that they will trip the switches or limiting devices in sufficient time to stop motion without damage to any part of the hoisting arrangement. On hoists having adjustable trip-setting limit devices, care shall be exercised to achieve adjustment setting without the load block striking the hoist frame or without all the slack being taken out of the unloaded chain or less than one wrap of rope on the drum.				

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06.3.3.d	Testing: Operational Test. Together with proof load and periodic load tests, the following shall be performed with a dummy rated load unless otherwise specified (platform hoists shall be operationally tested using the attached platform only): After testing in the unloaded state, apply the test load to the hoist or winch to check the proper load control. Test load hoisting, lowering at various speeds (maximum safe movement up and down as determined by the LDEM and the responsible safety, engineering, operations, and maintenance organizations), and braking/holding mechanisms. Holding brakes shall be tested to verify stopping capabilities and demonstrate the ability to hold a rated load (see paragraph 6.3.3.e). The load should be held long enough to allow any dynamics to dampen out.	No requirements specific to hoists only.	No requirement 30.16 (2) Operation of brake(s) shall be tested under no-load conditions.				
06.3.3.e	Testing: Operational Test. Together with proof load and periodic load tests, the following shall be performed with a dummy rated load unless otherwise specified (platform hoists shall be operationally tested using the attached platform only): Powered hoists and winches used for critical lifts are required to be equipped with two holding brakes, each capable of bringing a rated load to zero speed and holding it (see paragraph 6.2.6.b(3)). If a worm gear is used as a holding brake, it shall be tested to ensure it is able to hold a static load and stop a dynamic load. The operational test must demonstrate each brake's ability to stop and hold a rated load. This can be done in one of the following ways:	No requirements specific to hoists only.	No requirement				
06.3.3.e.1	Testing: Operational Test. Together with proof load and periodic load tests, the following shall be performed with a dummy rated load unless otherwise specified (platform hoists shall be operationally tested using the attached platform only): The operational test must demonstrate each brake's ability to stop and hold a rated load. This can be done in one of the following ways: Each brake's ability to hold shall be statically tested (under no load) with 150 percent of the rated load hoisting torque at the point of brake application. (Requirement 41121)	No requirements specific to hoists only.	No requirement				
06.3.3.e.2	Testing: Operational Test. Together with proof load and periodic load tests, the following shall be performed with a dummy rated load unless otherwise specified (platform hoists shall be operationally tested using the attached platform only): The operational test must demonstrate each brake's ability to stop and hold a rated load. This can be done in one of the following ways: Alternately, each brake shall be tested for its ability to stop and hold a rated load in both the raising and lowering modes. (CAUTION: It must be possible to quickly reenergize the out of circuit brake or provide other safety measures to perform this test safely.) (Requirement 41122)	No requirements specific to hoists only.	No requirement				
06.3.3.e.3	Testing: Operational Test. Together with proof load and periodic load tests, the following shall be performed with a dummy rated load unless otherwise specified (platform hoists shall be operationally tested using the attached platform only): The operational test must demonstrate each brake's ability to stop and hold a rated load. This can be done in one of the following ways: Other methods may be used as approved by the LDEM with concurrence from the responsible safety, engineering, operations, and maintenance organizations.	No requirements specific to hoists only.	No requirement				

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06.3.3.f	Testing: Operational Test. Together with proof load and periodic load tests, the following shall be performed with a dummy rated load unless otherwise specified (platform hoists shall be operationally tested using the attached platform only): The operational test for a modified hoist or winch can be tailored to test only those portions of the equipment that were modified, only if the periodic load and operational test interval has not expired.	No requirements specific to hoists only.	No requirement				
06.3.4(1)	Testing: Test Reports and Periodic Recertification Tags. After each test, designated personnel shall prepare written, dated, and signed test reports, including procedure reference. (Requirement 41125)	No requirements specific to hoists only.	30.16 (c) If a load test is conducted, the person conducting the load test shall prepare a written report of the load sustained during the test and the operations performed during the test. Reports shall be placed on file.				
06.3.4(2)	Testing: Test Reports and Periodic Recertification Tags: Inadequacies shall be documented and, if determined to be a hazard, corrected prior to further use. (Requirement 41126)	No requirements specific to hoists only.	No requirement.				
06.3.4(3)	Testing: Test Reports and Periodic Recertification Tags: These reports shall be filed and shall be made readily available by the organization responsible for testing the hoist. (Requirement 41127)	No requirements specific to hoists only.	30.16 (c) If a load test is conducted, the person conducting the load test shall prepare a written report of the load sustained during the test and the operations performed during the test. Reports shall be placed on file.				
06.3.4(4)	Testing: Test Reports and Periodic Recertification Tags: Following the periodic load test, all hoists and winches shall be given a permanently affixed tag, posted on the hoist or winch or an appropriate location, identifying the equipment and stating the next required periodic load test date or load test expiration date. (Requirement 41128)	No requirements specific to hoists only.	No requirement				
06.4.1(1)	Inspection: Inspections, as described below, shall be performed on all hoists and winches in regular service.	No requirements specific to hoists only.	General				
06.4.1(2)	Inspection: Inspections shall be performed according to this section, the manufacturers' recommendations, and the applicable ASME standard.	No requirements specific to hoists only.	General				
06.4.1(3)	Inspection: Inadequacies discovered during an inspection shall be documented and, if determined to be a hazard, tagged out and corrected prior to further use. (Requirement 41132)	No requirements specific to hoists only.	No requirement				
06.4.1(4)	Inspection: Inspections shall be performed by qualified personnel according to approved technical operating procedures.	No requirements specific to hoists only.	SECTION 7-2.1: INSPECTION (a) Initial Inspection. Prior to initial use, all new, reinstalled, altered, or modified hoists shall be inspected by a designated person to verify compliance with the applicable provisions of this Volume.				
06.4.2	Inspection: All new, extensively repaired, or modified hoists and winches shall be inspected to the requirements of both daily and periodic inspections prior to first use. For component repair on hoists and winches, only the inspections that apply to the repaired portion need to be performed prior to first use unless a periodic inspection interval expires during the downtime (see paragraph 6.4.5). (Requirement 41134)	No requirements specific to hoists only.	SECTION 7-2.1: INSPECTION (a) Initial Inspection. Prior to initial use, all new, reinstalled, altered, or modified hoists shall be inspected by a designated person to verify compliance with the applicable provisions of this Volume. (b) Inspection Classifications. Inspection procedure for hoists in regular service is divided into two general classifications based upon the intervals at which inspection should be performed. The intervals in turn are dependent upon the nature of the critical components of the hoists and the degree of their exposure to wear, deterioration, or malfunction. The two general classifications are designated as frequent and periodic with respective intervals between inspections as defined in the following:				
06.4.3(1)	Inspection: Hoists and winches in regular service (used at least once per month) shall be inspected as required in paragraphs 6.4.4 and 6.4.5. (Requirement 41135)	No requirements specific to hoists only.	Defines regular service: 16-2.1.4 Hoists Not in Regular Service (a) A hoist that is used infrequently, which has been idle for a period of 1 month or more, but less than 1 year, shall be inspected, in accordance with the requirements listed in para. 16-2.1.2, before being placed in service.				

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06.4.3(2)	Inspection: Idle and standby hoists/winches shall be inspected according to paragraph 6.4.6. (Requirement 41136)	No requirements specific to hoists only.	30.16 (b) A hoist that is used infrequently, which has been idle for a period of 1 year or more, shall be inspected, in accordance with the requirements listed in para. 16-2.1.3, before being placed in service.				
06.4.4	Inspection: Daily Inspections. These inspections shall be performed each day the hoist or winch is used and shall include the following: (Requirement 41137)	No requirements specific to hoists only.	16-2.4.1 Rope Inspection (a) Frequent Inspection (1) The operator or other designated person should visually inspect all ropes at the start of each shift. These visual observations should be concerned with discovering gross damage, such as listed below, which may be an immediate hazard: (a) distortion of the rope such as kinking, crushing, unstranding, birdcaging, main strand displacement, or core protrusion. (b) general corrosion. (c) broken or cut strands. (d) number, distribution, and type of visible broken wires. [See paras. 16-2.4.2(b)(1), (2), and (3) for further guidance.]				
06.4.5	Inspection: Formal Periodic Inspections. These inspections shall be performed at varying intervals, depending on activity, severity of service, environment, and criticality. (Requirement 41144)	No requirements specific to hoists only.	30.16 (b) Inspection procedures for hoists in regular service are divided into two general classifications based upon the intervals at which inspection should be performed. The intervals in turn are dependent upon the nature of the critical components of the hoist and the degree of their exposure to wear, deterioration, or malfunction. The two general classifications are herein designated as frequent and periodic, with respective intervals between inspections as defined below. (1) frequent inspection: visual examinations by the operator or other designated person with records not required. (a) normal service — monthly (b) heavy service — weekly to monthly (c) severe service — daily to weekly (2) periodic inspection: visual inspection by a designated person who makes records of external conditions to provide the basis for a continuing evaluation. An external coded mark on the hoist is an acceptable identification in lieu of records. (a) normal service — yearly (b) heavy service — semiannually (c) severe service — quarterly				
06.4.5.a	Inspection: Formal Periodic Inspections. These inspections shall be performed at varying intervals, depending on activity, severity of service, environment, and criticality: Monthly Inspections (Frequent Inspections). At least once per month: (Requirement 41145)	No requirements specific to hoists only.	Periodic not same as "monthly" 30.16 (2) periodic inspection: visual inspection by a designated person who makes records of external conditions to provide the basis for a continuing evaluation. An external coded mark on the hoist is an acceptable identification in lieu of records. (a) normal service — yearly (b) heavy service — semiannually (c) severe service — quarterly				

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06.4.5.a.2	<p>Inspection: Formal Periodic Inspections. These inspections shall be performed at varying intervals, depending on activity, severity of service, environment, and criticality: Monthly Inspections (Frequent Inspections). At least once per month: Inspect wire rope monthly (except those on platform systems that shall be inspected at least twice a year), paying particular attention to the following signs of deterioration and damage:</p>	No requirements specific to hoists only.	<p>16-2.1.2 Frequent Inspection (See Also Tables 1 and 2) (a) Frequent inspections shall be performed at intervals defined in para. 16-2.1.1(b)(1) and shall include observations during operation. (b) A designated person shall determine whether conditions found during the inspection constitute a hazard and whether a more detailed inspection is required. (c) The following items shall be inspected: (1) operating mechanisms for proper operation, proper adjustment, and unusual sounds. (2) hoist upper limit device of electric- or airpowered hoists, without a load on the hook at the beginning of each shift. Care shall be exercised. The load block shall be inched into its limit device or run in at slow speed on multi-speed or variable-speed hoists. (3) hoist braking system for proper operation. 11 (4) lines, valves, and other parts of air systems for leakage. (5) hooks in accordance with ASME B30.10, Frequent Inspection. (6) hook latches, if used, for proper operation. (7) hoist rope in accordance with para. 16-2.4.1(a). (8) hoist load chain in accordance with para. 16-2.5.1 or 16-2.6.1. (9) rope or load chain reeving for compliance with recommendations of the hoist manufacturer.</p>				
06.4.5.b	<p>Inspection: Formal Periodic Inspections. These inspections shall be performed at varying intervals, depending on activity, severity of service, environment, and criticality: Annual Inspections (Periodic Inspections). At least once per year: (Requirement 41170)</p>	No requirements specific to hoists only.	<p>30.16 (2) periodic inspection: visual inspection by a designated person who makes records of external conditions to provide the basis for a continuing evaluation. An external coded mark on the hoist is an acceptable identification in lieu of records. (a) normal service — yearly (b) heavy service — semiannually (c) severe service — quarterly</p>				

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06.4.5.b.2	<p>Inspection: Formal Periodic Inspections. These inspections shall be performed at varying intervals, depending on activity, severity of service, environment, and criticality: Annual Inspections (Periodic Inspections). At least once per year: Check for loose bolts and rivets and cracked or worn drums and sheaves. Various methods of NDT such as ultrasonics, radiography, magnetic particle, and liquid penetrant shall be used as needed.</p>	No requirements specific to hoists only.	<p>16-2.1.3 Periodic Inspection (See Also Tables 1 and 2) (a) Periodic inspections shall be performed at intervals defined in para. 16-2.1.1(b)(2) and may be performed with the hoist at its normal location and do not require the hoist to be disassembled. (b) Covers and other items normally supplied to allow inspection of components should be opened or removed. (c) A designated person shall determine whether conditions found during inspection constitute a hazard and whether disassembly is required. (d) The following items shall be inspected: (1) the items listed in para. 16-2.1.2(c) (2) fasteners for evidence of loosening (3) load blocks, suspension housings, hand chain wheels, chain attachments, clevises, yokes, suspension bolts, shafts, gears, bearings, pins, rollers, and locking and clamping devices for evidence of wear, corrosion, cracks, and distortion (4) hook-retaining nuts or collars, and pins, welds, or rivets used to secure the retaining members for evidence of damage (5) load sprockets, idler sprockets, drums, and sheaves for evidence of damage and wear (6) the brake mechanism on hand chain hoists for evidence of worn, glazed, or oil-contaminated friction disks; worn pawls, cams, or ratchets; corroded, stretched, or broken pawl springs (7) the motor brake and load brake on electric- or air-powered hoists for evidence of wear (8) electrical apparatus on electric-powered hoists for evidence of pitting or deterioration of controller contacts (9) supporting structure or trolley, if used, for evidence of damage (10) label or labels required by para. 16-1.1.4 for legibility (11) end connections of wire ropes or load chains</p>				
06.4.5.b.3	<p>Inspection: Formal Periodic Inspections. These inspections shall be performed at varying intervals, depending on activity, severity of service, environment, and criticality: Annual Inspections (Periodic Inspections). At least once per year: Check for worn, corroded, cracked, or distorted parts such as pins, bearings, shafts, gears, rollers, and locking and clamping devices. Surface or volumetric NDT shall be used to validate the existence or absence of cracks or to her load test effects indicated by this inspection.</p>	No requirements specific to hoists only.	<p>Reference Above</p> <p>No NDT requirements</p>				
06.4.5.b.6	<p>Inspection: Formal Periodic Inspections. These inspections shall be performed at varying intervals, depending on activity, severity of service, environment, and criticality: Annual Inspections (Periodic Inspections). At least once per year: Inspect hook-retaining nuts or collars, pins, welds, or rivets used to secure retaining members for deformations, cracks, or excessive corrosion. Surface or volumetric NDT shall be used to validate the existence or absence of cracks or other load test effects indicated by this inspection.</p>	No requirements specific to hoists only.	See Above				
06.4.6	<p>Inspection: Idle and Standby Hoists/Winches. Idle and standby hoists/winches shall be inspected prior to first use according to the requirements of paragraphs 6.4.4 and 6.4.5 unless these daily and formal periodic inspections were performed at required intervals and recorded during the idle/standby period.</p>	No requirements specific to hoists only.	<p>30.16 (b) A hoist that is used infrequently, which has been idle for a period of 1 year or more, shall be inspected, in accordance with the requirements listed in para. 16-2.1.3, before being placed in service.</p>				

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06.4.7(1)	Inspection: Inspection Reports. After each formal periodic inspection, qualified, authorized personnel shall prepare written, dated, and signed inspection reports. (Requirement 41180)	No requirements specific to hoists only.	16-2.1.5 Inspection Records (a) Dated inspection reports and records should be maintained at time intervals specified in para. 16-2.1.1(b)(2). Records should be stored where they are available to appointed persons. (b) A long-range rope or chain inspection program should be established and should include records on examination of ropes or chains removed from service so a relationship can be established between visual observation and actual condition of the rope or chain.				
06.4.7(2)	Inspection: Inspection Reports: These reports shall include procedure reference and adequacy of the hoist/hoist components. (Requirement 41181)	No requirements specific to hoists only.	No requirement				
06.4.7(3)	Inspection: Inspection Reports: Inadequacies shall be documented and, if determined to be a hazard, corrected prior to further use. (Requirement 41182)	No requirements specific to hoists only.	No requirement				
06.4.7(4)	Inspection: Inspection Reports: These reports shall be filed and be made readily available by the organizational element responsible for hoist and winch inspection. (Requirement 41183)	No requirements specific to hoists only.	See Above				
06.5(1)	Maintenance. A maintenance program based on manufacturers' recommendations, integrating proactive, reactive, preventive, and predictive maintenance shall be established to increase the probability the hoist or winch will function in the required manner over its design life cycle with a minimum of maintenance.	No requirements specific to hoists only.	16-2.3.1 Preventive Maintenance (a) A preventive maintenance program should be established. The program should be based on recommendations outlined in the hoist manufacturer's manual. If a qualified person determines it is appropriate, the program should also include that individual's additional recommendations based upon a review of the hoist application and operation. Dated records should be placed on file. (b) Replacement parts shall be at least equal to the original manufacturer's specifications.				
06.5(2)	Maintenance: The program shall include procedures and a scheduling system for normal periodic maintenance items, adjustments, replacements, and repairs.	No requirements specific to hoists only.	No requirement				
06.5(3)	Maintenance: The program shall also ensure that records are kept and unsafe test and inspection discrepancies are documented and corrected.	No requirements specific to hoists only.	See Above				
06.5(4)	Maintenance: Any hoist or winch found in an unsafe operating condition shall be tagged out and removed from service until repaired.	No requirements specific to hoists only.	16-2.3.3 Adjustments, Repairs, and Replacements (a) Any condition disclosed by the inspections performed in accordance with the requirements of Section 16-2.1, that is determined to be a hazard to continued operation, shall be corrected by adjustment, repair, or replacement before continuing the use of the hoist.				
06.5(5)	Maintenance: All repairs shall be made by qualified personnel in accordance with the manufacturers' instructions.	No requirements specific to hoists only.	30.16 (b) Adjustments, repairs, and replacements shall be performed by a designated person.				
06.5.1	Maintenance: Maintenance Procedures. Before maintenance, adjustments, repairs, and replacements are initiated, the following safety precautions shall be taken: (Requirement 41189)	No requirements specific to hoists only.	General				

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06.5.1.c	Maintenance: Maintenance Procedures. Before maintenance, adjustments, repairs, and replacements are initiated, the following safety precautions shall be taken: If power has to be on, "Warning," "Out-of-Order," or a like sign shall be placed in a conspicuous location or an operator shall remain at the pendant.	No requirements specific to hoists only.	7-2.3.2 Maintenance Procedure (a) Before adjustments and repairs are started on a hoist, the following precautions shall be taken, as applicable: (1) if electrically powered, the main or emergency switch locked in the open position (2) the power plant stopped or disconnected at the takeoff (3) power plant starting means rendered inoperative (4) drum pawls engaged, or other means provided to prevent load ropes from inadvertently rotating the mechanism (5) warning or Out of Order signs placed on the hoist 16-2.3.2 Maintenance Procedure (Refer to Hoist Manufacturer's Manual) (a) Before adjustments and repairs are started on a hoist, the following precautions shall be taken as applicable: (1) If a load is attached to the hoist, it shall be removed. (2) If the hoist is electric- or air-powered, all controllers shall be placed in the off position. (3) If the hoist is electric- or air-powered, a lockout/tagout procedure shall be performed (see Section 16-3.3). 15 (4) If the hoist is suspended from a trolley, provisions should be taken to prevent movement of the trolley. (5) Warning signs and barriers shall be utilized on the floor beneath the hoist where overhead maintenance work creates a hazard.				
06.5.1.d	Maintenance: Maintenance Procedures. Before maintenance, adjustments, repairs, and replacements are initiated, the following safety precautions shall be taken: Hoists and winches shall not be operated until all safety devices have been activated and tested/adjusted if involved in the maintenance action.	No requirements specific to hoists only.	See Above				
06.5.2	Maintenance: Adjustments. Based upon the manufacturer's documentation and/or experience, adjustments shall be made to ensure that all hoist components function properly, paying particular attention to: (Requirement 41194)	No requirements specific to hoists only.	No requirement				
06.5.2.a	Maintenance: Adjustments. Based upon the manufacturer's documentation and/or experience, adjustments shall be made to ensure that all hoist components function properly, paying particular attention to: Brakes. Appropriate precautions shall be taken by inspectors, repair personnel, and others who may be potentially exposed to airborne dust fibers from any asbestos friction materials present in braking mechanisms.	No requirements specific to hoists only.	30.16 No warning for dust and asbestos (c) Components shall be adjusted or repaired as needed. The following are examples: (1) all operating mechanisms (2) brakes and pawls (3) limit devices of electric- or air-powered hoists (4) control systems of electric- or air-powered hoists				
06.5.2.c.1	Maintenance: Adjustments. Based upon the manufacturer's documentation and/or experience, adjustments shall be made to ensure that all hoist components function properly, paying particular attention to: Limit switches: The hoist initial upper limit switch shall be verified by running the empty hook at full speed into the limit switch. It is recommended that the switch be verified at slow speed prior to adjustment.	No requirements specific to hoists only.	See Above				
06.5.2.c.2	Maintenance: Adjustments. Based upon the manufacturer's documentation and/or experience, adjustments shall be made to ensure that all hoist components function properly, paying particular attention to: Limit switches: For hoists and winches used for critical lifts, the final upper limit switch shall be independently verified and adjusted as described above at installation and after modifications that could affect switch operation. The switch can be tested periodically by manually tripping it and verifying that all hoist motion is precluded.	No requirements specific to hoists only.	No requirement				

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06.5.3	Maintenance: Repairs and Replacements. Repairs or replacements shall be provided for safe operation. Special attention shall be given to: (Requirement 41202)	No requirements specific to hoists only.	General				
06.5.3.d	Maintenance: Repairs and Replacements. Repairs or replacements shall be provided for safe operation. Special attention shall be given to: For repair/replacement requirements for hoist and winch hooks with deformation or cracks, see Section 7. If repaired, hoist and winch hooks shall be proof load tested using the associated hoist or winch proof load value.	No requirements specific to hoists only.	30.16 (d) Repairs or replacements shall be made as needed. The following are examples: (1) all excessively worn braking components such as friction disks, ratchets, pawls, and pawl springs. (2) all critical parts, including load suspension components, that are cracked, broken, bent, or excessively worn. (3) worn, corroded, or otherwise damaged load chain in accordance with para. 16-2.5.2 or 16-2.6.2. (4) worn or otherwise damaged rope in accordance with para. 16-2.4.2. (5) damaged or worn hooks as described under Maintenance in ASME B30.10. Repairs by welding or reshaping are not recommended. (6) on electric-powered hoists, pitted or burned electrical contacts should be corrected only by replacement and in sets. Controller parts should be lubricated as recommended by the manufacturer. (7) missing or illegible function labels on pendant control stations. (8) missing or illegible warning labels. (9) items that are determined to be missing.				
06.5.3.e	Maintenance: Repairs and Replacements. Repairs or replacements shall be provided for safe operation. Special attention shall be given to: The need to replace wire rope shall be determined by a certified otherwise qualified person based on an evaluation of inspection results. Any of the signs of deterioration and damage outlined in paragraph 6.4.5.a are sufficient reasons for questioning continued use of the rope (see Wire Rope Users Manual for additional information on wire rope inspections).	No requirements specific to hoists only.	16-2.4.2 Rope Replacement (a) No precise rules can be given for determination of the exact time for rope replacement, since many variable factors are involved. Once a rope reaches any one of the specified removal criteria, it may be allowed to operate to the end of the work shift, based on the judgment of a qualified person. The rope shall be replaced after that work shift, at the end of the day, or at the latest time prior to the equipment being used by the next work shift. (b) Removal criteria for the rope replacement shall be as follows: SEE CRITERIA				
06.5.3.f	Maintenance: Repairs and Replacements. Repairs or replacements shall be provided for safe operation. Special attention shall be given to: Replacement rope or chain shall be at least equal to the same size, grade, and construction as original furnished by the hoist or winch manufacturer. When replaced, perform a proof load test using the associated hoist or winch proof load value.	No requirements specific to hoists only.	30.16 (e) Replacement rope and connections shall have a strength rating at least as great as the original rope and connections furnished by the hoist manufacturer. Any deviation from the original size, grade, or construction shall be specified by a rope manufacturer, the hoist manufacturer, or a qualified person. PROOF LOAD TEST ADDRESSED ABOVE.				
06.6.1(1)	Personnel Certification: Program. Only certified (licensed) and trained operators shall be authorized to use/operate powered hoists and winches except for platform hoists where procedural contrals can be provided in a technical operating procedure.	No requirements specific to hoists only.	7-3.1.1 Operators (a) Hoists shall be operated only by the following personnel: (1) designated persons (2) trainees under the direct supervision of a designated person (3) maintenance and test personnel when it is necessary in the performance of their duties				

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06.6.1(2)	Personnel Certification: Program: A training, examination, and licensing program shall be established or made available. (Requirement 41211)	No requirements specific to hoists only.	7-3.1.2 Qualifications for Operators (a) Operators shall be required by the employer to pass a written or oral examination and a practical operating examination unless able to furnish satisfactory evidence of qualifications and experience. Qualifications shall be limited to the specific type of equipment for which examined. (b) Operators and the operator trainees shall meet the following physical qualifications: (1) have vision of at least 20/30 Snellen in one eye and 20/50 in the other, with or without corrective lenses (2) be able to distinguish colors, regardless of position, if color differentiation is required for operation (3) hearing, with or without hearing aid, must be adequate for the specific operation (4) have sufficient strength, endurance, agility, coordination, and speed of reaction to meet the demands of equipment operation				
06.6.1(3)	Personnel Certification: Program: For those NASA installations that do not have a training program, all hoist and winch operators shall be trained and certified by a recognized hoist certification organization that normally performs this function.	No requirements specific to hoists only.	No requirement				
06.6.1(4)	Personnel Certification: Program: The operator certification program will be reviewed at least annually to assure that the contents, training material, testing, and examination elements are up-to-date with current methods and techniques; and that any "lessons-learned" are adequately addressed. (Requirement 41213)	No requirements specific to hoists only.	No requirement				
06.6.1(5)	Personnel Certification: Program: Riggers (see Section 10) and personnel performing NDT (see paragraph 1.9) shall be certified in their discipline.	No requirements specific to hoists only.	No requirement				
06.6.1(6)	Personnel Certification: Program: Training shall be provided to observers and flagmen.	No requirements specific to hoists only.	No requirement				
06.6.1(7)	Personnel Certification: Program: All participants in the lifting operation shall have clearly defined roles and responsibilities.	No requirements specific to hoists only.	No requirement				
06.6.2	Personnel Certification: Levels. Two levels of operator training and proficiency will be established. Operations where critical lifts are involved will require a more rigid operator certification program than those operations that involve more routine lifts that do not involve critical hardware or unique hazards.	No requirements specific to hoists only.	No requirement				
06.6.2.a	Personnel Certification: Levels: Noncritical Lifts. The certification program for noncritical lift operators shall include the following: (Requirement 41218)	No requirements specific to hoists only.	No requirement				
06.6.2.a.1.a	Personnel Certification: Levels: Noncritical Lifts. The certification program for noncritical lift operators shall include the following: Training: Classroom training in safety, lifting equipment emergency procedures, general performance standards, requirements, pre-operational checks, and safety-related defects and symptoms (for initial certification and as needed).	No requirements specific to hoists only.	No requirement				
06.6.2.a.1.b	Personnel Certification: Levels: Noncritical Lifts. The certification program for noncritical lift operators shall include the following: Training: Hands-on training (for initial certification and as needed).	No requirements specific to hoists only.	No requirement				
06.6.2.a.1.c	Personnel Certification: Levels: Noncritical Lifts. The certification program for noncritical lift operators shall include the following: Training: An annual review of the items in paragraph 6.6.2.a(1) above. (This may be conducted informally by local supervisory personnel.)	No requirements specific to hoists only.	No requirement				
06.6.2.a.2.a	Personnel Certification: Levels: Noncritical Lifts. The certification program for noncritical lift operators shall include the following: Examination: Physical examination (criteria to be determined by the cognizant medical official).	No requirements specific to hoists only.	See Above				

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06.6.2.a.2.b	Personnel Certification: Levels: Noncritical Lifts. The certification program for noncritical lift operators shall include the following: Examination: Written examination.	No requirements specific to hoists only.	See Above				
06.6.2.a.2.c	Personnel Certification: Levels: Noncritical Lifts. The certification program for noncritical lift operators shall include the following: Examination: Operational demonstration (for initial certification only).	No requirements specific to hoists only.	See Above				
06.6.2.a.2.d	Personnel Certification: Levels: Noncritical Lifts. The certification program for noncritical lift operators shall include the following: Examination: Proficiency examination for recertification.	No requirements specific to hoists only.	No requirement				
06.6.2.a.3.a(1)	Personnel Certification: Levels: Noncritical Lifts. The certification program for noncritical lift operators shall include the following: Licensing/Operator Certification: An organizational element shall be designated to issue operator licenses/operator certification.	No requirements specific to hoists only.	No requirement				
06.6.2.a.3.a(2)	Personnel Certification: Levels: Noncritical Lifts. The certification program for noncritical lift operators shall include the following: Licensing/Operator Certification: Provisions shall be made to revoke licenses for negligence, violations of safety requirements, or failure to meet medical standards.	No requirements specific to hoists only.	No requirement				
06.6.2.a.3.a(3)	Personnel Certification: Levels: Noncritical Lifts. The certification program for noncritical lift operators shall include the following: Licensing/Operator Certification: Provisions shall be made for periodic checks of operators to verify they have licenses in their possession.	No requirements specific to hoists only.	No requirement				
06.6.2.a.3.a(4)	Personnel Certification: Levels: Noncritical Lifts. The certification program for noncritical lift operators shall include the following: Licensing/Operator Certification: The licenses shall indicate the type of hoist the holder is qualified to operate. Alternately, the organizational element may elect to maintain a master list of licensed operators instead of issuing individual licenses, providing copies of the list are readily available to assurance and supervisory personnel at the work site. (Requirement 41232)	No requirements specific to hoists only.	No requirement				
06.6.2.a.3.b(1)	Personnel Certification: Levels: Noncritical Lifts. The certification program for noncritical lift operators shall include the following: Licensing/Operator Certification: Renewal of all licenses shall require demonstration of proficiency or approval of supervision that proficiency is adequate and current.	No requirements specific to hoists only.	No requirement				
06.6.2.a.3.b(2)	Personnel Certification: Levels: Noncritical Lifts. The certification program for noncritical lift operators shall include the following: Licensing/Operator Certification: Licenses or certifications shall expire at least every 4 years. Renewal procedures will be established by each licensing organization, but as a minimum, will include items in paragraphs 6.6.2.a(1) and 6.6.2.a(2). (Requirement 41234)	No requirements specific to hoists only.	No requirement				
06.6.2.b	Personnel Certification: Levels: Critical Lifts. Besides the training, examination, licensing, and renewal requirements for noncritical lifts, operators that are being certified to perform critical lifts must be trained in the specific hazards and special procedures associated with the lift. Operators must also demonstrate proficiency and operating finesse with the hoist using a test load as appropriate for the initial certification or alternately be immediately supervised by a certified operator during the first initial lifting period. The licenses will indicate specific hoists for which the operator is certified.	No requirements specific to hoists only.	No requirement				

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06.7(1)	Operations. Hoists and winches shall be operated according to this section, the manufacturers' recommendations, and the applicable ASME standard.	No requirements specific to hoists only.	16-3.1.1 Before Operating Hoist (a) The operator shall be familiar with all operating controls of the hoist, and be instructed in the operation(s) to be performed. Instructions shall include, as applicable, the warnings on the hoist, the hoisting practices listed in this Section, and the operation instructions portion of the hoist manufacturer's manual.				
06.7(2)	Operations: The following practices shall be followed for hoist and winch operations: (Requirement 41237)	No requirements specific to hoists only.	General				
06.7.a	Operations: The following practices shall be followed for hoist and winch operations: Operators will adhere to all tags placed on the hoist or winch controls.	No requirements specific to hoists only.	30.16 (c) The operator shall not operate a hoist that bears an out-of-order sign.				
06.7.b(1)	Operations: The following practices shall be followed for hoist and winch operations: Before starting a hoist or winch, the operator shall be certain that all personnel are clear of the area. (Requirement 41239)	No requirements specific to hoists only.	30.16 (c) The operator shall not lift or lower a load with the hoist until the operator and all other personnel are clear of the load.				
06.7.b(2)	Operations: The following practices shall be followed for hoist and winch operations: Operators shall not engage in practices that will divert their attention while operating a hoist.	No requirements specific to hoists only.	16-3.1.3 Moving the Load (a) The operator shall not engage in any activity that will divert the operator's attention while operating the hoist.				
06.7.c	Operations: The following practices shall be followed for hoist and winch operations: The operator shall test all controls before beginning an operation. If the controls do not operate properly, adjustments or repairs shall be made before operations begin. (Requirement 41241)	No requirements specific to hoists only.	30.7 (j) All controls shall be tested by the operator at the start of a new shift. If any controls do not operate properly, they shall be adjusted or repaired before operations are begun.				
06.7.d(1)	Operations: The following practices shall be followed for hoist and winch operations: Hoists and winches shall not be loaded beyond rated load except during authorized tests. (Requirement 41242)	No requirements specific to hoists only.	30.16 (h) The operator shall not pick up a load in excess of the rated load appearing on the hoist or load block, except during properly authorized tests or properly authorized planned engineered lifts in accordance with para. 16-3.2.2. A hoist overload limiting device shall not be used to measure the maximum load to be lifted.				
06.7.d(2)	Operations: The following practices shall be followed for hoist and winch operations: Platform systems shall not be loaded beyond maximum load as designated on the platform hoist system. (Requirement 41243)	No requirements specific to hoists only.	No requirement				
06.7.e	Operations: The following practices shall be followed for hoist and winch operations: Hoists and winches shall not be used for handling personnel unless specifically designed for such purpose (see Section 9).	No requirements specific to hoists only.	30.7 Provisions of this Volume do not encompass all of the safety precautions and safeguards applicable when hoist loads consist wholly, or in part, of personnel. For personnel handling hoists refer to ANSI A10.4. When basemounted drum hoists are used as an integral part of other lifting equipment, this Standard may not apply.				
06.7.f	Operations: The following practices shall be followed for hoist and winch operations: Personnel shall not be located under suspended or moving loads unless the operation adheres to the OSHA-approved NASA Alternate Standard for Suspended Load Operations (see Appendix A).	No requirements specific to hoists only.	Addressed in Appendix A.				

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06.7.g(1)	Operations: The following practices shall be followed for hoist and winch operations: An operator shall be at the hoist or winch controls at all times while a load is suspended. (Requirement 41246)	No requirements specific to hoists only.	7-3.2.3 Holding the Suspended Load (a) The operator shall not leave the controls while the load is suspended unless the precautions in the exceptions listed in paras. 7-3.2.3(b) through (d) have been taken. (b) If the load must remain suspended for any considerable time, a pawl or other equivalent means, rather than the brake alone, shall be used to hold the load. (c) As an exception to para. 7-3.2.3(a), the operator may leave the controls, provided that prior to leaving, the operator and an appointed individual shall establish the requirements for dogging the hoist [see para. 7-3.2.3(b)], furnishing notices, setting up barricades, or whatever other precautions may be necessary. (d) Hoists, when holding anchor lines or applying static pressure, are not considered as holding suspended loads. However, prior to the operator leaving the controls, the operator and an appointed individual shall establish the requirements for braking, dogging the hoist [see para. 7-3.2.3(b)], furnishing notices, setting up barricades, or whatever other precautions may be necessary.				
06.7.g(2)	Operations: The following practices shall be followed for hoist and winch operations: Due to the length of some NASA operations, an operator change may be required while a load is suspended. This shall be accomplished via a procedure designed for the specific hoist and operation, ensuring that the hoist or winch controls are manned at all times.	No requirements specific to hoists only.	See Above				
06.7.h(1)	Operations: The following practices shall be followed for hoist and winch operations: Before each lift or series of lifts, the operator shall functionally test proper operation of the upper limit switch with no load on the hook. (Requirement 41248)	No requirements specific to hoists only.	30.16 (2) hoist upper limit device of electric- or airpowered hoists, without a load on the hook at the beginning of each shift. Care shall be exercised. The load block shall be inched into its limit device or run in at slow speed on multi-speed or variable-speed hoists.				
06.7.h(2)	Operations: The following practices shall be followed for hoist and winch operations: Upper limit switches shall not be used as operating controls.	No requirements specific to hoists only.	30.16 (m) The operator shall not use the upper (or lower, if provided) limit device(s) as a normal means of stopping the hoist. These are emergency devices only.				
06.7.i(1)	Operations: The following practices shall be followed for hoist and winch operations: Hoists and winches shall not be used to load test items such as slings, platforms, or lifting fixtures unless specifically identified to do so based on a specified percentage of rated load and a safety analysis approved by the LDEM and the responsible safety, engineering, operations, and maintenance organizations.	No requirements specific to hoists only.	No requirement				
06.7.i(2)	Operations: The following practices shall be followed for hoist and winch operations: Test procedures shall be approved by the responsible safety, engineering, operations, and maintenance organizations. This is to ensure that the hoist or winch is not damaged due to sudden unloading should the test article fail.	No requirements specific to hoists only.	No requirement				
06.7.i(3)	Operations: The following practices shall be followed for hoist and winch operations: Appendix D, crane/hoist requirements to load test other lifting equipment, shall be followed.	No requirements specific to hoists only.	No requirement				
06.7.j	Operations: The following practices shall be followed for hoist and winch operations: Installed or fixed air or electric powered hoists and winches, excluding platform systems, shall be operated by designated personnel only.	No requirements specific to hoists only.	No requirement				

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06.7.k	Operations: The following practices shall be followed for hoist and winch operations: The operator shall ensure that the hoist or winch is within inspection and periodic recertification intervals by examination of its tag(s) and/or appropriate documentation. (Requirement 41254)	No requirements specific to hoists only.	No requirement				
06.7.L	Operations: The following practices shall be followed for hoist and winch operations: Outdoor hoisting operations should not commence if winds are above 20 knots (23 mph, 37 km/hr) steady state or if gusts exceed 35 knots (40 mph, 65 km/hr). Consideration shall also be given to sail area and weather conditions such as lightning or snow before commencing operations.	No requirements specific to hoists only.	No requirement				
06.7.m	Operations: The following practices shall be followed for hoist and winch operations: Hoists and winches shall not be used for side pulls unless specifically designed to do so.	No requirements specific to hoists only.	No requirement				
06.7.n(1)	Operations: The following practices shall be followed for hoist and winch operations: If radio communications are to be used, operators and/or lift supervisors shall test the communication system prior to each operation. (Requirement 41257)	No requirements specific to hoists only.	No requirement				
06.7.n(2)	Operations: The following practices shall be followed for hoist and winch operations: Operations shall stop immediately upon communication loss and shall not continue until communication is restored.	No requirements specific to hoists only.	No requirement				
06.7.o(1)	Operations: The following practices shall be followed for hoist and winch operations: If hand signals are required, only standard signals shall be used according to Appendix B. (Requirement 41259)	No requirements specific to hoists only.	7-3.3.2 Hand Signals Hand signals shall be in accordance with Fig. 4 and shall be posted conspicuously.				
06.7.o(2)	Operations: The following practices shall be followed for hoist and winch operations: Hand signals shall be posted in a conspicuous location. (Requirement 41260)	No requirements specific to hoists only.	See Above				
06.7.p(1)	Operations: The following practices shall be followed for hoist and winch operations: The operator shall know the weight of the working load.	No requirements specific to hoists only.	No requirement				
06.7.p(2)	Operations: The following practices shall be followed for hoist and winch operations: When raising loads that approach 75% of the rated capacity of the hoist or winch, the operator shall test the holding brakes. (Requirement 41262)	No requirements specific to hoists only.	30.16 (g) Each time a load approaching rated capacity is handled, the operator shall check hoist brake action by lifting the load just clear of supports and continuing only after verifying that the brake system is operating properly.				
06.7.p(3)	Operations: The following practices shall be followed for hoist and winch operations: The brakes shall be tested by raising the load minimally above the surface and holding the load with the brake. The load should be held long enough to allow any dynamics to dampen out. (Requirement 41263)	No requirements specific to hoists only.	No requirement				
06.8.1	Special Criteria: Handling Explosives or Electro-Explosive Devices (EED's). Special precautions shall be taken while handling explosives or EED's. (Requirement 41266)	No requirements specific to hoists only.	No requirement				
06.8.1.a(1)	Special Criteria: Handling Explosives or Electro-Explosive Devices (EED's). Special precautions shall be taken while handling explosives or EED's: DOT-packaged explosives shall be handled in accordance with approved hazardous operating procedures. (Requirement 41267)	No requirements specific to hoists only.	No requirement				
06.8.1.a(2)	Special Criteria: Handling Explosives or Electro-Explosive Devices (EED's). Special precautions shall be taken while handling explosives or EED's: Barricades and warning signs shall be erected to control access. (Requirement 41268)	No requirements specific to hoists only.	No requirement				
06.8.1.b(1)	Special Criteria: Handling Explosives or Electro-Explosive Devices (EED's). Special precautions shall be taken while handling explosives or EED's: Explosives and EED's that are not within DOT-approved containers shall be handled in accordance with approved hazardous operations procedures.	No requirements specific to hoists only.	No requirement				

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06.8.1.b(2)	Special Criteria: Handling Explosives or Electro-Explosive Devices (EED's). Special precautions shall be taken while handling explosives or EED's: In addition to system configuration controls, these procedures shall ensure the following requirements are met: (Requirement 41270)	No requirements specific to hoists only.	No requirement				
06.8.1.b.1	Special Criteria: Handling Explosives or Electro-Explosive Devices (EED's). Special precautions shall be taken while handling explosives or EED's: In addition to system configuration controls, these procedures shall ensure the following requirements are met: Voltage checks on crane hooks that will handle explosives or EED's shall be performed prior to the start of operations; all crane motions shall be checked.	No requirements specific to hoists only.	No requirement				
06.8.1.b.2(1)	Special Criteria: Handling Explosives or Electro-Explosive Devices (EED's). Special precautions shall be taken while handling explosives or EED's: In addition to system configuration controls, these procedures shall ensure the following requirements are met: For static sensitive systems, the crane hook shall be connected to facility ground before connecting to explosives or EED's. (Requirement 41272)	No requirements specific to hoists only.	No requirement				
06.8.1.b.2(2)	Special Criteria: Handling Explosives or Electro-Explosive Devices (EED's). Special precautions shall be taken while handling explosives or EED's: In addition to system configuration controls, these procedures shall ensure the following requirements are met: Electrical grounding of the hook and load shall be accomplished prior to lifting operations. If a ground connection must be disconnected to facilitate operations, an alternate ground should be connected prior to disconnecting the existing ground. The final attachment/detachment must be at least 10 feet (3 m) from exposed propellant grain, explosives, or EED's.	No requirements specific to hoists only.	No requirement				
06.8.1.b.3	Special Criteria: Handling Explosives or Electro-Explosive Devices (EED's). Special precautions shall be taken while handling explosives or EED's: In addition to system configuration controls, these procedures shall ensure the following requirements are met: The danger potential for radio transmissions near explosives shall be evaluated prior to the operation.	No requirements specific to hoists only.	No requirement				
06.8.1.b.4	Special Criteria: Handling Explosives or Electro-Explosive Devices (EED's). Special precautions shall be taken while handling explosives or EED's: In addition to system configuration controls, these procedures shall ensure the following requirements are met: Personnel limits, protective clothing, warning signs and barricades shall be used as required. (Requirement 41275)	No requirements specific to hoists only.	No requirement				
06.8.1.b.5	Special Criteria: Handling Explosives or Electro-Explosive Devices (EED's). Special precautions shall be taken while handling explosives or EED's: In addition to system configuration controls, these procedures shall ensure the following requirements are met: Safety surveillance requirements shall be followed.	No requirements specific to hoists only.	No requirement				
06.8.2	Special Criteria: Policy shall be developed and enforced for hoist operation during electrical storms. Operations are generally permitted without restriction within enclosed metal or framed buildings that are properly grounded. Restrictions are necessary for outside operations or for those that cannot tolerate power failure/loss.	No requirements specific to hoists only.	No requirement				
07.2(1)	Safety and Design Criteria. Hooks shall meet the manufacturer's recommendations, and shall not be overloaded. Swiveling hooks should rotate 360 degrees on antifriction bearings with means for lubrication. If grease is a contamination concern, drip funnels (cups), nonlubricated bearings, or permanently lubricated sealed bearings should be provided.						

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07.2(2)	Safety and Design Criteria: A latch or mousing shall be provided to bridge the throat opening of the hook to retain slings, chains, or other similar parts under slack conditions.						
07.2(3)	Safety and Design Criteria: Hooks on cranes used for lifting people shall be a lockable type as required by ASME B30.23. (Requirement 41282)						
07.3(1)	Testing: Hooks shall be required to pass the tests of the equipment of which they are a part.						
07.3(2)	Testing: Written, dated, and signed test reports shall be prepared together with the test reports for the equipment of which the hooks are a part. (Requirement 41284)						
07.3(3)	Testing: Inadequacies shall be documented and, if determined to be a hazard, corrected prior to further use.						
07.4.1	Inspection: Hooks shall be inspected during the daily and periodic inspections of the equipment of which they are a part. (Requirement 41287)						
07.4.2	Inspection: Daily Inspections. These inspections shall be performed each day the lifting equipment is used. Inspect for: (Requirement 41288)						
07.4.3(1)	Inspection: Periodic Inspections. These inspections shall be performed at varying intervals depending on activity, severity of service, environment, and criticality. (Requirement 41293)						
07.4.3(2)	Inspection: Periodic Inspections: The following inspections shall be performed at least once per year. Inspect for: (Requirement 41294)						
07.4.4	Inspection: Visual inspection of painted hooks requires consideration of the coating. Surface variations may indicate heavy or severe service. Such instances may call for stripping the paint to allow for more detailed analysis.						
07.4.5(1)	Inspection: NDT. Hooks shall be given a surface NDT (see paragraphs 3.1.35 and 3.1.57) immediately after all periodic load and proof load tests and prior to further use of the hook. Cracks are not acceptable. Linear indications greater than 1/8 inch long whose length is equal to or greater than three times its width are not acceptable. A visual inspection of hooks used for noncritical lifts (if not attached to a crane) and sling hooks of 5 tons or less is acceptable. (Requirement 41300)						
07.4.5(2)	Inspection: NDT: All new crane hooks shall undergo a volumetric NDT (if determined necessary by the LDEM and the responsible design engineering organization) followed by a proof load test in accordance with ASME B30.10 followed by a surface NDT. (Requirement 41301)						
07.4.5(3)	Inspection: NDT: Personnel performing NDT shall be qualified and certified in accordance with paragraph 1.9.						
07.4.6(1)	Inspection: Written, dated, and signed inspections reports shall be prepared in conjunction with inspection reports for the equipment of which the hooks are a part. (Requirement 41303)						
07.4.6(2)	Inspection: Inadequacies shall be documented and, if determined to be a hazard, corrected prior to further use. (Requirement 41304)						
07.5.1(1)	Maintenance: Hooks with deficiencies as noted in paragraph 7.4 shall be removed from service and replaced or repaired. (Requirement 41306)						
07.5.1(2)	Maintenance: Replacement shall be with original equipment or equal.						
07.5.1(3)	Maintenance: Repair shall require approval by certified or otherwise qualified personnel. Minor grinding of cracks is not considered a repair providing an approved procedure is used. (Requirement 41308)						

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07.5.2	Maintenance: Cracks, nicks, and gouges shall be repaired by grinding longitudinally, following the contour of the hook, provided that no dimension is reduced more than 10 percent (or as recommended by the manufacturer) of its original value. (Requirement 41309)						
07.5.3	Maintenance: If repaired, hooks shall be proof load tested using the associated lifting device/equipment proof load value. (Requirement 41310)						
07.5.4	Maintenance: A system shall be established for tracking/documenting the maintenance and repair history of hooks.						
07.6	Operations. The following practices shall be followed when using hooks: (Requirement 41312)						
07.6.a	Operations. The following practices shall be followed when using hooks: Loads shall be centered in the base (bowl saddle) of the hook, to avoid point loading. (Requirement 41313)						
07.6.b	Operations. The following practices shall be followed when using hooks: Hooks shall not be side or back loaded. (Requirement 41314)						
07.6.c	Operations. The following practices shall be followed when using hooks: Duplex sister hooks shall be equally loaded on both sides, and the pin hole shall not be point loaded or loaded beyond the rated load of the hook except for testing. (Requirement 41315)						
08.2.1	Safety and Design Aspects: Design Criteria. Hydra-sets used for critical lifts shall have a 5 to 1 design factor based on ultimate strength for load bearing elements.	There are no OSHA standards for Hydra Sets or load measuring devices. Per Del Mar website Hydra Sets have a 5 to 1 safety factor. It should be noted that most but not all load measuring devices have a 5 to 1 SF. Requirement should be included in NASA Std.	There are no ASME standards for Hydra Sets or load measuring devices. Per Del Mar website Hydra Sets have a 5 to 1 safety factor. It should be noted that most but not all load measuring devices have a 5 to 1 SF. Requirement should be included in NASA Std.				
08.2.2.a	Safety and Design Aspects: Labeling/Tagging of Hydra-Sets and Load Measuring Devices: The rated load shall be plainly marked on each Hydra-set and load measuring device (unless permanent part of lifting device). (Requirement 41321)	There are no OSHA standards for Hydrasets or load measuring devices.	There are no ASME standards for Hydra Sets or load measuring devices.				
08.2.2.b	Safety and Design Aspects: Labeling/Tagging of Hydra-Sets and Load Measuring Devices: Hydra-sets and load measuring devices that have the necessary design features, maintenance/inspection, and test intervals to lift critical loads will be marked conspicuously so that the operator and assurance personnel can distinguish that the Hydra-set and load measuring device (unless permanent part of lifting device) are qualified for critical lifts.	There are no OSHA standards for Hydrasets or load measuring devices.	There are no ASME standards for Hydra Sets or load measuring devices.				
08.2.2.c	Safety and Design Aspects: Labeling/Tagging of Hydra-Sets and Load Measuring Devices: A standard system of labeling shall be established and used throughout the installation. (Requirement 41323)	There are no OSHA standards for Hydrasets or load measuring devices.	There are no ASME standards for Hydra Sets or load measuring devices.				
08.2.2.d	Safety and Design Aspects: Labeling/Tagging of Hydra-Sets and Load Measuring Devices: A standard lockout/tagout system shall be established and used throughout the installation to indicate equipment that is not to be used due to inspection discrepancies, ongoing maintenance operations, or other reason. (Requirement 41324)	There are no OSHA standards for Hydrasets or load measuring devices.	There are no ASME standards for Hydra Sets or load measuring devices.				
08.2.2.e	Safety and Design Aspects: Labeling/Tagging of Hydra-Sets and Load Measuring Devices: Certification/recertification tags are required as described in paragraph 8.3.5. (Requirement 41325)	There are no OSHA standards for Hydrasets or load measuring devices.	There are no ASME standards for Hydra Sets or load measuring devices.				
08.2.3(1)	Safety and Design Aspects: Safety Analysis and Documentation of Hydra-Sets Used for Critical Lifts. A recognized safety hazard analysis such as fault tree analysis, FMEA, O&SHA shall be performed on all Hydra-sets used for critical lifts. (Requirement 41326)	There are no OSHA standards for Hydrasets or load measuring devices.	There are no ASME standards for Hydra Sets or load measuring devices.				

