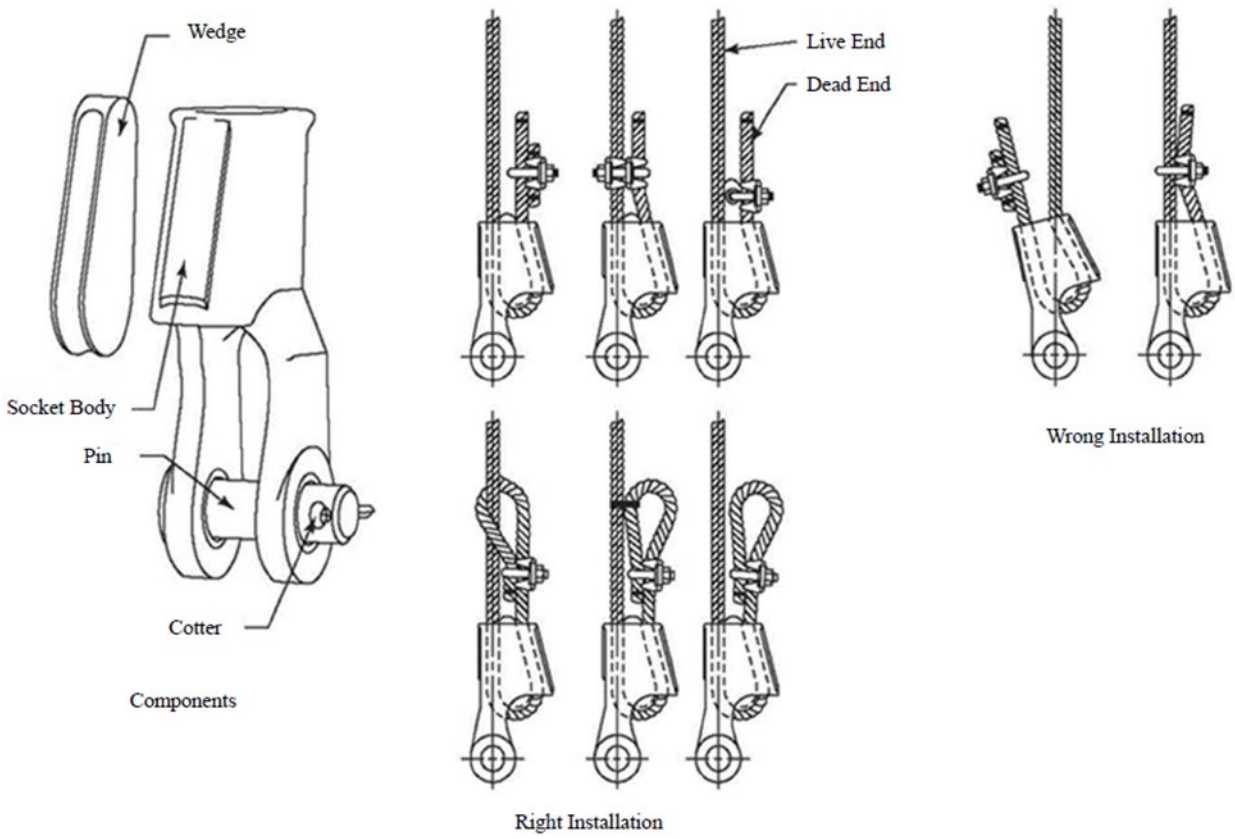


Figure 15-2. Wire Rope Clip Orientation

15-10. Checklists and Forms.
Not Applicable.

Chapter 16
Load Handling Equipment

The requirements of this chapter apply to all LHE with a hoisting or lifting capacity over 2,000 lbs. (907.2 kg). LHE includes cranes, derricks, hoists, and power-operated equipment (excavators, forklifts, rough terrain equipment) when used with rigging that can raise, lower, and horizontally move a suspended load.

a. Helicopter Operations. Refer to 29 CFR 1910.183 and 29 CFR 1926.551 for helicopter operations that are configured to hoist loads.

b. Hoisting/Lifting Capacity. Refer to 29 CFR 1926.1441 (29 CFR 1926 Subpart CC) for LHE with a rated hoisting/lifting capacity of 2,000 lbs. (907.2 kg) or less.

c. Exemptions. All requirements of this chapter apply except as noted below:

(1) Affixed A-frames or dredge-related operations, while performing anchor handling, are exempt from LHE operator training, physical requirements, and Naval Architectural Analysis (NAA).

(2) Digger derricks used for utility pole installation.

(3) Vehicle-mounted aerial devices (bucket trucks), vehicle-mounted elevating and rotating work platforms (aerial devices, lifts), and elevating aerial work platforms (AWPs).

(4) Hydraulic excavators, wheeled, trackhoe or backhoe loaders used to hoist loads with rigging are exempt only from LHE operator training requirements (for example, crane operator certifications). Rigger qualifications still apply.

(5) Powered industrial trucks (PIT's) (forklifts, telehandlers) are exempt from crane operator certifications when configured to hoist and lower by a winch or hook and horizontally move a suspended (rigged) load. Rigger qualifications still apply.

(6) Machinery that hoists by using a come-along or chainfall, whether human, air, or electric powered, chain or wire rope type.

(7) Operators of equipment with a maximum manufacturer-rated hoisting/lifting capacity of 2,000 lbs. (907.2 kg) or less are exempt from the operator qualification or certification requirements. Do not use this equipment to hoist personnel.

(8) Operators of Class II hoisting equipment are exempt from medical requirements unless this equipment is used to hoist/lift personnel.

(9) Dedicated drilling rigs.

(10) Tree trimming and removal work.

(11) Gin poles, when used for the erection of communication towers.

(12) Helicopter cranes are exempt from paragraph 16-3.

(13) Stacker cranes.

(14) Mechanic's trucks with a hoisting device, when used in activities related to maintenance and repair.

(15) Material Delivery.

(a) Articulating/knuckle-boom truck cranes that deliver material to a construction site, when used to transfer materials from the truck crane to the ground without arranging the materials in a particular sequence for hoisting.

(b) Articulating /knuckle-boom truck cranes that deliver material to a construction site when used to transfer building supply sheet goods or building supply packaged materials from the truck crane onto a structure, using a fork/cradle at the end of the boom, but only when the truck crane is equipped with a properly functioning automatic overload prevention device. Such sheet goods or packaged materials include but are not limited to sheets of sheet rock, sheets of plywood, bags of cement, sheets or packages of roofing shingles, and rolls of roofing felt.

(c) This exclusion does not apply when:

(c-1) The articulating crane is used to hold, support, or stabilize the material to facilitate a construction activity, such as holding material in place while it is attached to the structure.

(c-2) The material being handled by the articulating crane is a prefabricated component. Prefabricated components include precast concrete members or panels, roof trusses (wooden, cold-formed metal, steel), prefabricated building sections floor panels, wall panels, roof panels, roof structures), and similar items.

(c-3) The material being handled by the crane is a structural steel member (steel joists, beams, columns, steel decking (bundled or unbundled) or a component of a systems-engineered metal building).

(16) Rescue boat and lifeboat launch systems that are designated for launching rescue lifeboats and regulated by the USCG and the International Convention for the Safety of Life at Sea.

16-1. References.

a. American Petroleum Institute (API) Specification 2C (https://www.api.org/products-and-services/standards/important-standards-announcements/spec2c) (16-1.a)

b. ANSI/ASSE A10.22, Construction and Demolition Operations - Safety Requirements for Rope-Guided and Non-Guided Worker's Hoists (https://webstore.ansi.org/) (16-1.b)

c. AR 600-85, The Army Substance Abuse Program (https://armypubs.army.mil/ProductMaps/PubForm/AR.aspx) (16-1.c)

d. ASME B30, Safety Standard for Cableways, Cranes, Derricks, Hoists, Hooks, Jacks, and Slings (https://www.ansi.org) (16-1.d)

e. Federal Motor Carrier Safety Administration (FMCSA) National Registry of Certified Medical Examiners (https://www.fmcsa.dot.gov/national-registry-certified-medical-examiners-search) (16-1.e)

f. NFPA 70, National Electric Code (https://www.nfpa.org/Codes-and-Standards) (16-1.f)

g. 29 CFR 1910.178, Powered Industrial Trucks (https://www.govinfo.gov/content/pkg/CFR-2020-title29-vol5/pdf/CFR-2020-title29-vol5-sec1910-178.pdf) (16-1.g)

h. 29 CFR 1910.179, Overhead and Gantry Cranes (https://www.govinfo.gov/content/pkg/CFR-2020-title29-vol5/pdf/CFR-2020-title29-vol5-sec1910-179.pdf) (16-1.h)

i. 29 CFR 1910.180, Crawler Locomotive and Truck Cranes (https://www.govinfo.gov/content/pkg/CFR-2020-title29-vol5/pdf/CFR-2020-title29-vol5-sec1910-180.pdf) (16-1.i)

j. 29 CFR 1910.181, Derricks (https://www.govinfo.gov/content/pkg/CFR-2020-title29-vol5/pdf/CFR-2020-title29-vol5-sec1910-181.pdf) (16-1.j)

k. 29 CFR 1910.183, Helicopters (https://www.govinfo.gov/content/pkg/CFR-2020-title29-vol5/pdf/CFR-2020-title29-vol5-sec1910-183.pdf) (16-1.k)

l. 29 CFR 1926.551, Helicopters (https://www.govinfo.gov/content/pkg/CFR-2020-title29-vol8/pdf/CFR-2020-title29-vol8-sec1926-551.pdf) (16-1.l)

m. 29 CFR 1926.603, Pile Driving Equipment (https://www.govinfo.gov/content/pkg/CFR-2020-title29-vol8/pdf/CFR-2020-title29-vol8-sec1926-603.pdf) (16-1.m)

n. 29 CFR 1926, Subpart CC Cranes and Derricks in Construction (https://www.govinfo.gov/content/pkg/CFR-2020-title29-vol8/pdf/CFR-2020-title29-vol8-part1926-subpartCC.pdf) (16-1.n)

o. 46 CFR 173, Special Rules Pertaining to Vessel Use (https://www.govinfo.gov/content/pkg/CFR-2020-title46-vol7/pdf/CFR-2020-title46-vol7-part173.pdf) (16-1.o)

16-2. Definitions.

a. Articulating Boom Crane (also known as, knuckle boom crane). A crane with two or more boom sections that pivot (articulate) by hydraulic cylinders. The boom may have a telescoping section. The crane can be stationary or mounted on a vehicle, track, locomotive) and is used to lift, swing, and lower loads. (16-2.a)

b. Boom. A member hinged to the superstructure of cranes and derricks and used for supporting hoisting tackle. (16-2.b)

c. Boom Angle. The angle of the boom relative to horizontal. (16-2.c)

d. Boom Angle Indicator. A device that measures the angle of the boom relative to the horizontal. (16-2.d)

e. Boom Stop. A device used to limit the angle of the boom from moving above a certain maximum angle and toppling over backward. (16-2.e)

f. Bridge. The part of a gantry or overhead crane that carries the trolley(s). (16-2.f)

g. Class I Crane/Hoist Types. (16-2.g)

(1) Fixed cab telescopic hydraulic mobile cranes.