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08.2.3(2)	Safety and Design Aspects: Safety Analysis and Documentation of Hydra-Sets Used for Critical Lifts: The analysis shall, as a minimum, determine potential sources of danger, identify failure modes, and recommend resolutions and a system of risk acceptance for those conditions found in the hardware-facility-environment-human relationship that could cause loss of life, personal injury, and loss of or damage to the Hydra-set, facility, or load.	There are no OSHA standards for Hydrasets or load measuring devices.	There are no ASME standards for Hydra Sets or load measuring devices.				
08.2.3(3)	Safety and Design Aspects: Safety Analysis and Documentation of Hydra-Sets Used for Critical Lifts: The analysis shall be done as part of the initial evaluation process for critical lift compliance and prior to use in a critical lift, included in the Hydra-set documentation, and updated as required to reflect any changes in operation and/or configuration. (Requirement 41328)	There are no OSHA standards for Hydrasets or load measuring devices.	There are no ASME standards for Hydra Sets or load measuring devices.				
08.3(1)	Testing. Three types of tests are required: proof load tests, periodic load tests, and operational tests. The acceptable tolerance for load test accuracy is +5/-0 percent. An inspection shall be performed after each load test and prior to release for service to ensure there is no damage. If cracks are suspected, suitable NDT techniques should be used to determine their extent.	There are no OSHA standards for Hydrasets or load measuring devices.	There are no ASME standards for Hydra Sets or load measuring devices.				
08.3(2)	Testing: Tests shall be performed by qualified personnel according to written (specific or general) technical procedures.	There are no OSHA standards for Hydrasets or load measuring devices.	There are no ASME standards for Hydra Sets or load measuring devices.				
08.3.1(1)	Testing: Hydra-set Proof Load Test. Before first use, all new, extensively repaired, modified, or altered Hydra-sets shall undergo a proof load at 200 percent of rated load. (Requirement 41331)	There are no OSHA standards for Hydrasets or load measuring devices.	There are no ASME standards for Hydra Sets or load measuring devices.				
08.3.1(2)	Testing: Hydra-set Proof Load Test: Proof load tests shall be performed with piston rod fully extended to prevent instrument and seal damage.	There are no OSHA standards for Hydrasets or load measuring devices.	There are no ASME standards for Hydra Sets or load measuring devices.				
08.3.2(1)	Testing: Hydra-set Periodic Load Test. Load tests shall be performed with the piston rod fully extended to prevent instrument and seal damage.	There are no OSHA standards for Hydrasets or load measuring devices.	There are no ASME standards for Hydra Sets or load measuring devices.				
08.3.2(2)	Testing: Hydra-set Periodic Load Test: All Hydra-sets shall be tested at 100 percent of rated load at least every 4 years.	There are no OSHA standards for Hydrasets or load measuring devices.	There are no ASME standards for Hydra Sets or load measuring devices.				
08.3.2(3)	Testing: Hydra-set Periodic Load Test: Tests of Hydra-sets used for critical lifts shall be based on frequency of usage.	There are no OSHA standards for Hydrasets or load measuring devices.	There are no ASME standards for Hydra Sets or load measuring devices.				
08.3.2(4)	Testing: Hydra-set Periodic Load Test: Hydra-sets used infrequently for critical lifts shall be load tested before each critical lift if it has been more than one year since the last test.	There are no OSHA standards for Hydrasets or load measuring devices.	There are no ASME standards for Hydra Sets or load measuring devices.				
08.3.2(5)	Testing: Hydra-set Periodic Load Test: Hydra-sets used frequently for critical lifts shall be load tested at least once per year.	There are no OSHA standards for Hydrasets or load measuring devices.	There are no ASME standards for Hydra Sets or load measuring devices.				
08.3.3	Testing: Hydra-set Operational Test. The following shall be performed in conjunction with proof load tests and periodic load tests and at least once per year: (Requirement 41338)	There are no OSHA standards for Hydrasets or load measuring devices.	There are no ASME standards for Hydra Sets or load measuring devices.				
08.3.4(1)	Testing: Load Measuring Device Periodic Load Test. Before first use, all new, extensively repaired, modified, or altered load measuring devices shall undergo a load test at rated capacity.	There are no OSHA standards for Hydrasets or load measuring devices.	There are no ASME standards for Hydra Sets or load measuring devices.				
08.3.4(2)	Testing: Load Measuring Device Periodic Load Test: All load measuring devices shall be tested at rated capacity at least once every 4 years.	There are no OSHA standards for Hydrasets or load measuring devices.	There are no ASME standards for Hydra Sets or load measuring devices.				
08.3.4(3)	Testing: Load Measuring Device Periodic Load Test: Load measuring devices used for critical lifts shall be load tested at least once per year.	There are no OSHA standards for Hydrasets or load measuring devices.	There are no ASME standards for Hydra Sets or load measuring devices.				
08.3.4(4)	Testing: Load Measuring Device Periodic Load Test: Load measuring devices used infrequently for critical lifts shall be load tested before each critical lift if it has been more than one year since the last test.	There are no OSHA standards for Hydrasets or load measuring devices.	There are no ASME standards for Hydra Sets or load measuring devices.				

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08.3.4(5)	Testing: Load Measuring Device Periodic Load Test: Calibration of load measuring devices satisfies the load test requirement.	There are no OSHA standards for Hydrasets or load measuring devices.	There are no ASME standards for Hydra Sets or load measuring devices.				
08.3.5(1)	Testing: Test Reports and Periodic Recertification Tags. After each load test and/or inspection, written, dated, and signed reports shall be prepared. (Requirement 41347)	There are no OSHA standards for Hydrasets or load measuring devices.	There are no ASME standards for Hydra Sets or load measuring devices.				
08.3.5(2)	Testing: Test Reports and Periodic Recertification Tags: Inadequacies shall be documented and, if determined to be a hazard, corrected prior to further use. (Requirement 41348)	There are no OSHA standards for Hydrasets or load measuring devices.	There are no ASME standards for Hydra Sets or load measuring devices.				
08.3.5(3)	Testing: Test Reports and Periodic Recertification Tags: These reports shall be kept on file by the responsible owner organization for a minimum of two test cycles and shall be made readily available. (Requirement 41349)	There are no OSHA standards for Hydrasets or load measuring devices.	There are no ASME standards for Hydra Sets or load measuring devices.				
08.3.5(4)	Testing: Test Reports and Periodic Recertification Tags: Following the periodic load test, all Hydra-sets and load measuring devices (unless permanent part of lifting device) shall have a permanently affixed tag or label, identifying the equipment and stating the next required periodic load test date or the load test expiration date. (Requirement 41350)	There are no OSHA standards for Hydrasets or load measuring devices.	There are no ASME standards for Hydra Sets or load measuring devices.				
08.4.1(1)	Inspection: Inspections, as described below, shall be performed on all Hydra-sets. (Requirement 41352)	There are no OSHA standards for Hydrasets or load measuring devices.	There are no ASME standards for Hydra Sets or load measuring devices.				
08.4.1(2)	Inspection: Inspections shall be performed according to this section and the manufacturers' recommendations.	There are no OSHA standards for Hydrasets or load measuring devices.	There are no ASME standards for Hydra Sets or load measuring devices.				
08.4.1(3)	Inspection: Inadequacies discovered during an inspection shall be documented and, if determined to be a hazard, tagged out and corrected prior to further use. (Requirement 41354)	There are no OSHA standards for Hydrasets or load measuring devices.	There are no ASME standards for Hydra Sets or load measuring devices.				
08.4.1(4)	Inspection: Inspections shall be performed by qualified personnel according to approved technical operating procedures.	There are no OSHA standards for Hydrasets or load measuring devices.	There are no ASME standards for Hydra Sets or load measuring devices.				
08.4.2	Inspection: All new, extensively repaired, or modified Hydra-sets shall be given a daily and a periodic inspection prior to first use. For component repair on Hydra-sets, only the inspections that apply to the repaired portion need to be performed prior to first use unless a periodic inspection interval expires during the downtime (see paragraph 8.4.5).	There are no OSHA standards for Hydrasets or load measuring devices.	There are no ASME standards for Hydra Sets or load measuring devices.				
08.4.3(1)	Inspection: Hydra-sets in regular service (used at least once a month) shall be inspected as required in paragraphs 8.4.4 and 8.4.5. (Requirement 41357)	There are no OSHA standards for Hydrasets or load measuring devices.	There are no ASME standards for Hydra Sets or load measuring devices.				
08.4.3(2)	Inspection: Idle and standby Hydra-sets shall be inspected according to paragraph 8.4.6.	There are no OSHA standards for Hydrasets or load measuring devices.	There are no ASME standards for Hydra Sets or load measuring devices.				
08.4.4	Inspection: Daily Inspections. These inspections shall be performed by the certified operator prior to first use each day the Hydra-set is used, and shall include the following: (Requirement 41359)	There are no OSHA standards for Hydrasets or load measuring devices.	There are no ASME standards for Hydra Sets or load measuring devices.				
08.4.5	Inspection: Periodic Inspections. Periodic inspections are the same as paragraph 8.4.4. Periodic inspections shall be performed at least once per year or more frequently if required by the manufacturer. Periodic inspections consist of visual inspection by an appointed person and require dated documented records. (Requirement 41365)	There are no OSHA standards for Hydrasets or load measuring devices.	There are no ASME standards for Hydra Sets or load measuring devices.				
08.4.6	Inspection: Idle and Standby Hydra-sets. Idle and standby Hydra-sets shall be inspected prior to first use according to the requirements of paragraphs 8.4.4 and 8.4.5 unless these daily and periodic inspections were performed at required intervals and recorded during the idle/standby period. (Requirement 41366)	There are no OSHA standards for Hydrasets or load measuring devices.	There are no ASME standards for Hydra Sets or load measuring devices.				
08.5(1)	Maintenance. A maintenance program based on manufacturers' recommendations, integrating proactive, reactive, preventive, and predictive maintenance shall be established to increase the probability the Hydra-set or load measuring device will function in the required manner over its design life cycle with a minimum of maintenance.	There are no OSHA standards for Hydrasets or load measuring devices.	There are no ASME standards for Hydra Sets or load measuring devices.				

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08.5(2)	Maintenance: The program shall include procedures and a scheduling system for normal periodic maintenance items, adjustments, replacements, and its repairs.	There are no OSHA standards for Hydrasets or load measuring devices.	There are no ASME standards for Hydra Sets or load measuring devices.				
08.5(3)	Maintenance: The program also shall ensure that records are kept and unsafe test and inspection discrepancies are documented and corrected.	There are no OSHA standards for Hydrasets or load measuring devices.	There are no ASME standards for Hydra Sets or load measuring devices.				
08.5(4)	Maintenance: Any Hydra-set or load measuring device found in an unsafe operating condition shall be tagged out and removed from service until repaired. (Requirement 41370)	There are no OSHA standards for Hydrasets or load measuring devices.	There are no ASME standards for Hydra Sets or load measuring devices.				
08.5(5)	Maintenance: All repairs shall be made by qualified personnel in accordance with the manufacturers' instructions.	There are no OSHA standards for Hydrasets or load measuring devices.	There are no ASME standards for Hydra Sets or load measuring devices.				
08.6.1	Personnel Certification: A training and operator certification program that specifically addresses the properties of Hydra-sets and operational procedures needed to retain positive control of the same during close mating operations shall be implemented. Elements of the initial training and certification program will include a review of the above procedures, hands-on training, and an operational demonstration.	There are no OSHA standards for Hydrasets or load measuring devices.	There are no ASME standards for Hydra Sets or load measuring devices.				
08.6.2	Personnel Certification: Licensing/operator certification will be issued every 4 years. Renewal shall require demonstration of proficiency or approval of supervision that proficiency is adequate and current.	There are no OSHA standards for Hydrasets or load measuring devices.	There are no ASME standards for Hydra Sets or load measuring devices.				
08.7	Operations. The following shall be followed for Hydra-set operations: (Requirement 41375)	There are no OSHA standards for Hydrasets or load measuring devices.	There are no ASME standards for Hydra Sets or load measuring devices.				
08.7.a	Operations. The following shall be followed for Hydra-set operations: When Hydra-set seals are replaced, an operational test and inspection shall be performed.	There are no OSHA standards for Hydrasets or load measuring devices.	There are no ASME standards for Hydra Sets or load measuring devices.				
08.7.b	Operations. The following shall be followed for Hydra-set operations: Hydra-sets shall be stored in their appropriate handling containers when not in use.	There are no OSHA standards for Hydrasets or load measuring devices.	There are no ASME standards for Hydra Sets or load measuring devices.				
08.7.c	Operations. The following shall be followed for Hydra-set operations: Hydra-sets and load measuring devices (unless permanent part of lifting device) shall be clearly and permanently marked with rated load value.	There are no OSHA standards for Hydrasets or load measuring devices.	There are no ASME standards for Hydra Sets or load measuring devices.				
08.7.d(1)	Operations. The following shall be followed for Hydra-set operations: Prior to use, the operator shall ensure the Hydra-set and load measuring device (unless permanent part of lifting device) are within the inspection and periodic recertification intervals by examination of the load test tag(s), load test label(s), and/or documentation.	There are no OSHA standards for Hydrasets or load measuring devices.	There are no ASME standards for Hydra Sets or load measuring devices.				
08.7.d(2)	Operations. The following shall be followed for Hydra-set operations: The operator shall adhere to all tags on the controls.	There are no OSHA standards for Hydrasets or load measuring devices.	There are no ASME standards for Hydra Sets or load measuring devices.				
08.7.e	Operations. The following shall be followed for Hydra-set operations: Hydraulically controlled Hydra-sets are preferred over pneumatically controlled Hydra-sets where close mating operations or accurate control of distances is required. Pneumatically controlled Hydra-sets shall not be used for these operations unless the following items are incorporated:	There are no OSHA standards for Hydrasets or load measuring devices.	There are no ASME standards for Hydra Sets or load measuring devices.				

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08.7.e.1	Operations. The following shall be followed for Hydra-set operations: Pneumatically controlled Hydra-sets shall not be used for these operations unless the following items are incorporated: Installation of a fail-safe check valve in the Hydra-set. This is installed on the Hydra-set pneumatic feedline and "locks up" the Hydra-set in the event of a drop or loss of pneumatic control system pressure. A procedure shall be developed and implemented to ensure that the valve is set to an appropriate sensitivity. Normally, the valve is set at the mid-point of its range, which is satisfactory for most operations. However, depending on the specifics of the lift, it may be necessary to reset the valve using a dummy load as outlined in the manufacturer's recommended procedures.	There are no OSHA standards for Hydrasets or load measuring devices.	There are no ASME standards for Hydra Sets or load measuring devices.				
08.7.e.3	Operations. The following shall be followed for Hydra-set operations: Pneumatically controlled Hydra-sets shall not be used for these operations unless the following items are incorporated: Installation of electronic remote position indicators that warn operators of small movements of the hung load. However, these should only be installed if they will not adversely affect the operation or contamination control features of existing Hydra-sets.	There are no OSHA standards for Hydrasets or load measuring devices.	There are no ASME standards for Hydra Sets or load measuring devices.				
09.2.1	Safety and Design Aspects: Generally, any time personnel must be raised or lowered with hoisting equipment, ASME A17.1 should be used. Only when unique project requirements dictate that the elevator standard cannot be applied must special equipment be procured for raising and lowering personnel. In some cases, standard or custom designed equipment can be obtained from manufacturers regularly engaged in the design and construction of personnel lifting devices. This equipment must comply with applicable industry and government standards such as ANSI and OSHA and must be tested, maintained and inspected to their requirements and as required. When industry standards do not apply to a specific project requirement, then a system with an equivalent level of safety must be provided as outlined herein with appropriate concurrence of the applicable design, operations, and safety engineers.	OSHA 1910.66:					
09.2.2.a(1)	Safety and Design Aspects: Labeling/Tagging of Special Hoist Supported Personnel Lifting Devices: The rated load/applicable capacity ratings shall be clearly marked on the personnel lifting device. (Requirement 41391)	OSHA 1910.66: 1910.66(f)(5)(i)(C) Each suspended unit shall be provided with a load rating plate, conspicuously located, stating the unit weight and rated load of the suspended unit.	ASME A120.1-2006: 3.7.2 Load-Rating Identification. Each suspended unit of an equipment installation shall be provided with a load-rating plate, conspicuously located, stating the weight of the unit and live load rating of the suspended unit. The load-rating plate shall be of a noncorrosive, permanent-type, compatible material and securely fastened to the unit. All letters and figures on the plate shall be made by printing, stamping, or etching, or shall be cast on the surface of the plate. The letters and figures shall be not less than 1/4 in. (6.35 mm), with the load indicated in 1/2 in. high (13 mm) figures. The letters and figures shall be maintained in a legible condition.				
09.2.2.a(2)	Safety and Design Aspects: Labeling/Tagging of Special Hoist Supported Personnel Lifting Devices: The rated capacity of the personnel lifting device shall be clearly marked at the entrance-way, and warnings, cautions, and restrictions for safe operations shall be provided according to the applicable industry and government standards. (Requirement 41392)	OSHA 1910.66: See above	ASME A120.1-2006: See above.				
09.2.2.b	Safety and Design Aspects: Labeling/Tagging of Special Hoist Supported Personnel Lifting Devices: A standard system of labeling shall be established and used throughout the installation.	OSHA 1910.66: Not covered.	ASME A120.1-2006: Not covered.				

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09.2.2.c	Safety and Design Aspects: Labeling/Tagging of Special Hoist Supported Personnel Lifting Devices: A standard lockout/tagout system shall be established and used throughout the installation to indicate equipment that is not to be used due to inspection discrepancies, ongoing maintenance, or other reasons. (Requirement 41394)	OSHA 1910.66: Not covered.	ASME A120.1-2006: Not covered.				
09.2.3(1)	Safety and Design Aspects: Safety Analysis and Documentation of Special Hoist Supported Personnel Lifting Devices. A recognized safety hazard analysis such as fault tree analysis, FMEA, O&SHA shall be performed on all special hoist supported personnel lifting devices. (Requirement 41396)	OSHA 1910.66: Not covered.	ASME A120.1-2006: Not covered.				
09.2.3(2)	Safety and Design Aspects: Safety Analysis and Documentation of Special Hoist Supported Personnel Lifting Devices: The analysis shall, as a minimum, determine potential sources of danger, identify failure modes, and recommend resolutions and a system of risk acceptance for those conditions found in the hardware-facility-environment-human relationship that could cause loss of life, personal injury, and loss of or damage to the lifting device, facility or load.	OSHA 1910.66: Not covered.	ASME A120.1-2006: Not covered.				
09.2.3(3)	Safety and Design Aspects: Safety Analysis and Documentation of Special Hoist Supported Personnel Lifting Devices: The analysis shall be done as part of the initial evaluation process for critical lift compliance and prior to use in a critical lift, included in the lifting device documentation, and updated as required to reflect any changes in operation and/or configuration. (Requirement 41398)	OSHA 1910.66: Not covered.	ASME A120.1-2006: Not covered.				
09.2.4(1)	Safety and Design Aspects: General Design Requirements. The design shall produce a personnel lifting device that will lift, lower, sustain, and transport personnel safely.	OSHA 1910.66: Not covered.	ASME A120.1-2006: 3 EQUIPMENT DESIGN AND CONSTRUCTION REQUIREMENTS				
09.2.4(2)	Safety and Design Aspects: General Design Requirements: The structure, mechanism, and material shall be of sufficient strength to meet operational and testing requirements and shall comply with applicable industry and government standards as a minimum and in addition, the requirements outlined in this section.	OSHA 1910.66: Not covered.	ASME A120.1-2006: 3 EQUIPMENT DESIGN AND CONSTRUCTION REQUIREMENTS				
09.2.4(3)	Safety and Design Aspects: General Design Requirements: Besides the requirements in Section 6, paragraphs 6.2.4, 6.2.5, 6.2.6, and 6.2.7, the following requirements shall be met for all hoist supported personnel lifting devices: (Requirement 41401)	OSHA 1910.66:	ASME A120.1-2006:				
09.2.4.a	Safety and Design Aspects: General Design Requirements: Besides the requirements in Section 6, paragraphs 6.2.4, 6.2.5, 6.2.6, and 6.2.7, the following requirements shall be met for all hoist supported personnel lifting devices: It is the responsibility of design, operations, and safety engineers to ensure that the design, testing, operations, maintenance, and inspection of this equipment comply with the applicable industry and government standards. Most hoist supported personnel lifting devices should comply with applicable industry standards. ASME A120.1, A39 and A10 series, and OSHA standards establish the configuration, materials, design stresses, safety devices, power and control, test, operation, inspection, and maintenance requirements that should be followed.	OSHA 1910.66:	ASME A120.1-2006:				

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09.2.4.b(1)	<p>Safety and Design Aspects: General Design Requirements: Besides the requirements in Section 6, paragraphs 6.2.4, 6.2.5, 6.2.6, and 6.2.7, the following requirements shall be met for all hoist supported personnel lifting devices: When industry standards do not cover a unique project requirement, then a system with an equivalent level of safety must be provided. This system may consist of two separate independent support systems; that is, two separate hoists such that the failure of one hoist, its reeving system, or other component will not cause the stability of the personnel lifting device to be lost or prohibit its movement to a safe location. With this configuration, alternate materials or higher design stresses than permitted by industry and OSHA standards can be used with concurrence from the appropriate design, operations, and safety engineers. Another option may consist of lifting equipment with at least two holding brakes and additional factors of safety for the hoist load bearing components. The option selected shall be approved by the LDEM with concurrence from the responsible safety, engineering, operations, and maintenance organizations.</p>	<p>OSHA 1910.66: 1910.66(f)(4)(ix) Each hoisting machine shall be provided with a primary brake and at least one independent secondary brake, each capable of stopping and holding not less than 125 percent of the lifting capacity of the hoist.</p>	<p>ASME A120.1-2006: 3.6.8 Brakes. All hoisting machines shall be provided with at least two independent brakes, which shall comply with the following: ...</p>				
09.2.4.b(2)	<p>Safety and Design Aspects: General Design Requirements: Besides the requirements in Section 6, paragraphs 6.2.4, 6.2.5, 6.2.6, and 6.2.7, the following requirements shall be met for all hoist supported personnel lifting devices: Operation, maintenance, and inspection requirements shall be developed to provide equivalent verification of equipment as required by industry and OSHA standards and as outlined in this section.</p>	<p>OSHA 1910.66: Periodic inspections and tests. 1910.66(g)(2)(i) 1910.66(g) Inspection and tests -- 1910.66(g)(3) Maintenance inspections and tests. 1910.66(g)(3)(i) A maintenance inspection and, where necessary, a test shall be made of each platform installation every 30 days, or where the work cycle is less than 30 days such inspection and/or test shall be made prior to each work cycle. This inspection and test shall follow procedures recommended by the manufacturer, and shall be made by a competent person.</p>	<p>ASME A120.1-2006: 5 INSPECTIONS, TESTS, OPERATION, AND MAINTENANCE 5.1 Inspections and Tests</p>				
09.2.4.c(1)	<p>Safety and Design Aspects: General Design Requirements: Besides the requirements in Section 6, paragraphs 6.2.4, 6.2.5, 6.2.6, and 6.2.7, the following requirements shall be met for all hoist supported personnel lifting devices: A method for safe egress of personnel or emergency lowering to the ground level or other safe location shall be provided.</p>	<p>OSHA 1910.66: 1910.66(e)(9) Emergency planning. A written emergency action plan shall be developed and implemented for each kind of working platform operation. This plan shall explain the emergency procedures which are to be followed in the event of a power failure, equipment failure or other emergencies which may be encountered. The plan shall also explain that employees inform themselves about the building emergency escape routes, procedures and alarm systems before operating a platform. Upon initial assignment and whenever the plan is changed the employer shall review with each employee those parts of the plan which the employee must know to protect himself or herself in the event of an emergency.</p>	<p>ASME A120.1-2006: 3.3.6 Access and Egress. Safe access to and egress from the carriage shall be provided from a safe-boarding area. If the carriage traverses an elevated exposed area, any operating areas on the carriage shall be protected by a guardrail system in compliance with para. 2.3.4. Any access gate provided shall be self-closing and selflatching or provided with an interlock. (a) Each installation shall be provided with a means for safe egress of personnel in the event of a loss of power to the equipment. b) Emergency Recovery Requirements. Procedures shall be provided for the safe emergency recovery of persons working from suspended equipment, or other types of installations, in the event of power failure, equipment failure, or disability of any nature. Emergency procedures shall be included in the operating and maintenance instructions for the installation.</p>				
09.2.4.c(2)	<p>Safety and Design Aspects: General Design Requirements: Besides the requirements in Section 6, paragraphs 6.2.4, 6.2.5, 6.2.6, and 6.2.7, the following requirements shall be met for all hoist supported personnel lifting devices: The emergency lowering shall be clearly marked and accessible from the ground or fixed structure.</p>	<p>OSHA 1910.66: 1910.66(e)(9) Emergency planning. A written emergency action plan shall be developed and implemented for each kind of working platform operation. This plan shall explain the emergency procedures which are to be followed in the event of a power failure, equipment failure or other emergencies which may be encountered. The plan shall also explain that employees inform themselves about the building emergency escape routes, procedures and alarm systems before operating a platform. Upon initial assignment and whenever the plan is changed the employer shall review with each employee those parts of the plan which the employee must know to protect himself or herself in the event of an emergency.</p>	<p>ASME A120.1-2006: (b) Emergency Recovery Requirements. Procedures shall be provided for the safe emergency recovery of persons working from suspended equipment, or other types of installations, in the event of power failure, equipment failure, or disability of any nature. Emergency procedures shall be included in the operating and maintenance instructions for the installation.</p>				

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09.2.4.d	Safety and Design Aspects: General Design Requirements: Besides the requirements in Section 6, paragraphs 6.2.4, 6.2.5, 6.2.6, and 6.2.7, the following requirements shall be met for all hoist supported personnel lifting devices: An emergency stop device that deenergizes the powered systems and stops the personnel lifting device movement shall be provided to the personnel controlling movement of this personnel lifting device. An additional emergency stop separate from normal operating controls should be considered for personnel at ground level or on a fixed structure to enhance operational safety.	OSHA 1910.66: 1910.66(f)(3)(i)(E) Traversing controls for a powered carriage shall be of a continuous pressure weatherproof type. Multiple controls when provided shall be arranged to permit operation from only one control station at a time. An emergency stop device shall be provided on each end of a powered carriage for interrupting power to the carriage drive motors; 1910.66(f)(8)(viii) Emergency stop switches shall be provided on remote controlled, roof-powered manned platforms adjacent to each control station on the platform.	ASME A120.1-2006: 3.7.5.5 Controls for Vertical Movement (b) Every manned platform shall be provided with an emergency means of interrupting the power supply at the operating stations on the platform. 3.7.6.4 Controls for Vertical Movement (b) Emergency Controls. Each unmanned suspended unit shall be provided with an accessible overriding emergency control at each operating station on the structural or carriage assembly from which the unit is suspended. The activation of said control shall prevent any further powered ascent or descent of the suspended unit. The emergency control shall be red and shall be labeled "EMERGENCY STOP."				
09.2.4.e(1)	Safety and Design Aspects: General Design Requirements: Besides the requirements in Section 6, paragraphs 6.2.4, 6.2.5, 6.2.6, and 6.2.7, the following requirements shall be met for all hoist supported personnel lifting devices: All directional controls shall be designed so that they automatically return to a neutral position when released.	OSHA 1910.66: 1910.66(f)(3)(i)(E) Traversing controls for a powered carriage shall be of a continuous pressure weatherproof type. Multiple controls when provided shall be arranged to permit operation from only one control station at a time. An emergency stop device shall be provided on each end of a powered carriage for interrupting power to the carriage drive motors; 1910.66(f)(5)(ii)(E) All operating controls for the vertical travel of the platform shall be of the continuous-pressure type, and shall be located on the platform.	ASME A120.1-2006: 3.7.5.5 Controls for Vertical Movement (a) All operating controls for the vertical travel of a platform shall be located on the platform and shall be of the constant-pressure type.				
09.2.4.e(2)	Safety and Design Aspects: General Design Requirements: Besides the requirements in Section 6, paragraphs 6.2.4, 6.2.5, 6.2.6, and 6.2.7, the following requirements shall be met for all hoist supported personnel lifting devices: Neutral position of controls shall bring the unit to a safe stop and hold the unit in that position until commanded to move to another position.	OSHA 1910.66: See above.	ASME A120.1-2006: See above.				
09.3(1)	Testing. Testing of personnel lifting devices shall be completed according to its applicable industry standard and OSHA requirements.	OSHA 1910.66: Testing section does not mention OSHA and industry standards. EL	ASME A120.1-2006: 5 INSPECTIONS, TESTS, OPERATION, AND MAINTENANCE 5.1 Inspections and Tests Testing section does not mention OSHA and industry standards. EL				
09.3(2)	Testing: The responsible design, operations, and safety engineers shall develop and oversee these tests for each system as required by these standards as described in this section.	OSHA 1910.66: Not covered.	ASME A120.1-2006:				
09.3(3)	Testing: The following tests shall also be completed (or combined with industry requirements when practical to avoid duplication of efforts). Three types of tests are required for personnel lifting devices: proof load tests, periodic load tests, and operational tests. (Requirement 41412)	OSHA 1910.66: 1910.66(g) Inspection and tests -- 1910.66(g)(1) Installations and alterations. All completed building maintenance equipment installations shall be inspected and tested in the field before being placed in initial service to determine that all parts of the installation conform to applicable requirements of this standard, and that all safety and operating equipment is functioning as required. A similar inspection and test shall be made following any major alteration to an existing installation. No hoist in an installation shall be subjected to a load in excess of 125 percent of its rated load. 1910.66(g)(6) Hoist inspection. Before lowering personnel below the top elevation of the building, the hoist shall be tested each day in the lifting direction with the intended load to make certain it has sufficient capacity to raise the personnel back to the boarding level.	ASME A120.1-2006: 5.1.1 Performance Tests. Before an installation is initially used, the equipment shall be successfully tested by its manufacturer/supplier with the rated load through the complete range of operation on all drops and be so certified in writing. The result of the demonstration shall be signed by the inspection personnel and filed with the building owner. 5.1.6 Hoist Test. Each day, before lowering personnel below the top elevation of the building, the hoist shall be tested in the lifting direction with the intended load to make certain it has sufficient capacity to raise the personnel back to the boarding level.				

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09.3(4)	Testing: Proof load tests and operational tests shall be performed prior to first use for new or extensively repaired or altered components directly involved in the hoist or personnel lifting device load path. Repairs or alterations to nonlifting or holding components do not require a load test, although a functional check should be performed to determine if the repairs or alterations are acceptable. (Requirement 41413)	OSHA 1910.66: See above.	ASME A120.1-2006: See above.				
09.3(5)	Testing: The periodic load and operational tests shall be performed annually. (Requirement 41414)	OSHA 1910.66: Special inspection of governors and secondary brakes. 1910.66(g)(4)(i) Governors and secondary brakes shall be inspected and tested at intervals specified by the manufacturer/supplier but not to exceed every 12 months.	ASME A120.1-2006: 5.1.2 Periodic Inspections (a) To determine that they are in safe operating condition, all parts of the equipment, including control systems, shall be inspected by a qualified person and, where necessary, tested by a qualified person, at intervals not exceeding 12 months. 5.1.3 Maintenance Inspections and Tests. The equipment shall undergo a maintenance inspection or test every 30 days, or before each use if the cycle is more than 30 days. 5.1.4 Special Inspection of Governors and Secondary Brakes (a) Special inspections and tests of the governor and secondary braking system shall be made at intervals not exceeding 1 year.				
09.3(6)	Testing: If a personnel lifting device is upgraded, a proof load test and an operational test shall be performed based on the upgraded rating. The acceptable tolerance for load test accuracy is +5/-0 percent. (Requirement 41415)	OSHA 1910.66: 1910.66(g) Inspection and tests -- 1910.66(g)(1) Installations and alterations. All completed building maintenance equipment installations shall be inspected and tested in the field before being placed in initial service to determine that all parts of the installation conform to applicable requirements of this standard, and that all safety and operating equipment is functioning as required. A similar inspection and test shall be made following any major alteration to an existing installation. No hoist in an installation shall be subjected to a load in excess of 125 percent of its rated load.	ASME A120.1-2006: Not covered.				
09.3(7)	Testing: All load and operational tests shall be performed by qualified personnel according to written (specific or general) technical operating procedures.	OSHA 1910.66: 1910.66(i)(1)(iv) Written work procedures for the operation, safe use and inspection of working platforms shall be provided for employee training. Pictorial methods of instruction, may be used, in lieu of written work procedures, if employee communication is improved using this method. The operating manuals supplied by manufacturers for platform system components can serve as the basis for these procedures.	ASME A120.1-2006: 3.1.5 Installation Documentation. The owner of the equipment or installation shall initially be provided by the equipment supplier with the following documentation constituting the equipment design record: (b) operating instructions (see Mandatory Appendix I for the minimum requirements in an operating manual) (c) maintenance instructions MANDATORY APPENDIX I OPERATING MANUAL LAYOUT				

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09.3(8)	<p>Testing: An inspection of the personnel lifting device and its components shall be performed after each load test and prior to the device being released for service to ensure there is no damage. (Requirement 41417)</p>	<p>OSHA 1910.66: 1910.66(g)(1) Installations and alterations. All completed building maintenance equipment installations shall be inspected and tested in the field before being placed in initial service to determine that all parts of the installation conform to applicable requirements of this standard, and that all safety and operating equipment is functioning as required. A similar inspection and test shall be made following any major alteration to an existing installation. No hoist in an installation shall be subjected to a load in excess of 125 percent of its rated load. Maintenance inspections and tests. 1910.66(g)(3)(i) A maintenance inspection and, where necessary, a test shall be made of each platform installation every 30 days, or where the work cycle is less than 30 days such inspection and/or test shall be made prior to each work cycle. This inspection and test shall follow procedures recommended by the manufacturer, and shall be made by a competent person. 1910.66(g)(4) Special inspection of governors and secondary brakes.</p>	<p>ASME A120.1-2006: 5 INSPECTIONS, TESTS, OPERATION, AND MAINTENANCE 5.1 Inspections and Tests 5.1.1 Performance Tests. Before an installation is initially used, the equipment shall be successfully tested by its manufacturer/supplier with the rated load through the complete range of operation on all drops and be so certified in writing. The result of the demonstration shall be signed by the inspection personnel and filed with the building owner. Inspection after load test not specifically mentioned. EL</p>				
09.3(9)	<p>Testing: Surface or volumetric NDT of critical components shall be used to validate the existence or absence of cracks or other load test effects indicated by this inspection. The periodic load test requirement may be fulfilled by a concurrently performed proof load test. (Requirement 41418)</p>	<p>OSHA 1910.66: Not covered.</p>	<p>ASME A120.1-2006: 2.3.5 Equipment Structural Support. When welding is employed for making structural connections for the equipment installation, the welding shall be done by welders qualified under American Welding Society standards. All welds shall be visually inspected, and welds specified by the registered professional engineer shall undergo nondestructive testing. A report of inspection, together with any test reports, shall be made part of the installation design record. 3.1.4 Construction Requirements. All structural welds shall be visually inspected for compliance with design requirements and shall be subjected to nondestructive testing. Inspection and test records shall be maintained by the equipment manufacturer for domestically manufactured equipment and by the engineer for foreign manufactured equipment.</p>				
09.3.1(1)	<p>Testing: Proof Load Test. Before first use, all new, extensively repaired, extensively modified, or altered personnel lifting devices shall undergo a proof load test at 1.5 times the rated load. A proof load test may also be performed when there is a question in design or previous testing. (Requirement 41419)</p>	<p>OSHA 1910.66: 1910.66(g) Inspection and tests -- 1910.66(g)(1) Installations and alterations. All completed building maintenance equipment installations shall be inspected and tested in the field before being placed in initial service to determine that all parts of the installation conform to applicable requirements of this standard, and that all safety and operating equipment is functioning as required. A similar inspection and test shall be made following any major alteration to an existing installation. No hoist in an installation shall be subjected to a load in excess of 125 percent of its rated load.</p>	<p>ASME A120.1-2006: 5.1.1 Performance Tests. Before an installation is initially used, the equipment shall be successfully tested by its manufacturer/supplier with the rated load through the complete range of operation on all drops and be so certified in writing. The result of the demonstration shall be signed by the inspection personnel and filed with the building owner. 3.6.1 Prime Mover. Each hoisting machine shall be provided with a source of power sufficient to raise and lower 125% of the hoist's rated load. No hoisting machine shall be capable of exerting power sufficient to exceed three quarters of the system moment resisting overturning or one-third of the catalog strength of the support ropes.</p>				
09.3.1(2)	<p>Testing: Proof Load Test: The load shall be secured to the personnel lifting device and lifted slowly and in an area where minimal damage will occur if the device fails. (Requirement 41420)</p>	<p>OSHA 1910.66: Not covered.</p>	<p>ASME A120.1-2006: Not covered.</p>				

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09.3.2	<p>Testing: Periodic Load Test. Each personnel lifting device shall be tested at least once every year with a load equal to the rated load. (Requirement 91073)</p>	<p>OSHA 1910.66: 1910.66(g)(2)(ii) All parts of the equipment including control systems shall be inspected, and, where necessary, tested by a competent person at intervals specified by the manufacturer/supplier, but not to exceed 12 months, to determine that they are in safe operating condition. Parts subject to wear, such as wire ropes, bearings, gears, and governors shall be inspected and/or tested to determine that they have not worn to such an extent as to affect the safe operation of the installation. Special inspection of governors and secondary brakes. 1910.66(g)(4)(i) Governors and secondary brakes shall be inspected and tested at intervals specified by the manufacturer/supplier but not to exceed every 12 months. Periodic load test not mentioned. EL</p>	<p>ASME A120.1-2006: 5.1.2 Periodic Inspections (a) To determine that they are in safe operating condition, all parts of the equipment, including control systems, shall be inspected by a qualified person and, where necessary, tested by a qualified person, at intervals not exceeding 12 months. 5.1.3 Maintenance Inspections and Tests. The equipment shall undergo a maintenance inspection or test every 30 days, or before each use if the cycle is more than 30 days. 5.1.4 Special Inspection of Governors and Secondary Brakes (a) Special inspections and tests of the governor and secondary braking system shall be made at intervals not exceeding 1 year. Periodic load test not mentioned. EL</p>				
09.3.3	<p>Testing: Operational Test. Together with proof load and periodic load tests, the following shall be performed with a dummy rated load unless otherwise specified: (Requirement 41422)</p>	OSHA 1910.66:	ASME A120.1-2006:				
09.3.3.c	<p>Testing: Operational Test. Together with proof load and periodic load tests, the following shall be performed with a dummy rated load unless otherwise specified: Determine trip setting of limit switches and limiting devices by tests under no load conditions. Conduct tests first by hand, if practical, and then under the slowest speed obtainable. Test with increasing speeds up to the maximum speed. Locate actuating mechanisms so that they will trip the switches or limiting devices in time to stop motion without damaging the hoist.</p>	OSHA 1910.66: Not covered.	ASME A120.1-2006: I-8 CHECKS BEFORE OPERATION (c) Limit switches				
09.3.3.d	<p>Testing: Operational Test. Together with proof load and periodic load tests, the following shall be performed with a dummy rated load unless otherwise specified: After testing in the unloaded state, apply the test load to check for proper load control. Test load hoisting, lowering at various speeds (maximum safe movement up and down as determined by the LDEM and the responsible safety, engineering, operations, and maintenance organizations) and braking/holding mechanisms. Holding brakes shall be tested to verify stopping capabilities and demonstrate the ability to hold a rated load (see paragraph 9.3.3.e). The load should be held long enough to allow any dynamics to dampen out.</p>	<p>OSHA 1910.66: Inspection and tests -- 1910.66(g)(1) Installations and alterations. All completed building maintenance equipment installations shall be inspected and tested in the field before being placed in initial service to determine that all parts of the installation conform to applicable requirements of this standard, and that all safety and operating equipment is functioning as required. A similar inspection and test shall be made following any major alteration to an existing installation. No hoist in an installation shall be subjected to a load in excess of 125 percent of its rated load. 1910.66(g)(2)(ii) All parts of the equipment including control systems shall be inspected, and, where necessary, tested by a competent person at intervals specified by the manufacturer/supplier, but not to exceed 12 months, to determine that they are in safe operating condition. Parts subject to wear, such as wire ropes, bearings, gears, and governors shall be inspected and/or tested to determine that they have not worn to such an extent as to affect the safe operation of the installation. Special inspection of governors and secondary brakes. 1910.66(g)(4)(i) Governors and secondary brakes shall be inspected and tested at intervals specified by the manufacturer/supplier but not to exceed every 12 months. 1910.66(g)(4)(ii) The results of the inspection and test shall confirm that the initiating</p>	<p>ASME A120.1-2006: 5.1.4 Special Inspection of Governors and Secondary Brakes (b) The inspection and test shall include a verification that the initiating device for the secondary braking system operates at the proper overspeed. (d) The inspection shall include a verification of the proper functioning of the secondary brake.</p>				

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09.3.3.e	<p>Testing: Operational Test. Together with proof load and periodic load tests, the following shall be performed with a dummy rated load unless otherwise specified: For hoist supported personnel lifting devices equipped with two means of braking (see paragraph 9.2.4.b) the operational test must demonstrate each brake's ability to stop and hold a rated load. This can be done in one of the following ways:</p>	<p>OSHA 1910.66: Special inspection of governors and secondary brakes. 1910.66(g)(4)(i) Governors and secondary brakes shall be inspected and tested at intervals specified by the manufacturer/supplier but not to exceed every 12 months. 1910.66(g)(4)(ii) The results of the inspection and test shall confirm that the initiating device for the secondary braking system operates at the proper overspeed. 1910.66(g)(4)(iii) The results of the inspection and test shall confirm that the secondary brake is functioning properly.</p>	<p>ASME A120.1-2006: brake, primary: a brake designed to be automatically applied whenever power to the prime mover is interrupted or discontinued. brake, secondary: a brake designed to prevent the descent of the suspended or supported equipment in the event of an overspeed condition. 3.6.8 Brakes. All hoisting machines shall be provided with at least two independent brakes, which shall comply with the following: (a) Primary Brake (2) The primary brake shall be rated to stop and hold not less than 125% of the rated load of the hoist but in no case less than the maximum lifting capacity of the hoist. (b) Secondary Brake (1) Each hoist shall be provided with an automatic secondary brake that will stop and hold at least 125% of the rated load under an accelerating or overspeed condition.</p>				
09.3.3.e.1	<p>Testing: Operational Test. Together with proof load and periodic load tests, the following shall be performed with a dummy rated load unless otherwise specified: For hoist supported personnel lifting devices equipped with two means of braking (see paragraph 9.2.4.b) the operational test must demonstrate each brake's ability to stop and hold a rated load. This can be done in one of the following ways: Each brake's ability to hold shall be statically tested (under no load) with 150 percent of the rated load hoisting torque at the point of brake application.</p>	<p>OSHA 1910.66: See above.</p>	<p>ASME A120.1-2006: See above.</p>				
09.3.3.e.2	<p>Testing: Operational Test. Together with proof load and periodic load tests, the following shall be performed with a dummy rated load unless otherwise specified: For hoist supported personnel lifting devices equipped with two means of braking (see paragraph 9.2.4.b) the operational test must demonstrate each brake's ability to stop and hold a rated load. This can be done in one of the following ways: Alternately, each brake shall be tested for its ability to stop a rated load moving at full speed in the down direction. (CAUTION: It must be possible to quickly reenergize the out of circuit brake or provide other safety measures to perform this test safely.)</p>	<p>OSHA 1910.66: See above.</p>	<p>ASME A120.1-2006: See above.</p>				
09.3.3.e.3	<p>Testing: Operational Test. Together with proof load and periodic load tests, the following shall be performed with a dummy rated load unless otherwise specified: For hoist supported personnel lifting devices equipped with two means of braking (see paragraph 9.2.4.b) the operational test must demonstrate each brake's ability to stop and hold a rated load. This can be done in one of the following ways: Other methods may be used as approved by the LDEM with concurrence from the responsible safety engineering, operations, and maintenance organizations.</p>	<p>OSHA 1910.66: See above.</p>	<p>ASME A120.1-2006: See above.</p>				
09.3.3.f	<p>Testing: Operational Test. Together with proof load and periodic load tests, the following shall be performed with a dummy rated load unless otherwise specified: The operational test for a modified hoist supported personnel lifting device can be tailored to test only those portions of the equipment that were modified, only if the rated load and operational test interval has not expired.</p>	<p>OSHA 1910.66: See above.</p>	<p>ASME A120.1-2006: See above.</p>				

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09.3.4(1)	Testing: Test Reports and Periodic Recertification Tags. After each test, designated personnel shall prepare written, dated, and signed test reports including procedure reference. (Requirement 41432)	OSHA 1910.66: 1910.66(g)(2)(iii) The building owner shall keep a certification record of each inspection and test required under paragraphs (g)(2)(i) and (ii) of this section. ... 1910.66(g)(3)(ii) The building owner shall keep a certification record of each inspection and test performed under paragraph (g)(3)(i) of this section. ... 1910.66(g)(5)(v) The building owner shall keep a certification record of each monthly inspection of a suspension wire rope as required in paragraph (g)(5)(iii) of this section.	ASME A120.1-2006: 5.1.3 Maintenance Inspections and Tests. The equipment shall undergo a maintenance inspection or test every 30 days, or before each use if the cycle is more than 30 days. This inspection and test, and the inspections required by para. 4.1.4, shall be made by a qualified person. The results of these inspections and tests shall be recorded in a log, which shall be available for review. Each log entry shall include the date of the inspection or test and shall be signed by the person making the inspection or test.				
09.3.4(2)	Testing: Test Reports and Periodic Recertification Tags: Inadequacies shall be documented and, if determined to be a hazard, corrected prior to further use. (Requirement 41433)	OSHA 1910.66: Not covered.	ASME A120.1-2006: Not covered.				
09.3.4(3)	Testing: Test Reports and Periodic Recertification Tags: These reports shall be kept on file by the owner organization for a minimum of two test cycles and shall be made readily available. (Requirement 41434)	OSHA 1910.66: Not covered.	ASME A120.1-2006: Not covered.				
09.3.4(4)	Testing: Test Reports and Periodic Recertification Tags: Following the periodic load test, personnel lifts shall be given a permanently affixed tag identifying the equipment and stating the next required periodic load test date or load test expiration date. (Requirement 41435)	OSHA 1910.66: Not covered.	ASME A120.1-2006: I-16 ILLUSTRATION OF ALL LABELS AFFIXED TO EQUIPMENT				
09.4.1(1)	Inspection: Inspections, as described below, are required for personnel lifting devices. Inspections shall be completed according to its applicable industry standard and OSHA requirements and shall be performed on all personnel lifting devices.	OSHA 1910.66:	ASME A120.1-2006:				
09.4.1(2)	Inspection: The responsible design, operation, and safety engineers shall develop and oversee the inspections for each system as required by these standards and as described herein. (Requirement 41438)	OSHA 1910.66: Not covered.	ASME A120.1-2006: Not covered.				
09.4.1(3)	Inspection: Inspections also shall be completed (or combined with industry requirements where practical to avoid duplication of efforts).	OSHA 1910.66: Not covered.	ASME A120.1-2006: Not covered.				
09.4.1(4)	Inspection: Inadequacies discovered during an inspection shall be documented and, if determined to be a hazard, tagged out and corrected prior to further use. (Requirement 41440)	OSHA 1910.66: Not covered.	ASME A120.1-2006: Not covered.				
09.4.1(5)	Inspection: Inspections shall be performed by qualified personnel according to approved technical operating procedures.	OSHA 1910.66: Maintenance inspections and tests. 1910.66(g)(3)(i) A maintenance inspection and, where necessary, a test shall be made of each platform installation every 30 days, or where the work cycle is less than 30 days such inspection and/or test shall be made prior to each work cycle. This inspection and test shall follow procedures recommended by the manufacturer, and shall be made by a competent person.	ASME A120.1-2006: 5.1.2 Periodic Inspections (a) To determine that they are in safe operating condition, all parts of the equipment, including control systems, shall be inspected by a qualified person and, where necessary, tested by a qualified person, at intervals not exceeding 12 months.				
09.4.2	Inspection: All new, extensively repaired, or modified personnel lifting devices shall be given a daily and a periodic inspection prior to first use. For component repair on personnel lifts, only the inspections that apply to the repaired portion need to be performed prior to first use unless a periodic inspection interval expires during the downtime (see paragraph 9.4.5). (Requirement 41442)	OSHA 1910.66: Inspection and tests -- 1910.66(g)(1) Installations and alterations. All completed building maintenance equipment installations shall be inspected and tested in the field before being placed in initial service to determine that all parts of the installation conform to applicable requirements of this standard, and that all safety and operating equipment is functioning as required. A similar inspection and test shall be made following any major alteration to an existing installation. No hoist in an installation shall be subjected to a load in excess of 125 percent of its rated load.	ASME A120.1-2006: ASME A120.1-2006: 5.1.1 Performance Tests. Before an installation is initially used, the equipment shall be successfully tested by its manufacturer/supplier with the rated load through the complete range of operation on all drops and be so certified in writing. The result of the demonstration shall be signed by the inspection personnel and filed with the building owner.				

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09.4.3(1)	Inspection: Personnel lifts in regular service (used at least once a month) shall be inspected as required in paragraphs 9.4.4 and 9.4.5. (Requirement 41443)	OSHA 1910.66: Maintenance inspections and tests. 1910.66(g)(3)(i) A maintenance inspection and, where necessary, a test shall be made of each platform installation every 30 days, or where the work cycle is less than 30 days such inspection and/or test shall be made prior to each work cycle. This inspection and test shall follow procedures recommended by the manufacturer, and shall be made by a competent person.	ASME A120.1-2006: 5.1.3 Maintenance Inspections and Tests. The equipment shall undergo a maintenance inspection or test every 30 days, or before each use if the cycle is more than 30 days. This inspection and test, and the inspections required by para. 4.1.4, shall be made by a qualified person. The results of these inspections and tests shall be recorded in a log, which shall be available for review. Each log entry shall include the date of the inspection or test and shall be signed by the person making the inspection or test.				
09.4.3(2)	Inspection: Idle and standby personnel lifting devices shall be inspected according to paragraph 9.4.6. (Requirement 41444)	OSHA 1910.66: See above.	ASME A120.1-2006: See above.				
09.4.4	Inspection: Daily Inspections. These inspections shall be performed prior to first use each day the personnel lifting device is used, and shall include the following: (Requirement 41445)	OSHA 1910.66: ???	ASME A120.1-2006:				
09.4.5	Inspection: Periodic Inspection. These inspections shall be performed at varying intervals, depending on activity, severity of service, environment, and criticality. (Requirement 41453)	OSHA 1910.66: ???	ASME A120.1-2006: ???				
09.4.5.a	Inspection: Periodic Inspection. These inspections shall be performed at varying intervals, depending on activity, severity of service, environment, and criticality: Monthly Inspections (Frequent Inspections). At least once per month: (Requirement 41454)	OSHA 1910.66: Special inspection of governors and secondary brakes. 1910.66(g)(4)(vi) The secondary brake governor and actuation device shall be tested before each day's use. Where testing is not feasible, a visual inspection of the brake shall be made instead to ensure that it is free to operate. 1910.66(g)(6) Hoist inspection. Before lowering personnel below the top elevation of the building, the hoist shall be tested each day in the lifting direction with the intended load to make certain it has sufficient capacity to raise the personnel back to the boarding level.	ASME A120.1-2006: 5.1.3 Maintenance Inspections and Tests. The equipment shall undergo a maintenance inspection or test every 30 days, or before each use if the cycle is more than 30 days. 5.1.6 Hoist Test. Each day, before lowering personnel below the top elevation of the building, the hoist shall be tested in the lifting direction with the intended load to make certain it has sufficient capacity to raise the personnel back to the boarding level. 5.1.5 Wire Rope Inspection Procedure. The need for replacement of suspension wire ropes shall be determined by regular inspection and shall be based on the condition of the wire rope inspected. Wire rope in active service should be visually inspected once every working day.				
09.4.5.b	Inspection: Periodic Inspection. These inspections shall be performed at varying intervals, depending on activity, severity of service, environment, and criticality: Annual Inspections (Periodic Inspections). At least once per year, inspect for: (Requirement 41472)	OSHA 1910.66: Periodic inspections and tests. 1910.66(g)(2)(ii) All parts of the equipment including control systems shall be inspected, and, where necessary, tested by a competent person at intervals specified by the manufacturer/supplier, but not to exceed 12 months, to determine that they are in safe operating condition. Parts subject to wear, such as wire ropes, bearings, gears, and governors shall be inspected and/or tested to determine that they have not worn to such an extent as to affect the safe operation of the installation. Special inspection of governors and secondary brakes. 1910.66(g)(4)(i) Governors and secondary brakes shall be inspected and tested at intervals specified by the manufacturer/supplier but not to exceed every 12 months.	ASME A120.1-2006: 5.1.2 Periodic Inspections (a) To determine that they are in safe operating condition, all parts of the equipment, including control systems, shall be inspected by a qualified person and, where necessary, tested by a qualified person, at intervals not exceeding 12 months. (b) Parts subject to wear, such as wire ropes, bearings, gears, and governors, shall be inspected or tested to determine that they have not worn to such an extent as to affect the safe operation of the installation.				
09.4.5.b.02	Inspection: Periodic Inspection. These inspections shall be performed at varying intervals, depending on activity, severity of service, environment, and criticality: Annual Inspections (Periodic Inspections). At least once per year, inspect for: Deformed, cracked, or corroded members and welds and loose bolts or rivets in personnel lift structure. Various methods of NDT such as ultrasonics, radiography, magnetic particle, or liquid penetrant shall be utilized as needed.	OSHA 1910.66: Not covered.	ASME A120.1-2006: See above.				

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09.4.5.b.04	<p>Inspection: Periodic Inspection. These inspections shall be performed at varying intervals, depending on activity, severity of service, environment, and criticality: Annual Inspections (Periodic Inspections). At least once per year, inspect for: Excessive wear or cracks in pins, bearings, shafts, gears, followers, and locking and clamping devices. Surface or volumetric NDT shall be used to validate the existence or absence of cracks indicated by this inspection.</p>	<p>OSHA 1910.66: 1910.66(g)(2)(ii) All parts of the equipment including control systems shall be inspected, and, where necessary, tested by a competent person at intervals specified by the manufacturer/supplier, but not to exceed 12 months, to determine that they are in safe operating condition. Parts subject to wear, such as wire ropes, bearings, gears, and governors shall be inspected and/or tested to determine that they have not worn to such an extent as to affect the safe operation of the installation.</p>	<p>ASME A120.1-2006: See above.</p>				
09.4.5.c	<p>Inspection: Periodic Inspection. These inspections shall be performed at varying intervals, depending on activity, severity of service, environment, and criticality: Other Inspections. When wire ropes or chains are replaced or hooks repaired, a proof load test of the hook, rope, or chain shall be performed prior to use. (Requirement 41484)</p>	<p>OSHA 1910.66: 1910.66(g)(2)(ii) All parts of the equipment including control systems shall be inspected, and, where necessary, tested by a competent person at intervals specified by the manufacturer/supplier, but not to exceed 12 months, to determine that they are in safe operating condition. Parts subject to wear, such as wire ropes, bearings, gears, and governors shall be inspected and/or tested to determine that they have not worn to such an extent as to affect the safe operation of the installation. 1910.66(g)(5)(ii) Suspension wire rope shall be inspected by a competent person for visible defects and gross damage to the rope before every use and after each occurrence which might affect the wire rope's integrity. 1910.66(g)(5)(iii) A thorough inspection of suspension wire ropes in service shall be made once a month. Suspension wire ropes that have been inactive for 30 days or longer shall have a thorough inspection before they are placed into service. These thorough inspections of suspension wire ropes shall be performed by a competent person.</p>	<p>ASME A120.1-2006: 5.1.2 Periodic Inspections (b) Parts subject to wear, such as wire ropes, bearings, gears, and governors, shall be inspected or tested to determine that they have not worn to such an extent as to affect the safe operation of the installation. 3.10.3.3 Rope Renewal Tag. A new tag shall be installed at each rope renewal. When ropes are resocketed, the original tag shall be retained and a supplemental tag showing the date of resocketing and the name of the person or firm who resocketed the ropes shall be provided.</p>				
09.4.6	<p>Inspection: Idle and Standby Personnel Lifting Devices. Idle and standby personnel lifting devices shall be inspected prior to first use according to the requirements of paragraphs 9.4.4 and 9.4.5 unless these monthly and annual inspections were performed at required intervals and recorded during the idle/standby period. (Requirement 41485)</p>	<p>OSHA 1910.66: see above. And... 1910.66(g)(5)(iii) A thorough inspection of suspension wire ropes in service shall be made once a month. Suspension wire ropes that have been inactive for 30 days or longer shall have a thorough inspection before they are placed into service. These thorough inspections of suspension wire ropes shall be performed by a competent person.</p>	<p>ASME A120.1-2006: 5.1.3 Maintenance Inspections and Tests. The equipment shall undergo a maintenance inspection or test every 30 days, or before each use if the cycle is more than 30 days. This inspection and test, and the inspections required by para. 4.1.4, shall be made by a qualified person. The results of these inspections and tests shall be recorded in a log, which shall be available for review. Each log entry shall include the date of the inspection or test and shall be signed by the person making the inspection or test. 5.1.5 Wire Rope Inspection Procedure. The need for replacement of suspension wire ropes shall be determined by regular inspection and shall be based on the condition of the wire rope inspected. Wire rope in active service should be visually inspected once every working day. A thorough inspection shall be made once a month, or before each use if the suspension wire ropes have been inactive for 30 days or longer and are placed into service. Dated and signed monthly reports of that inspection must be kept, indicating the condition of the ropes.</p>				
09.4.7(1)	<p>Inspection: Inspection Reports. After each formal periodic inspection, qualified authorized personnel shall prepare written, dated, and signed inspection reports, including procedure reference and adequacy of components. (Requirement 41486)</p>	<p>OSHA 1910.66: 1910.66(g)(2)(iii) The building owner shall keep a certification record of each inspection and test required under paragraphs (g)(2)(i) and (ii) of this section. The certification record shall include the date of the inspection, the signature of the person who performed the inspection, and the number, or other identifier, of the building support structure and equipment which was inspected. This certification record shall be kept readily available for review by the Assistant Secretary of Labor or the Assistant Secretary's representative and by the employer.</p>	<p>ASME A120.1-2006: 5.1.5 Wire Rope Inspection Procedure. ... Dated and signed monthly reports of that inspection must be kept, indicating the condition of the ropes. I-6 CHECKS BEFORE RIGGING AND USE (a) Maintenance logs/usage logs</p>				

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09.4.7(2)	Inspection: Inspection Reports: Inadequacies shall be documented and, if determined to be a hazard, corrected prior to further use. (Requirement 41487)	OSHA 1910.66: Not covered.	ASME A120.1-2006: Not covered.				
09.4.7(3)	Inspection: Inspection Reports: These reports shall be filed and be made readily available by the organizational element responsible for personnel lift inspection. (Requirement 41488)	OSHA 1910.66: Not covered.	ASME A120.1-2006: Not covered.				
09.5(1)	Maintenance: A maintenance program based on manufacturers' recommendations, integrating proactive, reactive, preventive and predictive maintenance shall be established to increase the probability the personnel lifting device will function in the required manner over its design life cycle with a minimum of maintenance.	OSHA 1910.66: 1910.66(i)(1)(iv) Written work procedures for the operation, safe use and inspection of working platforms shall be provided for employee training. Pictorial methods of instruction, may be used, in lieu of written work procedures, if employee communication is improved using this method. The operating manuals supplied by manufacturers for platform system components can serve as the basis for these procedures.	ASME A120.1-2006: 3.1.5 Installation Documentation. The owner of the equipment or installation shall initially be provided by the equipment supplier with the following documentation constituting the equipment design record: (c) maintenance instructions				
09.5(2)	Maintenance: The program shall include procedures and a scheduling system for normal periodic maintenance items, adjustments, replacements, and repairs.	OSHA 1910.66: not covered.	ASME A120.1-2006: Not covered.				
09.5(3)	Maintenance: The program also shall ensure that records are kept and unsafe test and inspection discrepancies are documented and corrected.	OSHA 1910.66: Not covered.	ASME A120.1-2006: Not covered.				
09.5(4)	Maintenance: The need to replace wire rope or chain shall be determined by a certified or otherwise qualified person based on an evaluation of inspection results. Any of the signs of deterioration and damage provided in paragraphs 9.4.5.a and 9.4.5.b are sufficient reasons for questioning continued use (see Wire Rope Users Manual for additional information on wire rope inspections).	OSHA 1910.66: 1910.66(g)(5)(ii) Suspension wire rope shall be inspected by a competent person for visible defects and gross damage to the rope before every use and after each occurrence which might affect the wire rope's integrity. 1910.66(g)(5)(iii) A thorough inspection of suspension wire ropes in service shall be made once a month. Suspension wire ropes that have been inactive for 30 days or longer shall have a thorough inspection before they are placed into service. These thorough inspections of suspension wire ropes shall be performed by a competent person. 1910.66(g)(5)(iv) The need for replacement of a suspension wire rope shall be determined by inspection and shall be based on the condition of the wire rope. Any of the following conditions or combination of conditions will be cause for removal of the wire rope: ...	ASME A120.1-2006: 5.1.5 Wire Rope Inspection Procedure. The need for replacement of suspension wire ropes shall be determined by regular inspection and shall be based on the condition of the wire rope inspected. Wire rope in active service should be visually inspected once every working day. A thorough inspection shall be made once a month, or before each use if the suspension wire ropes have been inactive for 30 days or longer and are placed into service. Dated and signed monthly reports of that inspection must be kept, indicating the condition of the ropes.				
09.5(5)	Maintenance: Any personnel lifting device found in an unsafe operating condition shall be tagged out and removed from service until repaired. (Requirement 41493)	OSHA 1910.66: Not covered.	ASME A120.1-2006: Not covered.				
09.5(6)	Maintenance: All repairs shall be made by qualified personnel in accordance with the manufacturers' instruction.	OSHA 1910.66: Not covered.	ASME A120.1-2006: Not covered.				

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09.6(1)		<p>OSHA 1910.66: 1910.66(f)(8)(v) Suspended or supported equipment shall have a control system which will require the operator of the equipment to follow predetermined procedures.</p> <p>Training.</p> <p>1910.66(i)(1)(i) Working platforms shall be operated only by persons who are proficient in the operation, safe use and inspection of the particular working platform to be operated.</p> <p>1910.66(i)(1)(iii) Training of employees in the operation and inspection of working platforms shall be done by a competent person.</p> <p>1910.66(i)(1)(iv) Written work procedures for the operation, safe use and inspection of working platforms shall be provided for employee training. Pictorial methods of instruction, may be used, in lieu of written work procedures, if employee communication is improved using this method. The operating manuals supplied by manufacturers for platform system components can serve as the basis for these procedures.</p>	ASME A120.1-2006: 5.2.1 Qualified Operators. Powered equipment shall be used only by persons who have been instructed and trained in its use and control by a qualified person. The instructor shall certify in writing that the operator is qualified to operate the specific equipment he/she has been trained to operate.				
	Personnel Certification. Operators shall be trained and certified before operating a personnel lifting device.						
09.6(2)	Personnel Certification: A training, examination, and licensing program shall be established or made available.	OSHA 1910.66: See above.	ASME A120.1-2006: See above.				
09.6(3)	Personnel Certification: For those NASA installations that do not have a training program, all personnel lifting device operators shall be trained and certified by a recognized certification organization that normally performs this function.	OSHA 1910.66: See above.	ASME A120.1-2006: See above.				
09.6(4)	Personnel Certification: The basic certification program will include the following: (Requirement 41498)	OSHA 1910.66:	ASME A120.1-2006: Not covered.				
09.6.1.a	Personnel Certification: The basic certification program will include the following: Training: Classroom training in safety, lifting equipment emergency procedures, general performance standards, requirements, pre-operational checks, and safety-related defects and symptoms (for initial certification and as needed).	<p>OSHA 1910.66: 1910.66(e)(9) Emergency planning. A written emergency action plan shall be developed and implemented for each kind of working platform operation. This plan shall explain the emergency procedures which are to be followed in the event of a power failure, equipment failure or other emergencies which may be encountered. The plan shall also explain that employees inform themselves about the building emergency escape routes, procedures and alarm systems before operating a platform. Upon initial assignment and whenever the plan is changed the employer shall review with each employee those parts of the plan which the employee must know to protect himself or herself in the event of an emergency.</p>	ASME A120.1-2006: 2.3.7 Miscellaneous Requirements (b) Emergency Recovery Requirements. Procedures shall be provided for the safe emergency recovery of persons working from suspended equipment, or other types of installations, in the event of power failure, equipment failure, or disability of any nature. Emergency procedures shall be included in the operating and maintenance instructions for the installation.				
09.6.1.b	Personnel Certification: The basic certification program will include the following: Training: Hands-on training (for initial certification and as needed).	OSHA 1910.66: Not covered.	ASME A120.1-2006: Not covered.				
09.6.1.c	Personnel Certification: The basic certification program will include the following: Training: An annual review of items in paragraphs 9.6.1.a and 9.6.2.b above. (This may be conducted informally by local supervisory personnel.)	OSHA 1910.66: Not covered.	ASME A120.1-2006: Not covered.				
09.6.2.a	Personnel Certification: The basic certification program will include the following: Examination: Physical examination (criteria to be determined by the cognizant medical official).	OSHA 1910.66: Not covered.	ASME A120.1-2006: Not covered.				
09.6.2.b	Personnel Certification: The basic certification program will include the following: Examination: Written examination.	OSHA 1910.66: Not covered.	ASME A120.1-2006: Not covered.				
09.6.2.c	Personnel Certification: The basic certification program will include the following: Examination: Operational demonstration (for initial certification only).	OSHA 1910.66: Not covered.	ASME A120.1-2006: Not covered.				
09.6.2.d	Personnel Certification: The basic certification program will include the following: Examination: Proficiency examination for recertification.	OSHA 1910.66: Not covered.	ASME A120.1-2006: Not covered.				

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09.6.3(1)	Personnel Certification: The basic certification program will include the following: Licensing. An organizational element shall be designated to issue operator licenses.	OSHA 1910.66: Not covered.	ASME A120.1-2006: Not covered.				
09.6.3(2)	Personnel Certification: The basic certification program will include the following: Licensing: Provisions shall be made to revoke licenses for negligence, violations of safety requirements, or failure to meet medical standards.	OSHA 1910.66: Not covered.	ASME A120.1-2006: Not covered.				
09.6.3(3)	Personnel Certification: The basic certification program will include the following: Licensing: Provisions shall be made for periodic checks of operators to verify they have licenses in their possession.	OSHA 1910.66: Not covered.	ASME A120.1-2006: Not covered.				
09.6.3(4)	Personnel Certification: The basic certification program will include the following: Licensing: The licenses shall indicate the type of personnel lifting device the holder is qualified to operate.	OSHA 1910.66: Not covered.	ASME A120.1-2006: Not covered.				
09.6.3(5)	Personnel Certification: The basic certification program will include the following: Licensing: Alternately, the organizational element may elect to maintain a master list of licensed operators instead of issuing individual licenses, providing copies of the list are readily available to assurance and supervisory personnel at the work site.	OSHA 1910.66: Not covered.	ASME A120.1-2006: Not covered.				
09.6.4	Personnel Certification: The basic certification program will include the following: Renewal. Licenses or certifications will expire at least every 4 years. Renewal procedures will be established by each licensing organization, but as a minimum, will include items in paragraphs 9.6.1 and 9.6.2.	OSHA 1910.66: Not covered.	ASME A120.1-2006: Not covered.				
09.7(1)	Operations. Hoist support personnel lifting devices shall be operated according to applicable industry standards, government requirements, and manufacturers' instructions.	OSHA 1910.66: 1910.66(i)(1)(iv) Written work procedures for the operation, safe use and inspection of working platforms shall be provided for employee training. Pictorial methods of instruction, may be used, in lieu of written work procedures, if employee communication is improved using this method. The operating manuals supplied by manufacturers for platform system components can serve as the basis for these procedures.	ASME A120.1-2006: Not covered.				
09.7(2)	Operations: The following practices shall be followed for hoist supported personnel lifting device operations: (Requirement 41515)	OSHA 1910.66:	ASME A120.1-2006:				
09.7.a	Operations: The following practices shall be followed for hoist supported personnel lifting device operations: Determine that the proposed personnel lifting operation is either the least hazardous method or the only method available to position personnel so that an operation can be accomplished.	OSHA 1910.66: Not covered.	ASME A120.1-2006: Not covered.				
09.7.b	Operations: The following practices shall be followed for hoist supported personnel lifting device operations: Before use, the operator shall have read and understood the manufacturer's operating instructions and safety rules, have been trained and licensed according to paragraph 9.6, and have read and understood all decals and warnings on the device.	OSHA 1910.66: Not covered.	ASME A120.1-2006: Not covered.				
09.7.c(1)	Operations: The following practices shall be followed for hoist supported personnel lifting device operations: Before use, the operator shall inspect the personnel lifting device per the daily inspection requirements.	OSHA 1910.66: 1910.66(g)(2)(iv) Working platforms and their components shall be inspected by the employer for visible defects before every use and after each occurrence which could affect the platform's structural integrity.	ASME A120.1-2006: MANDATORY APPENDIX I OPERATING MANUAL LAYOUT I-6 CHECKS BEFORE RIGGING AND USE (a) Maintenance logs/usage logs (b) Wire rope (c) Electric supply/cords (d) Platform, work cage, or bosun's chair (e) Safety equipment (f) Labels/instructions				
09.7.c(2)	Operations: The following practices shall be followed for hoist supported personnel lifting device operations: The operator shall perform a pre-operational check to demonstrate operational readiness.	OSHA 1910.66: 1910.66(g)(6) Hoist inspection. Before lowering personnel below the top elevation of the building, the hoist shall be tested each day in the lifting direction with the intended load to make certain it has sufficient capacity to raise the personnel back to the boarding level.	ASME A120.1-2006: 5.1.6 Hoist Test. Each day, before lowering personnel below the top elevation of the building, the hoist shall be tested in the lifting direction with the intended load to make certain it has sufficient capacity to raise the personnel back to the boarding level.				

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09.7.c(3)	Operations: The following practices shall be followed for hoist supported personnel lifting device operations: If controls do not operate properly, the operator is responsible for notifying the supervisor.	OSHA 1910.66: Not covered.	ASME A120.1-2006: Not covered.				
09.7.c(4)	Operations: The following practices shall be followed for hoist supported personnel lifting device operations: Repairs and adjustments shall be made before operations begin.	OSHA 1910.66: Not covered.	ASME A120.1-2006: Not covered.				
09.7.c(5)	Operations: The following practices shall be followed for hoist supported personnel lifting device operations: The operator shall adhere to all tags placed on the controls.	OSHA 1910.66: 1910.66(f)(8)(v) Suspended or supported equipment shall have a control system which will require the operator of the equipment to follow predetermined procedures.	ASME A120.1-2006: I-4 WARNINGS FOR OWNER AND USER (a) General (b) Duty to understand and comply (c) Duty to inspect and maintain (d) Duty to train and control (e) Duty to avoid taking chances				
09.7.d(1)	Operations: The following practices shall be followed for hoist supported personnel lifting device operations: Before the personnel lifting device is used, the operator shall survey the area for applicable hazards such as overhead obstructions and high-voltage conductors, debris, bumps and loose obstructions, dropoffs and holes, ditches, untamped earth fills, obstructed path of travel, unstable footing, and other possible hazardous conditions.	OSHA 1910.66: Not covered.	ASME A120.1-2006: Not covered.				
09.7.d(2)	Operations: The following practices shall be followed for hoist supported personnel lifting device operations: The operator shall establish appropriate safety zones before initiating operations.	OSHA 1910.66: Not covered.	ASME A120.1-2006: Not covered.				
09.7.e(1)	Operations: The following practices shall be followed for hoist supported personnel lifting device operations: Detailed technical operating procedures describing personnel lifting device operation, emergency steps, communication requirements, and special requirements shall be prepared. There must be a formal system for review, approval, and update to maintain valid operating procedures. (Requirement 41525)	OSHA 1910.66: Not covered.	ASME A120.1-2006: Not covered.				
09.7.e(2)	Operations: The following practices shall be followed for hoist supported personnel lifting device operations: Emergency procedures shall be developed for contingency actions such as power loss, brake failure, or other emergencies.	OSHA 1910.66: 1910.66(i)(1)(ii)(C) Emergency action plan procedures required in paragraph (e)(9) of this section. 1910.66(e)(9) Emergency planning. A written emergency action plan shall be developed and implemented for each kind of working platform operation. This plan shall explain the emergency procedures which are to be followed in the event of a power failure, equipment failure or other emergencies which may be encountered. The plan shall also explain that employees inform themselves about the building emergency escape routes, procedures and alarm systems before operating a platform. Upon initial assignment and whenever the plan is changed the employer shall review with each employee those parts of the plan which the employee must know to protect himself or herself in the event of an emergency.	ASME A120.1-2006: 2.3.7 Miscellaneous Requirements (b) Emergency Recovery Requirements. Procedures shall be provided for the safe emergency recovery of persons working from suspended equipment, or other types of installations, in the event of power failure, equipment failure, or disability of any nature. Emergency procedures shall be included in the operating and maintenance instructions for the installation. I-11 EMERGENCY RECOVERY PROCEDURE/RESCUE				
09.7.f	Operations: The following practices shall be followed for hoist supported personnel lifting device operations: A personnel lifting device shall not be loaded beyond its rated load (capacity) except for required testing.	OSHA 1910.66: Installations and alterations. All completed building maintenance equipment installations shall be inspected and tested in the field before being placed in initial service to determine that all parts of the installation conform to applicable requirements of this standard, and that all safety and operating equipment is functioning as required. A similar inspection and test shall be made following any major alteration to an existing installation. No hoist in an installation shall be subjected to a load in excess of 125 percent of its rated load.	ASME A120.1-2006: Not covered.				

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09.7.g	Operations: The following practices shall be followed for hoist supported personnel lifting device operations: The operator shall ensure that the personnel lifting device is within inspection and testing intervals by examination of the periodic recertification tags and documentation.	OSHA 1910.66: Not covered.	ASME A120.1-2006: I-6 CHECKS BEFORE RIGGING AND USE (a) Maintenance logs/usage logs (b) Wire rope (c) Electric supply/cords (d) Platform, work cage, or bosun's chair (e) Safety equipment (f) Labels/instructions				
09.7.h(1)	Operations: The following practices shall be followed for hoist supported personnel lifting device operations: Necessary clothing and personnel belongings shall be stored so as not to interfere with access or operations.	OSHA 1910.66: Not covered.	ASME A120.1-2006: Not covered.				
09.7.h(2)	Operations: The following practices shall be followed for hoist supported personnel lifting device operations: Tools, oil can, waste, extra fuses, and other necessary articles shall be stored properly, and shall not be permitted to lie loose during the personnel lift.	OSHA 1910.66: 1910.66(i)(2)(vii) Tools, materials and debris not related to the work in progress shall not be allowed to accumulate on platforms. Stabilizer ties shall be located so as to allow unencumbered passage along the full length of the platform and shall be of such length so as not to become entangled in rollers, hoists or other machinery.	ASME A120.1-2006: I-8 CHECKS BEFORE OPERATION (e) Security of tools, etc. 3.7.5.7 Provisions for Tools and Items. Tools, water tanks, and other items shall be secured to prevent their movement or accumulation on the floor of the platform.				
09.7.h(3)	Operations: The following practices shall be followed for hoist supported personnel lifting device operations: Operators shall be familiar with the operation and care of the fire extinguishers provided.	OSHA 1910.66: not covered.	ASME A120.1-2006: Not covered.				
09.7.i(1)	Operations: The following practices shall be followed for hoist supported personnel lifting device operations: Prior to an operation, personnel lifting device operators shall test the communication system.	OSHA 1910.66: 1910.66(e)(11)(vi) An effective two-way voice communication system shall be provided between the equipment operators and persons stationed within the building being serviced. The communications facility shall be operable and shall be manned at all times by persons stationed within the building whenever the platform is being used.	ASME A120.1-2006: I-8 CHECKS BEFORE OPERATION (c) Limit switches (d) Communication system				
09.7.i(2)	Operations: The following practices shall be followed for hoist supported personnel lifting device operations: Operation shall stop immediately upon communication loss and shall not continue until communication is restored.	OSHA 1910.66: See above.	ASME A120.1-2006: 2.3.6 Electrical Requirements (j) Communication Facilities. A two-way voice communication system shall be provided between the equipment operators and a manned station while the working platform is in use. The communication facility shall be operable and manned at all times when the equipment is being used.				
09.7.j(1)	Operations: The following practices shall be followed for hoist supported personnel lifting device operations: Operator discipline shall be maintained at all times.	OSHA 1910.66: Not covered.	ASME A120.1-2006: Not covered.				
09.7.j(2)	Operations: The following practices shall be followed for hoist supported personnel lifting device operations: There shall be no eating, drinking, or rowdiness during personnel lifting operations.	OSHA 1910.66: Not covered.	ASME A120.1-2006: Not covered.				
09.7.j(3)	Operations: The following practices shall be followed for hoist supported personnel lifting device operations: Personnel shall keep all parts of the body, tools, and equipment inside the work platform periphery during raising, lowering, and traveling operations.	OSHA 1910.66: Not covered.	ASME A120.1-2006: 3.3.5 Required Features (d) Enclosures or guards shall be provided to prevent accidental contact by personnel with moving parts or pinch points.				

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09.7.k	Operations: The following practices shall be followed for hoist supported personnel lifting device operations: Fall protection is required for personnel using personnel lifting devices. Where possible, personnel should tie off to approved attachment points not on the work cage. Handrails shall not be used as an attachment point.	OSHA 1910.66: Personal fall protection. Employees on working platforms shall be protected by a personal fall arrest system meeting the requirements of appendix C, Section I, of this standard, and as otherwise provided by this standard. 1910.66(f)(5)(ii)(L) The platform shall be provided with a secondary wire rope suspension system if the platform contains overhead structures which restrict the emergency egress of employees. A horizontal lifeline or a direct connection anchorage shall be provided, as part of a fall arrest system which meets the requirements of appendix C, for each employee on such a platform. 1910.66(f)(5)(ii)(M) A vertical lifeline shall be provided as part of a fall arrest system which meets the requirements of appendix C, for each employee on a working platform suspended by two or more wire ropes, if the failure of one wire rope or suspension attachment will cause the platform to upset. If a secondary wire rope suspension is used, vertical lifelines are not required for the fall arrest system, provided that each employee is attached to a horizontal lifeline anchored to the platform.	ASME A120.1-2006: 3.7.5.10 Fall Protection. All persons shall be provided with and shall use a personal fall protection system complying with ANSI Z359.1-1992 (R1999), Safety Requirements for Personal Fall Arrest Systems, Subsystems and Components, or ANSI/ASSE A10.32-2004, Fall Protection Systems for Construction and Demolitions. Fall protection systems shall be engaged whenever a worker is exposed to the risk of a fall greater than 6 ft (1.6 m). An independent vertical lifeline is required for each worker on suspended equipment where a failure of any support wire or its fastenings allows the suspended equipment to upset. Suspended equipment that does not upset as a result of failure of a support wire rope or its fastenings may incorporate a trolleyline complying with the following requirements: (a) Trolleylines shall be designed to provide fall protection for workers. (b) The trolleyline shall be not less than 5/16 in. (8 mm) in diameter galvanized or stainless steel wire rope. (c) The trolleyline, the platform members it is attached to, and its fastenings shall be designed to maintain a minimum safety factor of 2. Separate hanging lifelines shall not be used when a powered platform has an overhead structure that would restrict emergency egress of the occupants. In such cases, the suspended equipment shall be designed such that the failure of any support wire rope shall not allow the suspended equipment to upset or fall. The occupants in such cases shall be secured to the suspended equipment by fall protection system equipment.				
09.7.L(1)	Operations: The following practices shall be followed for hoist supported personnel lifting device operations: Personnel required to hold onto a moving platform shall use both hands.	OSHA 1910.66:	ASME A120.1-2006: Not covered.				
09.7.L(2)	Operations: The following practices shall be followed for hoist supported personnel lifting device operations: Tools and other objects shall be carried in canvas bags or by other methods that free both hands and do not present a snagging hazard.	OSHA 1910.66: Not covered.	ASME A120.1-2006: Not covered.				
09.7.L(3)	Operations: The following practices shall be followed for hoist supported personnel lifting device operations: Alternate methods of tool delivery beside personnel lifting devices should be investigated.	OSHA 1910.66:	ASME A120.1-2006:				
10.2.1(1)	Safety and Design Aspects: Design Criteria that should be emphasized during sling design are contained in the documents listed in Section 2. Sling design shall be in accordance with industry standards and meet the applicable requirements of OSHA and ASME.						
10.2.1(2)	Safety and Design Aspects: Sling design shall maintain the minimum design factors listed in Table 10-1. Table 10-1, Minimum Design Factors for Slings. Equipment, Design Load Safety Factor. Alloy Steel Chain Slings, 5. Wire Rope Slings, 5. Metal Mesh Slings, 5. Synthetic Rope Slings, 5. Synthetic Web Slings, 5. Linear Fiber Slings, 5. Structural Slings, Lesser of 3 times yield or 5 times ultimate. Shackles, D-rings, Turnbuckles, Eye Bolts, Lifting Lugs, Safety Hoist Rings, etc., 5. Note: Design factor based on ultimate material strength, except for structural slings.		B30.9 Alloy chain sling 4, all other 5--No references to lifting lugs. Structural???				
10.2.2	Safety and Design Aspects: Labeling/Tagging of Slings. Certification/recertification tags are required as described in paragraph 10.3.5. A system shall be developed to identify slings used in critical lift applications. Completely assembled slings that have the necessary design features and maintenance/inspection, and test intervals to lift critical loads will be marked conspicuously so that the operator and assurance personnel can distinguish that the sling is qualified for critical lifts. (Requirement 41547)						

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10.3(1)	Testing. The following proof load and periodic load tests apply to slings except as noted in paragraph 10.3.3. Turnbuckles shall be tested at the open position as a minimum. It is recommended that turnbuckles be tested at the open, closed, and midway positions. (Requirement 41548)						
10.3(2)	Testing: These tests shall be performed by qualified personnel according to written (specific or general) technical operating procedures. The acceptable tolerance for load test accuracy is +5/-0 percent.						
10.3(3)	Testing: When slings are composed of major components that fall into more than one of the categories listed in Table 10-2, the components shall be tested individually according to applicable requirements and then as a system to the lowest test value (if practical).						
10.3(4)	Testing: An inspection shall be performed after each load test and prior to release for service to ensure there is no damage. A periodic load test requirement can be fulfilled by a concurrent proof load test.						
10.3(5)	Testing: The load shall be held for a minimum of 3 minutes for load tests. (Requirement 41552)						
10.3.1(1)	Testing: Proof Load Test. Before first use, all new, extensively modified, repaired, or altered slings shall undergo a proof load test at a specified factor of the rated load according to Table 10-2. Proof load tests performed by the manufacturer prior to delivery are acceptable, if the necessary load test papers are provided to verify the extent and thoroughness of the test on the specific item. A proof load test also may be performed at a prescribed time when there is a question in design or previous testing. (Requirement 41553)						
10.3.1(2)	Testing: Proof Load Test: All components shall be tested together as a system, if practical.						
10.3.1(3)	Testing: Proof Load Test: Prior to first use, all lifting interfaces such as eyebolts, D-rings, and lifting lugs permanently attached to the load shall be proof load tested if feasible. For lifting interfaces, when deemed unfeasible by the responsible design organization and accepted by the user organization, based on possible overloading of structural members not required during lifting or other considerations, this proof load test can be eliminated. (Requirement 41555)						
10.3.1(4)	Testing: Proof Load Test: However, design analysis and inspection shall be used to verify the integrity of the interface. Table 10-2, Proof Load Test Factors (Based on Manufacturers' Rated Load). Equipment, Proof Load Test Factor. Alloy Steel Chain Slings, 2.0. Wire Rope Slings, 2.0. Metal Mesh Slings, 2.0. Synthetic Rope Slings, 2.0. Synthetic Web Slings, 2.0. Linear Fiber Slings, 2.0. Structural Slings, 2.0*. Shackles, D-rings, Turnbuckles, Eye Bolts, Lifting Lugs, Safety Hoist Rings, etc., 2.0. *Unless otherwise specified by design, due to material characteristics, geometry, design factors, etc., but in any case, at least 125 percent of the sling's rated capacity.						
10.3.2(1)	Testing: Periodic Load Test. Slings shall undergo periodic load tests at least every 4 years at a specific load test factor of the design rated load as given in Table 10-3.						
10.3.2(2)	Testing: Periodic Load Test: All components shall be tested together as a system, if practical.						
10.3.2(3)	Testing: Periodic Load Test: Slings used for critical lifts shall be load tested at least once per year.						

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10.3.2(4)	Testing: Periodic Load Test: Slings used infrequently for critical lifts shall be load tested before each critical lift if it has been over a year since the last load test. Lifting interfaces such as eyebolts, D-rings, and lifting lugs permanently attached to the load are exempt from periodic load testing. Table 10-3 Periodic Load Test Factors (Based on Manufacturers' Rated Load), Equipment, Periodic Load Test Factor. Alloy Steel Chain Slings, 1.00. Wire Rope Slings, 1.00. Metal Mesh Slings, 1.00. Synthetic Rope Slings, 1.00*. Synthetic Web Slings, 1.00. Linear Fiber Slings, 1.00. Structural Slings, 1.00. Shackles, D-rings, Turnbuckles, Eye Bolts, Lifting Lugs, Safety Hoist Rings, etc., 1.00. *Critical lift rope slings of synthetic material shall not be used beyond 50 percent of the manufacturer's rating to maintain an equivalent design factor in the load system.						
10.3.3(1)	Testing: Non-Load Test Slings. Due to unique design and usage requirements, a sling may be designated as a non-load test sling by the LDEM, with concurrence from the affected/responsible program/project office, the responsible safety, design engineering, systems engineering, operations, and maintenance organizations. Such slings do not require periodic load tests. Inspections shall be conducted in accordance with paragraph 10.4.						
10.3.3(2)	Testing: Non-Load Test Slings: This non-load test designation shall be formally documented by each installation and the sling marked accordingly to designate it as a non-load test sling.						
10.3.4	Testing: Sling Rated Load. Rated loads for slings shall be based on the periodic load test weight divided by the periodic load test factor (see Table 10-3). For metal mesh slings, the rated capacity will be noted for vertical basket and choker hitch configurations. For synthetic rope slings, used in noncritical lifts, a 50-percent derating for use is recommended. For synthetic rope slings used in critical lifts, a 50-percent derating is required.						
10.3.5.a(1)	Testing: Test Reports and Periodic Recertification Tags: Written, dated, and signed reports shall be prepared after each test. (Requirement 41565)						
10.3.5.a(2)	Testing: Test Reports and Periodic Recertification Tags: Inadequacies shall be documented and, if determined to be a hazard, corrected prior to further use. (Requirement 41566)						
10.3.5.a(3)	Testing: Test Reports and Periodic Recertification Tags: These reports shall be kept on file by the owner organization for a minimum of two test cycles and shall be made readily available. (Requirement 41567)						
10.3.5.b(1)	Testing: Test Reports and Periodic Recertification Tags: Following the 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 or load test expiration date. (Requirement 41568)						
10.3.5.b(2)	Testing: Test Reports and Periodic Recertification Tags: For alloy steel chains, size, grade, and reach shall be stated along with the rated load. (Requirement 41569)						
10.3.5.b(3)	Testing: Test Reports and Periodic Recertification Tags: For synthetic rope slings used for critical lifts, the marked rated load shall be 50 percent of the manufacturer's rated load. (Requirement 41570)						
10.3.5.b(4)	Testing: Test Reports and Periodic Recertification Tags: The type of material shall also be stated. (Requirement 41571)						

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10.3.5.b(5)	Testing: Test Reports and Periodic Recertification Tags: All load bearing components shall be traceable of 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. (NOTE: Load bearing components not traceable to load test will invalidate the load test of the whole assembly.) (Requirement 41572)						
10.4.1(1)	Inspection: Inspections, as described below, shall be performed on all slings.						
10.4.1(2)	Inspection: Inspections shall be performed according to this section, the manufacturers' recommendations, and ASME B30.9.						
10.4.1(3)	Inspection: Visual inspections for cracks, deformations, gouges, galling, kinks, crushed areas, corrosion, and proper configuration shall be performed each day the sling is used, prior to first use.						
10.4.1(4)	Inspection: An indepth inspection shall be performed annually or when a sling is suspected to have even a small loss of strength or is repaired.						
10.4.1(5)	Inspection: Inspections shall be performed by qualified personnel according to approved technical operating procedures.						
10.4.1(6)	Inspection: Inadequacies shall be documented and, if determined to be a safety hazard, tagged out and corrected prior to further use.						
10.4.2	Inspection: All new, extensively repaired, or modified slings shall be given a daily and a periodic inspection prior to first use. For component repair on slings, only the inspections that apply to the repaired portion need to be performed prior to first use unless a periodic inspection interval expires during the downtime (see paragraph 10.4.5). (Requirement 41580)						
10.4.3(1)	Inspection: Slings in regular service (used at least once a month) shall be inspected as required in paragraphs 10.4.4 and 10.4.5.						
10.4.3(2)	Inspection: Idle and standby slings shall be inspected according to paragraph 10.4.6.						
10.4.4	Inspection: Daily Inspections. These inspections shall be performed prior to first use each day the sling is used and shall include the following: (Requirement 41583)						
10.4.5(1)	Inspection: Periodic Inspections. The following inspections shall be performed at least once a year, unless otherwise specified below.						
10.4.5(2)	Inspection: Periodic Inspections: The need to replace or repair slings shall be determined by a certified or otherwise qualified person based on an evaluation of inspection results. Any discrepancy (deterioration or damage) is sufficient reason for questioning continued use of the sling (see Wire Rope Users Manual for additional information on wire rope inspections):						
10.4.5.e.6	Inspection: Periodic Inspections: The following inspections shall be performed at least once a year, unless otherwise specified below: Synthetic Web and Linear Fiber Slings: Perform all inspections provided for by the sling manufacturer. This may include red fibers used as a wear indicator, or a fiber optic sling damage indicator, or some other NDT method designed into the sling.						
10.4.5.g	Inspection: Periodic Inspections: The following inspections shall be performed at least once a year, unless otherwise specified below: Rejected Slings. All slings rejected during inspection shall be marked. An engineering assessment will be made to determine if the sling is repairable. Non-repairable slings will be destroyed as soon as possible to avoid unintentional use.						

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10.4.6	Inspection: Idle and Standby Slings. Idle and standby slings shall be inspected prior to first use according to the requirements in paragraphs 10.4.4 and 10.4.5 unless these daily and periodic inspections were performed at required intervals during the idle/standby period. (Requirement 41633)						
10.4.7(1)	Inspection: Inspection Reports. Written, dated, and signed inspection reports shall be prepared after each periodic inspection. (Requirement 41634)						
10.4.7(2)	Inspection: Inspection Reports: Inadequacies shall be documented and, if determined to be a hazard, corrected prior to further use. (Requirement 41635)						
10.4.7(3)	Inspection: Inspection Reports: These reports shall be filed and made readily available by the organizational element responsible for inspecting sling(s). (Requirement 41636)						
10.5(1)	Inspection: Maintenance. A maintenance program based on manufacturers' recommendations, integrating proactive, reactive, preventive, and predictive maintenance shall be established to increase the probability the sling will function in the required manner over its design life cycle with a minimum of maintenance.						
10.5(2)	Inspection: Maintenance: The program shall include procedures and a scheduling system for normal periodic maintenance items, adjustments, replacements, and repairs.						
10.5(3)	Inspection: Maintenance: The program shall also ensure that records are kept and unsafe test and inspection discrepancies are documented and corrected.						
10.5(4)	Inspection: Maintenance: Any sling found in an unsafe operating condition shall be tagged out and removed from service until repaired. (Requirement 41640)						
10.5(5)	Inspection: Maintenance: All repairs shall be made by qualified personnel in accordance with the manufacturers' instructions.						
10.5(6)	Inspection: Maintenance: The need to repair or replace slings shall be determined by a certified or otherwise qualified person based on an evaluation of inspection results.						
10.6.1(1)	Personnel Certification: Program. Only certified (licensed) and trained riggers are authorized to perform rigging tasks for lifting devices, equipment, and/or operations. A comprehensive training, examination, and licensing program shall be established or made available. For those NASA installations/initiatives or sponsored programs and activities that do not have a training program, these requirements may be provided by a third party that is proficient in the principles of rigging. The rigging certification program will be reviewed at least annually to assure that the contents, training material, testing, and examination elements are up-to-date with current methods and techniques; and that any "lessons-learned" are adequately addressed.						
10.6.1(2)	Personnel Certification: Program: Personnel performing NDT shall be qualified and certified in accordance with paragraph 1.9.						
10.6.1(3)	Personnel Certification: Program: Training shall be provided to observers and flagmen.						
10.6.1(4)	Personnel Certification: Program: All participants in the lifting operation shall have clearly defined roles and responsibilities.						
10.6.2(1)	Personnel Certification: The certification program for rigging operations shall include the following and may be included in the operator training for the individual lifting device training and certification.						