(2) Swing cab telescopic hydraulic mobile cranes.

(3) Lattice boom, truck, or crawler cranes.

(4) Cab-operated overhead, bridge, gantry, under hung and monorail cranes.

(5) Pedestal cranes.

(6) Remote-operated (wireless) overhead, bridge, gantry, under hung and monorail cranes over 30 ton (T) (27.2 metric ton (MT)) capacity.

(7) Hammerhead cranes.

(8) Portal cranes.

(9) Tower cranes.

(10) Post or stiff leg type derricks.

(11) Spider cranes.

(12) Floating or barge mounted LHE, temporarily or permanently mounted, that requires a NAA floating load chart according to this chapter.

h. Class II Crane/Hoist Types. (16-2.h)

(1) All hard-wired, pendant-mounted operated overhead, bridge, and gantry cranes.

(2) Under hung.

(3) Monorail.

(4) Wall-mounted jib cranes.

(5) Any remote-operated (wireless) overhead, bridge, gantry, under hung and monorail cranes 30T (27.2 MT) capacity or less.

i. Competent Person (CP), Cranes and Rigging. A person designated in writing by the employer to be responsible for the immediate supervision, implementation, and monitoring of the Crane and Rigging Program. Must have sufficient training, knowledge, and experience in crane(s) and rigging and be capable of identifying, evaluating, and addressing existing and potential hazards and must have the authority to take prompt corrective measures with regard to such hazards. The term “Competent Person” (CP), as used in this chapter, refers to “Competent Person, Cranes and Rigging”. (16-2.i)

j. Critical Lift. A non-routine crane lift requiring detailed planning and additional or unusual safety precautions. The following lifts are defined as critical lifts and require detailed planning and added safety precautions. (16-2.j)

(1) Lifts involving HAZMAT (for example, explosives, highly volatile substances).

(2) Hoisting personnel with LHE.

(3) Lifts made with more than one LHE.

(4) Lifts where the center of gravity (CG) could change.

(5) Lifts that exceed 75% of the load chart of the LHE during construction work.

(6) Lifts without the use of outriggers using rubber tire load charts.

(7) Lifts using more than one hoist on the same LHE.

(8) Lifts involving MLR assemblies or other non-routine or technically difficult rigging arrangements.

(9) Lifts involving submerged loads.

Note. Exception. Lifts that are engineered to travel in guided slots throughout the lift and have fixed rigging and/or lifting beams (for example, intake gates, tailgates/logs) are not considered critical lifts.

Note. Exception. Affixed A-frames or dredge-related operations, while performing tasks that the equipment was specifically designed to do, are exempt from critical lift requirements.

(10) Lifts out of the operator's view.

Note. Exception. If hand signals are used by a signal person in view of the operator or radio communications are available and in use, the load does not exceed 2T (1.8MT), and it is determined a routine lift by the lift director, then it is not considered a critical lift.

(11) Load tests.

(12) When land based LHE mounted on barges, pontoons, or other means of flotation are required to travel while lifting the load.

(13) When two or more tower cranes are set up in the same operating envelope.

(14) Any lift the operator, lift director, supervisor, or employer believes should be considered critical.

k. Derrick. An apparatus consisting of a mast or equivalent member held at the end by guys or braces, with or without a boom, for use with a hoisting mechanism and operating ropes. (16-2.k)

l. Design Load. The maximum intended load, that is, the total of all loads including the worker(s), material, and the equipment placed on the unit. (16-2.l)

m. Jib. On hammerhead cranes, the horizontal structural member attached to the rotating superstructure of a crane and upon which the load trolley travels. On mobile cranes, an extension attached to the boom to provide added boom length for lifting specified loads. (16-2.m)

n. Lift Director. The person designated to direct the load handling activity. They must have a thorough knowledge of safety procedures for the crane, rigging, employee conduct, and be both a CP and a QP working with the specific LHE being used. The person may be the crane operator or another individual. (16-2.n)

o. Load Handling Equipment (LHE). A term used to describe cranes, hoists, and all other hoisting equipment (hoisting equipment means equipment, including excavators or forklifts, used with rigging to hoist and move a load). (16-2.o)

p. Load Indicator. A device that measures the weight of the load. (16-2.p)

q. Load Moment Indicator (LMI) (rated capacity indicator). A device that indicates the bending moment on a crane by measuring both the load on a boom and the horizontal distance from the load (boom point) to the crane's axis of rotation. LMI are often equipped with warning devices or disengaging devices that are actuated before a crane is overloaded. (16-2.q)

r. Operating Envelope. The area surrounding any crane. Inside this "envelope" is the crane, the 360-degree area up to the crane's maximum working radius, the operator, riggers, and crane walkers, rigging gear between the hook and the load, the load and the crane's supporting structure (for example, ground, rail). (16-2.r)

s. Operational Test. A test to evaluate if the crane is operating properly and its ability to safely lift loads within its performance rating. The test includes operational performance tests and load performance tests. (16-2.s)

t. Qualified Person (QP). See paragraphs 1-2 or 2-2, as applicable. (16-2.t)

u. Rated Load. The maximum allowable working load established by the rigging equipment manufacturer. The terms "rated capacity" and "working load limit (WLL)" are commonly used to describe rated load. (16-2.u)

v. Registered Professional Engineer (RPE). See paragraphs 1-2 or 2-2, as applicable. (16-2.v)

w. Two-Block Damage Prevention Device (also known as anti-two blocking (A2B). A system that stops the current function so that a hoist rope or crane machinery components are not damaged. (16-2.w)

x. Two-Block/A2B Warning Device. A warning device to alert the operator of an impending two blocking condition. (16-2.x)

y. Working Load. The external load applied to the crane or derrick, including the weight of load-attaching equipment such as load blocks, shackles, and slings. (16-2.y)

16-3. Personnel Required Qualification/Training.

a. Only properly trained, certified, and qualified personnel that are designated in writing by the employer may operate LHE. Prior to designating any LHE operator, the employer must obtain the intended operational functions and proof of qualifications for the operator. The employer may designate the following personnel to operate LHE under limited conditions: (16-3.a)

(1) Trainees under the direct supervision of the designated operator of the LHE.

(2) LHE maintenance, inspection, and repair personnel are permitted to operate the equipment only where all of the following requirements are met:

(a) The operation is limited to those functions necessary for maintenance, equipment inspection or performance verification.

(b) No lifting of loads. They may only operate the equipment under the direct supervision of a qualified operator or they must read and review the specific LHE operations manual so that they are familiar with the operations, limitations, characteristics, and associated hazards.

b. Lift Director Requirements. Must be competent and qualified on lift operations and have the ability to develop, review and approve lift plans. (16-3.b)

c. Crane Operator Requirements. (16-3.c)

(1) Crane operators must successfully complete written and operational testing to become certified.

(2) Qualification of all crane/hoist operators must be made by the employer after a review of the certification documents. Qualification includes completed certification documents. Qualifications also include employer verification that the operator is familiar with the equipment and has adequate knowledge of USACE and OSHA crane safety requirements and the procedures and recommendations in the specific crane's operation manual.

(3) Crane operators must demonstrate their ability to read, write, and comprehend the language of the crane manufacturer's operation and maintenance instruction materials. They must exhibit acceptable arithmetic skills, be able to use load charts, and follow written manufacturer's procedures applicable to the type and configuration of the equipment.

(4) Operators of A-frame non-slewing anchor handling barges or vessels must be trained in the anchor handling barge system operation.

d. Class I Crane Operator Training. (16-3.d)

(1) Initial. Training duration is a minimum of 24 total hours. The trainer must determine the necessary duration based on the type of equipment, logistics (for example, classroom, outdoors), class size, and other factors. The syllabus must address the applicable ASME B30 requirements for successful completion of written and practical/operational examinations.

(2) Refresher. Conduct refresher training at least once every five years. Recertifications may require more frequent refresher training. Training duration is a minimum of 8 hours total. The trainer must determine the necessary duration based on

the type of equipment, logistics (for example, classroom, outdoors), class size, and other factors. The syllabus must address the applicable ASME B30 requirements for successful completion of written and practical/operational examinations.

e. Class II Crane Operator Training. (16-3.e)

(1) Initial. Training duration is a minimum of 2 hours total. The trainer must determine the necessary duration based on the type of equipment, logistics (for example, classroom, outdoors), class size, and other factors. The syllabus must address the applicable ASME B30 requirements for successful completion of written and practical/operational examinations.

(2) Refresher. Conduct refresher training at least once every five years. Recertifications may require more frequent refresher training. Training duration is a minimum of 1 hour. The trainer must determine the necessary duration based on the type of equipment, logistics (for example, classroom, outdoors), class size, and other factors. The syllabus must address the applicable ASME B30 requirements for successful completion of written and practical/operational examinations.

f. Physical Qualifications/Examination. Operator physical examinations are required every three years or more frequently if their employer deems it necessary. The employer must complete and sign ENG Form 6209 (Certificate of Compliance for Load Handling Equipment and Rigging) (see para 16-10.b) that states that the operator received a physical examination and meets the physical qualifications of the ASME B30.5 standards for the specific type of equipment. Contractors will submit the signed CoC to the KO or COR for acceptance prior to allowing the operator to use the equipment. (16-3.f)

Note. Operators of Class II cranes/hoisting equipment are exempt from the Physical Qualifications Examination requirements, unless this equipment is used to hoist/lift personnel. Hoisting/lifting personnel is a Critical Lift activity and requires a physical examination for the operator. Train all Class II operators hoisting personnel on the specific requirements for hoisting personnel.

Note. LHE maintenance, inspection, and repair personnel covered by paragraph 16-3 are exempt from the crane operator physical requirements identified in this chapter.

g. Government Drug Testing Program. All government employees will follow AR 600-85. (16-3.g)

h. Crane Operator Certification and Qualification Options. The following two options are available for the certification and qualification of crane operators. Contractor must use mandatory ENG Form 6209 (Certificate of Compliance for Load Handling Equipment and Rigging) to designate each operator for the equipment to be used. (See para 16-10.b) (16-3.h)

(1) Crane operators are trained, tested, and certified by a nationally accredited testing organization. If this option is chosen, the employer is still responsible for designating in writing that the operator is qualified to operate a particular type, capacity, and configuration of equipment.

(2) Crane operators are trained, tested, and qualified by a USACE designated in-house crane trainer. If this option is chosen, the employer is still responsible for designating in writing that the operator is qualified to operate a particular type, capacity, and configuration of equipment. Certification and qualification under this option is:

(a) Not portable. Such a certification and qualification is applicable only where the operator is employed by and operates the equipment for USACE.

(b) Is valid for 5 years from date of issuance.

Note. Each USACE activity or operating project must maintain a current list of operators, complete crane and hoisting equipment training records for each operator, and a list of all equipment that each operator is qualified to operate.

i. Signal Person Qualifications. (16-3.i)

(1) A third-party Qualified Evaluator or the employer's Qualified Evaluator/LHE trainer must qualify all signal persons.

(2) For a signal person to be qualified, the evaluator must assess the individual's capabilities and determine and document that they meet the following requirements:

(a) Know and understand the type of signals used (for example, radio, cell, hand). If the signal person uses hand signals, they must know and understand the Standard Method for hand signals.

(b) Be competent in the application of the type of signals used.

(c) Have a basic understanding of crane operation and limitations, including crane dynamics involved in swinging and stopping loads and boom deflection from hoisting loads.

(d) Demonstrate that they meet the requirements through written and practical test that assesses both technical knowledge and hands-on skills.

(3) An assessment by an employer's Qualified Evaluator/LHE trainer is not portable. Other employers are not permitted to use it to meet these requirements.

(4) If subsequent actions by the signal person indicate that the individual does not meet the qualification requirements, the employer may not allow them to work as a

signal person until they are retrained and re-assessed. See also 29 CFR 1926.1428(c) (29 CFR 1926 Subpart CC) Qualification Requirements.

j. Powered Industrial Trucks (PITs)/Telehandlers. Equipment operators, riggers, and others involved in transportation and hoisting operations must have written proof of qualifications. (16-3.j)

k. Operators of excavators used with attachments, such as drill rigs or pile driving equipment, must be trained on the specific operation. (16-3.k)

16-4. Roles and Responsibilities.

a. Employers and supervisors will ensure all LHE operations are conducted according to applicable OSHA, ASME, and USACE requirements: (16-4.a)

b. Competent Person (CP). (16-4.b)

(1) Perform inspections according to paragraph 16-5.

(2) Develop Lift Plans (see para 16-7).

c. Qualified Person (QP). (16-4.c)

(1) Perform inspections according to paragraph 16-5.

(2) Conduct operational tests according to ANSI/ASME B30 and the manufacturer's instructions (see para 16-8.t).

(3) Supervise erection and dismantling of portal, tower, and pillar cranes.

(4) Assist CPs with development of lift plans.

d. Operator Responsibilities. The responsibilities of the operator include, but are not limited to, the following requirements: (16-4.d)

(1) Must communicate effectively with the lift director, rigger(s), signal person(s), and other affected employees onsite.

(2) May not engage in any activity that will divert attention while operating the equipment.

(3) Must not leave the controls while a load is suspended.

(4) Before leaving the LHE unattended, the operator must:

(a) Land any load, bucket, lifting magnet, or other device.

(b) Disengage the master clutch.

(c) Set travel, swing, boom brakes, and other locking devices.

(d) Put the controls in the “OFF” or neutral position.

(e) Secure the equipment against accidental travel.

(f) Stop the engine.

(g) Exception. When crane operation is frequently interrupted during a shift and the operator must leave the crane, the operator must follow all of the steps for securing unattended LHE, except for stopping the engine, and must also comply with the following:

(g-1) The CP determines that it is safe to do so;

(g-2) The crane must be located within an area protected from unauthorized entry;

(g-3) The operator remains adjacent to the equipment and not be engaged in any other duties; and

(g-4) The CP implements measures necessary to restrain the boom hoist and telescoping, load, swing, and outrigger functions.

(5) The operator must respond to signals from the person who is directing the lift or an appointed signal person. When a signal person is not used, the operator must ensure a full view of the load and the load travel paths at all times the load is rigged to the equipment.

(6) Each operator is responsible for those operations under their direct control. Whenever the operator is concerned about safety, the operator has the authority and responsibility to stop and refuse to handle loads until a QP has determined that the operation is safe.

e. The operator, qualified lift director and rigger must jointly ensure: (16-4.e)

(1) The LHE is level and, where necessary, blocked.

(2) The load is secured and balanced in the sling or lifting device before it is lifted more than a few inches.

(3) The lift and swing path is clear of obstructions and adequate clearance is maintained from electrical sources according to table 16-1.

(4) All persons are clear of the swing radius of the counterweight and housing.

f. The qualified lift director is responsible for the following when two or more cranes or LHE are used to lift one load: (16-4.f)

(1) Analyzing the operation and instructing all personnel involved in the proper positioning and rigging of the load, and the movements to be made.

(2) Making necessary assessments and determinations for a safe lift, to include crane (LHE) load ratings reductions, load position, boom location, ground support, and speed of movement.

(3) Ensuring that dedicated personnel are present and equipment is functioning properly. All personnel involved with the crane (LHE) operation must understand the communication systems and their individual responsibilities.

16-5. Inspection Requirements.

a. Inspect LHE according to the requirements of this chapter, applicable ASME standards, OSHA regulations, and the manufacturer's instructions. (16-5.a)

b. Maintain records of all LHE tests and inspections onsite. Records must be readily available upon request and, when submitted, they must become part of the official project/contract file. (16-5.b)

c. Contractors must notify the KO or COR within twenty-four hours of any LHE entering the site. The KO or COR may observe the contractor's inspection process and spot check the equipment. (16-5.c)

d. Whenever any LHE is found to be unsafe, or whenever a deficiency that affects the safe operation of the LHE is observed, immediately take the affected LHE out of service and prohibit its use until unsafe conditions have been corrected. (16-5.d)

e. Cranes, Hoists, Derricks, and Other LHE in Regular Service. (16-5.e)

(1) Inspection procedures for LHE in regular service are divided into three general classifications, shift, monthly and annual, based on the intervals at which inspections must be performed.

(2) The intervals depend on the nature of critical components of the LHE and the degree of their exposure to wear, deterioration, or malfunction.

Note. Monthly inspections are required by OSHA. The items to be inspected and the requirements are the same as those covered by the shift inspection. Therefore, monthly inspections will not be addressed separately in paragraph 16-5 and still must be performed.

(a) Shift Inspections. Before every LHE operation, at beginning of each shift, or following a change of operator, a CP must, at a minimum, visually inspect the items according to paragraph 16-5.e(2), applicable ASME standards, OSHA regulations, and the manufacturer's instructions. Do not use the equipment until this inspection demonstrates that no corrective action is required.

(a-1) Document the shift inspection with the results of the inspection, name and signature of the CP who conducted the inspection, and the date of the inspection.

(a-2) Maintain documentation for a minimum of twelve months, or the life of the contract, whichever is longer.

(b) Annual Inspections. Perform inspections at least annually. Perform inspections more frequently if recommended by the manufacturer, or if a load bearing or load controlling part or component has been altered, replaced, or repaired (see para 16-8.s).

Note. Adding/removing counterweights is not considered load controlling/load bearing.

(b-1) A QP must perform the annual inspection and must include operational testing to determine that the equipment as configured in the inspection is functioning properly.

(b-2) Document the inspection with a list of items checked to include findings, the name and signature of the person who conducted the inspection, and the date.

(b-3) Maintain the documentation until at least the next annual inspection, for twelve months, or the duration of the contract, whichever is longer.

(b-4) If any deficiency is identified, a QP must immediately determine whether the deficiency is a safety hazard. If so, then remove the equipment from service until it is corrected. If not a safety hazard, the QP may determine that the employer must monitor daily until the deficiency is corrected.

f. Cranes, Hoists, Derricks, and Other LHE Not in Regular Use. Perform an annual inspection if the equipment has been idle for three or more months. (16-5.f)

g. If LHE is involved in an incident or accident, inspect it according to the manufacturer's instructions. If the manufacturer is no longer available, an RPE must determine the level of inspection required. (16-5.g)

h. Running and Standing Wire Rope Inspection. (16-5.h)

(1) Each Shift. A CP must visually inspect all running ropes, counterweight ropes, and load trolley (standing) ropes according to this chapter, applicable ASME standards, OSHA regulations, and the manufacturer's instructions. Focus the inspection on

identifying apparent deficiencies in wire rope (running and standing). Do not open the wire rope to inspect it. Booming down is not a required part of this inspection.

(a) Document each shift inspection with the results of the inspection, name and signature of the CP who conducted the inspection, and the date of the inspection.

(b) Maintain documentation for a minimum of twelve months or the life of the contract, whichever is longer.

(2) Annual. At least every twelve months, a QP must inspect wire ropes (running and standing) in use on equipment according to this chapter, applicable ASME standards, OSHA regulations, and the manufacturer's instructions. Maintain the same documentation as for shift inspections.

i. Floating Cranes/Derricks, Crane Barges, and Auxiliary Shipboard-Mounted Cranes. In addition to inspecting of the crane/derrick according to paragraph 16-5, a CP must inspect the barge, pontoons, vessel, or other means of flotation used to support a land crane/derrick according to NAA requirements at the following frequencies: (16-5.i)

(1) Each Shift. Inspect the means used to secure/attach the equipment to the vessel/flotation device for proper condition, to include wear, corrosion, loose or missing fasteners, defective welds, water leaks and, where applicable, insufficient tension.