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10.6.2(2)	Personnel Certification: If the general rigging is included in the specific lifting device certification and training program, sufficient rigging details shall be included in the training, testing and "hands-on" examination portion of that lifting device training program to assure that each individual understands and demonstrates proficiency in the required rigging techniques and methods.						
10.6.2(3)	Personnel Certification: The following shall be addressed in the qualification of individuals for "rigging certification." (Requirement 41650)						
10.6.2.a.1	Personnel Certification: The following shall be addressed in the qualification of individuals for "rigging certification." Training: Classroom training in rigging safety, techniques, and methods, pre-use inspection, slings, and attachment devices (for initial certification and as needed).						
10.6.2.a.2	Personnel Certification: The following shall be addressed in the qualification of individuals for "rigging certification." Training: Hands-on training (for initial certification and as needed).						
10.6.2.a.3	Personnel Certification: The following shall be addressed in the qualification of individuals for "rigging certification." Training: An annual review by supervision or other designated personnel of each individual's performance as a rigger or operator/rigger to assure adequate proficiency in performing the necessary rigging tasks in a manner consistent with the principals, methods, and techniques associated with safe rigging practices.						
10.6.2.b.1	Personnel Certification: The following shall be addressed in the qualification of individuals for "rigging certification." Examination: Physical examination (criteria to be determined by the cognizant medical official based upon the related requirements associated with performing rigging tasks).						
10.6.2.b.2	Personnel Certification: The following shall be addressed in the qualification of individuals for "rigging certification." Examination: Written examination.						
10.6.2.b.3	Personnel Certification: The following shall be addressed in the qualification of individuals for "rigging certification." Examination: Operational (practical) demonstration test (for initial certification only or to address new techniques or methods as required). Each individual shall demonstrate the ability to adequately determine and/or apply load weight, center of gravity and apply special articulating devices essential to the safe and successful lift operation. Riggers must demonstrate the ability to apply proper rigging principals, methods, and techniques using simulated loads of various weights, sizes, and configurations.						
10.6.2.c.1(1)	Personnel Certification: The following shall be addressed in the qualification of individuals for "rigging certification." Rigger Licensing/Certification: An organization element shall be designated to issue rigger licenses/certifications.						
10.6.2.c.1(2)	Personnel Certification: The following shall be addressed in the qualification of individuals for "rigging certification." Rigger Licensing/Certification: Provisions shall be made to suspend/revoke licenses or certifications for violation of safety requirements, failure to meet medical requirements, or acts of negligence in rigging.						

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10.6.2.c.1(3)	Personnel Certification: The following shall be addressed in the qualification of individuals for "rigging certification." Rigger Licensing/Certification: A program element to assure current rigger certification status of persons performing rigging tasks shall be established and implemented. The method of licensing is the responsibility of the organization element that is designated to issue the rigger licenses/certifications. Generally this will involve the use of "License/Certification Cards" issued to each individual or maintaining a master list of licensed/certified riggers that is readily available to assurance and supervisory personnel.						
10.6.2.c.2	Personnel Certification: The following shall be addressed in the qualification of individuals for "rigging certification." Rigger Licensing/Certification: Renewal of all rigger licenses/certifications shall require demonstration of proficiency or approval of supervision that proficiency is adequate and current. Licenses/certifications will expire at least every 4 years. Renewal procedures and requirements will be established by the organizational element responsible for issuing rigger licenses/certifications and will include those requirements established in paragraphs 10.6.2 a. and 10.6.2 b.						
10.7(1)	Operations. Slings shall be operated according to this section, the manufacturers' recommendations, and ASME B30.9.						
10.7(2)	Operations: The following practices shall be followed for sling operations: (Requirement 41665)						
10.7.a	Operations: The following practices shall be followed for sling operations: Select a sling of suitable rated capacity, use proper hitch, and attach the sling securely to the load. For critical lifts, rope slings of synthetic construction shall not be used beyond 50 percent of their rated load. (The minimum design factors for determining rated load are provided in Table 10-1.)						
10.7.e	Operations: The following practices shall be followed for sling operations: Slings shall be shortened only by methods approved by the sling manufacturer or a qualified person.						
10.7.f	Operations: The following practices shall be followed for sling operations: Eyes in wire rope bridles, slings, or bull wires shall not be formed by wire rope clips or knots.						
10.7.g	Operations: The following practices shall be followed for sling operations: The following materials and techniques shall not be used in slings or rigging hardware to hoist personnel or loads: natural rope, wire rope clips, the fold back metal pressed sleeve or clip technique.						
10.7.i	Operations: The following practices shall be followed for sling operations: Slings shall not be loaded beyond rated load except for required testing.						
10.7.j(1)	Operations: The following practices shall be followed for sling operations: Particular attention shall be given to preventing corrosion.						
10.7.j(2)	Operations: The following practices shall be followed for sling operations: Slings shall be stored such that they will not be damaged by moisture, heat, sunlight, or chemicals.						
10.7.j(3)	Operations: The following practices shall be followed for sling operations: Nylon shall not be used in an acid or phenolic environment.						
10.7.j(4)	Operations: The following practices shall be followed for sling operations: Polyester, polypropylene, and aluminum shall not be used in a caustic environment.						
10.7.k(1)	Operations: The following practices shall be followed for sling operations: Precautions shall be taken to ensure proper sling assembly and that the proper configuration is maintained.						

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10.7.k(2)	Operations: The following practices shall be followed for sling operations: Slings shall be used according to design and/or manufacturers' instructions.						
10.7.L	Operations: The following practices shall be followed for sling operations: The user shall ensure that the sling is within the inspection and periodic recertification intervals and that all load bearing components are traceable to the most recent load test by examination of the tags and/or documentation.						
10.7.m	Operations: The following practices shall be followed for sling operations: Sling repair shall maintain the minimum design factors based on ultimate material strength. These factors are listed in Table 10-1.						
10.7.n	Operations: The following practices shall be followed for sling operations: Slings shall be padded or protected from the sharp edges of their loads.						
11.2.1	1926.453 and 1910.67 Safety and Design Aspects: Design criteria/general design requirements that should be emphasized for mobile aerial platforms are contained in ANSI/SIA A92.2, A92.3, A92.5, and A92.6. It is the responsibility of the applicable engineering, operations/maintenance, and safety organizations to ensure the design, testing, maintenance, inspection, and operation of this equipment complies with this standard, the manufacturers' recommendations, and ANSI/SIA.		General Statement				
11.2.2.a	Safety and Design Aspects: Labeling/Tagging of Mobile Aerial Platforms: The rated load/applicable capacity ratings shall be clearly marked on the mobile aerial platform.		92.2--6.2.2 Aerial Device Specifications. 6.2.2.1 General. The aerial device manufacturer shall clearly state in the manual and on the aerial device the following information: (1) Make and model. (2) Rated load capacity. 92.3--4.19 Instructions and Markings. The following information shall be displayed on all aerial platforms in a clearly visible accessible area and in a durable manner: (3) The rated work load,				
11.2.2.b	Safety and Design Aspects: Labeling/Tagging of Mobile Aerial Platforms: A standard system of labeling shall be established and used throughout the installation.		No Requirement				
11.2.2.c	Safety and Design Aspects: Labeling/Tagging of Mobile Aerial Platforms: A standard lockout/tagout system shall be established and used throughout the installation to indicate equipment that is not to be used due to inspection discrepancies, ongoing maintenance, or other reasons.		No Requirement				
11.2.3(1)	Safety and Design Aspects: Safety Analysis and Documentation of Mobile Aerial Platforms. A recognized safety hazard analysis such as fault tree analysis, FMEA, O&SHA shall be performed on all mobile aerial platforms used for lifts where failure/loss of control could result in loss of or damage to flight hardware.		No Requirement				
11.2.3(2)	Safety and Design Aspects: Safety Analysis and Documentation of Mobile Aerial Platforms: The analysis shall, as a minimum, determine potential sources of danger, identify failure modes, and recommend resolutions and a system of risk acceptance for those conditions found in the hardware-facility-environment-human relationship that could cause loss of life, personal injury, and loss of or damage to the mobile aerial platform, facility, or load.		No Requirement				
11.2.3(3)	Safety and Design Aspects: Safety Analysis and Documentation of Mobile Aerial Platforms: The analysis shall be done as part of the initial activation process, included in the equipment documentation, and updated as required to reflect any changes in operation and/or configuration.		No Requirement				

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11.3(1)	Testing. Testing of mobile aerial platforms shall be performed according to this section, the manufacturers' recommendations, and the applicable ANS/SIA standard. Three types of tests are required for mobile aerial platforms: proof load tests, periodic load tests, and operational tests.		8.2 Inspection and Testing Classifications. 8.2.1 Initial Inspection and Test.8.2.2 Regular Inspection and Tests.8.2.3 Frequent Inspection and Test.8.2.4 Periodic Inspection or Test.				
11.3(2)	Testing: Proof load tests and operational tests shall be performed prior to first use for new or extensively repaired or altered components directly in the mobile aerial platform load path. Repairs or alterations to nonlifting or nonholding components do not require a load test, although a functional check should be performed to determine if the repairs or alterations are acceptable. (Requirement 41699)		Different wording in different A92 standards 4.3.1 Proof Test. Each production aerial platform shall be tested and shall sustain a test load equal to 150% of the rated work load, on level ground, to verify its integrity. The manufacturer shall determine the most critical configuration(s) of the aerial platform for this test. The test load shall be placed in the most adverse location with its center of gravity 12 inches (.3m) inboard from the guardrail or in the center of the platform, whichever is less. The aerial platform shall remain stable during this test. A visual inspection shall be made to determine whether this test has produced an adverse effect on any component.				
11.3(3)	Testing: The periodic load and operational tests shall be performed annually. The acceptable tolerance for load test accuracy is +5/-0 percent. (Requirement 41700)		No Requirement				
11.3(4)	Testing: All load and operational tests shall be performed by qualified personnel according to written (specific or general) technical operating procedures.		Different wording in Different A92 standards 8. Responsibilities of Owners 8.1 General Responsibilities. Each owner shall comply with the requirements of this section. The following responsibilities pertain to the owner's inspection, testing, maintenance, modification, training, and transfer of ownership. These activities shall be performed by qualified person(s).				
11.3(5)	Testing: An inspection of the mobile aerial platform and its components shall be performed after each load test and prior to the platform being released for service to ensure there is no damage. The periodic load test requirement may be fulfilled by a concurrently performed proof load test. (Requirement 41702)						
11.3.1(1)	Testing: Proof Load Test. Before first use, all new, extensively repaired, or altered mobile aerial platforms shall undergo a proof load test in accordance with the manufacturers' instructions and the applicable ANSI/SIA standard. A proof load test may also be performed when there is a question in design, previous testing, or to ensure system integrity. (Requiremnt 91355)						
11.3.1(2)	Testing: Proof Load Test: The load shall be lifted slowly in an area where minimal damage will occur if the platform fails. (Requirement 41704)						
11.3.2	Testing: Periodic Load Test. Each mobile aerial platform shall be tested at least once every year with a load equal to the rated load. (Requirement 41705)						
11.3.3	Testing: Operational Test. Together with proof load and periodic load tests, the following shall be performed with a dummy rated load unless otherwise specified: (Requirement 41706)						
11.3.4(1)	Testing: Test Reports and Periodic Recertification Tags. After each test, designated personnel shall prepare written, dated, and signed test reports. (Requirement 41710)						
11.3.4(2)	Testing: Test Reports and Periodic Recertification Tags: Inadequacies shall be documented and, if determined to be a hazard, corrected prior to further use. (Requirement 41711)						
11.3.4(3)	Testing: Test Reports and Periodic Recertification Tags: These reports shall be kept on file for a minimum of two test cycles and shall be made readily available. (Requirement 41712)						

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11.3.4(4)	Testing: Test Reports and Periodic Recertification Tags: Following the periodic load test, mobile aerial platforms shall be given a permanently affixed tag identifying the equipment and stating the next required periodic load test date or load test expiration date. (Requirement 41713)						
11.4.1(1)	Inspection: Inspections, as described below, shall be performed on all mobile aerial platforms.						
11.4.1(2)	Inspection: Inspections shall be performed according to this section, the manufacturers' recommendations, and the applicable ANSI/SIA standard.						
11.4.1(3)	Inspection: Inadequacies discovered during an inspection shall be documented and, if determined to be a hazard, tagged out and corrected prior to further use. (Requirement 41717)						
11.4.1(4)	Inspection: Inspections shall be performed by qualified personnel according to approved technical operating procedures.						
11.4.2	Inspection: All new, extensively repaired, or modified mobile aerial platforms shall be inspected to the requirements of both daily and periodic inspections prior to first use. For component repair on mobile aerial platforms, only the inspections that apply to the repaired portion need to be performed prior to first use unless a periodic inspection interval expires during the downtime (see paragraph 11.4.5).						
11.4.3(1)	Inspection: Mobile aerial platforms in regular service (used at least once a month) shall be inspected as required in paragraphs 11.4.4 and 11.4.5.						
11.4.3(2)	Inspection: Idle and standby platforms shall be inspected according to paragraph 11.4.6.						
11.4.4	Inspection: Daily Inspections. These inspections shall be performed each day the mobile aerial platform is used and shall include the following: (Requirement 41722)						
11.4.5(1)	Inspection: Periodic Inspections. These inspections shall be performed at varying intervals depending on activity, severity of service, and environment.						
11.4.5(2)	Inspection: Periodic Inspections: The following inspections shall be performed at least once per year or more frequently if required by the manufacturer or the applicable ANSI/SIA standard. Inspect for: (Requirement 41730)						
11.4.6	Inspection: Idle and Standby Mobile Aerial Platforms. Idle and standby mobile aerial platforms shall be inspected prior to first use according to the requirements of paragraphs 11.4.4 and 11.4.5 unless these daily and periodic inspections were performed at required intervals and recorded during the idle/standby period. (Requirement 41744)						
11.4.7(1)	Inspection: Inspection Reports. After each formal periodic inspection, qualified personnel shall prepare written, dated, and signed inspection reports, including procedure reference and adequacy of components. (Requirement 41745)						
11.4.7(2)	Inspection: Inspection Reports: Inadequacies shall be documented and, if determined to be a hazard, corrected prior to further use. (Requirement 41746)						
11.4.7(3)	Inspection: Inspection Reports: These reports shall be filed and be made readily available by the organizational element responsible for mobile aerial platforms. (Requirement 41747)						
11.5(1)	Maintenance. A maintenance program based on manufacturers' recommendations, integrating proactive, reactive, preventive and predictive maintenance shall be established to increase the probability the mobile aerial platform will function in the required manner over its design life cycle with a minimum of maintenance.						

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11.5(2)	Maintenance: The program shall include procedures and a scheduling system for normal periodic maintenance items, adjustments, replacements, and repairs.						
11.5(3)	Maintenance: The program also shall ensure that records are kept and unsafe test and inspection discrepancies are documented and corrected.						
11.5(4)	Maintenance: Any mobile aerial platform found in an unsafe operating condition shall be removed from service until repaired.						
11.5(5)	Maintenance: All repairs shall be made by qualified personnel in accordance with the manufacturers' instructions.						
11.6(1)	Personnel Certification. Only certified (licensed) and trained operators shall be authorized to operate mobile aerial platforms (except for manually propelled platforms where training can be provided).						
11.6(2)	Personnel Certification: A training, examination, and licensing program shall be established or made available.						
11.6(3)	Personnel Certification: For those NASA installations that do not have a training program, all mobile aerial platform operators shall be trained and certified by a recognized certification organization that normally performs this function. The basic certification program will include the following: (Requirement 41755)						
11.6.1.a	Personnel Certification: The basic certification program will include the following: Training: Classroom training in safety, lifting equipment emergency procedures, general performance standards, requirements, pre-operational checks, and safety-related defects and symptoms (for initial certification and as needed).						
11.6.1.b	Personnel Certification: The basic certification program will include the following: Training: Hands-on training (for initial certification and as needed).						
11.6.1.c	Personnel Certification: The basic certification program will include the following: Training: An annual review of items listed in paragraphs 11.6.1.a and 11.6.1.b above. (This may be conducted informally by local supervisory personnel).						
11.6.1.d	Personnel Certification: The basic certification program will include the following: Training: Training for working at heights and the proper use of fall protection equipment.						
11.6.2.a	Personnel Certification: The basic certification program will include the following: Examination: Physical examination (criteria to be determined by the cognizant medical official).						
11.6.2.b	Personnel Certification: The basic certification program will include the following: Examination: Written/oral examination.						
11.6.2.c	Personnel Certification: The basic certification program will include the following: Examination: Operational demonstration.						
11.6.2.d	Personnel Certification: The basic certification program will include the following: Examination: Proficiency examination for recertification.						
11.6.3(1)	Personnel Certification: The basic certification program will include the following: Licensing. An organizational element shall be designated to issue operator licenses.						
11.6.3(2)	Personnel Certification: The basic certification program will include the following: Licensing: Provisions shall be made to revoke licenses for negligence, violations of safety requirements, or failure to meet medical standards.						
11.6.3(3)	Personnel Certification: The basic certification program will include the following: Licensing: Provisions shall be made for periodic checks of operators to verify they have licenses in their possession.						

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11.6.3(4)	Personnel Certification: The basic certification program will include the following: Licensing: The licenses shall indicate the type of mobile aerial platform the holder is qualified to operate. Alternately, the organizational element may elect to maintain a master list of licensed operators instead of issuing individual licenses, providing copies of the list are readily available to assurance and supervisory personnel at the work site.						
11.6.4	Personnel Certification: The basic certification program will include the following: Renewal. Licenses or certifications will expire at least every 4 years. Renewal shall require demonstration of proficiency or approval of supervision that proficiency is adequate and current. Renewal procedures will be established by each licensing organization, but as a minimum, will include items in paragraphs 11.6.1 and 11.6.2.						
11.7(1)	Operations. Mobile aerial platforms shall be operated according to this section, the manufacturers' recommendations, and the applicable ANSI/SIA standard.						
11.7(2)	Operations: The following practices shall be followed for mobile aerial platform operations: (Requirement 41772)						
11.7.b	Operations: The following practices shall be followed for mobile aerial platform operations: Before each use, the operator shall have read and understood the manufacturer's operating instructions and safety rules, have been trained and licensed according to paragraph 11.6, and have read and understood all decals and warnings on the equipment.						
11.7.c(1)	Operations: The following practices shall be followed for mobile aerial platform operations: Before each use, the operator shall perform a pre-operational check to demonstrate operational readiness, including all limit switches and outrigger drift switches, if applicable, but excluding the tilt alarm/shutoff. If controls do not operate properly, the operator is responsible for notifying the supervisor.						
11.7.c(2)	Operations: The following practices shall be followed for mobile aerial platform operations: Repairs and adjustments shall be made before operations begin.						
11.7.c(3)	Operations: The following practices shall be followed for mobile aerial platform operations: The operator shall adhere to all tags on the controls.						
11.7.d(1)	Operations: The following practices shall be followed for mobile aerial platform operations: Before each use, the operator shall survey the area for applicable hazards such as overhead obstructions and high-voltage conductors, debris, bumps and loose obstructions, dropoffs and holes, ditches, untamped earth fills, obstructed path of travel, unstable footing, and other possible hazardous conditions.						
11.7.d(2)	Operations: The following practices shall be followed for mobile aerial platform operations: The operator shall establish appropriate safety zones before initiating operations.						
11.7.e	Operations: The following practices shall be followed for mobile aerial platform operations: The equipment shall not be loaded beyond its rated load (capacity) except for required testing.						
11.7.f	Operations: The following practices shall be followed for mobile aerial platform operations: The operator shall ensure the equipment is within inspection and testing intervals by examination of the periodic recertification tags and/or documentation.						
11.7.g(1)	Operations: The following practices shall be followed for mobile aerial platform operations: Operator discipline shall be maintained at all times.						

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11.7.g(2)	Operations: The following practices shall be followed for mobile aerial platform operations: There shall be no eating, drinking, or rowdiness during mobile aerial platform operations.						
11.7.g(3)	Operations: The following practices shall be followed for mobile aerial platform operations: Personnel shall keep all parts of the body, tools, and equipment inside the work platform periphery during raising, lowering, and traveling operations.						
11.7.i	Operations: The following practices shall be followed for mobile aerial platform operations: Tools and other objects shall be carried in canvas bags or by other methods that free both hands and do not present a snagging hazard. Alternate methods of tool delivery beside mobile aerial platforms should be investigated.						
11.7.j	Operations: The following practices shall be followed for mobile aerial platform operations: For work on or near electrical distribution and transmission lines, mobile aerial platforms shall be operated in accordance with paragraphs 5.7.as, 5.7.at, and 5.7.au, of this standard and the applicable ANSI/SIA standard.						
11.7.k	Operations: The following practices shall be followed for mobile aerial platform operations: Insulated mobile aerial platforms shall be tested and inspected in accordance with ANSI/SIA.						
11.7.L	Operations: The following practices shall be followed for mobile aerial platform operations: Outdoor mobile aerial platform operations should not commence if winds are above 20 knots steady state (23 mph, 37 km/hr) or if gusts exceed 25 knots (29 mph, 46 km/hr) or as recommended by the manufacturer. Consideration shall also be given to weather conditions such as lightning or snow before commencing operations.						
12.2.2.a	Safety and Design Aspects: Labeling/Tagging of Powered Industrial Trucks: The rated load/applicable capacity ratings shall be clearly marked on the powered industrial truck. (Requirement 41796)	1910.178(l)(3) Training program content. Powered industrial truck operators shall receive initial training in the following topics, except in topics which the employer can demonstrate are not applicable to safe operation of the truck in the employer's workplace. 1910.178(l)(3)(i)(H) Vehicle capacity; 1910.178(a)(4) Modifications and additions which affect capacity and safe operation shall not be performed by the customer or user without manufacturers prior written approval. Capacity, operation, and maintenance instruction plates, tags, or decals shall be changed accordingly.	ANSI/ITSDF B56.1-2005: 4.2 Modifications, Nameplates, Markings, and Capacity; ...?? B56.6-2005: 7.2.10 The rough terrain forklift truck manufacturer's capacity, operation, and maintenance instruction plates, tags, or decals shall be maintained in legible condition.				
12.2.2.b	Safety and Design Aspects: Labeling/Tagging of Powered Industrial Trucks: A standard system of labeling shall be established and used throughout the installation.	Not covered in OSHA 1910.178	Not covered in B56.1-2005 or B56.6-2005				
12.2.2.c	Safety and Design Aspects: Labeling/Tagging of Powered Industrial Trucks: A standard lockout/tagout system shall be established and used throughout the installation to indicate equipment that is not to be used due to inspection discrepancies, ongoing maintenance, mishaps or other reason.	Not covered in OSHA 1910.178	Not covered in B56.1-2005 or B56.6-2005				
12.2.3(1)	Safety and Design Aspects: Safety Analysis and Documentation of Powered Industrial Trucks. A recognized safety hazard analysis such as fault tree analysis, FMEA, O&SHA shall be performed on all powered industrial trucks used for lifts where failure/loss of control could result in loss of or damage to flight hardware.	Not covered in OSHA 1910.178	Not covered in B56.1-2005 or B56.6-2005				

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12.2.3(2)	Safety and Design Aspects: Safety Analysis and Documentation of Powered Industrial Trucks: The analysis shall, as a minimum, determine potential sources of danger, identify failure modes, and recommend resolutions and a system of risk acceptance for those conditions found in the hardware-facility-environment-human relationship that could cause loss of life, personal injury, and loss of or damage to the powered industrial truck, facility, or load.	Not covered in OSHA 1910.178	Not covered in B56.1-2005 or B56.6-2005				
12.2.3(3)	Safety and Design Aspects: Safety Analysis and Documentation of Powered Industrial Trucks: The analysis shall be done as part of the initial activation process, included in the equipment documentation, and updated as required to reflect any changes in operation and/or configuration.	Not covered in OSHA 1910.178	Not covered in B56.1-2005 or B56.6-2005				
12.3(1)	Testing. Testing of powered industrial trucks shall be performed according to this section, the manufacturers' recommendations, and the applicable OSHA and ASME standards. Three types of tests are required for powered industrial trucks: proof load tests, periodic load tests, and operational tests.	Not covered in OSHA 1910.178	ANSI/ITSDF B56.1-2005 and B56.6-2005: 7.6 General Stability Criteria: Tilting Platform Tests; MANY TESTS (tilt tests and fork repair tests) ARE REQUIRED BUT THE TYPE TESTS LISTED IN 8719.9 ARE NOT COVERED. EL				
12.3(2)	Testing: All load and operational tests shall be performed by qualified personnel according to written (specific or general) technical operating procedures.	Not covered in OSHA 1910.178	ANSI/ITSDF B56.1-2005: 4.18 Operator Qualifications Only trained and authorized persons shall be permitted to operate a powered industrial truck. B56.6-2005 5.16 Operator Qualifications 5.16.1 Only trained and authorized persons shall be permitted to operate a rough terrain forklift truck. Operators of rough terrain forklift trucks shall be qualified as to visual, auditory, physical, and mental ability to operate the equipment safely according to para. 5.17 and all other applicable parts of Section 5.				
12.3(3)	Testing: An inspection of the powered industrial truck and its components shall be performed after each load test and prior to the truck being released for service to ensure there is no damage. The acceptable tolerance for load test accuracy is +5/-0 percent unless otherwise specified. The periodic load test requirement may be fulfilled by a concurrently performed proof load test. (Requirement 41805)	Not covered in OSHA 1910.178	ANSI/ITSDF B56.1-2005: Section 7.29.2 Test Procedures B56.6-2005: Load test not required except for tilt testing and fork repairs.				
12.3.1	Testing: Proof Load Test. Proof load tests and operational tests shall be performed prior to first use for new or extensively repaired or altered components directly in the powered industrial truck load path in accordance with the manufacturers' instruction and the applicable ASME standard. Repairs or alterations to non-lifting or non-holding components do not require a load test, although a functional check should be performed to determine if the repairs or alterations are acceptable. A proof load test may also be performed when there is a question in design, previous testing, or to ensure system integrity. (Requirement 41806)	Not covered in OSHA 1910.178	Not covered in B56.1-2005 or B56.6-2005				
12.3.2	Testing: Periodic Load Test. For powered industrial trucks used where failure/loss of control could result in loss of or damage to flight hardware, a periodic load and operational test shall be performed at least once every year with a load equal to the rated load. (Requirement 41807)	Not covered in OSHA 1910.178	Not covered in B56.1-2005 or B56.6-2005				
12.3.3	Testing: Operational Test. Together with proof load and periodic load tests, the following shall be performed with a dummy rated load unless otherwise specified: (Requirement 41808)	Not covered in OSHA 1910.178	Not covered in B56.1-2005 or B56.6-2005				
12.3.3.a	Testing: Operational Test. Together with proof load and periodic load tests, the following shall be performed with a dummy rated load unless otherwise specified: Perform all functions in a loaded condition including tilt operation. Ensure the load is secured and will not move during tilting operations.	Not covered in OSHA 1910.178	Not covered in B56.1-2005 B56.6-2005: 8.6 General Stability Criteria — Tilting Platform Tests				

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12.3.3.c	Testing: Operational Test. Together with proof load and periodic load tests, the following shall be performed with a dummy rated load unless otherwise specified: The operational test for a modified powered industrial truck can be tailored to test only those portions of the equipment that were modified/repared only if the rated and operational test interval has not expired.	Not covered in OSHA 1910.178	Not covered in B56.1-2005 or B56.6-2005				
12.3.4(1)	Testing: Test Reports and Periodic Recertification Tags. After each test, designated personnel shall prepare written, dated, and signed test reports. (Requirement 41812)	Not covered in OSHA 1910.178	Not covered in B56.1-2005 or B56.6-2005				
12.3.4(2)	Testing: Test Reports and Periodic Recertification Tags: Inadequacies shall be documented and, if determined to be a hazard corrected prior to further use. (Requirement 41813)	1910.178(p)(1) If at any time a powered industrial truck is found to be in need of repair, defective, or in any way unsafe, the truck shall be taken out of service until it has been restored to safe operating condition. 1910.178(q)(1) Any power-operated industrial truck not in safe operating condition shall be removed from service. All repairs shall be made by authorized personnel.	ANSI/ITSDF B56.1-2005: 6 MAINTENANCE AND REBUILD PRACTICES 6.1 Operation Operation of powered industrial trucks may be hazardous if maintenance is neglected or repairs, rebuilds, or adjustments are not performed in accordance with the manufacturer's design criteria. Therefore, maintenance facilities (on or off premises), trained personnel, and detailed procedures shall be provided. B56.6-2005: 6.5.1.1 If the rough terrain forklift truck is found to be in need of repair or in any way unsafe, or contributes to an unsafe condition, the matter shall be reported immediately to the user's designated authority, and the truck shall not be operated until it has been restored to safe operating condition.				
12.3.4(3)	Testing: Test Reports and Periodic Recertification Tags: These reports shall be kept on file for a minimum of two test cycles and shall be made readily available. (Requirement 41814)	Not covered in OSHA 1910.178	Not covered in B56.1-2005 or B56.6-2005				
12.3.4(4)	Testing: Test Reports and Periodic Recertification Tags: Following the periodic load test, powered industrial trucks shall be given a permanently affixed tag identifying the equipment and stating the next required periodic load test date or load test expiration date. (Requirement 41815)	Not covered in OSHA 1910.178	Not covered in B56.1-2005 or B56.6-2005				
12.4.1(1)	Inspection: Inspections shall be performed on all powered industrial trucks.	1910.178(l)(3) Training program content. Powered industrial truck operators shall receive initial training in the following topics, except in topics which the employer can demonstrate are not applicable to safe operation of the truck in the employer's workplace. 1910.178(l)(3)(i)(J) Any vehicle inspection and maintenance that the operator will be required to perform; 1910.178(q)(7) Industrial trucks shall be examined before being placed in service, and shall not be placed in service if the examination shows any condition adversely affecting the safety of the vehicle. Such examination shall be made at least daily. Where industrial trucks are used on a round-the-clock basis, they shall be examined after each shift. Defects when found shall be immediately reported and corrected.	ANSI/ITSDF B56.1-2005: 6.2 Maintenance and Inspection Maintenance and inspection of all powered industrial trucks shall be performed in conformance with the following practices. (a) A scheduled planned maintenance, lubrication, and inspection system shall be followed; consult the manufacturer's recommendations. B56.6-2005: 7.2 Specifications Maintenance and inspection of all rough terrain forklift trucks shall be performed in conformance with the manufacturer's and user's recommendations and the following practices: (a) a planned system for scheduled inspection, lubrication, maintenance, and adjustment shall be established and followed;				
12.4.1(2)	Inspection: Inspections shall be performed according to this section, the manufacturers' recommendations, and ASME B56.1.	1910.178(l)(3) Training program content. Powered industrial truck operators shall receive initial training in the following topics, except in topics which the employer can demonstrate are not applicable to safe operation of the truck in the employer's workplace. 1910.178(l)(3)(i)(J) Any vehicle inspection and maintenance that the operator will be required to perform;	ANSI/ITSDF B56.1-2005 and B56.6-2005: See above				

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12.4.1(3)	<p>Inspection: Inadequacies discovered during an inspection shall be documented and, if determined to be a hazard, the truck will be tagged out and the inadequacy corrected prior to further use. (Requirement 41819)</p>	<p>1910.178(p)(1) If at any time a powered industrial truck is found to be in need of repair, defective, or in any way unsafe, the truck shall be taken out of service until it has been restored to safe operating condition. 1910.178(q)(1) Any power-operated industrial truck not in safe operating condition shall be removed from service. All repairs shall be made by authorized personnel. 1910.178(q)(7) Industrial trucks shall be examined before being placed in service, and shall not be placed in service if the examination shows any condition adversely affecting the safety of the vehicle. Such examination shall be made at least daily. Where industrial trucks are used on a round-the-clock basis, they shall be examined after each shift. Defects when found shall be immediately reported and corrected.</p>	<p>B56.1-2005: 5.5 Operator Care of the Truck 5.5.1 At the beginning of each shift and before operating the truck, check its condition, giving special attention to the following: (n) additional items or special equipment as specified by the user and/or manufacturer. If the truck is found to be in need of repair or in any way unsafe, or contributes to an unsafe condition, the matter shall be reported immediately to the user's designated authority, and the truck shall not be operated until it has been restored to safe operating condition. B56.6-2005: 6.5.1.1 If the rough terrain forklift truck is found to be in need of repair or in any way unsafe, or contributes to an unsafe condition, the matter shall be reported immediately to the user's designated authority, and the truck shall not be operated until it has been restored to safe operating condition.</p>				
12.4.1(4)	<p>Inspection: Inspections shall be performed by qualified personnel according to approved technical operating procedures.</p>	<p>1910.178(l)(3) Training program content. Powered industrial truck operators shall receive initial training in the following topics, except in topics which the employer can demonstrate are not applicable to safe operation of the truck in the employer's workplace. 1910.178(l)(3)(i)(J) Any vehicle inspection and maintenance that the operator will be required to perform;</p>	<p>ANSI/ITSDF B56.1-2005: 6.2 Maintenance and Inspection Maintenance and inspection of all powered industrial trucks shall be performed in conformance with the following practices. (b) Only trained and authorized personnel shall be permitted to maintain, repair, adjust, and inspect industrial trucks, and in accordance with manufacturer's specifications. B56.6-2005: 7.2 Specifications (b) only trained and authorized personnel shall be permitted to maintain, repair, adjust, and inspect rough terrain forklift trucks, and they shall do so in accordance with manufacturer's specifications.</p>				
12.4.2	<p>Inspection: All new, extensively repaired, or modified powered industrial trucks shall be inspected to the requirements of both daily and periodic inspections prior to first use. For component repair on powered industrial trucks, only the inspections that apply to the repaired portion need to be performed prior to first use unless a periodic inspection interval expires during the downtime (see paragraph 12.4.5). (Requirement 41821)</p>	<p>1910.178(a)(4) Modifications and additions which affect capacity and safe operation shall not be performed by the customer or user without manufacturer's prior written approval. Capacity, operation, and maintenance instruction plates, tags, or decals shall be changed accordingly.</p>	<p>These inspections not covered in B56.1-2005 or B56.6-2005. There are a lot of inspection/test requirements for repair of forks.</p>				
12.4.3(1)	<p>Inspection: Powered industrial trucks in regular service (used at least once a month) shall be inspected as required in paragraphs 12.4.4 and 12.4.5. (Requirement 41822)</p>	<p>1910.178(l)(3) Training program content. Powered industrial truck operators shall receive initial training in the following topics, except in topics which the employer can demonstrate are not applicable to safe operation of the truck in the employer's workplace. 1910.178(l)(3)(i)(J) Any vehicle inspection and maintenance that the operator will be required to perform; 1910.178(q)(7) Industrial trucks shall be examined before being placed in service, and shall not be placed in service if the examination shows any condition adversely affecting the safety of the vehicle. Such examination shall be made at least daily. Where industrial trucks are used on a round-the-clock basis, they shall be examined after each shift. Defects when found shall be immediately reported and corrected.</p>	<p>ANSI/ITSDF B56.1-2005: 6.2.8 Inspection and Repair of Forks in Service on Fork Lift Trucks (a) Forks in use shall be inspected at intervals of not more than 12 months (for single shift operations) or whenever any defect or permanent deformation is detected. Severe applications will require more frequent inspection. B56.6-2005: 7.2.15 Inspection and Repair of Forks (a) Forks shall be inspected at intervals not greater than 12 months or whenever permanent deformation is suspected. Severe applications shall warrant more frequent inspection. Inspection records shall be kept.</p>				

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12.4.3(2)	Inspection: Idle and standby powered industrial trucks shall be inspected according to paragraph 12.4.6. (Requirement 41823)		Not covered in B56.1-2005 B56.6-2005: 7.2 Specifications Maintenance and inspection of all rough terrain forklift trucks shall be performed in conformance with the manufacturer's and user's recommendations and the following practices: (a) a planned system for scheduled inspection, lubrication, maintenance, and adjustment shall be established and followed; 7.2.6 Brakes, steering mechanisms, control mechanisms, warning devices, lights, governors, lift overload devices, guards and safety devices, lift and tilt mechanisms, articulating axle stops, and frame members shall be carefully and regularly inspected and maintained in a safe operating condition.				
12.4.4	Inspection: Daily Inspections. These inspections shall be performed by the operator prior to each shift the truck is used. Inspect: (Requirement 41824)	1910.178(l)(3) Training program content. Powered industrial truck operators shall receive initial training in the following topics, except in topics which the employer can demonstrate are not applicable to safe operation of the truck in the employer's workplace. 1910.178(l)(3)(i)(J) Any vehicle inspection and maintenance that the operator will be required to perform; 1910.178(q)(7) Industrial trucks shall be examined before being placed in service, and shall not be placed in service if the examination shows any condition adversely affecting the safety of the vehicle. Such examination shall be made at least daily. Where industrial trucks are used on a round-the-clock basis, they shall be examined after each shift. Defects when found shall be immediately reported and corrected.	ANSI/ITSDF B56.1-2005: 4.19 Operator Training (1) proper preshift inspection and approved method for removing from service a truck that is in need of repair B56.6-2005: 6.5 Operator Care of the Rough Terrain Forklift Truck 6.5.1 At the beginning of each shift and before operating the rough terrain forklift truck, check its condition, giving special attention to the following:				
12.4.5	Inspection: Periodic Inspections. The following inspections shall be performed at least once per year or more frequently as required by the manufacturer, ASME B56.1, users' experience gained, severity of service, environment, and criticality. Inspect: (Requirement 41840)	1910.178(l)(3) Training program content. Powered industrial truck operators shall receive initial training in the following topics, except in topics which the employer can demonstrate are not applicable to safe operation of the truck in the employer's workplace. 1910.178(l)(3)(i)(J) Any vehicle inspection and maintenance that the operator will be required to perform;	ANSI/ITSDF B56.1-2005: Inspections covered in section 4.19 Operator Training, but it does not mention time periods. EL B56.6-2005: 7.2 Specifications Maintenance and inspection of all rough terrain forklift trucks shall be performed in conformance with the manufacturer's and user's recommendations and the following practices: (a) a planned system for scheduled inspection, lubrication, maintenance, and adjustment shall be established and followed;				
12.4.6	Inspection: Idle and Standby Powered Industrial Trucks. Idle and standby powered industrial trucks shall be inspected prior to first use according to the requirements of paragraphs 12.4.4 and 12.4.5 unless these daily and periodic inspections were performed at required intervals and recorded during the idle/standby period. (Requirement 41849)	1910.178(l)(3) Training program content. Powered industrial truck operators shall receive initial training in the following topics, except in topics which the employer can demonstrate are not applicable to safe operation of the truck in the employer's workplace. 1910.178(l)(3)(i)(J) Any vehicle inspection and maintenance that the operator will be required to perform;	See above.				
12.4.7(1)	Inspection: Inspection Reports. After each formal periodic inspection, qualified personnel shall prepare written, dated, and signed inspection reports, including procedure reference and adequacy of components. (Requirement 41850)	Not covered in OSHA 1910.178	Not covered in B56.1-2005 or B56.6-2005				

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12.4.7(2)	Inspection: Inspection Reports: Inadequacies shall be documented and, if determined to be a hazard, corrected prior to further use. (Requirement 41851)	1910.178(p)(1) If at any time a powered industrial truck is found to be in need of repair, defective, or in any way unsafe, the truck shall be taken out of service until it has been restored to safe operating condition. 1910.178(q)(1) Any power-operated industrial truck not in safe operating condition shall be removed from service. All repairs shall be made by authorized personnel.	B56.1-2005: 5.5.1 At the beginning of each shift and before operating the truck, check its condition, giving special attention to the following: (n) additional items or special equipment as specified by the user and/or manufacturer. If the truck is found to be in need of repair or in any way unsafe, or contributes to an unsafe condition, the matter shall be reported immediately to the user's designated authority, and the truck shall not be operated until it has been restored to safe operating condition. B56.6-2005: 6.5.1.1 If the rough terrain forklift truck is found to be in need of repair or in any way unsafe, or contributes to an unsafe condition, the matter shall be reported immediately to the user's designated authority, and the truck shall not be operated until it has been restored to safe operating condition.				
12.4.7(3)	Inspection: Inspection Reports: These reports shall be filed and be made readily available by the organizational element responsible for powered industrial trucks. (Requirement 41852)	Not covered in OSHA 1910.178	Not covered in B56.1-2005 or B56.6-2005				
12.5(1)	Maintenance: A maintenance program based on manufacturers' recommendations, integrating proactive, reactive, preventive, and predictive maintenance shall be established to increase the probability the powered industrial truck will function in the required manner over its design life cycle with a minimum of maintenance.	1910.178(l)(3) Training program content. Powered industrial truck operators shall receive initial training in the following topics, except in topics which the employer can demonstrate are not applicable to safe operation of the truck in the employer's workplace. 1910.178(l)(3)(i)(J) Any vehicle inspection and maintenance that the operator will be required to perform;	ANSI/ITSDF B56.1-2005: 6.2 Maintenance and Inspection Maintenance and inspection of all powered industrial trucks shall be performed in conformance with the following practices. (a) A scheduled planned maintenance, lubrication, and inspection system shall be followed; consult the manufacturer's recommendations. B56.6-2005: 7.2 Specifications Maintenance and inspection of all rough terrain forklift trucks shall be performed in conformance with the manufacturer's and user's recommendations and the following practices: (a) a planned system for scheduled inspection, lubrication, maintenance, and adjustment shall be established and followed; (b) only trained and authorized personnel shall be permitted to maintain, repair, adjust, and inspect rough terrain forklift trucks, and they shall do so in accordance with manufacturer's specifications.				
12.5(2)	Maintenance: The program shall include procedures and a scheduling system for normal periodic maintenance items, adjustments, replacements, and repairs.	See above.	ANSI/ITSDF B56.1-2005: See above B56.6-2005: See above				
12.5(3)	Maintenance: The program also shall ensure that records are kept and unsafe test and inspection discrepancies are documented and corrected.	Not covered in OSHA 1910.178	ANSI/ITSDF B56.1-2005: See above B56.6-2005: See above				
12.5(4)	Maintenance: Any powered industrial truck found in an unsafe operating condition shall be tagged out and removed from service until repaired. (Requirement 41856)	1910.178(p)(1) If at any time a powered industrial truck is found to be in need of repair, defective, or in any way unsafe, the truck shall be taken out of service until it has been restored to safe operating condition. 1910.178(q)(1) Any power-operated industrial truck not in safe operating condition shall be removed from service. All repairs shall be made by authorized personnel.	B56.1-2005: 5.5.1 At the beginning of each shift and before operating the truck, check its condition, giving special attention to the following: (n) additional items or special equipment as specified by the user and/or manufacturer. If the truck is found to be in need of repair or in any way unsafe, or contributes to an unsafe condition, the matter shall be reported immediately to the user's designated authority, and the truck shall not be operated until it has been restored to safe operating condition. B56.6-2005: 6.5.1.1 If the rough terrain forklift truck is found to be in need of repair or in any way unsafe, or contributes to an unsafe condition, the matter shall be reported immediately to the user's designated authority, and the truck shall not be operated until it has been restored to safe operating condition.				

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12.5(5)	Maintenance: All repairs shall be made by qualified personnel in accordance with the manufacturers' instructions.	1910.178(l)(3) Training program content. Powered industrial truck operators shall receive initial training in the following topics, except in topics which the employer can demonstrate are not applicable to safe operation of the truck in the employer's workplace. 1910.178(l)(3)(i)(J) Any vehicle inspection and maintenance that the operator will be required to perform;	ANSI/ITSDF B56.1-2005: 6.2 Maintenance and Inspection Maintenance and inspection of all powered industrial trucks shall be performed in conformance with the following practices. (a) A scheduled planned maintenance, lubrication, and inspection system shall be followed; consult the manufacturer's recommendations. B56.6-2005: 7.2 Specifications Maintenance and inspection of all rough terrain forklift trucks shall be performed in conformance with the manufacturer's and user's recommendations and the following practices: (b) only trained and authorized personnel shall be permitted to maintain, repair, adjust, and inspect rough terrain forklift trucks, and they shall do so in accordance with manufacturer's specifications.				
12.5.1	Maintenance: Maintenance Procedures. Before maintenance, adjustments, repairs, and replacements are made, the following safety precautions shall be taken: (Requirement 41858)		Not covered in B56.1-2005 or B56.6-2005				
12.5.1.a	Maintenance: Maintenance Procedures. Before maintenance, adjustments, repairs, and replacements are made, the following safety precautions shall be taken: Move the powered industrial truck to a designated area where maintenance activities will not interfere with other operations and there is proper ventilation.	1910.178(l)(3) Training program content. Powered industrial truck operators shall receive initial training in the following topics, except in topics which the employer can demonstrate are not applicable to safe operation of the truck in the employer's workplace. 1910.178(l)(3)(ii)(H) Closed environments and other areas where insufficient ventilation or poor vehicle maintenance could cause a buildup of carbon monoxide or diesel exhaust;	B56.1-2005: 6.2.5 Properly ventilate work area and vent exhaust fumes. (a) The exhaust from all internal combustion power lift truck engines contains carbon monoxide, a colorless, odorless, tasteless, poisonous gas. Carbon monoxide can... B56.6-2005: 7 MAINTENANCE AND REBUILD PRACTICES 7.1 General Rough terrain forklift trucks may become hazardous if maintenance is neglected. Therefore, maintenance facilities, trained personnel, and procedures shall be provided. Such facilities may be on or off the premises. 7.2.4 Properly ventilate work area, vent exhaust fumes, and keep shop clean and dry.				
12.5.1.b	Maintenance: Maintenance Procedures. Before maintenance, adjustments, repairs, and replacements are made, the following safety precautions shall be taken: When lifting trucks for repair, trucks shall be lifted in a safe, secure, stable manner. The drive wheels will be raised free of the floor or the battery will be disconnected.	1910.178(q)(4) Trucks in need of repairs to the electrical system shall have the battery disconnected prior to such repairs.	ANSI/ITSDF B56.1-2005: 6.2.2 Before starting inspection and repair of truck (a) raise drive wheels free of floor or disconnect battery and use chocks or other positive truck-positioning devices. (b) block load-engaging means, innermast(s), or chassis before working on them. B56.6-2005: Not covered.				
12.5.1.c	Maintenance: Maintenance Procedures. Before maintenance, adjustments, repairs, and replacements are made, the following safety precautions shall be taken: Chocks or other positive truck positioning devices will be used.	Not covered in OSHA 1910.178	ANSI/ITSDF B56.1-2005: See above ANSI/ITSDF B56.1-2005: 7.2.1 Before starting inspection and repair of a rough terrain forklift truck: (a) use chocks or other positive truck-positioning devices;				
12.5.1.h	Maintenance: Maintenance Procedures. Before maintenance, adjustments, repairs, and replacements are made, the following safety precautions shall be taken: The charger connector shall be plugged only into the battery connector and never into the truck connector.	1910.178(q)(4) Trucks in need of repairs to the electrical system shall have the battery disconnected prior to such repairs.	ANSI/ITSDF B56.1-2005: 6.2.2 Before starting inspection and repair of truck (f) the charger connector shall be plugged only into the battery connector and never into the truck connector. ANSI/ITSDF B56.1-2005: Not covered.				
12.5.2	Maintenance: Adjustments. Based upon the manufacturers documentation and/or experience gained, adjustments shall be made to ensure that all powered industrial trucks function properly, paying particular attention to: (Requirement 41867)		Not covered in B56.1-2005 or B56.6-2005				

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12.5.3.a	Maintenance: Repair/Replacement: Modifications and additions that affect truck capacity (to include addition of counterweight) and safe truck operation shall not be performed without manufacturer approval.	1910.178(a)(4) Modifications and additions which affect capacity and safe operation shall not be performed by the customer or user without manufacturers prior written approval. Capacity, operation, and maintenance instruction plates, tags, or decals shall be changed accordingly.	ANSI/ITSDF B56.1-2005: 6.2.16 Modifications and additions that affect capacity and safe truck operation shall not be performed without manufacturer's prior written approval. Capacity, operation, and maintenance instruction plates, tags, or decals shall be changed accordingly. ANSI/ITSDF B56.1-2005: 5.2 Modifications, Nameplates, Markings, and Capacity 5.2.1 Except as provided in 5.2.2, no modifications or alterations to a rough terrain forklift truck, which may affect the capacity, stability, or safe operations of the truck, shall be made without the prior written approval of the original truck manufacturer or its successor thereof. When the truck manufacturer or its successor approve a modification or alteration, appropriate changes shall be made to capacity plates, decals, tags, and operation and maintenance manuals.				
12.5.3.b	Maintenance: Repair/Replacement: Replacement parts, including tires, shall be interchangeable with the original parts and of a quality at least equal to that provided in the original equipment. (Requirement 41876)	1910.178(q)(5) All parts of any such industrial truck requiring replacement shall be replaced only by parts equivalent as to safety with those used in the original design.	ANSI/ITSDF B56.1-2005: 6.2.17 Care shall be taken to ensure that all replacement parts, including tires, are interchangeable with the original parts and of a quality at least equal to that provided in the original equipment. Parts, including tires, are to be installed per manufacturer's procedures. ANSI/ITSDF B56.1-2005: 7.2.13 Care shall be taken to ensure that all replacement parts, including tires, are interchangeable with the original parts and of a quality at least equal to that provided in the original equipment. Parts, including tires, are to be installed using all safety and applicable installation procedures.				
12.5.3.d	Maintenance: Repair/Replacement: No repairs shall be made in Class I, II, and III locations (ref. OSHA 1910.178).	1910.178(c)(2)(iv) Power-operated industrial trucks designated as DY, EE, or EX may be used in locations where volatile flammable liquids or flammable gases are handled, processed or used, but in which the hazardous liquids, vapors or gases will normally be confined within closed containers or closed systems from which they can escape only in case of accidental rupture or breakdown of such containers or systems, or in the case of abnormal operation of equipment; also in locations in which hazardous concentrations of gases or vapors are normally prevented by positive mechanical ventilation but which might become hazardous through failure or abnormal operation of the ventilating equipment; or in locations which are adjacent to Class I, Division 1 locations, and to which hazardous concentrations of gases or vapors might occasionally be communicated unless such communication is prevented by adequate positivepressure ventilation from a source of clear air, and effective safeguards against ventilation failure are provided. TABLE N-1. -- SUMMARY TABLE ON USE OF INDUSTRIAL TRUCKS IN VARIOUS LOCATIONS	B56.1-2005: 5.2.19 In areas classified as hazardous, use only trucks approved for use in those areas. B56.6-2005: 6.2.16 In areas classified as hazardous, use only rough terrain forklift trucks approved for use in those areas.				
12.5.3.e	Maintenance: Repair/Replacement: Replacement batteries shall be of the service weight that falls within the minimum/maximum range specified on the truck nameplate by the truck manufacturer. (Requirement 41879)	1910.178(q)(5) All parts of any such industrial truck requiring replacement shall be replaced only by parts equivalent as to safety with those used in the original design.	ANSI/ITSDF B56.1-2005: 6.2.19 When changing batteries on battery-electric trucks, replacement batteries shall be of the service weight that falls within the minimum/maximum range specified on the truck nameplate by the truck manufacturer. B56.6-2005: See requirement 41876 above.				