(2) Monthly. In addition to paragraph 16-8.z(18), the vessel/means of flotation used for the following:

(a) Taking on water.

(b) Deck load for proper securing.

(c) Chain lockers, storage, fuel compartments, and battening of hatches for serviceability as a water-tight appliance.

(d) Firefighting and lifesaving equipment in place and functional.

(3) If any deficiency is identified, a QP must immediately determine whether the deficiency constitutes a hazard. If a hazard, remove the vessel/flotation device from service until it has been corrected.

j. Pile Drivers. Inspect the pile driving leads at least weekly and document the findings. If deemed unsafe, or whenever there is an observed safety deficiency, immediately remove the equipment from service and do not use it until the deficiencies have been corrected. (16-5.j)

16-6. Activity Hazard Analysis (AHA) Requirements.
Develop AHAs according to paragraphs 1-6 or 2-6, as applicable. Prepare AHAs for all LHE activities, to include the following:

a. Prior to the start of a specific activity or task, document the crane operator certifications, qualifications, and designations in the AHA. Submit the AHA to the USACE supervisor for approval or acceptance by the KO or COR. (16-6.a)

b. Boom Assembly and Disassembly. Include this operation in the AHA and identify the associated CP. (16-6.b)

c. Portal, Tower, and Pillar Cranes. Before the assembly or disassembly commences, establish the work procedures to ensure site-specific needs are considered and prepare an AHA. The AHA must include the following: (16-6.c)

(1) The location of the crane in relation to other tower cranes, adjacent buildings or towers, overhead power and communication lines, and underground utilities.

(2) Foundation design and construction requirements.

(3) Identify clearances between the tower, the structure, bracing and wedging requirements, when the tower is erected within a structure.

d. Hoisting with Hydraulic Excavating Equipment. Prepare a hoisting operation specific AHA. The AHA must include at least: (16-6.d)

(1) Written proof of qualifications of equipment operators, riggers, and others involved in the hoisting operations.

(2) The specific conditions where other personnel may also operate this equipment, as identified in paragraph 16-3.a.

(3) Operational testing, as described in paragraph 16-8.gg(5).

(4) Proper operating procedures according to the equipment manufacturer’s operating manual.

(5) Proper use and onsite availability of manufacturer's load rating capacity charts.

(6) Proper use of rigging, including positive latching devices to secure the load and rigging.

(7) Inspection of rigging.

(8) Use of tag lines to control the load.

(9) Adequate communications.

(10) Establishment of a sufficient swing radius for the equipment, rigging and load.

(11) Stability of surfaces beneath the hydraulic excavating equipment.

16-7. Minimum Plan Requirements.

a. Prior to the start of all crane activities, provide the USACE supervisor/KO or COR with the following documentation for any crane planned for use on a USACE project: (16-7.a)

(1) Detailed description of crane operations.

(2) Personnel required training/qualification (see para 16-3).

(a) Operators proof of qualification (for example, certification, designation letter).

(b) Rigger proof of qualification (for example, certification, designation letter).

(c) Signal Person proof of qualification (for example, certification, designation letter).

(d) Identify who the lift director is.

(3) Completed CoC (see para 16-10.b).

b. Standard Lift Plan (SLP). Plan all lifts to avoid situations where the operator cannot maintain safe control of the lift. Prepare a written SLP for every lift or series of lifts (if duty cycle or routine lifts are being performed). The SLP must be developed, reviewed, and accepted by all personnel involved in the lift. Keep a copy of the SLP on the LHE for the specific approved lift(s). Keep a copy of every SLP for a minimum of three months. Include at least the following in the plan or use the non-mandatory ENG Form 6203 (Crane Standard Lift Plan) (see para 16-10.a): (16-7.b)

(1) Personnel. Roles, responsibilities, qualification, and any public persons or other trade personnel affected by the lift.

(2) Area Preparation. Load handling location and path of travel, blocking/cribbing, overhead lines, ground stability.

(3) LHE Considerations. Capacity, configuration, obstructions, inspection, ground support conditions.

(4) Load Considerations. Weight, CG, radii, and configuration.

(5) Rigging Considerations. Type, configuration (for example, sling and load angle factors), inspection, need for sling protection.

(6) Environmental Considerations. Wind speed, storms, precipitation, power lines in area of travel or load swing, counterweight swing area barricaded.

c. Standard Lift Plan (SLP) - Floating Plant. Plan all lifts to avoid procedures that could result in configurations where the operator cannot maintain safe control of the lift. In addition to the requirements and criteria to be considered in paragraph 16-7.b for ENG Form 6203 (Crane Standard Lift Plan) (see para 16-10.a), supplement with the following requirements and information: (16-7.c)

(1) Lifts must reflect floating operational parameters, such as anticipated boom angles, values for wire leads, unknown load for extractions, and upper limits on crane force.

(2) When deck loads are to be carried while lifting, the situation must be analyzed for modified ratings.

(3) When mounted on barges or pontoons, the manufacturer or QP must modify the rated loads and radii of the land cranes. The QP must evaluate the modifications specific to the flotation device/platform being used.

(4) Post the load charts in the cab or at the operator's station (if no cab) according to paragraph 16-8.z(7). Make readily available on board all other procedures applicable to the operation of the equipment (for example, instructions and operator's manual, recommended operating speeds).

(5) If portable remote controls are used, the procedures to monitor vessel heel and trim and crane machine list and trim.

d. Critical Lift Plan. Before any critical lift, a CP or QP must prepare a Critical Lift Plan and submit it to the USACE supervisor for approval or acceptance by the KO or COR. See non-mandatory ENG Form 6213 (Load-Handling Equipment Crane Operation Critical Lift Plan) (see para 16-10.c). It must include at least the following items, in addition to all of the paragraphs 16-7.a and 16-7.b requirements. (16-7.d)

(1) Detailed description of critical lift to include:

(a) The specific make and model of each piece of LHE, the line, and boom, and the swing speeds.

(b) The exact size and weight of the load to be lifted and all LHE and rigging components that add to the weight. Include the maximum load limits for the entire range of the lift, as listed in the manufacturer's load charts.

(c) The specific lift geometry and procedures for the entire range of the lift. Include the LHE position, height of the lift, the load radius, and the boom length and angle.

(2) The anticipated hazards.

(3) A site drawing that identifies the placement and locations of LHE. Include any adjacent equipment, facilities, utilities, and other site features.

(4) A rigging plan that shows the lift points and describes rigging procedures and hardware requirements.

(5) The applicable LHE Load Chart with equipment serial number.

(6) A description of the ground conditions, outrigger, and crawler track requirements. If applicable, the design of mats necessary to achieve a level, stable foundation of sufficient bearing capacity for the lift. Ground conditions must be adequate for maximum ground pressure exerted by the crane(s).

(7) For floating LHE, a description of the operating base (platform) condition and any potential maximum list/trim.

(8) A list of environmental conditions under which lift operations are to be stopped. Include crane manufacturers requirements.

(9) The coordination and communication requirements for the lift operation.

(10) For tandem LHE lifts, identify the requirements for an equalizer beam if applicable.

e. Pile Driving. Prior to initiating pile driving or extraction operations, the contractor must develop a site-specific safety plan. The plan must identify specific steps for the intended operations, list of hazards, and procedures to minimize or eliminate those hazards. Plans must include at least: (16-7.e)

(1) Location of any above and below grade utilities.

(2) Designated areas for equipment operations and material storage.

(3) Assembly and disassembly sequences for pile driving equipment.

(4) Operation of pile driving equipment and handling of pile materials.

(5) A geotechnical report identifying subsurface and surface conditions.

(6) Daily documented inspections will include: the hammer, cushion blocks, rigging, fuel lines, pressurized hoses, clamps, welds, hardware, and all other pile driving associated equipment.

(7) A controlled work area plan to prevent access by persons not directly involved in the operation.

16-8. General Requirements.

a. The employer must comply with all manufacturer's instructions, procedures, and recommendations applicable to the operational functions of LHE, including LHE use with attachments. Do not exceed the safe operating speeds or loads for the LHE. Where the manufacturer procedures are not available, the employer must develop and ensure compliance with all procedures necessary for the safe operation of the equipment and attachments by preparing: (16-8.a)

(1) QP developed procedures for the operational controls.

(2) An RPE developed and signed procedures related to the capacity of the equipment.

b. When the manufacturer's instructions or recommendations are more stringent than the requirements of this manual, follow the manufacturer's instructions or recommendations. (16-8.b)

c. The use of all electronic equipment not necessary to the work activity being performed is prohibited. (16-8.c)

d. Shut down LHE before refueling. Diesel powered equipment may remain running if a closed system is used that has an automatic shut-off that will prevent spillage if connections are broken. (16-8.d)

e. Before operating the LHE, assess the condition and structure of the road and shoulder to assure that clearances and load capacities are sufficient for the safe passage or placement of any LHE. (16-8.e)

f. All LHE must have the following safety related components, as applicable to the type of equipment: (16-8.f)

(1) An operable fuel gage.

(2) An operable audible warning device (for example, a horn).

(3) Adequate rearview mirror or mirrors.

(4) Non-slip surfaces on steps.

(5) A power-operated starting device.

(6) Seats for the operator and all personnel that are required to be inside or on the equipment.

(7) Two functioning headlights and two taillights, whenever visibility warrants additional light.

(8) Safety glass in windshields, windows, and doors. Replace cracked or broken glass.

(9) At least one dry chemical or carbon dioxide (CO_2) fire extinguisher, with a minimum rating of 10B:C in the cab or at the machinery housing.

(10) Back-up alarm for all self-propelled LHE, whether moving alone or in combination (see chapter 18).

(11) Warning lights for airfield operations. The lights that are used as collision avoidance measures must comply with the Federal Aviation Administration (FAA) requirements and guidance. (See chapter 32)

g. Ensure that manufacturer required rollover protective structure is in place and maintained. (16-8.g)

h. Follow the manufacturer's specifications and operating manuals for hydraulic equipment and attachments utilizing quick connect/disconnect systems. After completing a switch of attachments, the equipment operator must take the actions necessary to ensure the quick connect/disconnect system is positively engaged. (16-8.h)

i. Provide and maintain all required guarding and safety devices as follows: (16-8.i)

(1) Guard all belts, gears, shafts, pulleys, sprockets, spindles, drums, flywheels, chains, or other reciprocating, rotating, or moving parts of equipment when exposed to contact by persons or when they otherwise create a hazard.