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12.6(1)	<p>Personnel Certification. Only certified (licensed) and trained operators shall be authorized to operate powered industrial trucks.</p>	<p>1910.178(l)(6) Certification. The employer shall certify that each operator has been trained and evaluated as required by this paragraph (l). The certification shall include the name of the operator, the date of the training, the date of the evaluation, and the identity of the person(s) performing the training or evaluation.</p>	<p>ANSI/ITSDF B56.1-2005: 4.18 Operator Qualifications Only trained and authorized persons shall be permitted to operate a powered industrial truck. Operators of powered industrial trucks shall be qualified as to visual, auditory, physical, and mental ability to operate the equipment safely according to para. 4.19 and all other applicable parts of para. 4.</p> <p>B56.6-2005: 5.17 Operator Training 5.17.1 The user shall ensure that operators understand that the safe operation is the operator's responsibility. The user shall ensure that operators are knowledgeable of, and observe, the safety rules and practices in paras. 6.1, 6.2, 6.3, 6.4, and 6.5. 5.17.2 An effective operator training program should center around user company's policies, operating conditions, and rough terrain forklift trucks. The program should be presented completely to all new operators and not be condensed for those claiming previous experience. 5.17.4 An operator training program should consist of: (a) careful selection of the operator, considering physical qualifications, job attitude, and aptitude; (b) emphasis on safety of stock, equipment, operator, and other personnel; (c) citing of rules and why they were formulated; (d) basic fundamentals of rough terrain forklift truck and component design as related to safety, e.g., in.-lb (N · m) loading, mechanical limitations, center of gravity, stability, etc.; (e) introduction to equipment, control locations, and functions. Explain how they work when used properly and problems when used improperly. (f) supervised practice on operating course remote from normal activity and designed to simulate actual operations, e.g., lumber stacking, elevating shingles to the roof, etc.; (g) oral, written, and operational performance tests and evaluations during and at completion of the course; (h) refresher courses, which may be condensed versions of the primary course, and periodic, "on job" operator evaluation; (i) understanding of nameplate data and operator instructions and warning information appearing on the</p>				
12.6(2)	<p>Personnel Certification: A training, examination, and licensing program shall be established or made available.</p>	<p>See above.</p>	<p>ANSI/ITSDF B56.1-2005: 4.19 Operator Training 4.19.1 Personnel who have not been trained to operate powered industrial trucks may operate a truck for the purposes of training only, and only under the direct supervision of the trainer. This training should be conducted in an area away from other trucks, obstacles, and pedestrians. 4.19.2 The operator training program should include the user's policies for the site where the trainee will operate the truck, the operating conditions for that location, and the specific truck the trainee will operate. The training program shall be presented to all new operators regardless of previous experience. 4.19.3 The training program shall inform the trainee of the following: B56.6-2005: See above</p>				
12.6(3)	<p>Personnel Certification: For those NASA installations that do not have a training program, all powered industrial truck operators shall be trained and certified by a recognized certification organization that normally performs this function. The basic certification program will include the following: (Requirement 41882)</p>	<p>See above.</p>	<p>ANSI/ITSDF B56.1-2005: See above B56.6-2005: See above</p>				

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12.6.1.a	Personnel Certification: The basic certification program will include the following: Training: Classroom training in safety, lifting equipment emergency procedures, general performance standards, requirements, pre-operational checks, and safety-related defects and symptoms (for initial certification and as needed).	1910.178(l)(2)(ii) Training shall consist of a combination of formal instruction (e.g., lecture, discussion, interactive computer learning, video tape, written material), practical training (demonstrations performed by the trainer and practical exercises performed by the trainee), and evaluation of the operator's performance in the workplace. 1910.178(l)(3)(i)(J) Any vehicle inspection and maintenance that the operator will be required to perform;	ANSI/ITSDF B56.1-2005: See above B56.6-2005: See above				
12.6.1.b	Personnel Certification: The basic certification program will include the following: Training: Hands-on training (for initial certification and as needed).	See above.	ANSI/ITSDF B56.1-2005: See above B56.6-2005: See above				
12.6.1.c	Personnel Certification: The basic certification program will include the following: Training: An annual review of items listed in paragraphs 12.6.1a and 12.6.1.b above. (This may be conducted informally by local supervisory personnel.)	Not covered in OSHA 1910.178	ANSI/ITSDF B56.1-2005: 4.19.5 Testing, Retraining, and Enforcement (b) Operators shall be retrained when new equipment is introduced, existing equipment is modified, operating conditions are changed, or an operator's performance is unsatisfactory. B56.6-2005: 5.17.4 An operator training program should consist of: (h) refresher courses, which may be condensed versions of the primary course, and periodic, "on job" operator evaluation;				
12.6.2.a	Personnel Certification: The basic certification program will include the following: Examination: Physical examination (criteria to be determined by the cognizant medical official and should comply with ASME B56.1).	Not covered in OSHA 1910.178	ANSI/ITSDF B56.1-2005: pg. vii, It is therefore essential to have competent and careful operators, physically and mentally fit, and thoroughly trained in the safe operation of the equipment and the handling of the loads. 4.18 Operator Qualifications Only trained and authorized persons shall be permitted to operate a powered industrial truck. Operators of powered industrial trucks shall be qualified as to visual, auditory, physical, and mental ability to operate the equipment safely according to para. 4.19 and all other applicable parts of para. 4. B56.6-2005: 5.16 Operator Qualifications 5.16.1 Only trained and authorized persons shall be permitted to operate a rough terrain forklift truck. Operators of rough terrain forklift trucks shall be qualified as to visual, auditory, physical, and mental ability to operate the equipment safely according to para. 5.17 and all other applicable parts of Section 5. 5.17.4 An operator training program should consist of: (a) careful selection of the operator, considering physical qualifications, job attitude, and aptitude;				
12.6.2.b	Personnel Certification: The basic certification program will include the following: Examination: Written/oral examination.	1910.178(l)(2)(ii) Training shall consist of a combination of formal instruction (e.g., lecture, discussion, interactive computer learning, video tape, written material), practical training (demonstrations performed by the trainer and practical exercises performed by the trainee), and evaluation of the operator's performance in the workplace.	ANSI/ITSDF B56.1-2005: 4.19.5 Testing, Retraining, and Enforcement (a) During training, performance and oral and/or written tests shall be given by the employer to measure the skill and knowledge of the operator in meeting the requirements of the Standard. B56.6-2005: 5.17.4 An operator training program should consist of: (g) oral, written, and operational performance tests and evaluations during and at completion of the course;				
12.6.2.c	Personnel Certification: The basic certification program will include the following: Examination: Operational demonstration.	See above.	ANSI/ITSDF B56.1-2005: 4.19.4 (3) training practice shall include the actual operation or simulated performance of all operating tasks such as load handling, maneuvering, traveling, stopping, starting, and other activities under the conditions that will be encountered in the use of the truck. B56.6-2005: See above				

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12.6.2.d	Personnel Certification: The basic certification program will include the following: Examination: Proficiency examination for recertification.	1910.178(l)(4) Refresher training and evaluation. 1910.178(l)(4)(i) Refresher training, including an evaluation of the effectiveness of that training, shall be conducted as required by paragraph (l)(4)(ii) to ensure that the operator has the knowledge and skills needed to operate the powered industrial truck safely.	Not covered in B56.1-2005 or B56.6-2005				
12.6.3(1)	Personnel Certification: Licensing. An organizational element shall be designated to issue operator licenses/certifications.	1910.178(l)(6) Certification. The employer shall certify that each operator has been trained and evaluated as required by this paragraph (l). The certification shall include the name of the operator, the date of the training, the date of the evaluation, and the identity of the person(s) performing the training or evaluation.	Not covered in B56.1-2005 or B56.6-2005				
12.6.3(2)	Personnel Certification: Licensing: Provisions shall be made to revoke licenses/certifications for negligence, violations of safety requirements, or failure to meet medical standards.	1910.178(l)(4)(ii) Refresher training in relevant topics shall be provided to the operator when: 1910.178(l)(4)(ii)(A) The operator has been observed to operate the vehicle in an unsafe manner; 1910.178(l)(4)(ii)(B) The operator has been involved in an accident or near-miss incident; 1910.178(l)(4)(ii)(C) The operator has received an evaluation that reveals that the operator is not operating the truck safely;	Not covered in B56.1-2005 or B56.6-2005				
12.6.3(3)	Personnel Certification: Licensing: Provisions shall be made for periodic checks of operators to verify they have licenses in their possession.	Not covered in OSHA 1910.178	Not covered in B56.1-2005 or B56.6-2005				
12.6.3(4)	Personnel Certification: Licensing: The licenses shall indicate the type of powered industrial truck the holder is qualified to operate. Alternately, the organizational element may elect to maintain a master list of licensed operators instead of issuing individual licenses, providing copies of the list are readily available to assurance and supervisory personnel at the work site. (Requirement 41895)	1910.178(l)(3) Training program content. Powered industrial truck operators shall receive initial training in the following topics, except in topics which the employer can demonstrate are not applicable to safe operation of the truck in the employer's workplace. 1910.178(l)(3)(i) Truck-related topics: 1910.178(l)(3)(i)(A) Operating instructions, warnings, and precautions for the types of truck the operator will be authorized to operate;	Not covered in B56.1-2005 or B56.6-2005				
12.6.4(1)	Personnel Certification: Renewal. Licenses or certifications will expire every 3 years. (Requirement 41896)	1910.178(l)(4)(iii) An evaluation of each powered industrial truck operator's performance shall be conducted at least once every three years.	Not covered in B56.1-2005 or B56.6-2005				
12.6.4(2)	Personnel Certification: Renewal: Renewal shall require demonstration of proficiency or approval of supervision that proficiency is adequate and current. Renewal procedures will be established by each licensing organization, but as a minimum, will include items in paragraphs 12.6.1 and 12.6.2. Renewal or refresher training will be provided to operators within the three year certificaion period when: (Requirement 41897)	1910.178(l)(4) Refresher training and evaluation. 1910.178(l)(4)(i) Refresher training, including an evaluation of the effectiveness of that training, shall be conducted as required by paragraph (l)(4)(ii) to ensure that the operator has the knowledge and skills needed to operate the powered industrial truck safely.	Not covered in B56.1-2005 or B56.6-2005				
12.7.1(1)	Operations: Powered industrial trucks shall be operated according to this section, the manufacturers' recommendations, and ASME B56.1.		B56.1-2005: 7.2 Operating Instructions 7.2.1 The manufacturer shall provide instructions covering the operation of the specific type of truck. B56.6-2005: 8.2 Operating Instructions The manufacturer shall provide an operator's manual covering the operation of the specific type of rough terrain forklift truck. A location to store manual(s) shall be provided on the truck.				
12.7.1(2)	Operations: The following practices shall be followed for powered industrial truck operations: (Requirement 41905)		Not covered in B56.1-2005 or B56.6-2005				

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12.7.1.a	Operations: The following practices shall be followed for powered industrial truck operations: General operating procedures describing powered industrial truck operations, emergency steps, communication requirements, and special requirements including checklists and inspection requirements shall be prepared, approved and followed for each area powered industrial truck operations are performed and shall include each type of truck. There must be a formal system for review approval, and update to maintain valid operating procedures.	Not covered in OSHA 1910.178	Not covered in B56.1-2005 or B56.6-2005				
12.7.1.aa	Operations: The following practices shall be followed for powered industrial truck operations: Industrial trucks shall not be parked where they block access to fire aisles, stairways, or fire equipment. (Requirement 41907)	1910.178(m)(14) Fire aisles, access to stairways, and fire equipment shall be kept clear.	ANSI/ITSDF B56.1-2005: 5.2.22 Do not block access to fire aisles, stairways, or fire equipment. B56.6-2005: 6.2.19 Do not block access to fire aisles, stairways, or fire equipment.				
12.7.1.ab	Operations: The following practices shall be followed for powered industrial truck operations: Motorized hand trucks shall not be ridden unless they are of the hand/rider design.	Not covered in OSHA 1910.178	ANSI/ITSDF B56.1-2005: 5.2.23 Motorized hand trucks shall not be ridden unless they are of the hand/rider design. B56.6-2005: Not covered.				
12.7.1.ac.10	Operations: The following practices shall be followed for powered industrial truck operations: Whenever a truck is used to lift personnel and there are no controls that are elevatable with the lifting carriage or forks: Restraining means such as rails or chains shall be in place and personnel on the platform shall wear a body harness and lanyard or retractable safety device.	Not covered in OSHA 1910.178	ANSI/ITSDF B56.1-2005: 4.17 Elevating Personnel 4.17.1 Only operator-up high lift trucks have been designed to lift personnel. If a work platform is used on trucks designed and intended for handling materials, the requirements of paras. 4.17.2 and 4.17.3 shall be met for the protection of personnel. 4.17.2 Whenever a truck is used to elevate personnel, the following precautions for the protection of personnel shall be taken: (a) Comply with the design requirements in para. 7.36 of this Standard. (b) Provide protection for personnel in their normal working position on the platform from moving parts of the truck that represent a hazard. (c) Be certain that required restraining means such as railings, chains, cable, body belt(s) with lanyard(s), or deceleration devices, etc., are in place and properly used. (d) Be certain that the lifting mechanism is operating smoothly throughout its entire lift height, both empty and loaded, and that all lift limiting devices and latches, if provided, are functional. (e) Provide overhead protection as indicated to be necessary by the operating conditions. (f) Replace any body belt, lanyard, or deceleration device that has sustained permanent deformation or is otherwise damaged. B56.6-2005: 5.15 Elevating Personnel 5.15.1 A rough terrain forklift truck shall not be used to lift people unless there is no other practical option. If a rough terrain forklift truck must be used to lift people, the following precautions for the protection				
12.7.1.ac.11	Operations: The following practices shall be followed for powered industrial truck operations: Whenever a truck is used to lift personnel and there are no controls that are elevatable with the lifting carriage or forks: Personnel on the platform shall be certified in Fall Protection.	Not covered in OSHA 1910.178	ANSI/ITSDF B56.1-2005: 4.17 Elevating Personnel, Body belts required but certification or training not covered. EL B56.6-2005: Body belts required but not certification in fall protection. EL				
12.7.1.ad	Operations: The following practices shall be followed for powered industrial truck operations: Whenever a truck is used to lift personnel and there are no controls that are elevatable with the lifting carriage or forks: While refueling, the engine shall be stopped and the operator shall not be on the truck. (Requirement 41921)	Not covered in OSHA 1910.178	ANSI/ITSDF B56.1-2005: 5.5.4 The engine shall be stopped, and the operator shall not be on the truck while refueling. B56.6-2005: 6.5.4 When refueling, smoking in the area shall not be permitted, the engine shall be stopped, and the operator shall not be on the rough terrain forklift truck.				
12.7.1.ae	Operations: The following practices shall be followed for powered industrial truck operations: Whenever a truck is used to lift personnel and there are no controls that are elevatable with the lifting carriage or forks: Spillage of oil or fuel shall be carefully and completely absorbed or evaporated and fuel tank cap replaced before restarting engine.	Not covered in OSHA 1910.178	ANSI/ITSDF B56.1-2005: 5.5.5 Spillage of oil or fuel shall be carefully and completely absorbed or evaporated and fuel tank cap replaced before restarting engine. B56.6-2005: 6.5.5 Spillage of oil or fuel shall be carefully and completely absorbed or evaporated and fuel tank cap replaced before restarting engine.				

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12.7.1.af	Operations: The following practices shall be followed for powered industrial truck operations: Whenever a truck is used to lift personnel and there are no controls that are elevatable with the lifting carriage or forks: Open flames shall not be used to check electrolyte levels in storage batteries, liquid level in fuel tanks, or the condition of LPG fuel lines and connectors.	Not covered in OSHA 1910.178	ANSI/ITSDF B56.1-2005: 6.2.4 Avoid fire hazards and have fire protection equipment present in the work area. Do not use an open flame to check the level or to check for leakage of any fluid, especially fuel and battery electrolyte. Do not use open pans of fuel or flammable cleaning fluids for cleaning parts. B56.6-2005: 6.5.6 Do not use open flames when checking electrolyte level in storage batteries, liquid level in fuel tanks, or the condition of LPG fuel lines and connectors.				
12.7.1.b(1)	Operations: The following practices shall be followed for powered industrial truck operations: Operations shall be analyzed for hazards.	Not covered in OSHA 1910.178	Not covered in B56.1-2005 or B56.6-2005				
12.7.1.b(2)	Operations: The following practices shall be followed for powered industrial truck operations: The analysis shall consider the environment in which the operation occurs, hazards associated with lift truck maintenance, and, in general, a systems safety analysis of the equipment, facility, load, and interfaces as a whole in support of the lift truck operation.	Not covered in OSHA 1910.178	Not covered in B56.1-2005 or B56.6-2005				
12.7.1.c(1)	Operations: The following practices shall be followed for powered industrial truck operations: Before each operation or series of operations, the operator shall perform a pre-operational check to demonstrate operational readiness of the truck. If controls do not operate properly, the operator is responsible for notifying the supervisor. (Requirement 41926)	1910.178(l)(3) Training program content. Powered industrial truck operators shall receive initial training in the following topics, except in topics which the employer can demonstrate are not applicable to safe operation of the truck in the employer's workplace. 1910.178(l)(3)(i)(J) Any vehicle inspection and maintenance that the operator will be required to perform;	B56.1-2005: 5.5 Operator Care of the Truck 5.5.1 At the beginning of each shift and before operating the truck, check its condition, giving special attention to the following: (a) condition of tires (b) if pneumatic tires, check inflation pressures (c) warning and safety devices (d) lights (e) battery (f) controls (g) lift and tilt systems (h) load-engaging means (i) chains and cables (j) limit switches (k) brakes (l) steering mechanism, etc. B56.6-2005: 6.5 Operator Care of the Rough Terrain Forklift Truck 6.5.1 At the beginning of each shift and before operating the rough terrain forklift truck, check its condition, giving special attention to the following: (a) tires and their inflation pressure (b) warning devices (c) lights (d) lift and tilt systems, load-engaging means, chains, cables, and limit switches (e) brakes (f) steering mechanism (g) fuel system, etc.				
12.7.1.c(2)	Operations: The following practices shall be followed for powered industrial truck operations: Repairs and adjustments shall be made before operations begin. (Requirement 41927)	1910.178(q)(1) Any power-operated industrial truck not in safe operating condition shall be removed from service. All repairs shall be made by authorized personnel.	Not covered in B56.1-2005 or B56.6-2005				
12.7.1.d(1)	Operations: The following practices shall be followed for powered industrial truck operations: Before each use, the operator shall survey the area for applicable hazards such as overhead obstructions, debris, bumps and loose obstructions, drop-offs and holes, ditches, obstructed path of travel, unstable ground, and other possible hazardous conditions.	1910.178(m)(8) There shall be sufficient headroom under overhead installations, lights, pipes, sprinkler system, etc.	B56.1-2005: 4.4.2 Some of the conditions that may affect stability are: ground and floor conditions, grade, speed, loading (trucks equipped with attachments behave as partially loaded trucks even when operated without a load on the attachment), battery weight, dynamic and static forces, and the judgment exercised by the operator. 5.3 Traveling, 5.3.6 Keep a clear view of the path of travel and observe for other traffic, personnel, and safe clearances. 5.3.16 Avoid running over loose objects on the roadway surface. B56.6-2005: 5.15 Elevating Personnel (n) be certain that the path of platform travel is clear of hazards, e.g., storage racks, scaffolds, overhead obstructions, and electrical wires; 6.3.18 Avoid running over loose objects on the roadway surface.				

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12.7.1.d(2)	Operations: The following practices shall be followed for powered industrial truck operations: The operator shall establish appropriate safety zones before initiating operations. (Requirement 41929)	Not covered in OSHA 1910.178	ANSI/ITSDF B56.1-2005: 6.2.3 Operation of the truck to check performance shall be conducted in an authorized area where safe clearance exists. (a) Before starting to operate the truck B56.6-2005: 7.2.2 Operation of the rough terrain forklift truck to check performance shall be conducted in an authorized area where safe clearance exists.				
12.7.1.e	Operations: The following practices shall be followed for powered industrial truck operations: The equipment shall not be loaded beyond its rated load (capacity) except for required testing. (Requirement 41930)	1910.178(o)(2) Only loads within the rated capacity of the truck shall be handled.	Not covered in B56.1-2005 or B56.6-2005				
12.7.1.f(1)	Operations: The following practices shall be followed for powered industrial truck operations: The operator shall ensure the equipment is within inspection and testing intervals by examination of the periodic recertification tags and/or documentation.	1910.178(a)(4) Modifications and additions which affect capacity and safe operation shall not be performed by the customer or user without manufacturers prior written approval. Capacity, operation, and maintenance instruction plates, tags, or decals shall be changed accordingly.	Not covered in B56.1-2005 or B56.6-2005				
12.7.1.f(2)	Operations: The following practices shall be followed for powered industrial truck operations: The operator shall adhere to all tags on the controls. (Requirement 41932)	1910.178(a)(6) The user shall see that all nameplates and markings are in place and are maintained in a legible condition.	ANSI/ITSDF B56.1-2005: 4.2.4 The user shall see that all nameplates and caution and instruction markings are in place and legible. B56.6-2005: 6.1.3 The operator shall be familiar with the operation and function of all controls and instruments before undertaking to operate the rough terrain forklift truck.				
12.7.1.g(1)	Operations: The following practices shall be followed for powered industrial truck operations: Operator discipline shall be maintained at all times.	1910.178(n)(9) Stunt driving and horseplay shall not be permitted.	ANSI/ITSDF B56.1-2005: 5.3.12 Do not indulge in stunt driving or horseplay. B56.6-2005: 6.3.14 Do not indulge in stunt driving or horseplay.				
12.7.1.g(2)	Operations: The following practices shall be followed for powered industrial truck operations: There shall be no eating, drinking, or rowdiness during powered industrial truck operations.	1910.178(n)(9) Stunt driving and horseplay shall not be permitted.	See above.				
12.7.1.h	Operations: The following practices shall be followed for powered industrial truck operations: Operators shall keep all parts of the body inside the operator compartment during operations.	Not covered in OSHA 1910.178	ANSI/ITSDF B56.1-2005: 5.2.3 Keep hands and feet inside the operator's compartment. Do not put any part of the body outside the operator compartment of the truck. B56.6-2005: 6.2.3 Keep hands and feet inside the operator's designated area or compartment. Do not put any part of the body outside the operator compartment of the rough terrain forklift truck.				
12.7.1.k	Operations: The following practices shall be followed for powered industrial truck operations: Trucks shall not be driven up to anyone standing in front of an object.	1910.178(m)(1) Trucks shall not be driven up to anyone standing in front of a bench or other fixed object.	ANSI/ITSDF B56.1-2005: 5.2.6 Understand truck limitations and operate the truck in a safe manner so as not to cause injury to personnel. Safeguard pedestrians at all times. (a) Do not drive a truck up to anyone standing in front of an object. B56.6-2005: 6.2.6 Understand rough terrain forklift truck limitations and operate the truck in a safe manner so as not to cause injury to personnel. Safeguard pedestrians at all times. Do not drive a rough terrain forklift truck up to anyone standing in front of an object. Exercise particular care during backing and other operations where pedestrians may step into the path of travel of the truck.				
12.7.1.L	Operations: The following practices shall be followed for powered industrial truck operations: Operators shall ensure other personnel are not in the swing radius prior to performing turning maneuvers.	Not covered in OSHA 1910.178	ANSI/ITSDF B56.1-2005: 5.2.6 Understand truck limitations and operate the truck in a safe manner so as not to cause injury to personnel. Safeguard pedestrians at all times. (b) Ensure that personnel stand clear of the rear swing area before conducting turning maneuvers. B56.6-2005: See above				

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12.7.1.m	Operations: The following practices shall be followed for powered industrial truck operations: Operators shall sound the horn when approaching cross aisles, doorways and other locations where pedestrians may step into the path of truck travel.	1910.178(n)(4) The driver shall be required to slow down and sound the horn at cross aisles and other locations where vision is obstructed. If the load being carried obstructs forward view, the driver shall be required to travel with the load trailing.	ANSI/ITSDF B56.1-2005: 5.2.6 Understand truck limitations and operate the truck in a safe manner so as not to cause injury to personnel. Safeguard pedestrians at all times. (c) Exercise particular care at cross aisles, doorways, and other locations where pedestrians may step into the path of travel of the truck. 5.3.4 Slow down and sound the audible warning device(s) at cross aisles and other locations where vision is obstructed. B56.6-2005: 6.3.6 Slow down and sound the audible warning device(s) at cross aisles and other locations where vision is obstructed.				
12.7.1.o(1)	Operations: The following practices shall be followed for powered industrial truck operations: Unauthorized personnel shall not be permitted to ride on powered industrial trucks.	1910.178(m)(3) Unauthorized personnel shall not be permitted to ride on powered industrial trucks. A safe place to ride shall be provided where riding of trucks is authorized.	ANSI/ITSDF B56.1-2005: 5.2.8 Do not permit passengers to ride on powered industrial trucks unless a safe place to ride has been provided by the manufacturer. B56.6-2005: 6.2.8 Do not permit passengers to ride on rough terrain forklift trucks unless a safe place has been provided by the manufacturer that complies with para. 8.27. The passenger shall:....				
12.7.1.o(2)	Operations: The following practices shall be followed for powered industrial truck operations: A safe place to ride shall be provided where riding of trucks is authorized.	1910.178(m)(3) Unauthorized personnel shall not be permitted to ride on powered industrial trucks. A safe place to ride shall be provided where riding of trucks is authorized.	ANSI/ITSDF B56.1-2005: 5.2.8 Do not permit passengers to ride on powered industrial trucks unless a safe place to ride has been provided by the manufacturer.. B56.6-2005: 6.2.8 Do not permit passengers to ride on rough terrain forklift trucks unless a safe place has been provided by the manufacturer that complies with para. 8.27. The passenger shall:....				
12.7.1.r	Operations: The following practices shall be followed for powered industrial truck operations: Before leaving the operator's position or dismounting from the truck, while still attending the truck, the operator shall: (Requirement 41946)		ANSI/ITSDF B56.1-2005:				
12.7.1.s	Operations: The following practices shall be followed for powered industrial truck operations: The operator shall maintain a safe distance from the edge of ramps, platforms and other similar working surfaces.	1910.178(m)(6) A safe distance shall be maintained from the edge of ramps or platforms while on any elevated dock, or platform or freight car. Trucks shall not be used for opening or closing freight doors.	ANSI/ITSDF B56.1-2005: 5.2.12 Maintain a safe distance from the edge of ramps, platforms, and other similar working surfaces. B56.6-2005: 5.12.4 Maintain a safe distance from the edge of ramps, platforms, or other similar working surfaces.				
12.7.1.t	Operations: The following practices shall be followed for powered industrial truck operations: When powered industrial trucks are driven on and off highway trucks or trailers, the brakes on the highway trucks or trailers shall be applied and wheels chocked or other positive mechanical means shall be used to prevent unintentional truck or trailer movement. Fixed jacks should be placed under trailers not coupled to a tractor.	1910.178(k)(1) The brakes of highway trucks shall be set and wheel chocks placed under therear wheels to prevent the trucks from rolling while they are boarded with powered industrial trucks.	ANSI/ITSDF B56.1-2005: 5.2.14 When powered industrial trucks are driven on and off highway trucks or trailers, the brakes on the highway trucks or trailers shall be applied and wheel chocks or other positive mechanical means shall be used to prevent unintentional movement of highway trucks and trailers. Whenever powered industrial trucks are driven on and off semitrailers that are not coupled to a tractor, supports may be needed to prevent upending or corner dipping. B56.6-2005: 5.12 Rough Terrain Forklift Trucks and Railroad Cars 5.12.1 When rough terrain forklift trucks are driven on and off road trucks or trailers during the loading and unloading operation, the brakes on the road trucks and trailers shall be applied and wheel chock(s), or positive mechanical restraints which provide the equivalent protection of wheel chocks, shall be engaged.				

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12.7.1.u(1)	Operations: The following practices shall be followed for powered industrial truck operations: Provision shall be made to prevent railroad cars from being moved during loading and unloading.	1910.178(k)(2) Wheel stops or other recognized positive protection shall be provided to prevent railroad cars from moving during loading or unloading operations.	ANSI/ITSDF B56.1-2005: 5.2.15 Provision shall be made to prevent railroad cars from being moved during loading and unloading. Wheel stops, hand brakes, or other recognized positive means shall be used to prevent movement of railroad cars during loading and unloading. B56.6-2005: 5.12.2 Provision shall be made to prevent railroad cars from being moved during loading and unloading. Wheel stops, hand brakes, or other recognized positive means shall be used to prevent movement during loading and unloading.				
12.7.1.u(2)	Operations: The following practices shall be followed for powered industrial truck operations: Wheel stops, hand brakes, or other recognized positive means shall be used to prevent movement of the railroad cars.	See above.	ANSI/ITSDF B56.1-2005: See above B56.6-2005: See above				
12.7.1.v	Operations: The following practices shall be followed for powered industrial truck operations: Operators shall verify sufficient headroom under overhead installations, lights, wiring, pipes, sprinkler systems, or other.	1910.178(m)(8) There shall be sufficient headroom under overhead installations, lights, pipes, sprinkler system, etc.	ANSI/ITSDF B56.1-2005: 5.2.16 Care shall be taken not to contact overhead installations such as lights, wiring, pipes, sprinkler systems, etc. B56.6-2005: 5.15 Elevating Personnel 5.15.1 A rough terrain forklift truck shall not be used to lift people unless there is no other practical option. If a rough terrain forklift truck must be used to lift people, the following precautions for the protection of personnel shall be taken: (n) be certain that the path of platform travel is clear of hazards, e.g., storage racks, scaffolds, overhead obstructions, and electrical wires;				
12.7.1.w	Operations: The following practices shall be followed for powered industrial truck operations: An overhead guard shall be used to protect against falling objects. (Requirement 41958)	1910.178(m)(9) An overhead guard shall be used as protection against falling objects. It should be noted that an overhead guard is intended to offer protection from the impact of small packages, boxes, bagged material, etc., representative of the job application, but not to withstand the impact of a falling capacity load.	ANSI/ITSDF B56.1-2005: 5.2.17 An overhead guard shall be used on all high lift rider trucks as protection against falling objects, unless all of the following conditions are met: B56.6-2005: 8.16 Overhead Guards 8.16.1 Rough terrain forklift trucks shall be fitted with an overhead guard. 8.16.2 Design Requirements <i>Numerous design and test requirements are listed. EL</i>				
12.7.1.x	Operations: The following practices shall be followed for powered industrial truck operations: A load backrest shall be used whenever necessary to minimize the possibility of the load or part of it from falling rearward.	1910.178(m)(10) A load backrest extension shall be used whenever necessary to minimize the possibility of the load or part of it from falling rearward.	ANSI/ITSDF B56.1-2005: 5.2.18 A load backrest extension shall be used when necessary to guard against a load, or part of it, from falling toward the operator. B56.6-2005: 8.17 Load Backrest Extension Load backrest extension, if provided, should have height, width, and size of openings not to exceed 6 in. (150 mm) in one of the two dimensions, to minimize the possibility of the load falling toward the operator.				
12.7.1.y	Operations: The following practices shall be followed for powered industrial truck operations: Only approved industrial trucks shall be used in areas classified as hazardous locations.	1910.178(m)(11) Only approved industrial trucks shall be used in hazardous locations.	ANSI/ITSDF B56.1-2005: 5.2.19 In areas classified as hazardous, use only trucks approved for use in those areas. B56.6-2005: 5.6 Hazardous Locations 5.6.1 It shall be the responsibility of the user to determine the hazard classification of any particular atmosphere or location according to ANSI/NFPA 505. 5.6.2 Rough terrain forklift trucks operated in hazardous areas shall be approved and of the type required by ANSI/NFPA 505. 5.6.2.1 Depending on the proposed type of rough terrain forklift truck and area, approved trucks shall be built in compliance with UL 558. 5.6.2.2 Rough terrain forklift trucks and areas of use shall be marked in accordance with ANSI/ NFPA 505.				
12.7.1.z	Operations: The following practices shall be followed for powered industrial truck operations: All accidents involving personnel, building structures, and equipment shall be reported to the supervisor. (Requirement 41961)	Not covered in OSHA 1910.178	ANSI/ITSDF B56.1-2005: 5.2.20 Report all accidents involving personnel, building structures, and equipment to the supervisor or as directed. B56.6-2005: 6.2.17 Report all accidents involving personnel, building structures, and equipment to the supervisor or as directed.				

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12.7.2.a	Operations: Traveling of Powered Industrial Trucks: Truck operators shall observe all traffic regulations including posted speed limits.	1910.178(n)(1) All traffic regulations shall be observed, including authorized plant speed limits. A safe distance shall be maintained approximately three truck lengths from the truck ahead, and the truck shall be kept under control at all times.	ANSI/ITSDF B56.1-2005: 5.3 Traveling 5.3.1 Observe all traffic regulations including authorized plant speed limits. Under normal traffic conditions, keep to the right. Maintain a safe distance, based on speed of travel, from the truck ahead; and keep the truck under control at all times. B56.6-2005: 6.3.3 Observe all traffic regulations including authorized speed limits. Under normal traffic conditions, keep to the right. Maintain a safe distance, based on speed of travel, from the truck ahead; and keep the truck under control at all times.				
12.7.2.b	Operations: Traveling of Powered Industrial Trucks: Truck operators shall yield the right of way to pedestrians and emergency vehicles such as ambulances and fire trucks.	1910.178(n)(2) The right of way shall be yielded to ambulances, fire trucks, or other vehicles in emergency situations.	ANSI/ITSDF B56.1-2005: 5.3.2 Yield the right of way to pedestrians and emergency vehicles such as ambulances and fire trucks. B56.6-2005: 6.3.4 Yield the right of way to pedestrians and emergency vehicles such as ambulances and fire trucks.				
12.7.2.c	Operations: Traveling of Powered Industrial Trucks: Truck operators shall not pass another truck traveling in the same direction at intersections, blind spots, or other dangerous locations.	1910.178(n)(3) Other trucks traveling in the same direction at intersections, blind spots, or other dangerous locations shall not be passed.	ANSI/ITSDF B56.1-2005: 5.3.3 Do not pass another truck traveling in the same direction at intersections, blind spots, or at other dangerous locations. B56.6-2005: 6.3.5 Do not pass another truck traveling in the same direction at intersections, blind spots, or at other dangerous locations.				
12.7.2.d	Operations: Traveling of Powered Industrial Trucks: Operators shall slow down and sound the horn, or audible warning device, at cross aisles and other locations where their view is obstructed.	1910.178(n)(4) The driver shall be required to slow down and sound the horn at cross aisles and other locations where vision is obstructed. If the load being carried obstructs forward view, the driver shall be required to travel with the load trailing.	ANSI/ITSDF B56.1-2005: 5.3.4 Slow down and sound the audible warning device(s) at cross aisles and other locations where vision is obstructed. B56.6-2005: 6.3.6 Slow down and sound the audible warning device(s) at cross aisles and other locations where vision is obstructed.				
12.7.2.e	Operations: Traveling of Powered Industrial Trucks: Railroad tracks will be crossed at an angle and trucks will not be parked closer than 6 feet to the nearest rail of a railroad track.	1910.178(n)(5) Railroad tracks shall be crossed diagonally wherever possible. Parking closer than 8 feet from the center of railroad tracks is prohibited.	ANSI/ITSDF B56.1-2005: 5.3.5 Cross railroad tracks at an angle wherever possible. Do not park closer than 2 m (6 ft) to the nearest rail of a railroad track. B56.6-2005: 6.3.7 Cross railroad tracks at an angle wherever possible. Do not park closer than 6 ft (1.8 m) to the nearest rail of a railroad track.				
12.7.2.f	Operations: Traveling of Powered Industrial Trucks: Truck operators shall keep a clear view of the path of travel and observe for other traffic, personnel, and safe clearances.	1910.178(n)(6) The driver shall be required to look in the direction of, and keep a clear view of the path of travel.	ANSI/ITSDF B56.1-2005: 5.3.6 Keep a clear view of the path of travel and observe for other traffic, personnel, and safe clearances. B56.6-2005: 6.3.8 Keep a clear view of the path of travel and observe for other traffic, personnel, and safe clearances.				
12.7.2.g	Operations: Traveling of Powered Industrial Trucks: If the load being carried obstructs forward travel, the operator will travel with the load trailing.	1910.178(n)(4) The driver shall be required to slow down and sound the horn at cross aisles and other locations where vision is obstructed. If the load being carried obstructs forward view, the driver shall be required to travel with the load trailing.	ANSI/ITSDF B56.1-2005: 7.14.5 Trucks employing a handwheel with the operator facing at a right angle to the normal line of travel shall steer such that when the truck is traveling with load end trailing, clockwise rotation of the handwheel shall steer the truck clockwise. B56.6-2005: 6.3.9 If the load being carried obstructs forward view, travel with the load trailing.				
12.7.2.h	Operations: Traveling of Powered Industrial Trucks: Truck operators shall ascend and descend grades slowly, with caution and by the following operations:	1910.178(n)(7) Grades shall be ascended or descended slowly.	ANSI/ITSDF B56.1-2005: 5.3.8 Ascend or descend grades slowly, and with caution. B56.6-2005: 6.3.10 Ascend or descend grades slowly, and with caution.				
12.7.2.h.1	Operations: Traveling of Powered Industrial Trucks: Truck operators shall ascend and descend grades slowly, with caution and by the following operations: Loaded rider trucks shall be driven with the load upgrade when ascending or descending grades in excess of 5%.	1910.178(n)(7) Grades shall be ascended or descended slowly. 1910.178(n)(7)(i) When ascending or descending grades in excess of 10 percent, loaded trucks shall be driven with the load upgrade.	ANSI/ITSDF B56.1-2005: 5.3.8 Ascend or descend grades slowly, and with caution. (a) When ascending or descending grades in excess of 5%, loading rider trucks shall be driven with the load upgrade. B56.6-2005: 6.3.10 Ascend or descend grades slowly, and with caution. (a) When ascending or descending grades in excess of 5%, loaded rough terrain forklift trucks shall be driven with the load upgrade.				

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12.7.2.h.3	Operations: Traveling of Powered Industrial Trucks: Truck operators shall ascend and descend grades slowly, with caution and by the following operations: On all grades the loads and load engaging means shall be tilted back and raised only as far as necessary to clear the road surface.	1910.178(n)(7)(iii) On all grades the load and load engaging means shall be tilted back if applicable, and raised only as far as necessary to clear the road surface.	ANSI/ITSDF B56.1-2005: 5.3.8 Ascend or descend grades slowly, and with caution. (c) On all grades the load and load-engaging means shall be tilted back, if applicable, and raised only as far as necessary to clear the road surface. B56.6-2005: 6.3.10 Ascend or descend grades slowly, and with caution. (b) Unloaded rough terrain forklift trucks should be operated on all grades with the load-engaging means downgrade. (c) On all grades, the load and load-engaging means shall be tilted back, if applicable, and raised only as far as necessary to clear the road surface.				
12.7.2.i	Operations: Traveling of Powered Industrial Trucks: Trucks shall be operated at a speed that will permit it to be brought to a stop in a safe manner.	1910.178(n)(8) Under all travel conditions the truck shall be operated at a speed that will permit it to be brought to a stop in a safe manner.	ANSI/ITSDF B56.1-2005: 5.3.9 Under all travel conditions, operate the truck at a speed that will permit it to be brought to a stop in a safe manner. B56.6-2005: 6.3.11 Under all travel conditions, operate the rough terrain forklift truck at a speed that will permit it to be brought to a stop in a safe manner.				
12.7.2.j	Operations: Traveling of Powered Industrial Trucks: The truck shall be operated with the load engaging means or load low and where possible tilted back. The load should not be elevated except during stacking.	1910.178(o)(6) Extreme care shall be used when tilting the load forward or backward, particularly when high tiering. Tilting forward with load engaging means elevated shall be prohibited except to pick up a load. An elevated load shall not be tilted forward except when the load is in a deposit position over a rack or stack. When stacking or tiering, only enough backward tilt to stabilize the load shall be used.	ANSI/ITSDF B56.1-2005: 5.3.10 Travel with load-engaging means or load low and, where possible, tilted back. Do not elevate the load except during stacking. This does not apply to trucks that are intended normally to be operated with the load or load-engaging means elevated. B56.6-2005: 6.3.12 Travel with load-engaging means or load low and, where possible, tilted back. Do not elevate the load except during stacking.				
12.7.2.k	Operations: Traveling of Powered Industrial Trucks: Starts, stops, turns, or direction reversals shall be in a smooth manner so as not to shift the load or overturn the truck.	1910.178(n)(15) While negotiating turns, speed shall be reduced to a safe level by means of turning the hand steering wheel in a smooth, sweeping motion. Except when maneuvering at a very low speed, the hand steering wheel shall be turned at a moderate, even rate.	ANSI/ITSDF B56.1-2005: 5.3.11 Make starts, stops, turns, or direction reversals in a smooth manner so as not to shift load and/or overturn the truck. B56.6-2005: 6.3.13 Make starts, stops, turns, or direction reversals in a smooth manner so as not to shift load and/or overturn the rough terrain forklift truck.				
12.7.2.L	Operations: Traveling of Powered Industrial Trucks: Horseplay and stunt driving will not be allowed.	1910.178(n)(9) Stunt driving and horseplay shall not be permitted.	ANSI/ITSDF B56.1-2005: 5.3.12 Do not indulge in stunt driving or horseplay. B56.6-2005: 6.3.14 Do not indulge in stunt driving or horseplay.				
12.7.2.m	Operations: Traveling of Powered Industrial Trucks: Operators will slow down for wet and slippery surfaces.	1910.178(n)(10) The driver shall be required to slow down for wet and slippery floors.	ANSI/ITSDF B56.1-2005: 5.3.13 Slow down for wet and slippery floors. B56.6-2005: 6.3.15 Slow down for wet and slippery floors.				
12.7.2.n	Operations: Traveling of Powered Industrial Trucks: Before driving over a dockboard or bridge plate, operators shall be sure it is properly secure and its rated capacity is not exceeded and shall drive across carefully and slowly.	1910.178(n)(11) Dockboard or bridgeplates, shall be properly secured before they are driven over. Dockboard or bridgeplates shall be driven over carefully and slowly and their rated capacity never exceeded.	ANSI/ITSDF B56.1-2005: 5.3.14 Before driving over a dockboard or bridge plate, be sure that it is properly secured. Drive carefully and slowly across the dockboard or bridge plate, and never exceed its rated capacity. B56.6-2005: 6.3.16 Before driving over a dockboard or bridge plate, be sure that it is properly secured. Drive carefully and slowly across the dockboard or bridge plate, and never exceed its rated capacity.				
12.7.2.o	Operations: Traveling of Powered Industrial Trucks: Operators shall avoid running over loose objects on the roadway surface.	1910.178(n)(14) Running over loose objects on the roadway surface shall be avoided.	ANSI/ITSDF B56.1-2005: 5.3.16 Avoid running over loose objects on the roadway surface. B56.6-2005: 6.3.18 Avoid running over loose objects on the roadway surface.				
12.7.2.p	Operations: Traveling of Powered Industrial Trucks: Operators shall reduce speed to a safe level when negotiating turns and shall reduce speed to be consistent with the environment.	1910.178(n)(15) While negotiating turns, speed shall be reduced to a safe level by means of turning the hand steering wheel in a smooth, sweeping motion. Except when maneuvering at a very low speed, the hand steering wheel shall be turned at a moderate, even rate.	ANSI/ITSDF B56.1-2005: 5.3.17 When negotiating turns, reduce speed to a safe level consistent with the operating environment. B56.6-2005: 6.3.19 When negotiating turns, reduce speed to a safe level, and turn steering handwheel in a smooth, sweeping motion. Except when maneuvering at a very low speed, turn the steering handwheel at a moderate, even rate.				

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12.7.2.q	Operations: Traveling of Powered Industrial Trucks: Seat belts, when provided, shall be used.	Not covered in OSHA 1910.178	Not covered in B56.1-2005 or B56.6-2005 B56.6-2005: 6.2 General 6.2.1 Before starting to operate the rough terrain forklift truck: (a) be in operating position and fasten seat belt, if so equipped; 7.2.2 Operation of the rough terrain forklift truck to check performance shall be conducted in an authorized area where safe clearance exists. (a) Before starting to operate the rough terrain forklift truck: (1) be in operating position and fasten seat belt, if so equipped; 8.25 Seat Belts Seat belts shall be provided that meet or exceed the requirements of ANSI/SAE J386.				
12.7.2.r	Operations: Traveling of Powered Industrial Trucks: The operator should stay with the truck if tipover occurs or if the truck falls off a loading dock or ramp. The operator should hold on firmly and lean away from the point of impact.	Not covered in OSHA 1910.178	ANSI/ITSDF B56.1-2005: 5.3.18... (d) The operator should stay with the truck if lateral or longitudinal tipover occurs. The operator should hold on firmly and lean away from the point of impact. B56.6-2005: Not covered.				
12.7.3.d	Operations: Loading Powered Industrial Trucks: When attachments are used, extra care shall be taken in securing, manipulating, positioning, and transporting the load.	not covered in OSHA 1910.178	ANSI/ITSDF B56.1-2005: 5.4.2 When attachments are used, extra care shall be taken in securing, manipulating, positioning, and transporting the load. Operate trucks equipped with attachments as partially loaded trucks when not handling a load. B56.6-2005: 6.4.4 When attachments are used, extra care shall be taken in securing, manipulating, positioning, and transporting the load. Operate rough terrain forklift trucks equipped with attachments as partially loaded trucks when not handling a load.				
12.7.3.e	Operations: Loading Powered Industrial Trucks: Trucks equipped with attachments shall be operated as partially loaded trucks when not handling a load.	1910.178(o)(4) Trucks equipped with attachments shall be operated as partially loaded trucks when not handling a load.	ANSI/ITSDF B56.1-2005: 5.4.2 When attachments are used, extra care shall be taken in securing, manipulating, positioning, and transporting the load. Operate trucks equipped with attachments as partially loaded trucks when not handling a load. B56.6-2005: 6.4.4 When attachments are used, extra care shall be taken in securing, manipulating, positioning, and transporting the load. Operate rough terrain forklift trucks equipped with attachments as partially loaded trucks when not handling a load.				
12.7.3.f	Operations: Loading Powered Industrial Trucks: Loads shall be completely engaged with the load engaging means. Forks should be at least 2/3 of the load length.	Not covered in OSHA 1910.178	ANSI/ITSDF B56.1-2005: 5.4.3 Completely engage the load with the loadengaging means. Fork length should be at least two-thirds of load length. B56.6-2005: 6.4.5 Completely engage the load with the loadengaging means. Fork length should be at least two-thirds of load length. Where tilt is provided, carefully tilt the load backward to stabilize the load. Caution should be used in tilting backward with high or segmentedloads (see paras. 5.3.3 and 6.4.6).				
13.2.1	Safety and Design Aspects: Design criteria/general design requirements for jacks are contained in ASME B30.1. It is the responsibility of the applicable engineering, operations/maintenance, and safety organizations to ensure the design, testing, maintenance, inspection, and operation of this equipment complies with this standard, the manufacturers' recommendations, and ASME B30.1.	No requirement	General reference to B30.1				
13.2.1.a	Safety and Design Aspects: Control parts shall be designed to provide a means of operation and adjustment, which will minimize exposure of the operator to injury. (Requirement 41999)	No requirement	1-1.1.1 Control Parts Control parts shall be designed to provide a means of operation and adjustment, which will minimize exposure of the operator to injury.				

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13.2.1.b(1)	Safety and Design Aspects: Jack construction shall incorporate a positive stop or method to prevent over travel. (Requirement 42000)	1926.305(a)(2) All jacks shall have a positive stop to prevent overtravel. 1910.244(a)(2)(ii) The operator shall watch the stop indicator, which shall be kept clean, in order to determine the limit of travel. The indicated limit shall not be overrun.	1-1.1.2 Overtravel The general construction of every jack shall incorporate a positive stop or method to prevent overtravel, but such a stop shall not alter the operating characteristics of the jack.				
13.2.1.b(2)	Safety and Design Aspects: The over travel prevention (or stop) shall not alter the operating characteristics of the jack.	No requirement	See Above				
13.2.2.a	Safety and Design Aspects: Labeling/Tagging of Jacks: The rated load/applicable capacity ratings shall be clearly and permanently marked on the jack. (Requirement 42003)	1926.305(a)(1) The manufacturer's rated capacity shall be legibly marked on all jacks and shall not be exceeded. 1910.244(a)(1)(ii) The rated load shall be legibly and permanently marked in a prominent location on the jack by casting, stamping, or other suitable means.	SECTION 1-1.2: MARKING AND INSTRUCTIONS 1-1.2.1 Marking The rated load shall be legibly and durably marked in a prominent location. Mechanical jacks that have two ratings (sustaining and lifting) shall be so marked. The brand name or trademark, and hydraulic pressure or lever arm length and force, shall be legibly marked on the jack. Each hydraulic jack should be marked to indicate that only recommended jack hydraulic fluid shall be used. Double-acting hydraulic jacks shall be marked to indicate the need for a relief valve, as indicated in para. 1-1.1.3(b)(2).				
13.2.2.b	Safety and Design Aspects: Labeling/Tagging of Jacks: Mechanical jacks with two ratings (sustaining and lifting) shall be so marked. (Requirement 42004)	No requirement	See Above				
13.2.2.c	Safety and Design Aspects: Labeling/Tagging of Jacks: Hydraulic pressure or lever arm length and force shall be legibly marked on the jack. (Requirement 42005)	No requirement	See Above				
13.2.2.d	Safety and Design Aspects: Labeling/Tagging of Jacks: Marking shall indicate the recommended hydraulic fluid to be used. (Requirement 42006)	No requirement	See Above				
13.2.2.e	Safety and Design Aspects: Labeling/Tagging of Jacks: Double acting hydraulic jacks shall be marked to indicate the need for a relief valve. (Requirement 42007)	No requirement	See Above				
13.2.2.f	Safety and Design Aspects: Labeling/Tagging of Jacks: A standard system of labeling shall be established and used throughout the installation. (Requirement 42008)	No requirement	No requirement				
13.2.2.g	Safety and Design Aspects: Labeling/Tagging of Jacks: A standard lockout/tagout system shall be established and used throughout the installation to indicate equipment that is not to be used due to inspection discrepancies, ongoing maintenance, or other reasons. (Requirement 42009)	No requirement	No requirement				
13.2.2.h	Safety and Design Aspects: Labeling/Tagging of Jacks: Certification/recertification are required as described in paragraph 13.3.4. (Requirement 42010)	No requirement	No requirement				
13.2.3(1)	Safety and Design Aspects: Safety Analysis and Documentation of Jacks. A recognized safety hazard analysis such as fault tree analysis, FMEA, O&SHA shall be performed on all jacks used for lifts where failure/loss of control could result in loss of or damage to flight hardware. (Requirement 42011)	No requirement	No requirement				
13.2.3(2)	Safety and Design Aspects: Safety Analysis and Documentation of Jacks: The analysis shall, as a minimum, determine potential sources of danger, identify failure modes, and recommend resolutions and a system of risk acceptance for those conditions found in the hardware-facility-environment-human relationship that could cause loss of life, personal injury, and loss of or damage to the jack, facility, or load.	No requirement	No requirement				
13.2.3(3)	Safety and Design Aspects: Safety Analysis and Documentation of Jacks: The analysis shall be done as part of the initial activation process, included in the equipment documentation, and updated as required to reflect any changes in operation and/or configuration. (Requirement 42013)	No requirement	No requirement				

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13.3(1)	Testing. Testing of jacks shall be performed according to this section, the manufacturers' recommendations, and ASME B30.1. Three types of tests are required for jacks: proof load tests, periodic load tests, and operational tests.	No requirement	General reference to B30.1				
13.3(2)	Testing: Proof load tests and operational tests shall be performed prior to first use for new or extensively repaired or altered components directly in the jack load path. Repairs or alterations to nonlifting or nonholding components do not require a load test, although a functional check should be performed to determine if the repairs or alterations are acceptable. (Requirement 42015)	No requirement	SECTION 1-2.2: TESTING 1-2.2.1 Rated Load Test (a) All new jacks shall be tested to rated load by the manufacturer. (b) All altered or modified jacks should be tested at rated load before being placed in service. (c) The need for load testing of a repaired jack shall be determined by a qualified person. When required, the repaired jack should be tested at rated load.				
13.3(3)	Testing: The periodic load and operational tests shall be performed annually. The acceptable tolerance for load test accuracy is +5/-0 percent unless otherwise specified. (Requirement 42016)	No requirement	No requirement				
13.3(4)	Testing: All load and operational tests shall be performed by qualified personnel according to written (specific or general) technical operating procedures. (Requirement 42017)	No requirement	No requirement				
13.3(5)	Testing: An inspection of the jack and its components shall be performed after each load test and prior to the jack being released for service to ensure there is no damage. The periodic load test requirement may be fulfilled by a concurrently performed proof load test. (Requirement 42018)	No requirement	No requirement				
13.3.1(1)	Testing: Proof Load Test. Before first use, all new, extensively repaired, or altered jacks shall undergo a proof load test at 120% of the rated load and operated to its full length of travel in accordance with the manufacturers' instructions and ASME B30.1. A proof load test may also be performed when there is a question in design, previous testing or to ensure system integrity. (Requirement 42019)	No requirement	1-1.1.3 Features of General Design All features of general design should be such as to minimize hazard(s) in the use, handling, and operation of the jack, and should conform to applicable industrial standards. The jack shall be designed to meet either of the following two criteria: (a) Design Qualification Testing. Each design or modification shall be proof tested in accordance with the following procedures: (1) Hydraulic Jacks (a) Dynamic Test. The jack shall be operated through ten cycles of full travel at 110% of rated load. (b) Static Load Test. The jack or cylinder shall be pressurized at 150% of pressure at rated load 3 times, with the ram extended to approximately 90% of full extension. After this test, the jack shall be functional at rated load for full extension and be free of leaks. (c) Integral Auxiliary Load Points. The tests as described in paras. 1-1.1.3 (a)(1)(a) and (a)(1)(b) shall be performed for each integral auxiliary load point, using appropriate rated loads as defined in Section 1-0.2 (see load rating, auxiliary). (2) Mechanical Jacks (a) Dynamic Load Test. The jack shall be loaded to 110% of its lifting rated load and operated to its full length of travel through ten cycles. (b) Static Load Test. The jack shall be loaded 3 times to 150% of its sustaining rated load, with the lifting member at approximately 90% of full extension. After this test, the jack shall be functional for full extension under 100% of lifting rated load. 5 (c) Auxiliary Load Points. Tests corresponding to paras. 1-1.1.3 (a)(2)(a) and (a)(2)(b) shall be performed for each auxiliary load point, using appropriate rated loads as defined in Section 1-0.2 (see load rating, auxiliary). (b) Static Design (1) The computed stress in the structural components				

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13.3.1(2)	Testing: Proof Load Test: The load shall be lifted slowly in an area where minimal damage will occur if the jack fails. For new jacks, manufacturer documentation of performed proof load tests will be acceptable as meeting this requirement. (Requirement 42020)	No requirement	No requirement				
13.3.2	Testing: Periodic Load Test. For jacks used where failure/loss of control could result in loss of or damage to flight hardware, a periodic load and operational test shall be performed at least once every year with a load equal to the rated load. (Requirement 42021)	No requirement	No requirement				
13.3.3	Testing: Operational Test. Together with proof load and periodic load tests, the following shall be performed with a dummy rated load unless otherwise specified: (Requirement 42022)	No requirement	No requirement				
13.3.3.a	Testing: Operational Test. Together with proof load and periodic load tests, the following shall be performed with a dummy rated load unless otherwise specified: Hydraulic jacks shall be operated to full length of travel. Hold the load for a minimum of 5 minutes and verify drift does not exceed that specified by the responsible engineering organization.	No requirement	No requirement				
13.3.3.b	Testing: Operational Test. Together with proof load and periodic load tests, the following shall be performed with a dummy rated load unless otherwise specified: Mechanical jacks shall be operated to full length of travel. Hold the load for a minimum of 5 minutes and verify no drift.	No requirement	No requirement				
13.3.3.c	Testing: Operational Test. Together with proof load and periodic load tests, the following shall be performed with a dummy rated load unless otherwise specified: The operational test for a modified jack can be tailored to test only those portions of the equipment that were modified/repared, only if the rated and operational test interval has not expired.	No requirement	No requirement				
13.3.4(1)	Testing: Test Reports and Periodic Recertification Tags. After each test, designated personnel shall prepare written, dated, and signed test reports. (Requirement 42026)	No requirement	No requirement				
13.3.4(2)	Testing: Test Reports and Periodic Recertification Tags: Inadequacies shall be documented and, if determined to be a hazard, corrected prior to further use. (Requirement 42027)	No requirement	No requirement				
13.3.4(3)	Testing: Test Reports and Periodic Recertification Tags: These reports shall be kept on file for a minimum of two test cycles and shall be made readily available. (Requirement 42028)	No requirement	No requirement				
13.3.4(4)	Testing: Test Reports and Periodic Recertification Tags: Following the periodic load test, jacks shall be given a permanently affixed tag identifying the equipment and stating the next required periodic load test date or load test expiration date. (Requirement 42029)	No requirement	No requirement				
13.4.1(1)	Inspection: Safety inspections shall be performed on all jacks. (Requirement 42031)	No requirement					
13.4.1(2)	Inspection: Inspections shall be performed according to this section, the manufacturers' recommendations, and ASME B30.1.	No requirement					
13.4.1(3)	Inspection: Inadequacies discovered during an inspection shall be documented and, if determined to be a hazard, tagged out and corrected prior to further use. (Requirement 42033)	No requirement					
13.4.1(4)	Inspection: Inspections shall be performed by qualified personnel according to approved technical operating procedures.	No requirement	No requirement				

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13.4.2	<p>Inspection: All new, extensively repaired, or modified jacks shall be inspected to the requirements of both daily and periodic inspections prior to first use. For component repair on jacks, only the inspections that apply to the repaired portion need to be performed prior to first use unless a periodic inspection interval expires during the downtime (see paragraph 13.4.5). (Requirement 42035)</p>	<p>1926.305(d)(1)(iv) Each jack shall be thoroughly inspected at times which depend upon the service conditions. Inspections shall be not less frequent than the following: 1926.305(d)(1)(iv)(a) For constant or intermittent use at one locality, once every 6 months, 1926.305(d)(1)(iv)(b) For jacks sent out of shop for special work, when sent out and when returned, 1926.305(d)(1)(iv)(c) For a jack subjected to abnormal load or shock, immediately before and immediately thereafter. 1910.244(a)(2)(vi) Each jack shall be thoroughly inspected at times which depend upon the service conditions. Inspections shall be not less frequent than the following: 1910.244(a)(2)(vi)(a) For constant or intermittent use at one locality, once every 6 months, 1910.244(a)(2)(vi)(b) For jacks sent out of shop for special work, when sent out and when returned, 1910.244(a)(2)(vi)(c) For a jack subjected to abnormal load or shock, immediately before and immediately thereafter.</p>	<p>1-2.1.1 Inspection Classification (a) Initial Inspection. Prior to initial use, all new, altered, modified, or repaired jacks shall be visually inspected by the user to verify compliance with the applicable provisions of this volume. (b) Inspection procedure for jacks in regular service is divided into two general classifications based upon the intervals at which inspection should be performed. The intervals in turn are dependent upon the nature of the critical components of the jack and the degree of wear, deterioration, or exposure to severe service. The two general classifications are herein designated as frequent and periodic, with respective intervals between inspections as defined below. (1) Frequent Inspection. This consists of visual examinations by the operator or other designated personnel with records not required. (a) normal service: monthly (b) severe service: daily to weekly (c) infrequent service: as recommended by a qualified person before and after each occurrence (2) Periodic Inspection. This consists of visual inspection by an appointed person who makes records of apparent external conditions to provide the basis for a continuing evaluation. An external coded mark on the jack is an acceptable identification in lieu of records. (a) normal service: equipment in place — yearly (b) severe service: as in normal service, unless external conditions indicate that disassembly should be done to permit detailed inspection — quarterly (c) infrequent service: as recommended by a qualified person before the first such occurrence and as directed by the qualified person for any subsequent occurrences 1-2.1.2 Frequent Inspection Items such as those listed in paras. 1-2.1.2 (a) through (j) shall be inspected at intervals as defined in para. 1-2.1.1(b)(1). Frequent inspection shall include observations during operation. A designated person shall determine</p>				
13.4.3(1)	Inspection: Jacks in regular service (used at least once a month) shall be inspected as required in paragraphs 13.4.4 and 13.4.5.	See above	See Above				
13.4.3(2)	Inspection: Idle and standby jacks shall be inspected according to paragraph 13.4.6.	See above	1-2.1.4 Jacks Not in Regular Use A jack which has been idle for one year or more shall be subject to an inspection prior to use, in accordance with para. 1-2.1.2.				
13.4.4(1)	Inspection: Daily Inspections. These inspections shall be performed each day the jack is used. Inspect for (without disassembly): (Requirement 42038)	See above	(1) Frequent Inspection. This consists of visual examinations by the operator or other designated personnel with records not required. (a) normal service: monthly (b) severe service: daily to weekly (c) infrequent service: as recommended by a qualified person before and after each occurrence				
13.4.4(2)	Inspection: Daily Inspections. If external conditions indicate possible internal difficulty, notify the supervisor. Repairs and adjustments shall be made before operations begin	See above	SECTION 1-3.1: OPERATIONAL REQUIREMENTS (a) Jacks shall be visually examined for general conditions before each shift or each use, whichever is the less frequent.				
13.4.5(1)	Inspection: Periodic Inspections. Periodic inspections are the same as paragraph 13.4.4. Periodic inspections shall be performed at least once per year or more frequently if required by the manufacturer or ASME B30.1. Periodic inspections consist of visual inspection by an appointed person and require dated documented records. If external conditions indicate possible internal difficulty, notify the supervisor. (Requirement 42053)	See above	1-2.1.5 Inspection Records Dated inspection records should be kept on all periodic inspections.				
13.4.5(2)	Inspection: Periodic Inspections: Repairs and adjustments shall be made before operations begin. (Requirement 42054)	See above	No requirement				

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13.4.6	Inspection: Idle and Standby Jacks. Idle and standby jacks shall be inspected prior to first use according to the requirements of paragraphs 13.4.4 and 13.4.5 unless these daily and periodic inspections were performed at required intervals and recorded during the idle/standby period. (Requirement 42055)	See above	1-2.1.4 Jacks Not in Regular Use A jack which has been idle for one year or more shall be subject to an inspection prior to use, in accordance with para. 1-2.1.2.				
13.5(1)	Maintenance. A maintenance program based on manufacturers' recommendations, integrating proactive, reactive, preventive, and predictive maintenance shall be established to increase the probability the jack will function in the required manner over its design life cycle with a minimum of maintenance.	1926.305(d)(1)(iii) All jacks shall be properly lubricated at regular intervals. 1910.244(a)(2)(v) All jacks shall be properly lubricated at regular intervals.	SECTION 1-2.3: MAINTENANCE 1-2.3.1 Lubrication All moving parts of the jack requiring lubrication should be regularly lubricated. Lubricating systems should be checked for proper delivery of lubricant. Care should be taken to follow manufacturer's recommendations as to points and frequency of lubrication, maintenance of lubricant levels, and types of lubricants to be used. 1-2.3.2 Hydraulic Fluid Only hydraulic jack fluid that is compatible with the jack manufacturer's specification shall be used. 1-2.3.3 Cleaning (a) Exposed screw threads should be cleaned and relubricated as necessary. (b) Jacks exposed to rain, sand, or grit-laden air should be cleaned prior to use. 8 (c) Jack operating lever and load-bearing surfaces should be free of slippery material or fluids. 1-2.3.4 Storage Jacks should be stored where protected from the elements, abrasive dust, and damage. Hydraulic jacks should be stored in the vertical position. 1-2.3.5 Repair Parts It is recommended that repair parts be purchased from the original equipment manufacturer or an authorized service center. Jacks that are repaired with parts other than those obtained from the original manufacturer shall conform to para. 1-1.1.3(a). A qualified person shall verify conformance with these requirements. 1-2.3.6 Additional Special Maintenance If additional special maintenance is required, it shall be done in accordance with the manufacturer's instructions.				
13.5(2)	Maintenance: The program shall include procedures and a scheduling system for normal periodic maintenance items, adjustments, replacements, and repairs.	No requirement	No requirement				
13.5(3)	Maintenance: The program also shall ensure that records are kept and unsafe test and inspection discrepancies are documented and corrected.	No requirement	No requirement				
13.5(4)	Maintenance: Any jack found in an unsafe operating condition shall be removed from service, tagged out, and not used until repaired. (Requirement 42059)	1926.305(d)(1)(vi) Jacks which are out of order shall be tagged accordingly, and shall not be used until repairs are made. 1910.244(a)(2)(viii) Jacks which are out of order shall be tagged accordingly, and shall not be used until repairs are made.	No requirement				
13.5(5)	Maintenance: All repairs shall be made by qualified personnel in accordance with the manufacturers' instructions.	No requirement	1-2.3.5 Repair Parts It is recommended that repair parts be purchased from the original equipment manufacturer or an authorized service center. Jacks that are repaired with parts other than those obtained from the original manufacturer shall conform to para. 1-1.1.3(a). A qualified person shall verify conformance with these requirements. 1-2.3.6 Additional Special Maintenance If additional special maintenance is required, it shall be done in accordance with the manufacturer's instructions.				

Doc Para	NASA-STD-8719.9 Requirement Text	OSHA Requirement Text	ASME / ANSI / Other Requirement Text				
13.5.1	Maintenance: Only hydraulic jack fluid which is compatible with the jack manufacturer's specifications shall be used. (Requirement 42061)	No requirement	1-2.3.2 Hydraulic Fluid Only hydraulic jack fluid that is compatible with the jack manufacturer's specification shall be used.				
13.5.5	Maintenance: Replacement parts should be purchased from the original manufacturer or verified as meeting the original manufacturer requirements. A qualified person shall verify replacement parts meet manufacturer requirements and instructions.	1926.305(d)(1)(v) Repair or replacement parts shall be examined for possible defects. 1910.244(a)(2)(vii) Repair or replacement parts shall be examined for possible defects.	1-2.3.5 Repair Parts It is recommended that repair parts be purchased from the original equipment manufacturer or an authorized service center. Jacks that are repaired with parts other than those obtained from the original manufacturer shall conform to para. 1-1.1.3(a). A qualified person shall verify conformance with these requirements. 1-2.3.6 Additional Special Maintenance If additional special maintenance is required, it shall be done in accordance with the manufacturer's instructions.				
13.5.6	Maintenance: Hydraulic jacks exposed to freezing temperatures shall be supplied with an adequate anti-freeze liquid. (Requirement 42066)	1926.305(d)(1)(ii) Hydraulic jacks exposed to freezing temperatures shall be supplied with an adequate antifreeze liquid. 1910.244(a)(2)(iv) Hydraulic jacks exposed to freezing temperatures shall be supplied with an adequate antifreeze liquid.	No requirement				
13.6(1)	Personnel Certification. Only qualified and designated personnel shall be authorized to perform inspection and/or maintenance operations on jacks. (Requirement 42067)	No requirement	SECTION 1-3.2: OPERATIONAL PROCEDURES (a) Be familiar with the equipment and the manufacturer's instructions on its operation, maintenance, and inspection.				
13.6(2)	Personnel Certification: Operators shall be instructed in the proper use of jacks.	No requirement	(d) Operators shall be instructed in the proper use of the jacks.				
13.7(1)	Operations. Jacks shall be operated according to this section, the manufacturers' recommendations, and ASME B30.1.	No requirement	General reference to B30.1				
13.7(2)	Operations: The following practices shall be followed for jack operations: (Requirement 42070)	No requirement	General				
13.7.a	Operations: The following practices shall be followed for jack operations: Before the jack is used each day (shift), the operator shall have read and understood the manufacturer's operating instructions and safety rules, and have read and understood all decals and warnings on the equipment.	No requirement	SECTION 1-3.2: OPERATIONAL PROCEDURES (a) Be familiar with the equipment and the manufacturer's instructions on its operation, maintenance, and inspection.				
13.7.b(1)	Operations: The following practices shall be followed for jack operations: Before the jack is used each day (shift), the operator shall perform a pre-operational check to demonstrate operational readiness, including all limit switches. If controls do not operate properly, the operator is responsible for notifying the supervisor.	No requirement	No requirement				
13.7.b(2)	Operations: The following practices shall be followed for jack operations: Repairs and adjustments shall be made before operations begin.	No requirement	No requirement				
13.7.c(1)	Operations: The following practices shall be followed for jack operations: Before operating the jack, the operator shall survey the area for applicable hazards such as obstructions, debris, bumps, drop-offs and holes, obstructed path of travel, unstable footing, and other possible hazardous conditions.	No requirement	No requirement				
13.7.c(2)	Operations: The following practices shall be followed for jack operations: The operator shall establish appropriate safety zones, if required, before initiating operations.	No requirement	(e) Take precautions to ensure that all personnel are clear of the load before lowering. (f) Take measures to prevent personnel from working or passing under the load until the load is secured by cribbing, blocking, or other means.				
13.7.d	Operations: The following practices shall be followed for jack operations: The equipment shall not be loaded beyond its rated load (capacity) except for required testing.	1910.244(a)(1)(i) The operator shall make sure that the jack used has a rating sufficient to lift and sustain the load.	(b) A determination of the load shall be made to assure that it is within the load rating of the jack.				
13.7.e(1)	Operations: The following practices shall be followed for jack operations: The operator shall ensure the equipment is within inspection and testing intervals by examination of the periodic load test tags and/or documentation.	No requirement	No requirement				

Doc Para	NASA-STD-8719.9 Requirement Text	OSHA Requirement Text	ASME / ANSI / Other Requirement Text				
13.7.e(2)	Operations: The following practices shall be followed for jack operations: The operator shall adhere to all tags on the controls.	No requirement	No requirement				
13.7.g	Operations: The following practices shall be followed for jack operations: The jack shall be firmly supported at the base under load.	No requirement	(c) The jack shall be firmly supported at the base such that it is stable under load.				
13.7.i	Operations: The following practices shall be followed for jack operations: Operators shall not straddle the operating lever of a mechanical jack.	No requirement	(c) See that operators do not straddle the operating lever of a mechanical jack.				
13.7.j	Operations: The following practices shall be followed for jack operations: Operating levers shall be removed when not in use to avoid accidental dislodging of the jack and reduce the tripping hazard.	No requirement	(d) Remove operating levers when not in use to avoid accidental dislocation of the jack and reduce the tripping hazard.				
13.7.k	Operations: The following practices shall be followed for jack operations: Measures shall be taken to prevent personnel from working or passing under the load until the load is secured by cribbing, blocking, or other means.	1926.305(c) Blocking. When it is necessary to provide a firm foundation, the base of the jack shall be blocked or cribbed. Where there is a possibility of slippage of the metal cap of the jack, a wood block shall be placed between the cap and the load. 1926.305(d)(1)(i) After the load has been raised, it shall be cribbed, blocked, or otherwise secured at once. 1910.244(a)(2)(i) In the absence of a firm foundation, the base of the jack shall be blocked. If there is a possibility of slippage of the cap, a block shall be placed in between the cap and the load. 1910.244(a)(2)(iii) After the load has been raised, it shall be cribbed, blocked, or otherwise secured at once.	(f) Take measures to prevent personnel from working or passing under the load until the load is secured by cribbing, blocking, or other means.				
13.7.L	Operations: The following practices shall be followed for jack operations: Precautions shall be taken to ensure all personnel are clear of the load before lowering.	No requirement	(e) Take precautions to ensure that all personnel are clear of the load before lowering.				
13.7.m	Operations: The following practices shall be followed for jack operations: Personnel shall be instructed in the signals and procedures for multiple jack use or special jack lift operations.	No requirement	(i) Ensure that all operators are instructed as to signals and other procedures for multiple jacks or other special lifts.				
13.7.n	Operations: The following practices shall be followed for jack operations: Off-center loading of jacks shall be avoided.	No requirement	(j) Off-center loading of jacks should be avoided.				
13.7.o	Operations: The following practices shall be followed for jack operations: Extenders shall not be used unless authorized by a qualified person.	No requirement	(k) Extenders shall not be used unless authorized by a qualified person.				
13.7.p	Operations: The following practices shall be followed for jack operations: If there is a possibility of slippage of the cap, a block shall be placed in between the cap and the load.	No requirement	No requirement				
A.2	As an alternative standard developed pursuant to Section 1-201(d) of Executive Order 12196 and 29 CFR 1960.17, it applies only to NASA employees. The Occupational Safety and Health Administration (OSHA) will inspect the working conditions of NASA employees performing these specified operations for compliance with these alternate standard requirements. Although OSHA cannot inspect private sector employees working in the same operation with NASA employees for compliance with the alternate standard, it will fully consider the equivalent safeguards specified in this standard for both NASA and contractor employees as the basis for a de minimis violation which is recorded, but not issued. (Requirement 42092)	No equivalent	No equivalent				

Doc Para	NASA-STD-8719.9 Requirement Text	OSHA Requirement Text	ASME / ANSI / Other Requirement Text				
A.4	Requirements. It is recognized that cranes and hoists do not generally meet the support requirements of a system that would allow personnel to work beneath a suspended load. NASA's first hazard avoidance protocol is to design hazards out of the system or operation. Accordingly, it is NASA's intent and goal that all future systems, hardware, and equipment be engineered, designed, installed, and operated to prevent exposing employees to working under loads suspended from cranes and hoists. Due to the uniqueness of NASA activities and the limitations imposed when using present systems, hardware, equipment, and facilities, suspended load operations may be permitted only under specifically approved and controlled conditions. No suspended load operation shall be performed unless all (15) of the following special requirements are met: (Requirement 42097)	No equivalent	No equivalent				
A.4.01	Requirements: No suspended load operation shall be performed unless all (15) of the following special requirements are met: All suspended load operations will be approved by the Center/facility NASA Director of Safety based upon a detailed engineering hazards analysis of the operation. The hazards analysis will be prepared by the responsible safety organization and coordinated through appropriate engineering and design offices. The analysis documentation will include the following: (Requirement 42098)	No equivalent	No equivalent				
A.4.01.a	Requirements: No suspended load operation shall be performed unless all (15) of the following special requirements are met: All suspended load operations will be approved by the Center/facility NASA Director of Safety based upon a detailed engineering hazards analysis of the operation. The hazards analysis will be prepared by the responsible safety organization and coordinated through appropriate engineering and design offices. The analysis documentation will include the following: A justification why the operation cannot be conducted without personnel beneath the load. Feasible procedure/design options will be investigated to determine if the work can be accomplished without personnel working under a load suspended from a crane/hoist.	No equivalent	No equivalent				
A.4.01.b	Requirements: No suspended load operation shall be performed unless all (15) of the following special requirements are met: All suspended load operations will be approved by the Center/facility NASA Director of Safety based upon a detailed engineering hazards analysis of the operation. The hazards analysis will be prepared by the responsible safety organization and coordinated through appropriate engineering and design offices. The analysis documentation will include the following: Details of the precautions taken to protect personnel should the load drop. Secondary support systems, i.e., equipment designed to assume support of (catch) the load preventing injury to personnel should the crane/hoist fail, shall be evaluated and used whenever feasible. Secondary support systems will be constructed with a minimum safety factor of 2 to yield. (Requirement 42100)	No equivalent	No equivalent				

Doc Para	NASA-STD-8719.9 Requirement Text	OSHA Requirement Text	ASME / ANSI / Other Requirement Text				
A.4.01.c	Requirements: No suspended load operation shall be performed unless all (15) of the following special requirements are met: All suspended load operations will be approved by the Center/facility NASA Director of Safety based upon a detailed engineering hazards analysis of the operation. The hazards analysis will be prepared by the responsible safety organization and coordinated through appropriate engineering and design offices. The analysis documentation will include the following: The maximum number of exposed personnel allowed. Steps shall be taken to limit the number of personnel working under a load suspended from a crane/hoist. Only those essential personnel absolutely necessary to perform the operation will be allowed to work in the safety controlled area.	No equivalent	No equivalent				
A.4.01.d	Requirements: No suspended load operation shall be performed unless all (15) of the following special requirements are met: All suspended load operations will be approved by the Center/facility NASA Director of Safety based upon a detailed engineering hazards analysis of the operation. The hazards analysis will be prepared by the responsible safety organization and coordinated through appropriate engineering and design offices. The analysis documentation will include the following: The time of exposure. Steps shall be taken to ensure that personnel do not remain under the load any longer than necessary to complete the work. (Requirement 42102)	No equivalent	No equivalent				
A.4.02	Requirements: No suspended load operation shall be performed unless all (15) of the following special requirements are met: Each operation will be reviewed on a case-by-case basis.	No equivalent	No equivalent				
A.4.03	Requirements: No suspended load operation shall be performed unless all (15) of the following special requirements are met: Only those suspended load operations approved by the Center/facility NASA Director of Safety will be permitted, subject to this standard. A list of approved suspended load operations will be maintained by NASA Safety and made available to OSHA personnel upon request.	No equivalent	No equivalent				
A.4.04	Requirements: No suspended load operation shall be performed unless all (15) of the following special requirements are met: The operational procedures document (e.g., Operations and Maintenance Instruction, Technical Operating Procedure, Work Authorization Document) will be revised to specify the necessary additional requirements identified by the hazard analysis discussed in paragraph A.4.1. The procedures will be available on site for inspection during the operation.	No equivalent	No equivalent				
A.4.05	Requirements: No suspended load operation shall be performed unless all (15) of the following special requirements are met: During a suspended load operation, if a new procedure not covered by the original analysis is deemed necessary due to unusual or unforeseen circumstances, the NASA Center/facility Safety Office will be consulted and must approve and document the procedure before operations continue. Safety will coordinate with Operations, Engineering, and other organizations as appropriate. If the new procedure is to be performed on a regular basis, a detailed hazards analysis and approval as outlined in paragraph A.4.1 are required.	No equivalent	No equivalent				

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A.4.06	Requirements: No suspended load operation shall be performed unless all (15) of the following special requirements are met: The crane/hoist shall be designed, tested, inspected, maintained, and operated in accordance with the NASA Standard for Lifting Devices and Equipment (NASA-STD-8719.9). Test, inspection, and maintenance procedures will be developed and approved by qualified, responsible NASA engineers. Qualified specialists will perform the procedures and resolve noted discrepancies. NASA Quality Assurance will perform an independent annual inspection of all cranes/hoists involved in suspended load operations. The results of the annual inspections will be maintained and made available to OSHA personnel upon request. (Requirement 42107)	No equivalent	No equivalent				
A.4.07	Requirements: No suspended load operation shall be performed unless all (15) of the following special requirements are met: Each crane/hoist involved in suspended load operations shall undergo a Failure Modes and Effects Analysis (FMEA) that shall be approved by the Center/facility NASA Director of Safety. The FMEA will determine Single Failure Points (SFP), assessing all critical mechanical functional components and support systems in the drive trains and critical electrical components. (Requirement 42108)	No equivalent	No equivalent				
A.4.07.a	Requirements: No suspended load operation shall be performed unless all (15) of the following special requirements are met: Each crane/hoist involved in suspended load operations shall undergo a Failure Modes and Effects Analysis (FMEA) that shall be approved by the Center/facility NASA Director of Safety. The FMEA will determine Single Failure Points (SFP), assessing all critical mechanical functional components and support systems in the drive trains and critical electrical components: For those cranes/hoists identified as having no SFP whose failure would result in dropping the load, the total weight of the suspended load shall not exceed the device's rated load. (Requirement 42109)	No equivalent	No equivalent				
A.4.07.b	Requirements: No suspended load operation shall be performed unless all (15) of the following special requirements are met: Each crane/hoist involved in suspended load operations shall undergo a Failure Modes and Effects Analysis (FMEA) that shall be approved by the Center/facility NASA Director of Safety. The FMEA will determine Single Failure Points (SFP), assessing all critical mechanical functional components and support systems in the drive trains and critical electrical components: For those cranes/hoists identified as having a SFP whose failure would result in dropping the load, use of that device for suspended load operations must be approved by NASA Headquarters. Complete documentation on the suspended load operation, including the hazards analysis outlined in paragraph A.4.1 and the FMEA described above, will be forwarded to NASA Headquarters for evaluation. Approval will be given based upon detailed analysis of the potential hazards and rationale for acceptance. Such cases will never exceed the device's rated load. OSHA shall be notified when NASA Headquarters approves using any crane/hoist identified as having a SFP whose failure would result in dropping the load. (Requirement 42110)	No equivalent	No equivalent				

Doc Para	NASA-STD-8719.9 Requirement Text	OSHA Requirement Text	ASME / ANSI / Other Requirement Text				
A.4.08	Requirements: No suspended load operation shall be performed unless all (15) of the following special requirements are met: Before lifting the load involved in a suspended load operation, the crane/hoist will undergo a visual inspection (without major disassembly) of components instrumental in assuring that the load will not be dropped (e.g., primary and secondary brake systems, hydraulics, mechanical linkages, and wire rope per NASA-STD-8719.9). Noted discrepancies will be resolved before the operation continues. This pre-lift inspection will be in addition to the inspections required in 1910.179(j) and 180(d).	No equivalent	No equivalent				
A.4.09	Requirements: No suspended load operation shall be performed unless all (15) of the following special requirements are met: A trained and licensed operator (certified per NASA-STD-8719.9) shall remain at the crane/hoist controls while personnel are under the load. (Requirement 42112)	No equivalent	No equivalent				
A.4.10(1)	Requirements: No suspended load operation shall be performed unless all (15) of the following special requirements are met: Safety controlled areas shall be established with appropriate barriers (rope, cones, etc.). (Requirement 42113)	No equivalent	No equivalent				
A.4.10(2)	Requirements: No suspended load operation shall be performed unless all (15) of the following special requirements are met: All nonessential personnel shall be required to remain behind the barriers. (Requirement 42114)	No equivalent	No equivalent				
A.4.11	Requirements: No suspended load operation shall be performed unless all (15) of the following special requirements are met: Prior to the suspended load operation, a meeting with the crane/hoist operator(s), signal person(s), person(s) who will work under the load, and the person responsible for the task shall be held to plan and review the approved operational procedures that will be followed, including procedures for entering and leaving the safety controlled area. (Requirement 42115)	No equivalent	No equivalent				
A.4.12(1)	Requirements: No suspended load operation shall be performed unless all (15) of the following special requirements are met: Communications (voice, radio, hard wired, or visual) between the operator(s), signal person(s), and the person(s) working under the load shall be maintained. (Requirement 42116)	No equivalent	No equivalent				
A.4.12(2)	Requirements: No suspended load operation shall be performed unless all (15) of the following special requirements are met: Upon communication loss, operations shall stop immediately, personnel shall clear the hazardous area, and the load shall be safed. (Requirement 42117)	No equivalent	No equivalent				
A.4.12(3)	Requirements: No suspended load operation shall be performed unless all (15) of the following special requirements are met: Operations shall not continue until communications are restored. (Requirement 42118)	No equivalent	No equivalent				
A.4.13	Requirements: No suspended load operation shall be performed unless all (15) of the following special requirements are met: Personnel working beneath the load shall remain in continuous sight of the operator(s) and/or the signal person(s). (Requirement 42119)	No equivalent	No equivalent				
A.4.14	Requirements: No suspended load operation shall be performed unless all (15) of the following special requirements are met: NASA shall conduct periodic reviews to ensure the continued safety of the procedures. As a minimum, NASA will annually evaluate the implementation of this procedure at each Center with operations on the suspended load list. (Requirement 42120)	No equivalent	No equivalent				

Doc Para	NASA-STD-8719.9 Requirement Text	OSHA Requirement Text	ASME / ANSI / Other Requirement Text				
A.4.15	Requirements: No suspended load operation shall be performed unless all (15) of the following special requirements are met: A list of approved suspended load operations, list of cranes/hoists used for suspended load operations, and copies of the associated hazards analyses will be provided to the OSHA Office of Federal Agency Programs via NASA Headquarters for distribution to the appropriate regional and area OSHA offices. (NASA Headquarters, in conjunction with OSHA, will develop a format for transmittal of this information.) Quarterly updates to the documentation will be provided as needed.	No equivalent	No equivalent				

SHIPBOARD PEDESTAL CRANES

	Requirements Text from Mobile Crane Section	API Spec 2C (Specification) / API RP 2D (Ops & MX)	ABS Certification of Lifting Appliances
	Safety and Design Aspects: Labeling/Tagging of Mobile Cranes and Derricks: The minimum radius/maximum load capacity of the crane/derrick shall be clearly marked to be legible from the operator's or user's position. For cranes/derricks with separate lifting systems of different ratings, the markings will indicate the lifting capabilities of each system (e.g., main hook, whip hook, and auxiliary hook). (Requirement 40764)	7.5.3.2 As a minimum, the rating label(s) shall contain the load block maximum non-personnel and personnel rated loads, service temperature and assembly weight. The label shall be permanently affixed to the hook block and overhaul ball. The maximum rated load(s) for dynamic conditions may be added at the option of the purchaser.	3.7 Working Load of Assembled Gear Working Load of Assembled Gear is the load for which each complete assembly is approved to lift excluding the weight of the gear itself (i.e., the load on the cargo hook). This load is the Safe Working Load, SWL, required to be marked on the heel of boom; see 3-3/5.9 and 3-4/5.7.
	Safety and Design Aspects: Labeling/Tagging of Mobile Cranes and Derricks: Mobile cranes and derricks that have the specified design features, maintenance/inspection, and test intervals to lift critical loads shall be marked conspicuously so that the operator and assurance personnel can distinguish that the crane/derrick is qualified for critical lifts. (Requirement 40765)	NR	NR
	Safety and Design Aspects: Labeling/Tagging of Mobile Cranes and Derricks: A standard system of labeling shall be established and used throughout the installation. (Requirement 40766)	13.1.3 Marking and Labeling Booms, boom sections and auxiliary tips shall be permanently identified.	3.11 Marking of Assembled Crane For single rated booms, the Safe Working Load (abbreviated "SWL") for the assembled gear is to be marked on the legs of gantry cranes and on the heel of jib crane booms together with the minimum angle to the horizontal or radius and date of test for which the boom is certified. These letters and figures shall be in contrasting colors to the background and at least one inch in height. Where the crane is approved for varying capacities, crane capacity rating chart indicating the maximum safe working loads are to be conspicuously posted near the controls and visible to the operator when working the gear. These charts should indicate the various working angles of the boom and the maximum and minimum radii at which the boom may be safely used, for each boom length intended.
	Safety and Design Aspects: Labeling/Tagging of Mobile Cranes and Derricks: A standard lockout/tagout system shall be established and used throughout the installation to indicate equipment that is not to be used due to inspection discrepancies, ongoing maintenance operations, or other reasons. (Requirement 40767)	NR	NR

Doc Para	NASA-STD-8719.9 Requirement Text	OSHA Requirement Text	ASME / ANSI / Other Requirement Text				
	Safety and Design Aspects: Labeling/Tagging of Mobile Cranes and Derricks: Certification/recertification tags are required as described in paragraph 5.3.4. (Requirement 40768)	1.6 MANUFACTURER SUPPLIED DOCUMENTATION The manufacturer shall supply to the purchaser certain documentation for each crane manufactured. Unless otherwise agreed to by the purchaser, the documentation shall include: 1. Load and information charts per Section 4.2. 2. Crane foundation design forces and moments per Section 5.2. 3. List of all critical components per Section 1.3 and certification that these components meet the API Spec 2C material, traceability, welding (as applicable), and nondestructive examination requirements.	NR				
	Safety and Design Aspects: Safety Analysis and Documentation of Mobile Cranes and Derricks Used for Critical Lifts: A recognized safety hazard analysis such as fault tree analysis, FMEA, O&SHA shall be performed on all mobile cranes and derricks used for critical lifts. (Requirement 40769)	NR	NR				
	Safety and Design Aspects: Safety Analysis and Documentation of Mobile Cranes and Derricks Used for Critical Lifts: The analysis shall, as a minimum, determine potential sources of danger, identify failure modes, and recommend resolutions and a system of risk acceptance for those conditions found in the hardware-facility-environment-human relationship that could cause loss of life, personal injury, and loss of or damage to the crane/derrick, facility, or load. (Requirement 40770)	NR	NR				
	Safety and Design Aspects: Safety Analysis and Documentation of Mobile Cranes and Derricks Used for Critical Lifts: The analysis shall be done as part of the initial evaluation process for critical lift compliance and prior to use in a critical lift, included in the equipment documentation, and updated as required to reflect any changes in operation and/or configuration. (Requirement 40771)	NR	NR				
	Safety and Design Aspects: Performance: Load capability and the desired controlled characteristics with which the crane/derrick handles the load shall be addressed for all designs. (Requirement 40772)	1.2 SAFE WORKING LIMITS The intent of this specification is to establish safe working limits for the crane in anticipated operations and conditions. This is accomplished by establishing Safe Working Loads (SWLs) based on allowable unit stresses and design factors. Operation of the crane outside of the limits established by the manufacturer in accordance with the guidelines set forth in this document can result in catastrophic failure up to and including separating the entire crane and operator from the foundation. Compliance with the allowable stresses and design factors set forth in this specification does not guarantee that the crane will not be dismantled from its foundation in the event of a gross overload such as might occur in the event of snagging the supply boat.	9.7 Safe Working Load (SWL) The Safe Working Load for shipboard lifting appliances and heavy lift cranes is the load that each complete crane assembly is approved to lift on the cargo hook, excluding the weight of the gear (hook, block, wire, etc.). The SWL for grab cranes is, in general, 80% of the load that each complete crane assembly is approved to lift on the cargo hook. The weight of cargoes lifted by the grab including the weight of the grab and its accessories is not to be greater than the SWL for the grab crane. The Safe Working Loads for offshore cranes are the static rated loads that each complete crane assembly is approved to lift on the cargo hook including the weight of the gear (hook, block, wire, etc.).				
	Safety and Design Aspects: Performance: Operational requirements shall be considered in the design phase to ensure load and function are adequately defined and critical crane/derrick design features are incorporated on the delivered units. (Requirement 40773)	NR	NR				

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	<p>Safety and Design Aspects: Structural: Structural design shall be in accordance with industry standards for material selection, welding, allowable stresses, design limitations, framing, wheels, and other structural elements. Refer to ASME and PCSA standards for specific design details. (Requirement 40774)</p>	<p>5 Allowable Stresses 5.1 GENERAL All critical structural components (except as noted in Section 5.3) shall be designed to conform with the allowable unit stresses specified in the AISC Manual of Steel Construction—Allowable Stress Design, 9th Edition, when subjected to the loads described in Section 4. For in-service load conditions described in Section 4.2, the basic AISC allowable unit stresses shall be used without benefit of the 1/3 stress increase. For extreme conditions of seismic loads (in-service or out-of-service) or extreme winds (out-of-service only), the AISC 1/3 allowable stress increase can be used. For structural steels other than those listed in the AISC Specification, compatibility with the AISC allowable unit stresses should be established and documented through discussions with the AISC technical staff. Critical connecting joints (welded, pinned, or bolted) such as boom splice and heel connections and gantry/mast tension leg members shall be designed to develop 100% of the strength of the connected members. Non-critical connecting joints (welded, pinned, or bolted) shall develop either the load carried by the connected members or the strength of the connected members based on AISC allowables, but in no case less than 50% of the tensile strength of the controlling member. Allowable shear stresses and width-to-thickness ratios shall be in accordance with the applicable provisions of AISC.</p>	<p>CHAPTER 2 Guide for Certification of Cranes SECTION 2 Structural Requirements</p>				
	<p>Safety and Design Aspects: Mechanical: The mechanical design requirements for mobile crane and derrick components are as follows: (Requirement 40775)</p>	<p>General comment.</p>	<p>CHAPTER 2 Guide for Certification of Cranes SECTION 6 Construction Standards for Crane Machinery, Piping and Electrical Systems</p>				
	<p>Safety and Design Aspects: Mechanical: The mechanical design requirements for mobile crane and derrick components are as follows: They shall meet all applicable requirements of OSHA, ASME, and PCSA. (Requirement 40776)</p>	<p>No overarching requirement 8.2.2.4 The boom cylinder(s) shall be designed with a 4:1 design factor (ASME Section VIII burst pressure/pressure required to support and raise the boom and a safe working load).</p>	<p>CHAPTER 2 Guide for Certification of Cranes SECTION 6 Construction Standards for Crane Machinery, Piping and Electrical Systems</p>				
	<p>Safety and Design Aspects: Mechanical: The mechanical design requirements for mobile crane and derrick components are as follows: The drum gear shall be pressed on and keyed to either the periphery of the hub or shell of the drum, bolted with close fitting milled body bolts to a flange on the drum, or attached by other means of equal safety. (Requirement 40777)</p>	<p>No requirement for drum gear 8.1.3 Components Components shall be designed to minimize the likelihood of incorrect use or assembly as set out below. 8.1.3.1 All critical drive components shall have unique spline, keying, or other arrangements to prevent improper installation or interchange of parts.</p>	<p>NR</p>				