(2) Guard or insulate all hot surfaces of equipment, including exhaust pipes or other lines, to prevent injury and fire.

(3) Design, construct, and install required platforms, foot walks, steps, handholds, guardrails, and toe-boards on machinery and equipment to provide safe footing and access ways.

j. Work Area Control. When there are accessible areas in which the LHEs permanently or temporarily mounted rotating superstructure poses a risk of striking,

pinching, or crushing an employee against another part of the equipment or another object, the employer must: (16-8.j)

(1) Prevent personnel from entering these hazardous areas.

(2) Train employees assigned to work on or near the equipment on the potential hazards.

(3) Erect and maintain control lines, warning lines, railings, or similar barriers to mark the boundaries of the hazard areas.

Note. Exception. When the employer can demonstrate that it is neither feasible to erect such barriers on the ground nor on the equipment, clearly mark the hazard areas by a combination of warning signs (such as, "Danger-Swing/Crush Zone") and high visibility markings on the equipment that identify the hazard areas. The employer must train each employee to understand what these markings signify.

k. Work Area Access. (16-8.k)

(1) Before an employee goes to location that is out of view of the operator (for example, around rotating superstructure), the employee (or someone instructed by the employee) must inform the operator that they are going to that location. The operator may not rotate the superstructure until the operator is informed, according to a pre-arranged system of communication, that the employee is in a safe position.

(2) Where any part of a crane/derrick is within the working radius of another crane/derrick, the responsible party must institute a system to coordinate operations.

l. Maintenance/Repair of LHE. (16-8.l)

(1) Perform maintenance, including preventive maintenance and repairs, according to the manufacturer's instructions. Make records of maintenance and repairs conducted during the life of a contract available to the USACE supervisor/KO or COR.

(2) Replacement parts or repairs must be of the same kind and quality as the original equipment manufacture’s parts and repairs. Obtain replacement parts for load bearing and other critical parts from the original manufacturer, (if possible) or have them certified by an RPE knowledgeable in LHE.

(3) Shut down all LHE and take positive means taken to prevent its operation while repairs or manual lubrications are being done.

(a) Equipment designed to be serviced while running are exempt from this requirement.

(b) Address control of hazardous energy (LOTO) prior to performing the maintenance and repair of equipment (see chapter 12).

m. Parking. (16-8.m)

(1) Whenever LHE is parked, set the parking brake.

(2) For LHE parked on an incline, chock the wheels or block the track mechanisms, and set the parking brake.

(3) Equip all LHE left unattended at night with lights or reflectors, or place barricades equipped with lights or reflectors. This includes all equipment adjacent to a highway in normal use or adjacent to construction areas where work is in progress.

n. Contractor must notify the KO or COR at least twenty-four hours before any LHE enters the site (prior to inspection/tests) so that the KO or COR can observe the contractor's inspection process and inspect the equipment. (16-8.n)

o. Safety Devices and Operational Aids. Do not use safety devices and operational aids as a substitute for the exercise of professional judgment by the operator. The following safety devices are required on all cranes and derricks covered by this chapter, unless otherwise specified: (16-8.o)

(1) Crane level indicator.

(a) The equipment must have a crane level indicator that is either built into the equipment or is available on the equipment.

(b) Crane level indicators are not required for portal overhead or gantry cranes, derricks, floating cranes/derricks and crane/derricks on barges, pontoons, vessels, or other means of flotation.

(2) Boom stops, except for derricks and hydraulic booms.

(3) Jib stops (if jib is attached), except for derricks.

(4) Equipment with foot pedal brakes must have locks, except for portal and floating cranes.

(5) Hydraulic outrigger jacks must have an integral holding device (check valve).

(6) Equipment on rails must have rail clamps and rail stops, except for portal cranes.

(7) Horn.

p. Proper Operation of Safety Devices. (16-8.p)

(1) Do not begin operations before the safety devices listed in paragraph 16-8.o are in proper working order.

(2) If a safety device stops working properly, then the operator must safely stop operations.

(3) Do not resume operations until the device is again working properly.

(4) Alternative measures may not be used.

q. Operational Aids. Operations may not begin until the listed operational aids are in proper working order, except where the employer meets the specified temporary alternative measures (see exception paragraphs below). More protective alternative measures specified by the crane manufacturer, if any, must be followed. If a listed operational aid stops working properly during operations, the operator must safely stop operations until the temporary alternative measures are implemented, or the device is again working properly. If a replacement part is no longer available, the use of a substitute device that performs the same type of function is permitted and is not considered a modification. (16-8.q)

(1) Category I Operational Aids and Alternative Measures. Repair all malfunctioning operational aids listed in this paragraph no later than seven days after the deficiency occurs.

Note. Exception. If the employer documents that it has ordered the necessary parts within seven days of the occurrence of the deficiency, the repair must be completed within seven days of receipt of the parts.

(a) Boom hoist limiting device. Temporary alternative measures must include at least one of the following:

(a-1) Use a boom angle indicator.

(a-2) Clearly mark the boom hoist cable at a spot that it is visible to the operator and that gives the operator sufficient time to stop the hoist so that the boom stays within the minimum allowable radius. If the operator cannot see the mark, then install mirrors or remote video cameras and displays.

(a-3) Clearly mark the boom hoist cable at a location that is visible to the spotter and that gives the spotter sufficient time to signal the operator to stop the hoist so that the boom stays within the minimum allowable radius.

(b) Luffing jib limiting device. Install a luffing jib limiting device on all equipment with a luffing jib.

(c) Anti-two blocking device (A2B). Install A2B devices at all points of two-blocking.

(c-1) Equip cranes and derricks with an A2B/Hoist-limit device that disengages the function that is causing the two-blocking or install an A2B damage prevention feature (except as noted). A CP must test and certify that the devices are functioning properly prior to operating the crane.

(c-2) Equip lattice boom cranes with an A2B device to stop the load hoisting and boom-down functions before the load block or load contacts the boom tip.

(c-3) Duty Cycle Exception. Lattice boom cranes used exclusively for duty cycle operations are exempt from A2B equipment requirements. When a lattice boom crane engaged in duty cycle work is required to make a non-duty cycle lift (for example, to lift a piece of equipment), it will be exempt from the A2B equipment requirements if the following procedures are implemented: 1) An international orange colored warning device (for example, flag, tape, ball) is properly secured to the hoist line at a distance of 8 feet to 10 feet (2.4 m to 3 m) above the rigging; 2) The signal person acts as a spotter to alert the crane operator with a “STOP” signal when the warning device approaches the boom tip and the crane operator immediately stops the hoisting functions; 3) During a non-duty cycle lift, the signal person does not stand under the load, has no duties other than as a signal person, and complies with the signaling requirements of this manual; and 4) A2B warning devices may be used in lieu of A2B prevention devices for lattice boom crane and hoisting equipment with manually activated friction brakes.

(d) Telescopic boom cranes.

(d-1) Equip telescopic boom cranes with an A2B device to stop the load hoisting function before the load block or load contacts the boom tip, and to prevent damage to the hoist rope or other machine components when extending the boom.

(d-2) Equip telescopic boom cranes used exclusively for duty cycle operations with a two-blocking damage prevention feature or warning device to prevent damage to the hoist rope or other machine components when extending the boom.

(e) Floating cranes. Floating cranes may use an A2B alarm system in lieu of a disengaging device unless they are hoisting personnel.

(f) Other cranes used in duty cycle operations, to include clamshell (grapple), magnet, drop ball, container handling, concrete bucket, pile driving and extracting operations, drilled shaft operations (except telescopic boom cranes), dynamic compaction, and continuous flight auger drilling are exempt from the requirements for A2B devices.

(g) Temporary alternative measure. Clearly mark the cable where it can be easily seen by the operator and that gives the operator sufficient time to stop the hoist to prevent two-blocking. Use a spotter when extending the boom.

(h) Locate the crane mounted wind speed indicating devices where the maximum wind speed can be measured for the lifting activity. Where wind speed and gusts can be effectively measured, a hand-held anemometer may be used.

(2) Category II Operational Aids and Alternative Measures. Repair malfunctioning operational aids listed in this paragraph no later than 30 days after the deficiency occurs.

Note. Exception. If the employer documents that it has ordered the necessary parts within seven days of the occurrence of the deficiency, and the parts are not received in time to complete the repair in 30 days, the repair must be completed with seven days of receipt of the parts.

(a) Boom angle or radius indicator. The equipment must have a boom angle or radius indicator readable from the operator's station unless it is an articulating boom crane or digger derrick manufactured before November 8, 2011. Calibrate and test the indicators following the manufacturer's instructions. An acceptable temporary alternative measure for figuring out the radii or boom angles is to use a measuring device.

(b) Jib angle indicator. Not applicable to articulating boom cranes. Required if the equipment has a luffing jib. An acceptable temporary alternative measure for figuring out the radii or jib angle is to first determine the main boom angle and to then use a measuring device.

(c) Boom length indicator. Not applicable to articulating boom cranes. Required if the equipment has a telescopic boom, except where the load rating is independent of the boom length. An acceptable temporary alternative measure to determine boom length is to use at least one of the following:

(c-1) Mark the boom with measured marks to calculate boom length.

(c-2) Calculate boom length from boom angle and radius measurements.

(c-3) Measure the boom with a measuring device.

(d) Load weighing and similar devices. Not applicable to digger derricks manufactured prior to November 8, 2011. Required if the equipment has any of the following: load weighing device, LMI, rated capacity indicator or rated capacity limiter. Acceptable temporary alternative measures to determine the load weight are to: use a reliable source (that is, load manufacturer), use a reliable calculation method (that is,

calculating a steel beam from measured dimensions and a known unit weight), or use other equally reliable means. Provide the operator with the load weight prior to the lift.

Note. Exception. Overhead and mobile LHE used in duty cycle operations are exempt from the requirements for load indicating devices and LMI devices.