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	<p>Safety and Design Aspects: Mechanical: The mechanical design requirements for mobile crane and derrick components are as follows: Gearing shall be designed and manufactured to comply with the latest AGMA gear standards. (Requirement 40778)</p>	<p>2 References 2.1 STANDARDS The following standards contain provisions, which through reference herein, constitute provisions of this standard. Unless a specific edition is referenced in this section, the latest edition of the referenced standard may be used. AGMA ANSI 6010-F97 Standard for Spur, Helical, Herringbone and Bevel Enclosed Drives ANSI 2001-C95 Fundamental Rating Factors and Calculation Methods for Involute Spur and Helical Gear Teeth 908-B89 Information Sheet—Geometry Factors for Determining the Pitting Resistance and Bending Strength of Spur, Helical, and Herringbone Gear Teeth</p>	<p>3 Design Acceptance Criteria Machinery, electrical and piping systems are to be designed and constructed to the requirements contained in this Section, and as applicable, Part 4, Chapters 3, 4 and 8 and Subsection 4-6-7/3 of the ABS Rules for Building and Classing Steel Vessels. Systems which are shown to be designed, constructed and tested to other recognized standards or codes of practice such as ANSI, ASME, IEEE, IEC, AGMA, etc., may be accepted on this basis, provided the alternative standard is not less effective.</p>				
	<p>Safety and Design Aspects: Mechanical: The mechanical design requirements for mobile crane and derrick components are as follows: Couplings shall be located immediately adjacent to bearings. (Requirement 40779)</p>	NR	NR				
	<p>Safety and Design Aspects: Mechanical: The mechanical design requirements for mobile crane and derrick components are as follows: Couplings between closely spaced bearings shall be of the full flexible type with internal gear form or grids, having metal-to-metal contact, and shall run in oil or be lubricated as recommended by the manufacturer. (Requirement 40780)</p>	NR	NR				
	<p>Safety and Design Aspects: Mechanical: The mechanical design requirements for mobile crane and derrick components are as follows: All couplings for hoists shall be pressed fit with keys. (Requirement 40781)</p>		NR				
	<p>Safety and Design Aspects: Mechanical: The mechanical design requirements for mobile crane and derrick components are as follows: The rated load of a hoisting rope shall not exceed the rope's breaking strength divided by 3.5. (Requirement 40782)</p>	<p>7.2.4.1 Hoist Systems The design factor of wire rope reeving used in load hoist and boom hoist systems shall not be less than 2.5 times Cv or 5.0, whichever is greater. 7.2.4.2 Suspension Systems The design factor of standing wire rope used for boom pendants and other support systems shall not be less than 2.0 times Cv or 4.0, whichever is greater. 7.2.4.3 Personnel Hoist System The design factor of load hoist wire rope when handling personnel shall not be less than 10.</p>	<p>11.5 Wire Rope Factors of Safety The minimum factors of safety specified in 2-2/Table 6 are to be satisfied for the load, auxiliary and boom hoist wires and pendants. The actual factors of safety reflecting the onboard wire rope arrangements are to be calculated as follows: TABLE 6 Wire Rope Factor of Safety * Load and Boom Hoist Rigging 3.5</p>				
	<p>Safety and Design Aspects: Mechanical: The mechanical design requirements for mobile crane and derrick components are as follows: Hoists shall be provided with at least two means of braking: a holding brake and a control brake. (Requirement 40783)</p>	<p>8.1.1.3 Brakes shall be provided to prevent the drum from rotating in the lowering direction and shall be capable of holding the rated load indefinitely without attention from the operator. Brakes shall be automatically applied upon the return of the control lever to its center (neutral) position. Brakes, which are applied on stopped drums, shall have sufficient impact capacity to hold 1.5 times the maximum torque induced by the hoist pull calculated in accordance with Section 8.1.7 where the rated load "L" is defined as the sum of the dead load plus safe working load.</p>	<p>15 Fail-safe Arrangements, Safety Devices and Brakes Fail-safe arrangements and safety devices are to be provided and are to be of a type approved by ABS. Brakes are to be provided for all winches and are to be effective in stopping and holding the test load of the crane in any position.</p>				
	<p>Safety and Design Aspects: Mechanical: The mechanical design requirements for mobile crane and derrick components are as follows: The torque ratings, physical characteristics, and capabilities of the brakes shall be in accordance with industry standards. (Requirement 40784)</p>	<p>See section 8.1.1 for many specific ratings, requirements, and characteristics.</p>	NR				

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	Safety and Design Aspects: Mechanical: The mechanical design requirements for mobile crane and derrick components are as follows: For mobile cranes and derricks used for critical lifts, two holding brakes shall be provided, each capable of bringing a rated load to zero speed and holding it. (Requirement 40785)	8.1.1.7 Except as noted in Section 8.1.1.8, hoists shall be provided with a dynamic friction braking system that shall actuate automatically to bring the hoist to a smooth stop in the event of a control or motive power loss. (No two brake requirement.)	NR				
	Safety and Design Aspects: Mechanical: The mechanical design requirements for mobile crane and derrick components are as follows: The brakes shall be designed so that they can be tested as required in paragraph 5.3.3.f. This may be accomplished by the following means: (Requirement 40786)	NR	3.7 Brakes and Fail-safe Devices The operation of all brakes and fail-safe devices is to be demonstrated under simulated loss of power conditions to the satisfaction of the Surveyor. The crane manufacturer shall prepare a test memorandum outlining the cautions and procedures for proper testing of the devices.				
	Safety and Design Aspects: Mechanical: The mechanical design requirements for mobile crane and derrick components are as follows: The brakes shall be designed so that they can be tested as required in paragraph 5.3.3.f. This may be accomplished by the following means: When brakes and clutches are used to control the motion of the hoist drum, two independent means of braking shall be provided: a service brake and an emergency brake. (Requirement 40787)	NR for two brakes	NR				
	Safety and Design Aspects: Mechanical: The mechanical design requirements for mobile crane and derrick components are as follows: The brakes shall be designed so that they can be tested as required in paragraph 5.3.3.f. This may be accomplished by the following means: The service brake shall be capable of functioning with power, and the emergency brake shall set in the event of a power failure. (Requirement 40788)	NR	3.7 Brakes and Fail-safe Devices The operation of all brakes and fail-safe devices is to be demonstrated under simulated loss of power conditions to the satisfaction of the Surveyor. The crane manufacturer shall prepare a test memorandum outlining the cautions and procedures for proper testing of the devices.				
	Safety and Design Aspects: Mechanical: The mechanical design requirements for mobile crane and derrick components are as follows: The brakes shall be designed so that they can be tested as required in paragraph 5.3.3.f. This may be accomplished by the following means: For load hoists equipped with a mechanically linked hydraulic motor/brake combination, the use of a counterbalance valve that locks the hydraulic fluid when the valve is in the neutral position is an acceptable braking means. If a free fall clutch is present in the hoist design between the hydraulic motor and planetary disc, then a second, independent holding or control brake is required. (Requirement 40789)	NR	NR				
	Safety and Design Aspects: Mechanical: The mechanical design requirements for mobile crane and derrick components are as follows: A positive ratchet and pawl shall be provided on all boom hoist drum(s). (Requirement 40790)	8.2.3.1 On rope boom support machines, a ratchet and pawl, or other positive holding device, shall be provided to prevent unintentional lowering of the boom.	NR				
	Safety and Design Aspects: Mechanical: The mechanical design requirements for mobile crane and derrick components are as follows: Mobile cranes and derricks with booms shall be equipped with a boom angle indicator, where applicable, to assist the operator in ensuring that the crane/derrick is not loaded beyond the rated load for any given configuration. (Requirement 40791)	NR 3.1.10 boom angle indicator: An accessory which measures the angle of the boom above horizontal.	iii) A boom angle or load radius indicator readable from the operator's station is to be provided. Cranes designed for one SWL from minimum to maximum radii are not required to have boom angle or load radius indicators.				
	Safety and Design Aspects: Mechanical: The mechanical design requirements for mobile crane and derrick components are as follows: Safe and adequate access to components to inspect, service, repair, or replace equipment shall be provided for during design. (Requirement 40792)	13.4.1 General Lubricating points on all parts shall be accessible without the necessity for removing guards or other parts. Fluid fill points (fuel, coolant, hydraulic fluid, etc.) shall be located in areas that are easily accessible and will not collect fluid spills.	NR				
	Safety and Design Aspects: Mechanical: The mechanical design requirements for mobile crane and derrick components are as follows: The design shall provide for visual and physical accessibility. (Requirement 40793)	NR	NR				

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	Safety and Design Aspects: Mechanical: The mechanical design requirements for mobile crane and derrick components are as follows: All wire rope hoists shall be designed to have not less than two wraps of hoisting rope on the drum when the hook is in its extreme low position. (Requirement 40794)	8.1.2.3 No less than five (5) full wraps of rope shall remain on the drum(s) in any operating condition. The drum end of the rope shall be anchored to the drum by an arrangement provided by the crane manufacturer.	SECTION 4 Wire Rope 1 General The construction of the wire rope is to comply with a recognized standard such as API Spec 9A. In general, boom hoist, load hoist and load block sheaves and wire rope drums are to have a pitch diameter of not less than 18 times the nominal diameter of the rope used. Plain or grooved drums will be acceptable provided that five (5) wraps of wire rope remain on the drum with the hook in its lowest position, unless otherwise approved by an ABS Technical Office. The end of the wire rope is to be effectively secured to the drum.				
	Safety and Design Aspects: Mechanical: The mechanical design requirements for mobile crane and derrick components are as follows: Drum grooves shall be provided as recommended by PCSA Standards No. 4 and No. 5. (Requirement 40795)	NR	See Above				
	Safety and Design Aspects: Mechanical: The mechanical design requirements for mobile crane and derrick components are as follows: The rope ends shall be anchored securely by a clamp or a swaged terminal in a keyhole slot, provided a keeper is used to prohibit the swage from moving out of the narrow slot. Other methods recommended by the hoist or wire rope manufacturer are acceptable if the rope termination anchor together with two wraps of rope on the drum will give an anchor system equal to or greater than the breaking strength of the wire rope. (Requirement 40796)	8.1.2.3 No less than five (5) full wraps of rope shall remain on the drum(s) in any operating condition. The drum end of the rope shall be anchored to the drum by an arrangement provided by the crane manufacturer.	NR				
	Safety and Design Aspects: Mechanical: The mechanical design requirements for mobile crane and derrick components are as follows: Each load bearing component shall be designed to sustain the maximum imposed loads with appropriate design factors. (Requirement 40797)	1.2 SAFE WORKING LIMITS The intent of this specification is to establish safe working limits for the crane in anticipated operations and conditions. This is accomplished by establishing Safe Working Loads (SWLs) based on allowable unit stresses and design factors.	9 Offshore Cranes 9.1 General These requirements apply to offshore cranes. See 2-1/9.3. For additional requirements see 2-2/1, 2-2/3 and 2-2/5. (Static and Dynamic)				
	Safety and Design Aspects: Electrical: Electrical design requirements are as follows: (Requirement 40798)	General comment.	1 General The mechanical, piping and electrical systems and components of the crane that are used for hoisting, luffing and slewing systems are subject to design review for compliance with the requirements of this Section. Plan submission is to be in accordance with 2-1/3 of this Guide.				
	Safety and Design Aspects: Electrical: Electrical design requirements are as follows: Wiring and safety devices shall be in accordance with the NFPA National Electrical Code. (Requirement 40799)	2.2 OTHER REFERENCES The following standards and specifications contain useful information. ANSI/NFPA 11 National Electric Code	3 Design Acceptance Criteria Machinery, electrical and piping systems are to be designed and constructed to the requirements contained in this Section, and as applicable, Part 4, Chapters 3, 4 and 8 and Subsection 4-6-7/3 of the ABS Rules for Building and Classing Steel Vessels. Systems which are shown to be designed, constructed and tested to other recognized standards or codes of practice such as ANSI, ASME, IEEE, IEC, AGMA, etc., may be accepted on this basis, provided the alternative standard is not less effective.				
	Safety and Design Aspects: Electrical: Electrical design requirements are as follows: Electrical enclosures shall provide protection for the contained equipment against environmental conditions. (Requirement 40800)	NR	13 Hazardous Locations Machinery arrangements, all electrical power, control and safety devices and wiring on cranes installed in hazardous locations (where a flammable atmosphere may exist) are to be suitable for operation in such areas.				
	Safety and Design Aspects: Electrical: Electrical design requirements are as follows: In addition to overload protection required by the National Electrical Code, undervoltage and phase reversal should be considered. (Requirement 40801)	NR	NR				

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	Safety and Design Aspects: Electrical: Electrical design requirements are as follows: The electrical system shall be designed fail-safe to ensure that a failure of any component will not cause the crane/derrick to operate in a speed range faster than commanded. A failure that would cause the crane/derrick to go to a slower speed is acceptable as long as the stop function is still available. Failure modes that could cause unplanned directional shifts and/or loss of control are unacceptable. (Requirement 40802)	NR	vii) Fail-safe arrangements are to be provided on all cranes. See 2-1/9.17.				
	Safety and Design Aspects: Electrical: Electrical design requirements are as follows: Provisions for grounding the hook are required for handling explosives, solid propellants, flammables, or any other load that requires a nonelectrical or static-free environment. See paragraph 5.8 for handling explosives or EED's. (Requirement 40803)	NR	NR				
	Safety and Design Aspects: Electrical: Electrical design requirements are as follows: Mobile crane anti-two-blocking features shall be in accordance with ASME B30.5. (Requirement 40804)	13.7 ANTI TWO-BLOCK Means shall be provided to protect hoist ropes, structural components and machinery from damage that may occur when two sheave groups (e.g., load block and boom tip) come into contact as the hoist cable is drawn in. A control override device or proximity-warning device may be used. Stalling of the hoist drum is acceptable where damage or loss of control would not result.	ii) An anti-two block system is to be provided to protect hoist ropes, structural components and machinery from damage.				
	Testing: Three types of tests are required for mobile cranes and derricks: proof load tests, periodic load tests, and operational tests. The proof load tests and operational tests shall be performed prior to first use for new, extensively repaired, or altered cranes and derricks. This applies only to those components directly involved with the lifting or holding capability of a crane/derrick that has been repaired or altered. Repairs or alterations to nonlifting, secondary lifting, or holding components such as suspension assemblies, electrical system, or crane cab do not require a load test, although a functional check should be performed to determine if the repairs or alterations are acceptable. (Requirement 40805)	6.1 DESIGN AUTHENTICATION Testing shall be used to verify the design method. The intent is to verify the overall design calculation procedure's accuracy and completeness. This shall be accomplished either by performing a strain gauged load test to 1.33 times the onboard "maximum" rated load or by performing a "heavy lift" test to 2.0 times the same. The results of the test shall prove the design adequacy either by review of measured stresses in the gauged test or by absence of measurable deformation, cracking, or damage in the heavy lift test. The manufacturer shall certify that a prototype, design, or major structural revision to a design has been tested in accordance with either Section 6.1.1 or 6.1.2 as set out below.	3.3 Proof Testing and Inspection Unless otherwise approved and as specified in 2-2/13, 2-7/9 and 2-8/7, the Original Proof Load Test is to be carried out using movable known weights.				

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	Testing: The periodic load and operational tests shall be performed at least every 4 years. (Requirement 40806)	NR	7 Annual Survey (1 January 2008) After undergoing the original test and examination required by 2-5/3, each crane is required to undergo an Annual Survey at intervals of 12 months. The Annual Survey should include the following: <input type="checkbox"/> Visual inspection of the crane structure for deformation, excessive wear, corrosion, damage or fractures, as necessary. The boom is to be lowered for this examination. <input type="checkbox"/> Visual examination of crane hooks for deformation, excessive wear or fractures. <input type="checkbox"/> For cranes intended for the transfer of personnel, nondestructive testing of crane hooks for fractures. <input type="checkbox"/> Visual external examination and operational test of crane machinery including prime mover, clutches, brakes; hoisting, slewing and luffing machinery. <input type="checkbox"/> Visual inspection of wire rope including end attachments. <input type="checkbox"/> Functional tests including main and auxiliary load hoisting and lowering, boom raising and lowering, slewing (swinging), safety protective (fail-safe) and limiting devices and load and boom angle or radius indicators.				
	Testing: Cranes and derricks used frequently for critical lifts shall be load tested annually. (Requirement 40807)	NR	NR				
	Testing: Cranes and derricks used infrequently for critical lifts shall be load tested before the critical lift if it has been more than a year since the last test. (Requirement 40808)	NR	NR				
	Testing: If a crane/derrick is upgraded, a proof load test and an operational test shall be performed based on the upgraded rating. (Requirement 40809)	NR	NR				
	Testing: All load and operational tests shall be performed by qualified personnel according to written (specific or general) technical operating procedures. (Requirement 40810)	NR	NR				

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	<p>Testing: An inspection of the crane/derrick and lifting components shall be performed after each load test and prior to the crane/derrick being released for service to ensure there is no damage. (Requirement 40811)</p>	<p>6.1.2 Heavy Lift Load Test This test shall consist of lifting 2.0 times the onboard "maximum" rated load with a corresponding sideload equal to 4% of the maximum rated load. Test loads and boom lengths shall be selected to produce maximum stress levels in all critical structural components. Following the lifts, the crane shall be completely disassembled, including the swingcircle assembly, and subjected to a complete fitness-for-purpose evaluation using an appropriate method of inspection (depending upon the component) chosen from the following: 1. Dye penetrant. 2. Magnetic particle. 3. Radiographic. 4. Ultrasonic. The acceptability criteria for this test shall be that no critical components exhibit any yielding, buckling, indentations, or surface cracks. Special attention shall be given to bolted and welded connections. Measurements and inspections shall be made before and after the test to determine any differences in condition of critical components. An accompanying requirement of the test shall be that computed stresses under the test loads specified above shall not exceed the AISC Specification allowable unit stresses increased by one-third.</p>	<p>7 Annual Survey (1 January 2008) After undergoing the original test and examination required by 2-5/3, each crane is required to undergo an Annual Survey at intervals of 12 months. The Annual Survey should include the following: <input type="checkbox"/> Visual inspection of the crane structure for deformation, excessive wear, corrosion, damage or fractures, as necessary. The boom is to be lowered for this examination. <input type="checkbox"/> Visual examination of crane hooks for deformation, excessive wear or fractures. <input type="checkbox"/> For cranes intended for the transfer of personnel, nondestructive testing of crane hooks for fractures. <input type="checkbox"/> Visual external examination and operational test of crane machinery including prime mover, clutches, brakes; hoisting, slewing and luffing machinery. <input type="checkbox"/> Visual inspection of wire rope including end attachments. <input type="checkbox"/> Functional tests including main and auxiliary load hoisting and lowering, boom raising and lowering, slewing (swinging), safety protective (fail-safe) and limiting devices and load and boom angle or radius indicators.</p>				
	<p>Testing: Surface or volumetric NDT of critical components shall be used to validate the existence or absence of cracks or other load test effects indicated by this inspection. The periodic load test requirement may be fulfilled by a concurrently performed proof load test. (Requirement 40812)</p>	<p>See above</p>	<p>Upon completion of proof tests, the critical welds of offshore crane pedestals are subject to the following nondestructive testing to the satisfaction of the attending Surveyor: <input type="checkbox"/> Volumetric NDT of all critical butt welds in the crane pedestals, including any transition pieces between the pedestal and crane slew ring. <input type="checkbox"/> NDT of critical fillet welds in the pedestal and transition pieces.</p>				
	<p>Testing: Proof Load Test: Before first use, all new, extensively repaired, extensively modified, or altered cranes and derricks shall undergo a proof load test. A proof load test also should be performed when there is a question in design or previous testing. (Requirement 40813)</p>	<p>See above 2D 3.5.3 Load Test a. A crane load test is required under the following conditions: 1. New cranes being placed into service. 2. Cranes that are being permanently relocated. 3. Temporary cranes after each rig-up or relocation. Note: If a physical change is made to the crane that would enable lifting over the original load-tested weight, the manufacturer or other qualified sources, such as an API-licensed 2C Crane Manufacturer, Authorized Surveyor or an engineer experienced in the design of the crane as determined by the Crane Owner should be consulted for the appropriate action (i.e., new load chart, load test, etc.). See Appendix E for additional information on load testing.</p>	<p>SECTION 7 Surveys 1 General Before being taken into use, all cranes, including all accessory gear, are to have been tested and examined by the crane manufacturer. The person performing the testing and examination is to be duly authorized by the manufacturer.</p>				
	<p>Testing: Proof Load Test: Mobile cranes and derricks shall be tested at the minimum practical working radius (and maximum working radius for new cranes and derricks only), without interfering with crane structure with a load as close as possible to, but not exceeding 1.10 times the rated load at the given radius. (Requirement 40814)</p>	<p>NR</p>	<p>3.1 Test Loads The crane is to be tested onboard to the following proof loads: TABLE 1 SWL of Assembled Crane, tf (Ltf) Proof Load Up to 20 tf (20 Ltf) 25% in excess of SWL 20-50 tf (20-50 Ltf) 5 tf (5 Ltf) in excess of SWL Over 50 tf (50 Ltf) 10% in excess of SWL (See radii requirement below)</p>				

Doc Para	NASA-STD-8719.9 Requirement Text	OSHA Requirement Text	ASME / ANSI / Other Requirement Text				
	Testing: Proof Load Test: The load shall be lifted slowly and in an area where minimal damage will occur if the crane/derrick fails. Proof load tests conducted by the manufacturer prior to delivery are acceptable if the necessary load test papers are provided to verify the extent and thoroughness of the test on that specific item. The acceptable tolerance for proof load test accuracy is -5/+0 percent. (Requirement 40815)	NR	3.3 Proof Testing and Inspection Unless otherwise approved and as specified in 2-2/13, 2-7/9 and 2-8/7, the Original Proof Load Test is to be carried out using movable known weights. Booms shall be tested at the minimum, maximum and intermediate radii. These radii are to be stated on the Certificate of Test together with the proof loads used. Test rating conditions most likely to represent all intended service should be selected. The proof load should be lifted and held for at least five minutes. The Proof Load Test should include hoisting and lowering of the main hook load, auxiliary hook load and boom; slewing (swinging) and luffing; test of safety, fail-safe and limiting devices and load-moment and boom-angle indicators.				
	Testing: Periodic Load Test: Each mobile crane/derrick shall be tested at least once every 4 years with a dummy load equal to the rated capacity of the crane/derrick at the minimum practical working radius, without interfering with crane structure, according to the manufacturer's load chart. (Requirement 40816)	NR	9 Retesting Survey At intervals of five years, in addition to the requirements of the Annual Survey in 2-7/7 above, the crane is to undergo testing and examination as noted in 2-5/3. If movable weights are not available for proof tests, a dynamometer or load cell may be used in lieu of weights, provided that the tests are repeated at two locations, at opposite sides of the slewing circle. Attention is called to the Owner that certain Administrations require the Retesting Survey at four year intervals, and the Bureau is prepared to do such retesting and note it in the Register of Lifting Appliances. Upon completion of proof tests, the critical welds of offshore crane pedestals are subject to the following nondestructive testing to the satisfaction of the attending Surveyor: <input type="checkbox"/> Volumetric NDT of all critical butt welds in the crane pedestals, including any transition pieces between the pedestal and crane slew ring. <input type="checkbox"/> NDT of critical fillet welds in the pedestal and transition pieces. In addition to the items noted in 2-5/3, the slewing ring assembly including bolting arrangements and foundation are to be examined for slack bolts, damaged bearings, and deformed or fractured weldments. As deemed necessary by the Surveyor, analysis of slew ring grease samples for metal particles and NDT examination of the slew ring for fractures or damage may be required.				
	Testing: Periodic Load Test: Cranes/derricks used for critical lifts shall be load tested at least once per year. (Requirement 40817)	NR	NR				
	Testing: Periodic Load Test: Cranes/derricks used infrequently for critical lifts shall be load tested prior to the critical lift if it has been over a year since the last load test. (Requirement 40818)	NR	NR				
	Testing: Periodic Load Test: A periodic load test shall be performed after each boom change (when boom disassembly/assembly is required) if the crane/derrick is to be used for critical lifts. The acceptable tolerance for periodic load test accuracy is +5/0 percent. (Requirement 40819)	NR	NR				

Doc Para	NASA-STD-8719.9 Requirement Text	OSHA Requirement Text	ASME / ANSI / Other Requirement Text				
	Testing: Operational Test: Together with proof load and periodic load tests, the following shall be performed with a dummy rated load, unless otherwise specified, and as determined by the LDEM and the responsible safety, engineering, operations, and maintenance organizations: (Requirement 40820)	<p>6.3 OPERATIONAL TESTS</p> <p>In addition to the prototype test and quality control measures established by this specification, each new production crane, at the option of the buyer, shall be tested by the manufacturer at his fabrication facility. The purchaser, or his designated representative, may witness the test. This test procedure, as agreed upon between buyer and manufacturer, is intended to verify safety systems as well as operational systems at rated capacity and full speed. Testing may include, but is not limited to, the following:</p> <ol style="list-style-type: none"> 1. Auxiliary and main line load tests at various radii. 2. Speed tests for main line, boom luff and swing. 3. Swing and free swing tests. 4. Overload test (1.33 times rated capacity), or as otherwise specified by buyer. 5. Anti two-block tests. 6. Upper and lower boom kick-out tests. 7. Engine functional tests. 	<p>7 Annual Survey (1 January 2008)</p> <p>After undergoing the original test and examination required by 2-5/3, each crane is required to undergo an Annual Survey at intervals of 12 months. The Annual Survey should include the following:</p> <ul style="list-style-type: none"> <input type="checkbox"/> Visual inspection of the crane structure for deformation, excessive wear, corrosion, damage or fractures, as necessary. The boom is to be lowered for this examination. <input type="checkbox"/> Visual examination of crane hooks for deformation, excessive wear or fractures. <input type="checkbox"/> For cranes intended for the transfer of personnel, nondestructive testing of crane hooks for fractures. <input type="checkbox"/> Visual external examination and operational test of crane machinery including prime mover, clutches, brakes; hoisting, slewing and luffing machinery. <input type="checkbox"/> Visual inspection of wire rope including end attachments. <input type="checkbox"/> Functional tests including main and auxiliary load hoisting and lowering, boom raising and lowering, slewing (swinging), safety protective (fail-safe) and limiting devices and load and boom angle or radius indicators. 				
	Testing: Operational Test: Together with proof load and periodic load tests, the following shall be performed with a dummy rated load, unless otherwise specified, and as determined by the LDEM and the responsible safety, engineering, operations, and maintenance organizations: Load hoisting, lowering at various speeds with the boom at the minimum radius (maximum safe movement up and down as determined by the LDEM and the responsible safety, engineering, operations, and maintenance organizations), and braking/holding mechanisms. Holding brakes shall be tested to verify stopping capabilities and demonstrate the ability to hold a rated load (see paragraph 5.3.3.f). The load should be held long enough to allow any dynamics to dampen out. (Requirement 40821)	<p>6.3 OPERATIONAL TESTS</p> <p>In addition to the prototype test and quality control measures established by this specification, each new production crane, at the option of the buyer, shall be tested by the manufacturer at his fabrication facility. The purchaser, or his designated representative, may witness the test. This test procedure, as agreed upon between buyer and manufacturer, is intended to verify safety systems as well as operational systems at rated capacity and full speed. Testing may include, but is not limited to, the following:</p> <ol style="list-style-type: none"> 1. Auxiliary and main line load tests at various radii. 2. Speed tests for main line, boom luff and swing. 3. Swing and free swing tests. 4. Overload test (1.33 times rated capacity), or as otherwise specified by buyer. 5. Anti two-block tests. 6. Upper and lower boom kick-out tests. 7. Engine functional tests. 	See Above				
	Testing: Operational Test: Together with proof load and periodic load tests, the following shall be performed with a dummy rated load, unless otherwise specified, and as determined by the LDEM and the responsible safety, engineering, operations, and maintenance organizations: Boom hoisting and lowering through full safe operating range as determined by the LDEM and the responsible safety, engineering, operations, and maintenance organizations. (Requirement 40822)	No recurring test required	See Above				
	Testing: Operational Test: Together with proof load and periodic load tests, the following shall be performed with a dummy rated load, unless otherwise specified, and as determined by the LDEM and the responsible safety, engineering, operations, and maintenance organizations: Swinging and traveling mechanisms. (Requirement 40823)	No recurring test required	See Above				

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	Testing: Operational Test: Together with proof load and periodic load tests, the following shall be performed with a dummy rated load, unless otherwise specified, and as determined by the LDEM and the responsible safety, engineering, operations, and maintenance organizations: Boom extension and retraction mechanism on telescoping boom cranes. (Requirement 40824)	No recurring test required	See Above				
	Testing: Operational Test: Together with proof load and periodic load tests, the following shall be performed with a dummy rated load, unless otherwise specified, and as determined by the LDEM and the responsible safety, engineering, operations, and maintenance organizations: All limit switches, locking devices, emergency stop switches, boom angle indicators, and other safety devices, excluding thermal overload and circuit breakers. The limit switch tests shall be performed with no load on the hook. (Requirement 40825)	No recurring test required	See Above				
	Testing: Operational Test: Together with proof load and periodic load tests, the following shall be performed with a dummy rated load, unless otherwise specified, and as determined by the LDEM and the responsible safety, engineering, operations, and maintenance organizations: Cranes and derricks used for critical lifts are required to be equipped with two holding brakes (hoist), each capable of bringing a rated load to zero speed and holding it (see paragraph 5.2.6.g). If a worm gear is used as a holding brake, it shall be tested to ensure it is able to hold a static load and stop a dynamic load. The operational test must demonstrate each brake's ability to stop and hold a rated load. This can be done in one of the following ways: (Requirement 40826)	No recurring test required	NR				
	Testing: Operational Test: Together with proof load and periodic load tests, the following shall be performed with a dummy rated load, unless otherwise specified, and as determined by the LDEM and the responsible safety, engineering, operations, and maintenance organizations: The operational test must demonstrate each brake's ability to stop and hold a rated load. This can be done in one of the following ways: Each brake's ability to hold shall be statically tested (under no load) with 150 percent of the rated load hoisting torque at the point of brake application. (Requirement 40827)	No recurring test required	3.7 Brakes and Fail-safe Devices The operation of all brakes and fail-safe devices is to be demonstrated under simulated loss of power conditions to the satisfaction of the Surveyor. The crane manufacturer shall prepare a test memorandum outlining the cautions and procedures for proper testing of the devices.				
	Testing: Operational Test: Together with proof load and periodic load tests, the following shall be performed with a dummy rated load, unless otherwise specified, and as determined by the LDEM and the responsible safety, engineering, operations, and maintenance organizations: The operational test must demonstrate each brake's ability to stop and hold a rated load. This can be done in one of the following ways: Alternately, each brake shall be tested for its ability to stop and hold a rated load in both the raising and lowering modes. (CAUTION: It must be possible to quickly reenergize the out-of-circuit brake or provide other safety measures to perform this test safely.) (Requirement 40828)	No recurring test required	NR				
	Testing: Operational Test: Together with proof load and periodic load tests, the following shall be performed with a dummy rated load, unless otherwise specified, and as determined by the LDEM and the responsible safety, engineering, operations, and maintenance organizations: The operational test must demonstrate each brake's ability to stop and hold a rated load. This can be done in one of the following ways: Other methods may be used as approved by the LDEM with concurrence from the responsible safety, engineering, operations, and maintenance organizations. (Requirement 40829)	No recurring test required	NR				

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	Testing: Operational Test: Together with proof load and periodic load tests, the following shall be performed with a dummy rated load, unless otherwise specified, and as determined by the LDEM and the responsible safety, engineering, operations, and maintenance organizations: The operational test for a modified crane/derrick can be tailored to test only those portions of the equipment that were modified, only if the periodic load and operational test interval has not expired. After a boom change on a crane/derrick used for critical lifts, the operational test does not have to include verification of each brake (paragraph 5.3.3.f) if it has been less than a year since the brakes were tested with a load equal to or greater than the maximum capacity of the crane/derrick with the new boom. (Requirement 40830)	No recurring test required	NR				
	Testing: Test Reports and Periodic Recertification Tags: After each test, designated personnel shall prepare written, dated, and signed test reports including procedure reference. (Requirement 40831)	4.2 INSPECTION AND LOAD TEST RECORDS 4.2.1 A log of Pre-use Inspections should be maintained per 3.1.5p and B.3.1.3o. 4.2.2 Written, dated and initialed Initial, Monthly, Quarterly and Annual Inspection reports, as well as records of repairs and modifications carried out on cranes in accordance with this RP, should be kept readily available for a period of four years at an appropriate location. The person performing the inspection should be identified on the inspection record. 4.2.3 When a load test is required, written reports should be furnished to the Crane Owner by a Qualified Inspector showing load test procedures and the results. Additional guidance on Load Testing is given in Appendix E.	3.13 Record of Test Copies of the initial and subsequent certificates of tests issued by the Surveyor are to be inserted in the Register of Lifting Appliances. See 2-8/1.				
	Testing: Test Reports and Periodic Recertification Tags: Inadequacies shall be documented and, if determined to be a hazard, corrected prior to further use. (Requirement 40832)	NR	NR				
	Testing: Test Reports and Periodic Recertification Tags: These reports shall be kept on file by the owner organization for a minimum of two test cycles and shall be made readily available. (Requirement 40833)	See above	3.13 Record of Test Copies of the initial and subsequent certificates of tests issued by the Surveyor are to be inserted in the Register of Lifting Appliances. See 2-8/1.				
	Testing: Test Reports and Periodic Recertification Tags: Following the periodic load test, mobile cranes/derricks shall be given a permanently affixed tag, posted on the crane/derrick or an appropriate location, identifying the equipment and stating the next required periodic load test date or load test expiration date. (Requirement 40834)	NR	3.11 Marking of Assembled Crane For single rated booms, the Safe Working Load (abbreviated "SWL") for the assembled gear is to be marked on the legs of gantry cranes and on the heel of jib crane booms together with the minimum angle to the horizontal or radius and date of test for which the boom is certified.				
	Inspection: Inspections, as described below, shall be performed on all mobile cranes/derricks and accessories. (Requirement 40836)	General comment.	1 General Before being taken into use, all cranes, including all accessory gear, are to have been tested and examined by the crane manufacturer. The person performing the testing and examination is to be duly authorized by the manufacturer. The Surveyor will witness tests during In-Plant, Initial, Annual, Retesting and Damage Surveys. The particulars of these tests and examinations will be entered on the applicable certificate and inserted in the Register of Lifting Appliances. See 2-8/1.				
	Inspection: Inspections shall be performed according to this section, the manufacturers' recommendations, and ASME B30.5. (Requirement 40837)	4 Inspection, Testing, and Maintenance 4.1 USAGE AND INSPECTION See Appendix C for detailed information.	NR				

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	Inspection: Inadequacies discovered during an inspection shall be documented and, if determined to be a hazard, tagged out and corrected prior to further use. (Requirement 40838)	<p>a. Inspections are intended to identify all deficiencies or items, which would affect the safe operation or reduce the lifting capability of the crane. Inspections should utilize methods and procedures appropriate for the crane type and its past and anticipated usage, as determined by the Crane Owner.</p> <p>b. Action taken to correct a deficiency should be made as soon as practicable.</p> <p>c. Limited (restricted) service may, in some cases, be continued after the identification and before correction of a deficiency. In such cases, it is the responsibility of the Qualified Crane Operator or Qualified Inspector to document the deficiency, reporting it to the Crane Owners. Based on this information, the Crane Owner should define the appropriate restriction and post necessary cautionary notices, after consultation with the Crane Manufacturer, Authorized Surveyor, certifying authority or other qualified source (such as an API-licensed 2C Crane Manufacturer, or an engineer experienced in the design of the crane, as determined by the Crane Owner).</p>	NR				
	Inspection: Inspections shall be performed by qualified personnel according to approved technical operating procedures. (Requirement 40839)	<p>4.1.2.1 Initial Inspection Initial Inspections apply to cranes that are new and are being placed into service, cranes that are being permanently relocated, and temporary cranes. A Qualified Inspector shall perform these inspections. Every Initial Inspection shall include a load test performed per the procedures outlined in Appendix E.</p>	See above				
	Inspection: All new, extensively repaired, or modified mobile cranes and derricks shall be given a daily and a periodic inspection prior to first use. For component repair on cranes/derricks, only the inspections that apply to the repaired portion need to be performed prior to first use unless a periodic inspection interval expires during the downtime (see paragraph 5.4.5). (Requirement 40840)	<p>4.1.2 Inspection Categories All cranes should receive inspections in accordance with the categories described below. These inspections are more clearly defined in Appendix C of this RP. These inspection requirements apply to all cranes including those installed for temporary use. These inspection guidelines are minimum requirements. The Crane Owner should determine the actual scope of the inspections, with input from manufacturers and other relevant sources, as appropriate.</p> <p>4.1.2.1 Initial Inspection Initial Inspections apply to cranes that are new and are being placed into service, cranes that are being permanently relocated, and temporary cranes. A Qualified Inspector shall perform these inspections. Every Initial Inspection shall include a load test performed per the procedures outlined in Appendix E.</p> <p>Initial, Pre-Use, monthly, quarterly annual inspections called out in API 2D</p>	<p>13 Repairs and Alterations 13.1 Crane Structure, Booms and Permanent Fittings When important repairs or renewals are required to be made to the structure, booms or permanent fittings of cranes, the repairs are to be carried out to the satisfaction of the Surveyor. Any welding is to be done by an approved procedure. Tests and examination of the particular crane as may be deemed necessary are to be carried out in accordance with 2-5/3, but a dynamometer or load cell may be used in lieu of weights.</p>				
	Inspection: Mobile cranes and derricks in regular service (used at least once a month) shall be inspected as required in paragraphs 5.4.4 and 5.4.5. Idle and standby cranes shall be inspected according to paragraph 5.4.6. (Requirement 40841)	<p>4.1.2.3 Monthly Inspection The Monthly Inspection shall be performed once per month, for all cranes assigned a Heavy Usage category. A Qualified Crane Operator shall perform this inspection. A Qualified Inspector may also perform these inspections.</p> <p>4.1.2.4 Quarterly Inspection The Quarterly Inspection shall be performed once every 3 months for all cranes assigned a Moderate or Heavy Usage category. A Qualified Inspector shall perform this inspection.</p>	NR				

Doc Para	NASA-STD-8719.9 Requirement Text	OSHA Requirement Text	ASME / ANSI / Other Requirement Text				
	Inspection: Daily Inspections. These inspections shall be performed and documented prior to first use each day the crane/derrick is used, and shall include the following: (Requirement 40842)	General comment.	NR				
	Inspection: Daily Inspections. These inspections shall be performed and documented prior to first use each day the crane/derrick is used, and shall include the following: Check operating and control mechanisms for proper function. (Requirement 40843)	4.1.2.2 Pre-use Inspection The Pre-use Inspection shall be performed and documented prior to the first crane use of the day, prior to or during each change in Crane Operator, and then as the Qualified Crane Operator deems necessary during the day for extended operations. A Qualified Crane Operator shall perform this inspection, and it applies to all cranes, regardless of usage category. A Qualified Inspector may also perform these inspections.	NR				
	Inspection: Daily Inspections. These inspections shall be performed and documented prior to first use each day the crane/derrick is used, and shall include the following: Without disassembling, visually inspect lines, tanks, valves, drain pumps, gear casings, and other components of fluid systems for deterioration and leaks. This applies to components that can be seen from the ground level or for which there is safe access via inspection walkways. (Requirement 40844)	See 2D Appendix C for detailed requirements.	NR				
	Inspection: Daily Inspections. These inspections shall be performed and documented prior to first use each day the crane/derrick is used, and shall include the following: Without disassembling, inspect all functional operating and control mechanisms, including brakes where visible, for excessive wear and contamination by excessive lubricants or foreign matter. (Requirement 40845)	See 2D Appendix C for detailed requirements.	NR				
	Inspection: Daily Inspections. These inspections shall be performed and documented prior to first use each day the crane/derrick is used, and shall include the following: Inspect hooks for cracks and deformities (see Section 7). (Requirement 40846)	See 2D Appendix C for detailed requirements.	NR				
	Inspection: Daily Inspections. These inspections shall be performed and documented prior to first use each day the crane/derrick is used, and shall include the following: Inspect rope reeving for proper travel and drum lay. (Requirement 40847)	See 2D Appendix C for detailed requirements.	NR				
	Inspection: Daily Inspections. These inspections shall be performed and documented prior to first use each day the crane/derrick is used, and shall include the following: Inspect hoist chains for excessive wear or distortion. (Requirement 40848)	See 2D Appendix C for detailed requirements.	NR				
	Inspection: Formal Periodic Inspections. These inspections shall be performed at varying intervals, depending on activity, severity of service, environment, and criticality. (Requirement 40849)	See 2D Appendix C for detailed requirements.	SECTION 7 Surveys 1 General Before being taken into use, all cranes, including all accessory gear, are to have been tested and examined by the crane manufacturer. The person performing the testing and examination is to be duly authorized by the manufacturer. The Surveyor will witness tests during In-Plant, Initial, Annual, Retesting and Damage Surveys. The particulars of these tests and examinations will be entered on the applicable certificate and inserted in the Register of Lifting Appliances. See 2-8/1.				
	Inspection: Formal Periodic Inspections: Monthly Inspections (Frequent Inspections). At least once per month: Perform daily inspection requirements described in paragraph 5.4.4. (Requirement 40851)	See 2D Appendix C for detailed requirements.	NR				
	Inspection: Formal Periodic Inspections: Monthly Inspections (Frequent Inspections). At least once per month: Inspect for excessive wear in brake (hoist and boom) and clutch system parts, linings, pawls, and ratchets without major disassembly. (Requirement 40852)	See 2D Appendix C for detailed requirements.	NR				

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	Inspection: Formal Periodic Inspections: Monthly Inspections (Frequent Inspections). At least once per month: Perform a thorough inspection of all ropes paying particular attention to the signs of deterioration and damage outlined in paragraph 5.5.3. (Requirement 40853)	See 2D Appendix C for detailed requirements.	NR				
	Inspection: Formal Periodic Inspections: Monthly Inspections (Frequent Inspections). At least once per month: Inspect for visible deformation or cracks in hooks (see Section 7). (Requirement 40854)	See 2D Appendix C for detailed requirements.	NR				
	Inspection: Formal Periodic Inspections: Annual Inspections (Periodic Inspections). At least once per year, inspect for: Requirements for monthly inspections (frequent inspections) described in paragraph 5.4.5.a. (Requirement 40856)	See 2D Appendix C for detailed requirements.	7 Annual Survey (1 January 2008) After undergoing the original test and examination required by 2-5/3, each crane is required to undergo an Annual Survey at intervals of 12 months. The Annual Survey should include the following: <input type="checkbox"/> Visual inspection of the crane structure for deformation, excessive wear, corrosion, damage or fractures, as necessary. The boom is to be lowered for this examination. <input type="checkbox"/> Visual examination of crane hooks for deformation, excessive wear or fractures. <input type="checkbox"/> For cranes intended for the transfer of personnel, nondestructive testing of crane hooks for fractures. <input type="checkbox"/> Visual external examination and operational test of crane machinery including prime mover, clutches, brakes; hoisting, slewing and luffing machinery. <input type="checkbox"/> Visual inspection of wire rope including end attachments. <input type="checkbox"/> Functional tests including main and auxiliary load hoisting and lowering, boom raising and lowering, slewing (swinging), safety protective (fail-safe) and limiting devices and load and boom angle or radius indicators.				
	Inspection: Formal Periodic Inspections: Annual Inspections (Periodic Inspections). At least once per year, inspect for: Deformed, cracked, or corroded members and welds and loose bolts or rivets in crane structure. Various methods of NDT such as ultrasonics, radiography, magnetic particle, liquid penetrant, etc., shall be used as needed. (Requirement 40857)	See 2D Appendix C for detailed requirements.	See Above				
	Inspection: Formal Periodic Inspections: Annual Inspections (Periodic Inspections). At least once per year, inspect for: Cracked or worn sheaves and drums. (Requirement 40858)	See 2D Appendix C for detailed requirements.	See Above				
	Inspection: Formal Periodic Inspections: Annual Inspections (Periodic Inspections). At least once per year, inspect for: Excessive wear or cracks in pins, bearings, shafts, gears, followers, and locking and clamping devices. Surface or volumetric NDT shall be used to validate the existence or absence of cracks indicated by this inspection. (Requirement 40859)	See 2D Appendix C for detailed requirements.	See Above				
	Inspection: Formal Periodic Inspections: Annual Inspections (Periodic Inspections). At least once per year, inspect for: Significant inadequacies in load, wind, boom, angle, and other indicators over full range. (Requirement 40860)	See 2D Appendix C for detailed requirements.	See Above				
	Inspection: Formal Periodic Inspections: Annual Inspections (Periodic Inspections). At least once per year, inspect for: Excessive wear in chain drive sprockets and stretch in the chain. (Requirement 40861)	See 2D Appendix C for detailed requirements.	See Above				
	Inspection: Formal Periodic Inspections: Annual Inspections (Periodic Inspections). At least once per year, inspect for: Abnormal performance in power plant(s) and compliance with applicable safety requirements, such as locations of guards on belts. (Requirement 40862)	See 2D Appendix C for detailed requirements.	See Above				

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	Inspection: Formal Periodic Inspections: Annual Inspections (Periodic Inspections). At least once per year, inspect for: Evidence of a malfunction in travel, steering, braking, and locking devices. (Requirement 40863)	See 2D Appendix C for detailed requirements.	See Above				
	Inspection: Formal Periodic Inspections: Annual Inspections (Periodic Inspections). At least once per year, inspect for: Evidence of a malfunction in any safety device. (Requirement 40864)	See 2D Appendix C for detailed requirements.	See Above				
	Inspection: Formal Periodic Inspections: Annual Inspections (Periodic Inspections). At least once per year, inspect for: Evidence of overheating. (Requirement 40865)	See 2D Appendix C for detailed requirements.	See Above				
	Inspection: Idle and Standby Cranes/Derricks. Idle and standby cranes/derricks shall be inspected prior to first use according to the requirements of paragraphs 5.4.4 and 5.4.5 unless these monthly and annual inspections were performed at required intervals and recorded during the idle/standby period. (Requirement 40866)	See 2D Appendix C for detailed requirements.	NR				
	Inspection: Inspection Reports: After each formal periodic inspection, qualified, authorized personnel shall prepare written, dated, and signed inspection reports. (Requirement 40867)	<p>4.2 INSPECTION AND LOAD TEST RECORDS</p> <p>4.2.1 A log of Pre-use Inspections should be maintained per 3.1.5p and B.3.1.3o.</p> <p>4.2.2 Written, dated and initialed Initial, Monthly, Quarterly and Annual Inspection reports, as well as records of repairs and modifications carried out on cranes in accordance with this RP, should be kept readily available for a period of four years at an appropriate location. The person performing the inspection should be identified on the inspection record.</p>	See Above				
	Inspection: Inspection Reports: These reports shall include procedure reference and adequacy of the crane/crane components. (Requirement 40868)	See above	<p>SECTION 7 Surveys</p> <p>1 General</p> <p>Before being taken into use, all cranes, including all accessory gear, are to have been tested and examined by the crane manufacturer. The person performing the testing and examination is to be duly authorized by the manufacturer.</p> <p>The Surveyor will witness tests during In-Plant, Initial, Annual, Retesting and Damage Surveys. The particulars of these tests and examinations will be entered on the applicable certificate and inserted in the Register of Lifting Appliances. See 2-8/1.</p>				
	Inspection: Inspection Reports: Inadequacies shall be documented and, if determined to be a hazard, corrected prior to further use. (Requirement 40869)	<p>a. Inspections are intended to identify all deficiencies or items, which would affect the safe operation or reduce the lifting capability of the crane. Inspections should utilize methods and procedures appropriate for the crane type and its past and anticipated usage, as determined by the Crane Owner.</p> <p>b. Action taken to correct a deficiency should be made as soon as practicable.</p> <p>c. Limited (restricted) service may, in some cases, be continued after the identification and before correction of a deficiency. In such cases, it is the responsibility of the Qualified Crane Operator or Qualified Inspector to document the deficiency, reporting it to the Crane Owners. Based on this information, the Crane Owner should define the appropriate restriction and post necessary cautionary notices, after consultation with the Crane Manufacturer, Authorized Surveyor, certifying authority or other qualified source (such as an API-licensed 2C Crane Manufacturer, or an engineer experienced in the design of the crane, as determined by the Crane Owner).</p>	NR				

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	Inspection: Inspection Reports: These reports shall be filed and made readily available by the organizational element responsible for inspection. (Requirement 40870)	See above	See above				
	Maintenance: A maintenance program based on manufacturers' recommendations, integrating proactive, reactive, preventive, and predictive maintenance shall be established to increase the probability the mobile crane/derrick will function in the required manner over its design life cycle with a minimum of maintenance. (Requirement 40871)	4.3 MAINTENANCE 4.3.1 Preventive Maintenance A preventive maintenance program should be established by the Crane Owner, taking into consideration crane type, frequency of usage, history of maintenance, and manufacturer's recommendations. Written and dated maintenance records should be readily available for a period of 4 years.	NR				
	Maintenance: The program shall include procedures and a scheduling system for normal periodic maintenance items, adjustments, replacements, and repairs. (Requirement 40872)	See above	NR				
	Maintenance: The program shall also ensure that records are kept and unsafe test and inspection discrepancies are documented and corrected. (Requirement 40873)	See above	NR				
	Maintenance: Any mobile crane or derrick found in an unsafe operating condition shall be tagged out and removed from service until repaired. (Requirement 40874)	4.3.3 Repairs and Replacements a. If unsafe conditions are disclosed by the inspection requirements as outlined in 4.1 of this RP, the crane shall be taken out of service or its operation restricted to eliminate the unsafe condition. b. Repairs or replacements of critical components should be made as soon as practical (see F.4.3.3). c. Written reports should be maintained by the Crane Owner, confirming the adequacy of major repairs or alterations as implemented.	NR				
	Maintenance: All repairs shall be made by qualified personnel in accordance with the manufacturers' instructions. (Requirement 40875)	See above in MX Program. No qualified personnel requirement for maintainers.	NR				
	Maintenance: Maintenance Procedures. Before maintenance, adjustments, repairs, and replacements are initiated, the following safety precautions shall be taken: (Requirement 40876)	General comment.	NR				
	Maintenance: Maintenance Procedures. Before maintenance, adjustments, repairs, and replacements are initiated, the following safety precautions shall be taken: Move to an area where maintenance will not interfere with other operations. (Requirement 40877)	F.4.3.2 Maintenance Procedure a. The following additional precautions, where applicable, should be taken, before adjustments, repairs and maintenance are started on a crane. 1. Boom shall be lowered to the deck or boom rest or otherwise secured against dropping and swinging. 2. Blocks shall be lowered to the deck or otherwise secured against dropping and swinging. 3. All controls shall be in the off or neutral position.	NR				
	Maintenance: Maintenance Procedures. Before maintenance, adjustments, repairs, and replacements are initiated, the following safety precautions shall be taken: Cranes/derricks shall not be operated until all safety devices have been activated and tested/adjusted if involved in the maintenance action. (Requirement 40878)	See above.	NR				
	Maintenance: Adjustments. Based upon the manufacturer's documentation and/or experience, adjustments shall be made to ensure that all components function properly, paying particular attention to: (Requirement 40879)	General comment.	NR				