(e) Hoist drum rotation indicator if the drum is not visible from the operator's station. Temporary alternative measures: mark the drum and if needed, install mirrors or remote video cameras and displays if necessary for the operator to see the mark.

(f) Outrigger position (horizontal beam extension) sensor/monitor if the equipment has outriggers (required on equipment manufactured after January 1, 2008). Temporary alternative measure: the operator must verify that the position of the outriggers is correct according to the manufacturer's instructions before beginning operations requiring outrigger deployment.

r. Determining Load. Ensure that the operator has the load information prior to the lift. Determine all loads from one of the following devices or methods: (16-8.r)

(1) Load weighing device.

(2) LMI (or rated capacity).

(3) Load moment (or rated capacity) limiter.

(4) The weight of the load must be determined either from a source recognized by the industry (such as the load manufacturer) or by a calculation method recognized by industry (that is, calculating a steel beam from measured dimensions and a known per foot weight as determine by a QP).

Note. Exception. Permanently installed overhead, gantry, or other cranes that are used to lift gates (for example, spillway, intake, discharge) from slots, have been designed with a reserve capacity and are factory proof tested at 125% of WLL. Load cells are highly recommended, but not required, to determine rigging capacities and overload conditions.

s. General Testing Requirements. The reports must include the test procedures and confirm the adequacy of the repairs or alterations. Keep the test reports with the crane and hoisting equipment or at the onsite project office. (16-8.s)

(1) A QP must conduct operational tests following the applicable ANSI/ASME standard and the manufacturer's instructions. If the manufacturer has no procedures, follow requirements included in this chapter.

(2) Perform operational testing at the following frequencies:

(a) Before the first use of a new or reinstalled crane or hoisting equipment.

(b) Before using a crane or hoisting equipment after altering, replacing or repairing a load bearing or load controlling part or component, brake, travel component, or clutch (to include securing devices, skids, and barges for floating cranes).

Note. Adding/removing counterweights is not a load controlling/load bearing.

(c) Every time a crane or hoisting equipment is reconfigured or re-assembled after disassembly (to include booms).

(d) Every time a crane and/or hoisting equipment is brought onto a USACE project.

(e) During annual inspections.

Note. When wire rope is replaced, full operational testing of the equipment is not required, but a limited operational test is required prior to putting the equipment back into service.

t. Operational Testing. Operational testing must include the following: (16-8.t)

(1) Load lifting and lowering mechanisms.

(2) Boom lifting and lowering mechanisms.

(3) Boom extension and retraction mechanisms.

(4) Swinging mechanisms.

(5) Travel mechanisms.

(6) Safety devices.

(7) Operational aids.

u. Load Testing. Load testing is considered a critical lift. Develop a Critical Lift Plan following the requirements of paragraph 16-7.d. (16-8.u)

(1) Load tests must be performed under the direction of a QP according to appropriate ASME standards and the manufacturer's instructions. At a minimum, the load test procedures must include the following:

(a) For all cranes. Hoist the test load for a minimum of five minutes to ensure that the load is supported by the crane and held by the hoist brake(s). Lower the test load,

stop lowering, and again hold the load for a minimum of five minutes above the ground with the brake(s).

(b) For mobile cranes, to the extent possible while clearing physical obstructions, operate the crane through the full range of motions below as applicable:

(b-1) Ensure there are no physical restrictions, the full range of its swing, with the test load.

(b-2) Boom the crane up and down within the allowable working radius for the test load. At the maximum radius, hold the load for a minimum of five minutes and ensure there is no movement of the load.

(c) For overhead cranes, to the extent possible while clearing physical obstructions, operate the crane through the full range of motions below as applicable:

(c-1) Travel to the extents of the trolley limits or end stops with the test load.

(c-2) Bridge to the extents of the bridge limits or end stops with the test load.

Note. If the manufacturer is no longer in business and procedures are unavailable, a QP familiar with the type of equipment involved must develop and approve the procedures. Perform load testing according to paragraph 16-8.u.

(2) Weight of test load.

(a) For mobile cranes, the weight of the test load must be 100% to 110% of the anticipated load for the specified configuration. Do not to exceed 100% of the manufacturer's load chart at the configuration of the test. The actual anticipated load may be used as the test load, if approved by the USACE supervisor or accepted by the KO or COR.

(b) For overhead cranes, use the test load weight recommended by the manufacturer.

(3) Perform load testing at the following frequencies:

(a) Before using a crane or hoisting equipment after altering, replacing or repairing a load bearing or load controlling part or component, brake, travel component, or clutch.

Note. Adding/removing counterweights is not considered load controlling/load bearing.

(b) Every time a crane or hoisting equipment(s) is reconfigured or re-assembled after disassembly (to include booms).

Note. Attaching/detaching a jib attachment is not considered “reconfiguring or re-assembling” a crane and so does not require a load test. Install or stow the jib following the manufacturer’s instructions and have a CP document this action prior to operation.

(c) When the manufacture requires load testing.

(c-1) The employer must specifically research, identify and document the manufacturer’s required load-testing frequency for each USACE-owned/operated and/or Contractor owned/ operated crane or hoisting equipment. Provide a copy of this information to the USACE supervisor/KO or COR.

(c-2) Under conditions (a) and (b) above, a selective load test may be performed when the manufacturer requires determination of the weight of test load (that is, testing only those components that have or may have been affected by the alteration, replacement, or repaired).

(c-3) Follow the manufacturer's specifications and limitations applicable to the operation of any crane and hoisting equipment. Do not load a crane or hoisting equipment more than the manufacturer's rated capacity, except overhead and gantry cranes may be loaded up to 125% of the crane load rating for test purposes or planned engineered lifts. (See para 16-7.d and ANSI/ASME B30.2 or B30.16)

(c-4) Where manufacturer's specifications are not available, the limitations assigned to the equipment must be based on the determinations of a registered engineer competent in this field, and such determinations must be documented and recorded.

(c-5) Attachments used with crane and hoisting equipment must not exceed the capacity, rating, or scope recommended by the manufacturer.

(d) Keep all reports that show test procedures and confirm the adequacy of repairs or alterations and provide copies upon request.

v. Operation. (16-8.v)

(1) All LHE must have the following documents with them (in the cab, if applicable) at all times they are to be operated:

(a) The operating manual developed by the manufacturer for the specific make and model of equipment.

(a-1) When not available from a manufacturer, a QP must develop an operation and maintenance manual type document for the LHE. The document must include the

ratings and operating limitations (such as, load charts), recommended operating speeds, special hazard warnings, instructions, and maintenance, testing, and inspection requirements.

(a-2) Where load capacities are available only in electronic format, in the event of a failure which makes the load capacities inaccessible, the operator must immediately cease operations or follow safe shut-down procedures until the operator obtains a useable electronic or hardcopy of the load capacities. A hardcopy of the load capacities must be maintained and available.

(b) The load-rating chart must include:

(b-1) The LHE make and model, serial number, and year of manufacture.

(b-2) Load ratings for all operating configurations, including optional equipment.

(b-3) Recommended reeving for the hoist line.

(b-4) Operating limits in windy or cold weather conditions.

(c) A durable load chart with legible letters and figures must be readily available to the operator at the control station.

(d) Crane logbook. Update the logbook daily as the crane is used. Record the operating hours and all crane inspections, tests, maintenance, and repair events. The operator and supervisor must sign the logbook each day of use. Service mechanics must sign the log after conducting maintenance or repairs on the crane.

(2) Do not make modifications or additions that affect the capacity or safe operation of LHE without the manufacturer's written approval.

(a) If such modifications or changes are made, revise the capacity, operation, and maintenance instruction plates, tags, or decals accordingly.

(b) In no case may the original safety factor of the equipment be reduced.

(3) Install hoisting wire ropes according to ANSI/ASME standards and the equipment manufacturer's instructions.

(a) Overhead and gantry cranes must have at least two full wraps of wire rope on the drums at all times.

(b) All other cranes must have at least two full wraps (that is, not layers) of wire rope on the drums at all times unless the manufacturer’s instructions or applicable ASME standards require additional wraps.

(c) The drum end of the wire rope must be anchored to the drum by an arrangement specified by the crane manufacturer.

(4) Communications.

(a) Use a standard signal system with all LHE (that is, by hand, voice, audible or comparable signals).

(a-1) Hand signals may be used when the distance between the operator and signal person is not more than 100 feet (30.5 m). If using hand signals, use the Standard Method.

(a-2) Use a radio or cellphone, or a combination voice/video system when the distance between operator and signal person is more than 100 feet (30.5 m) or when they cannot see each other.

(b) Use a signal person whenever:

(b-1) The operator does not have a clear line of sight to the point of operation, load travel, or area near or at load placement.

(b-2) The equipment is traveling and the view in the direction of travel is obstructed.

(b-3) The operator or the person handling the load determines that it is necessary.

(c) During LHE operations requiring signals, the ability to transmit signals between the operator and signal person must be maintained. If that ability is interrupted at any time, the operator must safely stop operations requiring signals until the signals can be given and understood.

(d) Only one person may communicate with an LHE operator at a time unless an emergency stop signal is given. Anyone may signal an emergency stop and the operator must immediately obey it.

(5) Do not ride on loads, hooks, hammers, buckets, material hoists, or other hoisting equipment not meant for personnel handling of the following actions.

(6) Always use tag lines to control loads unless it is not practical or their use creates a hazard.

(7) Whenever a slack line condition occurs, cease operations and check for the proper seating of the rope in the sheaves and on the drum prior to further use.

(8) Power Line Clearance - Equipment Operations (all voltages). The employer must identify the operating envelope for each LHE. Determine if any part of the LHE,

load line, or load (to include rigging and lifting accessories), if operated up to the equipment's maximum working radius in the operating envelope could get within 20 feet (6.1 m) of the power line. If so, perform at least one of the following:

(a) De-energize and ground. Confirm from the utility owner/operator that the power line has been de-energized and visibly grounded at the work site.

(b) Establish a 20 feet (6.1 m) clearance. Ensure no part of the LHE, load line or load gets closer than 20 feet (6.1 m) to the power line by doing all the following:

(b-1) Conduct a planning meeting with the site/lift director, signal person/rigger, operator, crew, and the other workers who will be in the area. Review location of the power lines and the control measures to prevent encroachment or electrocution.

(b-2) If tag lines are used, they must be non-conductive.

(b-3) Erect and maintain an elevated warning line, barricade, or line of signs in view of the operator. Equip them with flags or similar high-visibility markings at 20 feet (6.1 m) from the power line or at the minimum allowable distance required by table 16-1.

(b-4) Perform at least one of the following additional measures in paragraph (b-5) through (b-8):

(b-5) Use a dedicated spotter who is in continuous contact with the operator. The spotter must have a visual aid to assist in identifying the minimum clearance distance (for example, a clearly visible line painted on the ground). The spotter must stand where they can effectively gauge the clearance distance.

(b-6) Use a proximity alarm set to give operator sufficient warning.

(b-7) Use a device that automatically limits range of movement and is set to prevent encroachment.

(b-8) Use An insulating link/device installed at a point between the end of the load line (or below it) and the load.

(c) Minimum Clearance from Energized Overhead Electric Lines (see table 16-1).

(c-1) Determine the line's voltage and minimum allowable clearance distance using table 16-1.

(c-2) Determine if any part of the equipment, load line, or load in the operating envelope could get closer to the power line than is allowable. If so, implement the 20 feet (6.1 m) clearance control measures in (b) above.

(d) Install permanent overhead and gantry cranes with clearances according to NFPA 70.

(e) When working near transmitter/communication towers where the LHE is close enough for an electrical charge to be induced in the LHE or materials being handled, deenergize the transmitter or provide an electrical ground. Taglines, if used, must be non-conductive.

(f) Assume that all power lines are energized unless the utility owner/operator confirms that the power line has been and will continue to be deenergized and visibly grounded at the work site.

(9) Power Line Safety (over 350 kV). The requirements of paragraphs 16-8.v(8) and 16-8.v(9) apply to power lines over 350 kV except:

(a) For power lines over 350 kV but at or below 1000 kV, substitute “50 feet (15.2 m)” wherever “20 feet (6.1 m)” is specified.

(b) For power lines over 1000 kV, the utility owner/operator or an RPE, who is a QP with electrical power transmission and distribution experience, must establish the minimum clearance distance.

(10) Power line safety while traveling under or near power lines with no load. The employer must:

(a) Lower the boom/mast and its support system enough to meet the allowable clearances in table 16-2.

(b) Evaluate and address the effects of speed and terrain on equipment movement (including boom/mast) to ensure clearances are maintained according to table 16-2.

(c) If any part of the LHE will get closer than 20 feet (6.1 m) to the power line, position a dedicated spotter to be in continuous contact with the operator.

(d) When traveling at night, or in conditions of poor visibility, such as fog, smoke, or precipitation, the employer must:

(d-1) Illuminate the power lines, or use other method(s) to identify the location of power lines.

(d-2) Delineate and follow a safe travel path.

(11) Physical Clearances.

(a) Maintain adequate clearance between moving and rotating structures of the LHE and fixed objects so that employees can move about without harm. The minimum adequate clearance is 24 inches (61 cm).

(b) Barricade the accessible at the rear of the LHEs rotating superstructure areas and within the swing radius of permanently or temporarily mounted items to prevent an employee from being struck or crushed.

(12) Crane Mats. Where crane mats are required for a stable, level work surface for crane operations, the matting material must be in good condition and of adequate thickness, width, and length as to completely support the crane. Place the mats perpendicular to the crane travel path and as close to each other as possible. Use a spotter to guide the crane when it moves on the mat surface to prevent the crane from traveling beyond the limit of the crane mats.

w. Environmental Considerations. (16-8.w)

(1) Do not operate LHE when wind speeds reach the maximum wind velocity based on the surface/load ratio recommendations of the manufacturer.

(a) At winds greater than 20 mph (9 m/s), the operator, rigger, and lift director must cease all crane operations, evaluate conditions, and determine if the lift may proceed. Base this determination on the manufacturer's instructions for calculating wind speed.

(b) Document the decision to proceed or not with the lift in the LHE/crane operator's logbook.

(2) During adverse weather involving icing of the LHE or reduced visibility, operate the LHE at reduced functional speeds and with a signaling means appropriate to the situation.

(3) Stop all LHE operations when lightning is observed. If lightning is within 10 miles, all work stop until 30 minutes after the last thunder or lightning event. Determine how close the lighting is to the operations using a lightning detector. Alternately, once lightning is seen, count the number of seconds until thunder is heard. Divide number of seconds by five to get the distance the lightning is away in miles.

(4) Plan work activities according to the latest weather forecast and be prepared to stop operations until bad weather has safely passed. Document the event and actions taken (for example, in the daily report, crane operator's logbook).

(5) For night operations, provide lighting adequate to illuminate the working areas while not interfering with the operator's vision (see chapter 7).

x. Lattice, Hydraulic, Crawler-, Truck-, Wheel-, and Ringer-Mounted Cranes. (16-8.x)

(1) For required operator aids and indicating devices, see paragraph 16-8.q.

(2) Boom Assembly and Disassembly. Address these activities in the AHA. Identify the CP.

(a) The team must review the manufacturer's procedures before starting the boom assembly or disassembly. The CP must be present during assembly and disassembly operations.

(b) When removing pins or bolts from a boom, workers must stay out from under the boom. Block, crib, or otherwise secure all sections to prevent them from falling.

(c) A CP must confirm, verify, and approve the blocking, cribbing, and other means of securing before assembly and disassembly operations may begin.

(3) Outriggers.

(a) Anytime outriggers are required to be used, except for locomotive cranes, extend or deploy them according to the crane manufacturer’s load/capacity chart specifications, except for locomotive cranes.

(b) When partially extended outriggers are used, address the following requirements:

(b-1) Do not operate the LHE with partially extended outriggers unless approved by the crane manufacturer.

(b-2) Set the outriggers at equal positions that correspond to the load/capacity charts supplied by the manufacturer for those positions. Refer only to the load chart(s) corresponding to the outrigger positions that will be used.

(b-3) If outriggers must be set at unequal positions, consult with the manufacturer or QP to determine if the capacity reductions, special operating procedures, or limitations are required.

(c) Securely attach outrigger floats to the outriggers.

(d) Blocking/pads under outrigger floats must meet the following requirements:

(d-1) Have sufficient strength to prevent crushing, bending, or shear failure.

(d-2) Have sufficient thickness, width, and length to completely support the float, transmit the load to the supporting surface, and prevent shifting, toppling, or excessive

settlement under load. Base the blocking area size and thickness on soil conditions, soil type, compaction, liquid limits, underground utilities, crane type and capacity, and having the crane within 1% of level.

(e) Unless the manufacturer has specified an on-rubber rating, mobile cranes must not pick or swing loads over the side of the crane unless the outriggers are down and properly extended.

(4) When not in use, lower the crane booms to ground level or secure them against displacement by wind loads or other outside forces. If the manufacturer recommends against doing this, follow the manufacturer's recommended practice.

(5) When pick and carry operations occur (such as, with Rough Terrain Cranes), center the boom over the front of the crane, engage the mechanical swing lock, and restrain the load from swinging.

y. Portal, Tower, and Pillar Cranes. (16-8.y)

(1) Construct and install all load bearing foundations, supports, and rail tracks according to a design prepared by an RPE. The RPE must be familiar with the specific type of crane.

(2) Assemble and disassemble cranes following the manufacturer's instructions. If manufacturer’s procedures are not available, follow the instructions developed by an RPE with knowledge of the specific crane.

(a) When assembled or disassembled, keep the manufacturer’s or RPE’s instructions and a list of the weights at the site.

(b) A QP must supervise the assembling and disassembling activities.

(c) Prepare and have an AHA approved for the specific assembling or disassembling tasks, before starting the work. See paragraph 16-6.c. for the AHA requirements.

(d) The manufacturer must determine the wind velocity at the site at the time of assembly or disassembly, and evaluate whether it is a limiting factor that could require suspending the work. If the manufacturer’s data is not available, then a QP must evaluate any wind loading limitations.

(e) Before assembling any crane components, visually inspect them for damage. Do not assemble dented, bent, torn, gouged, or otherwise damaged members.

(f) Upon assembly and after each climb, plumb the crane and keep it plumbed with wedges or other means. Plumb cranes to the manufacturer’s tolerance. Where the

manufacturer does not specify a tolerance, plumb the crane to a tolerance of 1:500 (1 inch:40 feet; 2.5 cm:12.2 m).

(3) Perform pre-operation tests when cranes are assembled and after each climbing operation, and before placing the crane in service. Test all functional motions and motion limiting devices and brakes for proper operation according to the manufacturer's instructions and ASME B30.3 or B30.4, as applicable. Test the:

(a) Crane supports.

(b) Brakes and clutches, limit and overload switches, and locking and safety devices.

(c) Load hoisting and lowering, boom hoisting and lowering, and swing motion mechanisms and procedures.

(4) Climbing Procedures. Prior to and during, all climbing procedures (to include inside and top climbing), the employer must:

(a) Comply with all manufacturer prohibitions.

(b) Have an RPE verify that the host structure is strong enough to sustain the forces imposed through the braces, brace anchorages, and supporting floors.

(c) Ensure that no part of the climbing procedure takes place when wind velocity at the crane superstructure exceeds the lower of the limits set by the manufacturer or a QP. If neither has specified a limit, then the limit is 20 mph (9 m/s) at the crane superstructure. Evaluate wind gusts for their effect on the climbing operation.

(d) The operator of a hammerhead tower crane must be present during climbing or telescoping operations.

(5) Safety Devices and Operational Aids. Do not being other work until the operational aids are in proper working order, except where the employer meets the specified temporary alternative measures. In addition to those listed in paragraph 16-8.o, provide the following devices and aids:

Note. <u>The general requirements that are included in paragraph 16-8.o for operational aids do not apply to tower cranes</u>. <u>The devices listed are required on all tower cranes covered by this subpart, unless otherwise specified</u>.

(a) Rail clamps, if used, must have slack between the point of attachment to the rail and the end fastened to the crane. Do not use rail clamps as a means of restraining tipping of a locomotive crane.

(b) Hydraulic system pressure limiting device.

(c) The following brakes, which must automatically set in the event of pressure loss or power failure: hoist brake on all hoists, swing brake, trolley brake, and rail travel brake.