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	Maintenance: Adjustments. Based upon the manufacturer's documentation and/or experience, adjustments shall be made to ensure that all components function properly, paying particular attention to: Brakes. Appropriate precautions shall be taken by inspectors, repair personnel, and others who may be potentially exposed to airborne dust fibers from any asbestos friction materials present in braking mechanisms. (Requirement 40880)	<p>b. Adjustments should include the following:</p> <ol style="list-style-type: none"> 1. All operating mechanisms and control systems. 2. Limit devices. 3. Swing circle assembly. 4. Prime mover. 5. Non-mechanical System—Appropriate out of service signs should be placed at the control station and/or prime mover by a Qualified Crane Operator or Inspector. 6. Corrective action should be taken by the Crane Owner. 7. After adjustments, repairs and maintenance have been completed, the crane should not be put in-service until all guards have been reinstalled, limit devices reactivated and maintenance equipment removed. <p>d. All major replacement parts should equal or exceed the original equipment manufacturer's recommendations.</p> <p>e. No welding repairs shall be made to critical components, such as booms and swing circle assemblies, without specific repair procedures and recommendations from the original Crane Manufacturer, or other qualified source</p>	NR				
	Maintenance: Adjustments. Based upon the manufacturer's documentation and/or experience, adjustments shall be made to ensure that all components function properly, paying particular attention to: Control system. (Requirement 40881)	See above.	NR				
	Maintenance: Adjustments. Based upon the manufacturer's documentation and/or experience, adjustments shall be made to ensure that all components function properly, paying particular attention to: Power plants. (Requirement 40882)	See above.	NR				
	Maintenance: Adjustments. Based upon the manufacturer's documentation and/or experience, adjustments shall be made to ensure that all components function properly, paying particular attention to: Critical operating mechanisms and safety devices. (Requirement 40883)	See above.	NR				
	Maintenance: Adjustments. Based upon the manufacturer's documentation and/or experience, adjustments shall be made to ensure that all components function properly, paying particular attention to: Operator mechanical and electrical controls. (Requirement 40884)	See above.	NR				

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	Maintenance: Repairs/Replacements. Repairs/replacements shall be promptly provided for safe operation. (Requirement 40885)	<p>4.3.3 Repairs and Replacements</p> <p>a. If unsafe conditions are disclosed by the inspection requirements as outlined in 4.1 of this RP, the crane shall be taken out of service or its operation restricted to eliminate the unsafe condition.</p> <p>b. Repairs or replacements of critical components should be made as soon as practical (see F.4.3.3).</p> <p>c. Written reports should be maintained by the Crane Owner, confirming the adequacy of major repairs or alterations as implemented.</p> <p>d. All major replacement parts should equal or exceed the original equipment manufacturer's recommendations.</p> <p>e. No welding repairs shall be made to critical components, such as booms and swing circle assemblies, without specific repair procedures and recommendations from the original Crane Manufacturer, or other qualified source (such as an API-licensed 2C Crane Manufacturer, Authorized Surveyor, or an engineer experienced in the design of the crane, as determined by the Crane Owner). Care should be taken to ensure that arcing does not occur across any bearings.</p> <p>f. Field welding shall not be performed on load hooks or sling hooks. Hooks should not be exposed to excessive heat.</p>	<p>13 Repairs and Alterations</p> <p>13.1 Crane Structure, Booms and Permanent Fittings</p> <p>When important repairs or renewals are required to be made to the structure, booms or permanent fittings of cranes, the repairs are to be carried out to the satisfaction of the Surveyor. Any welding is to be done by an approved procedure. Tests and examination of the particular crane as may be deemed necessary are to be carried out in accordance with 2-5/3, but a dynamometer or load cell may be used in lieu of weights.</p>				
	Maintenance: Repairs/Replacements: For repair/replacement requirements for hooks with deformation or cracks, see Section 7. If repaired, hooks shall be proof load tested using the associated mobile crane/derrick minimum working radius proof load value. (Requirement 40886)	See above.	NR				
	Maintenance: Repairs/Replacements: Structural members that are cracked, bent, broken, excessively worn, or corroded shall be evaluated by the responsible engineering organization to determine if they should be repaired or replaced. Proper material and weld/repair procedures will be used according to ANSI/AWS D14.1 and manufacturer specifications. (Requirement 40887)	See above.	NR				
	Maintenance: Repairs/Replacements: Any structural repairs/replacements shall be performed with the proper approval/concurrences required by OSHA, the applicable ASME standards, and the manufacturers' requirements. Procedures will be conducted by properly qualified personnel. (Requirement 40888)	See above.	<p>13 Repairs and Alterations</p> <p>13.1 Crane Structure, Booms and Permanent Fittings</p> <p>When important repairs or renewals are required to be made to the structure, booms or permanent fittings of cranes, the repairs are to be carried out to the satisfaction of the Surveyor. Any welding is to be done by an approved procedure. Tests and examination of the particular crane as may be deemed necessary are to be carried out in accordance with 2-5/3, but a dynamometer or load cell may be used in lieu of weights.</p>				

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	Maintenance: Repairs/Replacements: The need to replace wire rope shall be determined by a certified or otherwise qualified person based on an evaluation of inspection results. Any of the following signs of deterioration and damage are sufficient reasons for rejection of the rope (see Wire Rope Users Manual for additional information on wire rope inspections): (Requirement 40889)	Extensive section on wire rope. 2D 5 Wire Rope and Sling Inspection, Replacement and Maintenance 5.1 WIRE ROPE	11 Inspection of Wire Rope All running wire ropes are to be visually inspected at each Annual and Retesting Survey. The crane Owner or operator is to examine the wire rope, including end connections, at frequent intervals between surveys. Wire rope is not to be used if in any length of ten diameters: <input type="checkbox"/> The total number of visible broken wires exceeds 5 percent of the total number of wires, <input type="checkbox"/> If there is more than one broken wire immediately adjacent to an end fitting, <input type="checkbox"/> If the broken wires are concentrated in one area or one strand, or <input type="checkbox"/> If the rope shows signs of excessive wear, corrosion, flattening, kinks, separation of the strands or wires, core failures or other defect which renders it unfit for use.				
	Maintenance: Repairs/Replacements: Any of the following signs of deterioration and damage are sufficient reasons for rejection of the rope (see Wire Rope Users Manual for additional information on wire rope inspections): In running ropes, six randomly distributed broken wires in one rope lay or three broken wires in one strand in one lay or one valley break. In rotation resistant ropes, two randomly distributed broken wires in thirty rope diameters. In standing ropes, more than two broken wires in one lay in sections beyond end connections or any broken wires at an end connection. (Requirement 40890)	Extensive section on wire rope. 2D 5 Wire Rope and Sling Inspection, Replacement and Maintenance 5.1 WIRE ROPE	See above				
	Maintenance: Repairs/Replacements: Any of the following signs of deterioration and damage are sufficient reasons for rejection of the rope (see Wire Rope Users Manual for additional information on wire rope inspections): Individual outside wires with wear of 1/3 the original diameter. (Requirement 40891)	Extensive section on wire rope. 2D 5 Wire Rope and Sling Inspection, Replacement and Maintenance 5.1 WIRE ROPE	See above				
	Maintenance: Repairs/Replacements: Any of the following signs of deterioration and damage are sufficient reasons for rejection of the rope (see Wire Rope Users Manual for additional information on wire rope inspections): Kinking, crushing, bird caging, or any other damage resulting in distortion. (Requirement 40892)	Extensive section on wire rope. 2D 5 Wire Rope and Sling Inspection, Replacement and Maintenance 5.1 WIRE ROPE	See Above				
	Maintenance: Repairs/Replacements: Any of the following signs of deterioration and damage are sufficient reasons for rejection of the rope (see Wire Rope Users Manual for additional information on wire rope inspections): Evidence of heat damage. (Requirement 40893)	Extensive section on wire rope. 2D 5 Wire Rope and Sling Inspection, Replacement and Maintenance 5.1 WIRE ROPE	See Above				
	Maintenance: Repairs/Replacements: Any of the following signs of deterioration and damage are sufficient reasons for rejection of the rope (see Wire Rope Users Manual for additional information on wire rope inspections): End connectors that are cracked, deformed, or with evidence of rope pullout. (Requirement 40894)	Extensive section on wire rope. 2D 5 Wire Rope and Sling Inspection, Replacement and Maintenance 5.1 WIRE ROPE	See Above				
	Maintenance: Repairs/Replacements: Any of the following signs of deterioration and damage are sufficient reasons for rejection of the rope (see Wire Rope Users Manual for additional information on wire rope inspections): Corrosion (internal or external) that results in reduction of rope diameter, or at end connectors. (Requirement 40895)	Extensive section on wire rope. 2D 5 Wire Rope and Sling Inspection, Replacement and Maintenance 5.1 WIRE ROPE	See Above				

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	Maintenance: Repairs/Replacements: Any of the following signs of deterioration and damage are sufficient reasons for rejection of the rope (see Wire Rope Users Manual for additional information on wire rope inspections): Reductions of nominal diameter (measured with a caliper or go/no-go gage) of more than: 1/64 inch (0.4 mm) for diameters of rope up to 5/16 inch (8.0 mm). (Requirement 40897)	Extensive section on wire rope. 2D 5 Wire Rope and Sling Inspection, Replacement and Maintenance 5.1 WIRE ROPE	See Above				
	Maintenance: Repairs/Replacements: Any of the following signs of deterioration and damage are sufficient reasons for rejection of the rope (see Wire Rope Users Manual for additional information on wire rope inspections): Reductions of nominal diameter (measured with a caliper or go/no-go gage) of more than: 1/32 inch (0.8 mm) for diameters 3/8 inch (9.5 mm) to 1/2 inch (13.0 mm). (Requirement 40898)	Extensive section on wire rope. 2D 5 Wire Rope and Sling Inspection, Replacement and Maintenance 5.1 WIRE ROPE	See Above				
	Maintenance: Repairs/Replacements: Any of the following signs of deterioration and damage are sufficient reasons for rejection of the rope (see Wire Rope Users Manual for additional information on wire rope inspections): Reductions of nominal diameter (measured with a caliper or go/no-go gage) of more than: 3/64 inch (1.2 mm) for diameters 9/16 inch (14.5 mm) through 3/4 inch (19.0 mm). (Requirement 40899)	Extensive section on wire rope. 2D 5 Wire Rope and Sling Inspection, Replacement and Maintenance 5.1 WIRE ROPE	See Above				
	Maintenance: Repairs/Replacements: Any of the following signs of deterioration and damage are sufficient reasons for rejection of the rope (see Wire Rope Users Manual for additional information on wire rope inspections): Reductions of nominal diameter (measured with a caliper or go/no-go gage) of more than: 1/16 inch (1.6 mm) for diameters 7/8 inch (22.0 mm) through 1-1/8 inches (29.0 mm). (Requirement 40900)	Extensive section on wire rope. 2D 5 Wire Rope and Sling Inspection, Replacement and Maintenance 5.1 WIRE ROPE	See Above				
	Maintenance: Repairs/Replacements: Any of the following signs of deterioration and damage are sufficient reasons for rejection of the rope (see Wire Rope Users Manual for additional information on wire rope inspections): Reductions of nominal diameter (measured with a caliper or go/no-go gage) of more than: 3/32 inch (2.4 mm) for diameters greater than 1-1/8 inches (29.0 mm). (Requirement 40901)	Extensive section on wire rope. 2D 5 Wire Rope and Sling Inspection, Replacement and Maintenance 5.1 WIRE ROPE	See Above				
	Maintenance: Repairs/Replacements: Any of the following signs of deterioration and damage are sufficient reasons for rejection of the rope (see Wire Rope Users Manual for additional information on wire rope inspections): If replaced, the new rope shall be proof load tested using the associated mobile crane/derrick minimum working radius proof load value. (Requirement 40902)	Extensive section on wire rope. 2D 5 Wire Rope and Sling Inspection, Replacement and Maintenance 5.1 WIRE ROPE	See Above				
	Personnel Certification: Only certified (licensed) and trained operators shall be authorized to use/operate mobile cranes and derricks. (Requirement 40904)	3.1 CRANE OPERATOR AND RIGGER QUALIFICATIONS AND OPERATING PRACTICES 3.1.1 Crane Operators Only the following personnel should operate cranes: a. Qualified Crane Operators who have met and passed the requirements of 2.1 and 3.1.2. b. Trainees under the direct supervision of a Qualified Crane Operator. c. Appropriate maintenance and supervisory personnel, when it is necessary for them to do so in the performance of their duties. d. Qualified Inspectors in the performance of their inspection duties. No one other than personnel specified above should enter a crane cab.	NR				
	Personnel Certification: A training, examination, and licensing program shall be established or made available. (Requirement 40905)	2D Appendix A has sections for Operator, Rigger, and Inspector training	NR				

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	Personnel Certification: For those NASA installations that do not have a training program, all operators shall be trained and certified by a recognized certification organization that normally performs this function. The operator certification program will be reviewed at least annually to assure that the contents, training material, testing, and examination elements are up-to-date with current methods and techniques; and that any "lessons-learned" are adequately addressed. (Requirement 40906)	NR	NR				
	Personnel Certification: Riggers (see Section 10) and personnel performing NDT (see paragraph 1.9) shall be certified in their discipline. (Requirement 40907)	Temporary Cranes is only reference for NDT Testing and Inspecting the Installation Load tests shall be performed by a Qualified Inspector in accordance with this standard (see Appendix E). An Annual Inspection shall be performed before and after the load test. The tie down welds shall be inspected by non destructive testing by a qualified person before and after load testing. Examples of this type of testing are Ultrasonic Testing, Magnetic Particle, Dye Penetrant or Radiographic Examination.	NR				
	Personnel Certification: Training shall be provided to observers and flagmen. (Requirement 40908)	NR	NR				
	Personnel Certification: All participants in the lifting operation shall have clearly defined roles and responsibilities . (Requirement 40909)	NR	NR				
	Personnel Certification: Levels: Two levels of operator training and proficiency will be established. Operations where critical lifts are involved will require a more rigid operator certification program than those operations that involve more routine lifts that do not involve critical hardware or unique hazards. (Requirement 40910)	NR	NR				
	Personnel Certification: Levels: Noncritical Lifts. The certification program for noncritical lift operators shall include the following: (Requirement 40911)	General comment.	NR				
	Personnel Certification: Levels: Noncritical Lifts. The certification program for noncritical lift operators shall include the following: Training: Classroom training in safety, lifting equipment emergency procedures, general performance standards, requirements, pre-operational checks, and safety-related defects and symptoms (for initial certification and as needed). (Requirement 40913)	Operator traing requirements in A1	NR				
	Personnel Certification: Levels: Noncritical Lifts. The certification program for noncritical lift operators shall include the following: Training: Hands-on training (for initial certification and as needed). (Requirement 40914)	Operator traing requirements in A2	NR				
	Personnel Certification: Levels: Noncritical Lifts. The certification program for noncritical lift operators shall include the following: Training: An annual review of the items in paragraph 5.6.2.a(1) above. (This may be conducted informally by local supervisory personnel.) (Requirement 40915)	Operator traing requirements in A3	NR				
	Personnel Certification: Levels: Noncritical Lifts. The certification program for noncritical lift operators shall include the following: Examination: Physical examination (criteria to be determined by the cognizant medical official and should comply with ASME B30.5). (Requirement 40917)	Operator traing requirements in A4	NR				
	Personnel Certification: Levels: Noncritical Lifts. The certification program for noncritical lift operators shall include the following: Examination: Written examination. (Requirement 40918)	Operator traing requirements in A5	NR				

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	Personnel Certification: Levels: Noncritical Lifts. The certification program for noncritical lift operators shall include the following: Examination: Operational demonstration (for initial certification only). (Requirement 40919)	See below	NR				
	Personnel Certification: Levels: Noncritical Lifts. The certification program for noncritical lift operators shall include the following: Examination: Proficiency examination for recertification. (Requirement 40920)	The following are recommended minimum requirements for Crane Operator training: Classroom-type sessions with written and hands-on examinations on the type of crane to be operated by the qualifying Crane Operator. Before a person may be designated a Qualified Crane Operator, the person shall also be required to demonstrate hands-on proficiency in the safe operation of cranes he or she is to operate. See 3.1.2c for suggested requirements on hands-on proficiency.	NR				
	Personnel Certification: Levels: Noncritical Lifts. The certification program for noncritical lift operators shall include the following: Licensing: An organizational element shall be designated to issue operator licenses. (Requirement 40922)	NR	NR				
	Personnel Certification: Levels: Noncritical Lifts. The certification program for noncritical lift operators shall include the following: Licensing: Provisions shall be made to revoke licenses for negligence, violations of safety requirements, or failure to meet medical standards. (Requirement 40923)	MR	NR				
	Personnel Certification: Levels: Noncritical Lifts. The certification program for noncritical lift operators shall include the following: Licensing: Provisions shall be made for periodic checks of operators to verify they have licenses in their possession. (Requirement 40924)	NR	NR				
	Personnel Certification: Levels: Noncritical Lifts. The certification program for noncritical lift operators shall include the following: Licensing: The licenses shall indicate the type of crane/derrick the holder is qualified to operate. Alternately, the organizational element may elect to maintain a master list of licensed operators instead of issuing individual licenses, providing copies of the list are readily available to assurance and supervisory personnel at the work site. (Requirement 40925)	NR	NR				
	Personnel Certification: Levels: Noncritical Lifts. The certification program for noncritical lift operators shall include the following: Licensing/Operator Certification: Renewal of all licenses shall require demonstration of proficiency or approval of supervision that proficiency is adequate and current. Licenses or certifications will expire at least every 4 years. Renewal procedures will be established by each licensing organization but, as a minimum, will include items in paragraphs 5.6.2.a.(1) and 5.6.2.a.(2). (Requirement 40926)	d. The employer shall assure that Crane Operator qualifications are maintained, at a minimum every 4 years, through requalification. This shall also include current vision and medical condition evaluations as per 3.1.2b. See above from 2D	NR				
	Personnel Certification: Levels: Critical Lifts. Besides the training, examination, licensing, and renewal requirements for noncritical lifts, operators that are being certified to perform critical lifts must be trained in the specific hazards and special procedures associated with the lift. Operators must also demonstrate proficiency and operating finesse with the crane/derrick using a test load for the initial certification or alternately be immediately supervised by a certified operator during the first initial lifting period. The licenses will indicate specific cranes/derrick for which the operator is certified. (Requirement 40927)	NR	NR				

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	Operations: Cranes/derricks shall be operated according to this section, the manufacturers' recommendations, and ASME B30.5. (Requirement 40928)	General comment.	7 Loading, Handling and Securing This Guide is published on the understanding that responsibility for control of Safe Working Loads, crane handling during lifting and setting loads, avoidance of improper weight distributions while lifting a load, securing of the crane on the vessel or unit when not in use, maintenance of the crane, and handling and stability of the vessel or unit during operation of the crane, rest with the Operator/ Owner. (Basically NR)				
	Operations: The following practices shall be followed for crane/derrick operations: (Requirement 40929)	General comment.	NR				
	Operations: The following practices shall be followed for crane/derrick operations: The operator is responsible for being totally familiar with the information contained in the crane/derrick operating manual and load chart. The operator must understand the correct meaning of all notes and warnings and be able to calculate or determine the crane's/derrick's actual net capacity for every possible machine configuration. (Requirement 40930)	3.1.5 Operating Practices a. The Qualified Crane Operator (herein also called Crane Operator) is responsible for those operations under his or her direct control. Whenever there is any doubt as to safety, the Crane Operator should have the authority to stop and refuse to handle loads or continue operations as safety dictates. See Appendix B.3.1.3a for additional safety considerations. b. The Crane Operator should be aware of the operating characteristics of the crane. Mechanical and nonmechanical cranes will require different operating techniques, especially with regards to engine speed, control operation, control arrangement and braking. The Crane Manufacturer should provide operating instructions or be consulted for specific information. c. The Crane Operator should be familiar with the equipment and its proper care.	NR				
	Operations: The following practices shall be followed for crane/derrick operations: Hands shall be free from encumbrances while personnel are using crane/derrick ladders. (Requirement 40931)	NR	NR				
	Operations: The following practices shall be followed for crane/derrick operations: Articles that are too large to be carried in pockets or belts shall be lifted and lowered by handline. (Requirement 40932)	NR	NR				
	Operations: The following practices shall be followed for crane/derrick operations: Necessary clothing and personal belongings in cabs shall be stored so as not to interfere with access or operations. (Requirement 40933)	NR	NR				
	Operations: The following practices shall be followed for crane/derrick operations: Tools, oil can, waste, extra fuses, and other necessary articles shall be stored properly and shall not be permitted to lie loose in the cab or on the crane. (Requirement 40934)	NR	NR				
	Operations: The following practices shall be followed for crane/derrick operations: Operators shall be familiar with the operation and care of the fire extinguishers provided. (Requirement 40935)	3.5.2 Fire Extinguishers a. Fire extinguishers shall be kept in the cab or vicinity of the crane and be of a size and type not less than specified by the proper authorities. b. Personnel who are expected to respond to fires should be trained in the use of fire extinguishers as described in 3.5.2a.	NR				
	Operations: The following practices shall be followed for crane/derrick operations: Crane/derrick crew discipline shall be maintained at all times during an operation. (Requirement 40936)	NR	NR				
	Operations: The following practices shall be followed for crane/derrick operations: There shall be no eating, drinking, or rowdiness during crane/derrick operation. (Requirement 40937)	NR	NR				
	Operations: The following practices shall be followed for crane/derrick operations: Mobile cranes shall be level. (Requirement 40938)	NR	NR				

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	Operations: The following practices shall be followed for crane/derrick operations: When the load to be handled and the operating radius require the use of outriggers, or any time when outriggers are used, the outrigger beams shall be fully extended or deployed per load rating chart specifications. (Requirement 40939)	NR	NR				
	Operations: The following practices shall be followed for crane/derrick operations: Additionally, the outriggers shall be set to remove the machine weight from wheels if required by the OEM per load rating chart. (Requirement 40940)	NR	NR				
	Operations: The following practices shall be followed for crane/derrick operations: Blocking under outrigger beams is not permitted. (Requirement 40941)	NR	NR				
	Operations: The following practices shall be followed for crane/derrick operations: Blocking under outrigger floats, when used, shall be strong enough to prevent crushing, bending, or shear failure and of sufficient thickness, width, and length as to completely support the float, transmit the load to the supporting surface, and prevent shifting or toppling under load. (Requirement 40942)	NR	NR				
	Operations: The following practices shall be followed for crane/derrick operations: On truck mounted cranes, loads shall not be lifted over the front area except as approved by the crane manufacturer. (Requirement 40943)	NR	NR				
	Operations: The following practices shall be followed for crane/derrick operations: Outriggers shall be used when the load to be handled at a particular radius exceeds rated load without outriggers, as specified by the crane manufacturer's load chart. (Requirement 40944)	NR	NR				
	Operations: The following practices shall be followed for crane/derrick operations: Floats, where used, shall be securely attached to the outriggers. (Requirement 40945)	NR	NR				
	Operations: The following practices shall be followed for crane/derrick operations: Neither the load nor the boom shall be lowered below the point where less than two full wraps of rope remain on the respective drums. (Requirement 40946)	g. No fewer than 5 full wraps of rope should remain on the drum(s) in any operating condition. Due consideration should be given to hoist manufacturer's RPs, especially for breakaway anchor-type hoists.	NR				
	Operations: The following practices shall be followed for crane/derrick operations: For mobile cranes in transit, the following precautions shall be taken: boom shall be stowed/carried in line with direction of motion,	NR	NR				
	Operations: The following practices shall be followed for crane/derrick operations: For mobile cranes in transit, the following precautions shall be taken: superstructure shall be secured against rotation, except in negotiating turns when there is an operator in the cab or boom is supported on a dolly,	NR	NR				
	Operations: The following practices shall be followed for crane/derrick operations: For mobile cranes in transit, the following precautions shall be taken: and hook shall be lashed or otherwise restrained so that it cannot swing freely while in transit or moving. (Requirement 40949)	NR	NR				
	Operations: The following practices shall be followed for crane/derrick operations: When traveling a mobile crane with a load, a person shall be designated responsible for determining and controlling safety and making decisions as to position of load, boom location, ground support, travel route, and speed of movement. (Requirement 40950)	NR	NR				
	Operations: The following practices shall be followed for crane/derrick operations: A mobile crane with or without a load shall not be traveled with the boom so high that it may bounce back over the cab. (Requirement 40951)	NR	NR				

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	Operations: The following practices shall be followed for crane/derrick operations: When rotating cranes/derricks, sudden starts and stops shall be avoided. (Requirement 40952)	During lifting, care shall be taken that: 1. Acceleration or deceleration of the moving load is accomplished in a smooth manner. 2. The Crane Operator should be aware of the effect of the velocity and weight of the load when lowering at high speeds to minimize shock loading. 3. Load, boom, or other parts of the machine do not contact any obstruction. The Crane Operator should engage the controls smoothly to avoid excessive stress on crane machinery. When rotating the crane, sudden starts and stops should be avoided. Rotational speed should be such that the load does not swing out beyond the radius at which it may be controlled.	NR				
	Operations: The following practices shall be followed for crane/derrick operations: Speed shall be such that the load does not swing out beyond radii at which it can be controlled. (Requirement 40953)	See above.	NR				
	Operations: The following practices shall be followed for crane/derrick operations: A tag line shall be used when rotation of load is hazardous. (Requirement 40954)	i. Appropriate tag or restraining lines should be used where necessary to control the load.	NR				
	Operations: The following practices shall be followed for crane/derrick operations: Ropes shall not be handled on a winch head without the knowledge of the operator. (Requirement 40955)	NR	NR				
	Operations: The following practices shall be followed for crane/derrick operations: While a winch head is being used, the operator shall be within convenient reach of the power unit control lever. (Requirement 40956)	NR	NR				
	Operations: The following practices shall be followed for crane/derrick operations: If the load must remain suspended for any considerable length of time, the operator shall hold the drum from rotating in the lowering direction by activating the positive control lever of the operator's station. (Requirement 40957)	NR	NR				
	Operations: The following practices shall be followed for crane/derrick operations: Mobile cranes shall not be operated without the full amount of ballast or counterweight in place as specified by the manufacturer. (Requirement 40958)	NR	NR				
	Operations: The following practices shall be followed for crane/derrick operations: The ballast or counterweight, as specified by the manufacturer, shall not be exceeded. (Requirement 40959)	NR	NR				
	Operations: The following practices shall be followed for crane/derrick operations: Refueling with small portable containers shall be done with Underwriter's Laboratories or Factory Mutual Laboratories approved (or equivalent) safety type can equipped with an automatic closing cap and flame arrestor. (Requirement 40960)	NR	NR				
	Operations: The following practices shall be followed for crane/derrick operations: Machines shall not be fueled with engines running. (Requirement 40961)	NR	NR				
	Operations: The following practices shall be followed for crane/derrick operations: A carbon dioxide, dry chemical, or equivalent fire extinguisher shall be kept in the cab or vicinity of the crane/derrick. (Requirement 40962)	3.5.2 Fire Extinguishers a. Fire extinguishers shall be kept in the cab or vicinity of the crane and be of a size and type not less than specified by the proper authorities. b. Personnel who are expected to respond to fires should be trained in the use of fire extinguishers as described in 3.5.2a.	NR				

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	Operations: The following practices shall be followed for crane/derrick operations: Except where the electrical distribution and transmission lines have been deenergized and visibly grounded at the point of work, or where insulating barriers, not a part of or an attachment to the crane, have been erected to prevent physical contact with power lines, mobile cranes shall be operated in accordance with the following: (Requirement 40963)	NR	NR				
	Operations: The following practices shall be followed for crane/derrick operations: Except where the electrical distribution and transmission lines have been deenergized and visibly grounded at the point of work, or where insulating barriers, not a part of or an attachment to the crane, have been erected to prevent physical contact with power lines, mobile cranes shall be operated in accordance with the following: For lines rated 50kV or below, minimum clearance between lines and any part of crane or load shall be 10 feet (3 m). (Requirement 40964)	NR	NR				
	Operations: The following practices shall be followed for crane/derrick operations: Except where the electrical distribution and transmission lines have been deenergized and visibly grounded at the point of work, or where insulating barriers, not a part of or an attachment to the crane, have been erected to prevent physical contact with power lines, mobile cranes shall be operated in accordance with the following: For lines rated over 50kV, minimum clearance between lines and any part of crane or load shall be 10 feet (3 m) plus 0.4 inch (10 mm) for each 1kV over 50kV, or twice the length of the line insulator, but never less than 10 feet (3 m). (Requirement 40965)	NR	NR				
	Operations: The following practices shall be followed for crane/derrick operations: Except where the electrical distribution and transmission lines have been deenergized and visibly grounded at the point of work, or where insulating barriers, not a part of or an attachment to the crane, have been erected to prevent physical contact with power lines, mobile cranes shall be operated in accordance with the following: The crane shall be positioned to preclude the boom or load from contacting or falling across the power line(s) in the event of crane failure. (Requirement 40966)	NR	NR				
	Operations: The following practices shall be followed for crane/derrick operations: Except where the electrical distribution and transmission lines have been deenergized and visibly grounded at the point of work, or where insulating barriers, not a part of or an attachment to the crane, have been erected to prevent physical contact with power lines, mobile cranes shall be operated in accordance with the following: In transit, with no load and boom lowered, the clearance between lines and any part of crane shall be a minimum of 4 feet (1.2 m), for lines rated 0.75kV or below. (Requirement 40967)	NR	NR				
	Operations: The following practices shall be followed for crane/derrick operations: Except where the electrical distribution and transmission lines have been deenergized and visibly grounded at the point of work, or where insulating barriers, not a part of or an attachment to the crane, have been erected to prevent physical contact with power lines, mobile cranes shall be operated in accordance with the following: For lines rated over 0.75kV, the clearance shall be 4 feet (1.2 m) plus 0.17 inch (4.3 mm) for each 1kV over 0.75kV. Refer to ASME B30.5 for more details. (Requirement 40968)	NR	NR				

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	Operations: The following practices shall be followed for crane/derrick operations: Except where the electrical distribution and transmission lines have been deenergized and visibly grounded at the point of work, or where insulating barriers, not a part of or an attachment to the crane, have been erected to prevent physical contact with power lines, mobile cranes shall be operated in accordance with the following: Clearance observers shall be provided with an acceptable means of giving a warning in time for operators to react to insufficient clearance. (Requirement 40969)	NR	NR				
	Operations: The following practices shall be followed for crane/derrick operations: Except where the electrical distribution and transmission lines have been deenergized and visibly grounded at the point of work, or where insulating barriers, not a part of or an attachment to the crane, have been erected to prevent physical contact with power lines, mobile cranes shall be operated in accordance with the following: Crane boom tips shall have two red flags, minimum of 12 inches (30.5 cm) x 12 inches (30.5 cm) each. (Requirement 40970)	NR	NR				
	Operations: The following practices shall be followed for crane/derrick operations: Before starting operation near electrical lines, the organization responsible for the lines shall be notified and provided with all pertinent information. (Requirement 40971)	NR	NR				
	Operations: The following practices shall be followed for crane/derrick operations: The responsible organization's cooperation shall be requested. (Requirement 40972)	NR	NR				
	Operations: The following practices shall be followed for crane/derrick operations: Any overhead wire shall be considered an energized line unless and until the person responsible for such line or the electrical utility authorities indicate that it is not an energized line. (Requirement 40973)	NR	NR				
	Operations: The following practices shall be followed for crane/derrick operations: Outdoor hoisting operations should not commence if winds are above 20 knots (23 mph, 37 km/hr) steady state or if gusts exceed 35 knots (40 mph, 65 km/hr). Consideration shall also be given to sail area and weather conditions such as lightning, or snow before commencing operations. (Requirement 40974)	B.3.1.3a During periods of bad weather, such as lightning or high winds, or where the Crane Operator's ability to see the signal person is impaired by darkness, fog, rain, etc., crane operations should be restricted, at the Crane Operator's discretion.	NR				
	Operations: The following practices shall be followed for crane/derrick operations: Cranes/derricks left outdoors shall be secured by the operator when operations are complete. (Requirement 40975)	j. The crane should be secured against swinging when not in use.	NR				
	Operations: The following practices shall be followed for crane/derrick operations: Wire rope should be used in accordance with the Wire Rope Users Manual. (Requirement 40976)	H.2 Related Documents and Associations The following are other standards and specifications not directly for slings, but related to lifting. ASME B30.9 Slings B30.10 Hooks B30.20 Below-the-Hook Lifting Devices B30.26 Rigging Hardware (Under Development) WRTB Wire Rope Users Manual	NR				
	Operations: The following practices shall be followed for crane/derrick operations: General operating procedures describing operation, emergency steps, communication requirements, and special requirements shall be prepared, approved, and followed for each crane/derrick. There must be a formal system for review, approval, and update to maintain valid operating procedures. (Requirement 40977)	NR	NR				

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	Operations: The following practices shall be followed for crane/derrick operations: Emergency procedures shall be developed for contingency actions such as power loss, brake failure, or other emergencies (also, see paragraph 1.5.1.c). (Requirement 40978)	NR	NR				
	Operations: The following practices shall be followed for crane/derrick operations: Operations shall be analyzed for hazards. (Requirement 40979)	4. All lifts should be planned in advance taking into account the crane's physical location, the available space for staging and assembling the test loads and the hazardous areas to be avoided.	NR				
	Operations: The following practices shall be followed for crane/derrick operations: The analysis shall consider the environment in which the operation occurs, hazards associated with crane/derrick maintenance, and, in general, a safety analysis of the equipment, facility, load, human factors, and interfaces as a whole in support of the lifting operation. (Requirement 40980)	NR	NR				
	Operations: The following practices shall be followed for crane/derrick operations: Appropriate load charts shall be located in the crane/derrick cab, if so equipped. (Requirement 40981)	b. The appropriate load-rating chart for the configuration in use shall be visible to the Crane Operator at the control station.	NR				
	Operations: The following practices shall be followed for crane/derrick operations: Otherwise, the load charts shall be kept in a central, easily accessible place. (Requirement 40982)	a. Crane lifting capacities are based on relative motion conditions between the crane and the load to be handled. All cranes shall have one onboard and at least one offboard load rating chart, developed specifically for each crane.	NR				
	Operations: The following practices shall be followed for crane/derrick operations: Mobile cranes and derricks shall not be operated without an appropriate load chart. (Requirement 40983)	NR	NR				
	Operations: The following practices shall be followed for crane/derrick operations: For critical lifts, the load shall not exceed 75 percent of the crane's/derrick's rated capacity. (Requirement 40984)	NR	NR				
	Operations: The following practices shall be followed for crane/derrick operations: Methods shall be developed and demonstrated for lowering a load in the event of crane/derrick failure or other contingencies. These should be demonstrated and verified if practical. (Requirement 40985)	l. If power or a necessary control function fails during operation, the Crane Operator should: 1. Set all brakes and locking devices. 2. Move all clutch or other power controls to the off or neutral position. 3. If practical, land the suspended load by controlled lowering and stopping.	NR				
	Operations: The following practices shall be followed for crane/derrick operations: A crane/derrick shall not be loaded beyond its rated load (capacity) except for required testing. (Requirement 40986)	c. The Crane Operator should verify that the hook load is within the crane's applicable Onboard or Offboard Rated Load at the radius at which the load is to be lifted. See Appendix B.3.2.1c for clarification of "hook load."	NR				
	Operations: The following practices shall be followed for crane/derrick operations: Cranes/derricks shall not be used to load test items such as slings, platforms, or lifting fixtures unless specifically identified to do so based on a specified percentage of rated load, and a safety analysis approved by the LDEM and the responsible safety, engineering, operations, and maintenance organizations. (Requirement 40987)	NR	NR				
	Operations: The following practices shall be followed for crane/derrick operations: Test procedures shall be approved by the responsible safety, engineering, operations, and maintenance organizations. This is to ensure that the crane/derrick is not damaged due to sudden unloading should the test article fail. Appendix D, crane/hoist requirements to load test other lifting equipment, shall be followed. (Requirement 40988)	NR	NR				
	Operations: The following practices shall be followed for crane/derrick operations: Cranes/derricks shall not be side loaded, used to drag loads sideways, or used to pull loads unless specifically designed to do so by the OEM as indicated in the load chart. (Requirement 40989)	b. No external forces should be applied to suspended loads that will create significant side loading of the boom. Care should be taken when swinging the crane so as to minimize the pendulum action of the hook and suspended load.	NR				

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	Operations: The following practices shall be followed for crane/derrick operations: Side loading of the boom shall be limited to freely suspended loads. (Requirement 40990)	NR	NR				
	Operations: The following practices shall be followed for crane/derrick operations: There shall be a system for documenting crane/derrick problems/discrepancies. (Requirement 40991)	NR	NR				
	Operations: The following practices shall be followed for crane/derrick operations: Prior to an operation, the operator shall review any previously noted problems/discrepancies to determine possible impact on planned activity. (Requirement 40992)	Implied, but NR	NR				
	Operations: The following practices shall be followed for crane/derrick operations: The operator shall ensure that the crane/derrick is within inspection and testing intervals by examination of the periodic recertification tags and/or documentation. (Requirement 40993)	d. Before starting the crane, the Crane Operator should verify the following: 1. The Pre-use Inspection outlined in C.4.1.2 and C.4.1.2a has been completed.	NR				
	Operations: The following practices shall be followed for crane/derrick operations: The operator shall adhere to all tags placed on the crane controls. (Requirement 40994)	c. The Crane Operator should be familiar with the equipment and its proper care. If adjustments or repairs to the crane are necessary, or any deficiencies that impair safe operation are known, the crane should be taken out of service or its operations restricted to eliminate the unsafe condition.	NR				
	Operations: The following practices shall be followed for crane/derrick operations: Before each lift or series of lifts, the operator shall perform a pre-operational check to demonstrate operational readiness. If controls do not operate properly, the operator is responsible for notifying the supervisor. (Requirement 40995)	e. For mechanical cranes, the Crane Operator should operationally test the brakes each time a load approaching the rated load is to be handled. Prior to raising the load, exposed brakes should be warmed and rusted surfaces on the drums cleaned by raising and lowering the boom and load lines under slight pressure.	NR				
	Operations: The following practices shall be followed for crane/derrick operations: Repairs and adjustments shall be made before operations begin. (Requirement 40996)	See above	NR				
	Operations: The following practices shall be followed for crane/derrick operations: The operator and ground lead man shall establish appropriate safety zones before initiating operations. Safety zones should have appropriate barriers (rope, cones, or other) established prior to lift. (Requirement 40997)	d. Before starting the crane, the Crane Operator should verify the following: 1. The Pre-use Inspection outlined in C.4.1.2 and C.4.1.2a has been completed. 2. All controls are in the "off" or "neutral" position. 3. All personnel are in the clear.	NR				
	Operations: The following practices shall be followed for crane/derrick operations: Before starting to hoist, the following conditions shall be noted: the hoist rope shall not be kinked, multiple part ropes shall not be twisted around each other, and the hook shall be centered over the load to prevent swinging. (Requirement 40998)	See pre-use inspection	NR				
	Operations: The following practices shall be followed for crane/derrick operations: The operator shall know the weight of the working load. (Requirement 40999)	c. The Crane Operator should verify that the hook load is within the crane's applicable Onboard or Offboard Rated Load at the radius at which the load is to be lifted. See Appendix B.3.2.1c for clarification of "hook load."	NR				
	Operations: The following practices shall be followed for crane/derrick operations: When raising loads that approach 75% of the rated capacity of the crane, the operator shall test the holding brakes. (Requirement 41000)	NR	NR				
	Operations: The following practices shall be followed for crane/derrick operations: The brakes shall be tested by raising the load minimally above the surface and holding the load with the brake. The load should be held long enough to allow any dynamics to dampen out. (Requirement 41001)	e. For mechanical cranes, the Crane Operator should operationally test the brakes each time a load approaching the rated load is to be handled. Prior to raising the load, exposed brakes should be warmed and rusted surfaces on the drums cleaned by raising and lowering the boom and load lines under slight pressure.	NR				

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	Operations: The following practices shall be followed for crane/derrick operations: If radio communications are to be used, operators and/or lift supervisors shall test the communication system prior to each operation. (Requirement 41002)	NR	NR				
	Operations: The following practices shall be followed for crane/derrick operations: Operations shall stop immediately upon communication loss and shall not continue until communication is restored. (Requirement 41003)	3.3.1 Standard Signals Signals between the Crane Operator and the designated signal person should be discernible, audibly or visually, at all times. The Crane Operator should not respond unless signals are clearly understood.	NR				
	Operations: The following practices shall be followed for crane/derrick operations: If hand signals are required, only standard signals shall be used according to Appendix B. (Requirement 41004)	3.3.2 Hand Signals Recommended standard hand signals are identified in Figure 1. The use of these recommended standard hand signals is encouraged.	NR				
	Operations: The following practices shall be followed for crane/derrick operations: Hand signals shall be posted in a conspicuous location. (Requirement 41005)	NR	NR				
	Operations: The following practices shall be followed for crane/derrick operations: If there is a slack rope condition, it shall be determined that the rope is properly seated on the drum and in the sheaves before starting the hoist. (Requirement 41007)	Before starting to lift, the following conditions shall be verified: 1. The correct slings have been selected for the weight to be lifted. 2. The load is free to be lifted. 3. Multiple part lines are not twisted around each other in such a manner that all of the lines will not separate upon application of lift. 4. The hook is brought over the load in such a manner as to minimize swinging. 5. If there is a slack rope condition, the rope is properly seated on the drum and in the sheaves.	NR				
	Operations: The following practices shall be followed for crane/derrick operations: During hoisting, care shall be taken that there is no sudden acceleration or deceleration of the moving load and that the load does not contact any obstructions. (Requirement 41008)	During lifting, care shall be taken that: 1. Acceleration or deceleration of the moving load is accomplished in a smooth manner. 2. The Crane Operator should be aware of the effect of the velocity and weight of the load when lowering at high speeds to minimize shock loading.	NR				
	Operations: The following practices shall be followed for crane/derrick operations: Load shall be secured, balanced, and kept under control with proper slings. The use of tag lines to keep the load stabilized may be required. (Requirement 41009)	i. Appropriate tag or restraining lines should be used where necessary to control the load.	NR				
	Operations: The following practices shall be followed for crane/derrick operations: Tag line personnel shall take care not to impart undesirable motion to the load. (Requirement 41010)	NR	NR				
	Operations: The following practices shall be followed for crane/derrick operations: Person(s) shall not ride the hook or load at anytime. (Requirement 41011)	e. The Crane Operator shall not hoist, lower or swing while any personnel are on the load or hook (other than in a personnel carrier or basket).	NR				
	Operations: The following practices shall be followed for crane/derrick operations: If conventional means of reaching a worksite such as an aerial platform, ladder, stairs, or scaffold, would be more hazardous or not possible because of structural design or worksite conditions, 29 CFR 1926.550 and ASME B30.23 shall be followed for lifting of personnel with a crane, which is considered a critical lift (see Appendix C). (Requirement 41012)	NR	NR				
	Operations: The following practices shall be followed for crane/derrick operations: Personnel shall not be located under suspended or moving loads unless the operation adheres to the OSHA-approved NASA Alternate Standard for Suspended Load Operations (see Appendix A).	f. The Crane Operator should avoid moving loads over personnel. Loads that are suspended by use of slings or hoists should be blocked or cribbed before personnel are permitted to work beneath or between them.	NR				

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	Operations: The following practices shall be followed for crane/derrick operations: The load shall not be lowered below the point where less than two full wraps of rope remain on the host drum. (Requirement 41014)	g. No fewer than 5 full wraps of rope should remain on the drum(s) in any operating condition. Due consideration should be given to hoist manufacturer's RPs, especially for breakaway anchor-type hoists.	NR				
	Operations: The following practices shall be followed for crane/derrick operations: A responsible person shall be in charge of the operation and shall instruct all personnel involved in the proper positioning, rigging, and moving to be done. (Requirement 41015)	3.1.5 Operating Practices a. The Qualified Crane Operator (herein also called Crane Operator) is responsible for those operations under his or her direct control.	NR				
	Operations: The following practices shall be followed for crane/derrick operations: An operator shall be at the crane/derrick controls at all times while a load is suspended (OSHA requirement). (Requirement 41016)	NR	NR				
	Operations: The following practices shall be followed for crane/derrick operations: Due to the length of some NASA operations, an operator change may be required while a load is suspended. This shall be accomplished via a procedure designed for the specific crane/derrick and operation, ensuring that the crane controls are manned at all times. (Requirement 41017)	NR	NR				
	Special Criteria: Handling Explosives or Electro-Explosive Devices (EED's). Special precautions shall be taken while handling explosives of EED's. (Requirement 41019)	NR	NR				
	Special Criteria: Handling Explosives or Electro-Explosive Devices (EED's): DOT-packaged explosives shall be handled in accordance with approved hazardous operating procedures. (Requirement 41020)	NR	NR				
	Special Criteria: Handling Explosives or Electro-Explosive Devices (EED's): Barricades and warning signs shall be erected to control access. (Requirement 41021)	NR	NR				
	Special Criteria: Handling Explosives or Electro-Explosive Devices (EED's): Explosives and EED's that are not within DOT-approved containers shall be handled in accordance with approved hazardous operations procedures. (Requirement 41022)	NR	NR				
	Special Criteria: Handling Explosives or Electro-Explosive Devices (EED's): In addition to system configuration controls, these procedures shall ensure the following requirements are met: (Requirement 41023)	NR	NR				
	Special Criteria: Handling Explosives or Electro-Explosive Devices (EED's): In addition to system configuration controls, these procedures shall ensure the following requirements are met: Voltage checks on crane hooks that will handle explosives or EED's shall be performed prior to the start of operations;	NR	NR				
	Special Criteria: Handling Explosives or Electro-Explosive Devices (EED's): In addition to system configuration controls, these procedures shall ensure the following requirements are met: all crane motions shall be checked. (Requirement 41025)	NR	NR				
	Special Criteria: Handling Explosives or Electro-Explosive Devices (EED's): In addition to system configuration controls, these procedures shall ensure the following requirements are met: For static sensitive systems, the crane hook shall be connected to facility ground before connecting to explosives or EED's. (Requirement 41026)	NR	NR				
	Special Criteria: Handling Explosives or Electro-Explosive Devices (EED's): In addition to system configuration controls, these procedures shall ensure the following requirements are met: Electrical grounding of the hook and load shall be accomplished prior to lifting operations. If a ground connection must be disconnected to facilitate operations, an alternate ground should be connected prior to disconnecting the existing ground. The final attachment/detachment must be at least 10 feet from exposed propellant grain, explosives or EED's.	NR	NR				

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	Special Criteria: Handling Explosives or Electro-Explosive Devices (EED's): In addition to system configuration controls, these procedures shall ensure the following requirements are met: The danger potential for radio transmissions near explosives shall be evaluated prior to the operation. (Requirement 41028)	NR	NR				
	Special Criteria: Handling Explosives or Electro-Explosive Devices (EED's): In addition to system configuration controls, these procedures shall ensure the following requirements are met: Personnel limits, protective clothing, warning signs and barricades shall be used as required. (Requirement 41029)	NR	NR				
	Special Criteria: Handling Explosives or Electro-Explosive Devices (EED's): In addition to system configuration controls, these procedures shall ensure the following requirements are met: Safety surveillance requirements shall be followed. (Requirement 41030)	NR	NR				
	Special Criteria: Policy shall be developed and enforced for crane/derrick operation during electrical storms. Operations are generally permitted without restriction within enclosed metal or framed buildings that are properly grounded. Restrictions are necessary for outside operations or for those that cannot tolerate power failure/loss. (Requirement 41031)	NR	NR				