(d) Deadman control or forced neutral return control (hand) levers.

(e) Emergency stop switch at the operator's station.

(f) Trolley travel limiting device to prevent the trolley from running into the trolley end stops.

(g) Ambient wind velocity device. Mount the device at or near the top of the crane. Provide a velocity display at the operator's station in the cab. A visible or audible alarm must illuminate or sound in the cab and at remote control stations when a preset wind velocity is exceeded.

(h) Hoist line pull limiting device that limits the lifted load.

(6) Multiple Tower Crane Jobsites. On jobsites where more than one fixed jib (hammerhead) tower crane is installed, locate the cranes so that no crane or its load may come in contact with the structure of another crane. Cranes are permitted to pass over one another.

(7) Weathervaning. Tower cranes required to weathervane when out-of-service must be installed with clearance for boom (jib) and superstructure to swing through a full 360-degree arc without striking any fixed object or other weathervaning crane. The boom must rotate to and in the natural direction of the wind. Follow manufacturer instruction and ASME B30.3.

z. Floating Cranes/Derricks, Crane Barges, and Auxiliary Shipboard-Mounted Cranes. (16-8.z)

(1) The requirements in paragraph 16-8.z are supplemental requirements for floating LHE, pile drivers, drill rigs, man-lifts, and land LHE on barges, pontoons, vessels or other means of flotation and auxiliary shipboard mounted cranes, unless otherwise specified.

(2) Design & Construction Standards. Design and construct the lifting equipment on floating cranes, crane barges, and on ships (shipboard cranes) according to one of the following standards:

(a) ASME B30.8.

(b) ABS Guide for Certification of Cranes.

(c) API Specification 2C.

(3) LHE Manufacturer's Floating Service Load Chart.

(a) Manufacturer's Floating Service Load Chart. A LHE manufacturer's Floating Service Load Chart will be provided. Prepare the Load Chart according to all criteria from the selected standard in paragraph 16-8.z(2).

(a-1) The Floating Service Load Chart must include a table of rated load vs. boom angle and radius.

(a-2) The Floating Service Load Chart must include the maximum allowable machine list and trim associated with the tabular loads and radii provided.

(b) If the manufacturer's Floating Service Load Chart is not available, a qualified RPE may develop a floating service load chart. The Load Chart must:

(b-1) Be developed according to the criteria from the selected standard in paragraph 16-8.z(2).

(b-2) Include a table of rated load vs. boom angle and radius.

(b-3) Include the maximum allowable machine list and machine trim associated with the tabular loads and radii provided.

(b-4) Be approved by an RPE. The RPE must seal and certify (sign) that the NAA meets the requirements of paragraph 16-8.z(3).

(4) Stability During Lift Operations.

(a) The stability of the floating LHE or vessel and shipboard crane must meet the requirements for "lifting" according to 46 CFR 173.005 through 46 CFR 173.025 (46 CFR 173) over the full range of crane slewing angles.

(b) The stability of the floating LHE or vessel and shipboard crane must limit floating platform heel and trim. The list and trim over the full range of LHE slewing angles must be within the limits shown in the LHE Floating Service Load Chart.

(c) Maintain a minimum of 12 inches (30.5 cm) of freeboard over the full range of crane slewing angles.

(d) Submerge the entire bottom area of the floating platform over the full range of crane slewing angles.

(5) Floating Service Naval Architectural Analysis (NAA). An NAA must be provided (see 46 CFR 173).

(a) The NAA must include an evaluation of the LHE on the floating platform. Validate the LHE Manufacturer's Floating Service Load Chart for the following (see para 16-8.z(3)):

(a-1) Stability during lift operation (see para 16-8.z).

(a-2) The machine list and trim limits for afloat service. The Load Chart must be de-rated (reduced) to meet the requirements for stability during lift operation and for machine list and trim limits for afloat service.

(b) The full 360-degree slewing range of the crane, unless specific slewing angle limits are identified.

(c) The deck loading amount, location, deck load CG, and sail area, when deck loads are to be carried while lifting

(d) Wind loading factored into the heel and list calculations. Use a minimum wind speed of 40 mph (18 m/s).

(e) An RPE or Naval Architect/Marine Engineer must seal and certify (sign) that the NAA meets the requirements of paragraph 16-8.z.

(6) Floating Service Structural Analysis.

(a) The floating platform structure must properly support the loads over the full crane slewing range.

(b) For vessels which are not intended for the application, an RPE must evaluate the structural adequacy of the floating platform. Evaluate the weight of the LHE itself and the lift loading developed in the NAA. Include all deck loads and environmental loads in the structural analysis.

(c) Established floating platform structural capacities, such as allowable deck loads, may be used to develop the structural analysis.

(d) An RPE must seal and certify (sign) that the Floating Service Structural Analysis meets the requirements of paragraph 16-8.z.

(e) Reduce the lift amounts developed in the NAA to less than the allowable structural capacity, if the structural analysis shows insufficient structural capacity with the NAA design loads.

(7) Floating Service Load Chart for LHE on Floating Platform. Use both the NAA and Floating Service Structural Analysis to develop the Floating Service Load Chart.

(a) The Floating Service Load Chart must define the lift/radius capacity of the LHE on the specific floating platform.

(b) The Floating Service Load Chart must incorporate any de-ratings required by either the NAA or Floating Service Structural Analysis.

(c) An RPE or Naval Architect/Marine Engineer must seal and certify (sign) that the Floating Service Load Chart meets the requirements of paragraph 16-8.z.

(d) The load chart certification may be either:

(d-1) A floating service load chart developed (de-rated) from the manufacturer's Floating Service Load Chart.

(d-2) If no de-rating is required, the crane manufacturer's Floating Service Load Chart with separate attached certification document.

(e) Submit both the Floating Service Load Chart and the Floating Service Naval Architect Analysis to the USACE supervisor for approval or to the KO or COR for acceptance prior to start of work.

(f) Post the Floating Service Load Chart in the cab or at the operator's station (if no cab). Make all other procedures applicable to the operation of the equipment (for example, instructions and operators manual, recommended operating speeds) readily available on board. The Floating Service Load Chart must include at least the following:

(f-1) Naval Architect's Notes specifying the draft limits, deck cargo weight and vertical CG above deck, maximum wind speed, environmental limits, vessel heel and trim limits, LHE machine list and trim limits, and vessel condition (for example, dry bilges, watertight integrity).

(f-2) The LHE Manufacturer's Floating Service Crane Load Chart.

(f-3) If de-rating of the crane manufacturer's Floating Service Crane Load Chart is required, a separate Floating Service Safe Working Load Chart must be provided with the following mode of operation; table of hook load, boom elevation angle, lift radius (with list/trim considered); maximum machine list and trim; maximum floating platform list and trim; LHE configuration, to include boom length, amount of counterweight, parts of wire, and block size.

(g) The Floating Service Load Chart must be programmed into the crane LMI.

(h) The Floating Service Load Chart must remain valid so long as no major modifications are made to the LHE or to the floating platform, as documented by a QP.

(8) Land the LHE, Derricks and Mobile Auxiliary LHE Mounted on Barges, Pontoons, or Other Means of Flotation.

(a) All requirements in paragraph 16-8.z are applicable for land LHE, derricks and mobile auxiliary LHE mounted on barges, pontoons, or other means of flotation.

(b) LHE Mats. Determine the required need, type, size, and location of LHE mats for the specific type of LHE on the barge.

(c) Provide the proper means of attachment of LHE to prevent shifting during lift operations. Do not use the attachment method to hold down LHE against overturning moment.

(9) LHE Travel.

(a) If traveling is required on the barge with no load, evaluate the travel area during the NAA and include it in the Floating Service Load Chart.

(b) If traveling is required while lifting the load, the lift must be deemed a critical lift. Prepare a Critical Lift Plan according to paragraph 16-7.d.

(c) If traveling is required while lifting the load, ensure that the requirements in paragraph 16-8.z are met throughout the travel range. The NAA and Structural Analysis must cover the travel range with load. Evaluate the travel area during the NAA and include it in the Floating Service Load Chart.

(10) A-Frame Non-Slewing Anchor Handling Barge/Vessel.

(a) An A-Frame Non-Slewing anchor handling barge/vessels may be used for anchor handling low lifting of loads such as, anchor buoys/weights, dredge pipe, submerged pipeline, and pontoons.

Note. If used for any other lifting application, the work platform must be considered a floating derrick and all other requirements of chapter 16 apply.

(b) A-Frame Non-Slewing anchor barge/vessels must also comply with the following:

(b-1) All deck surfaces of the pontoon or barge must be above the water.

(b-2) Provide means for limiting the applied load, such as mechanical means or marking the draft of the barge corresponding to the rated load. Provide the design calculations and test the barge to verify the rated load.

(b-3) Provide a ratchet and pawl for releasing the load from the hoisting machinery brake.

(b-4) Provide the operator with an operating manual and procedures. Train the operator in the anchor handling barge system operations.

(c) If the onboard hoisting equipment is loaded above its intended rating, then use a chain stopper to remove the external load from the A-frame and hoist machinery.

(11) Employer-Made Lift Equipment Used on Barges or Pontoons.

(a) If lift equipment is employer-made, it may not be used until the employer has properly documented that the load charts and applicable parameters for use meet the requirements of one of the standards identified in paragraph 16-8.z.

(b) All requirements in paragraph 16-8.z are applicable.

(12) Modifications.

(a) Weight and CG Changes. Any modifications to the crane and floating platform that change the crane and floating platform lightship characteristics require a new NAA and a new Floating Service Load Chart. Modifications include:

(a-1) An increase in vertical CG by more than 2 inches (5 cm).

(a-2) A change in the lightship displacement by more than 3° (degrees).

(a-3) A shift in longitudinal CG of more than 1° of floating platform length.

(b) Modifications to the crane that result in changes to the crane lift capacity or to the crane machine list and trim limits require a new NAA and a new Floating Service Load Chart.

(13) Overhead Bridge Cranes on Floating Platforms.

(a) An RPE or Naval Architect/Marine Engineer, competent in LHE on floating plant, must perform an overhead bridge crane Naval Architectural Heel and Trim Analysis for overhead bridge cranes on floating platforms.

(a-1) The Analysis must determine the maximum vessel heel and trim that can be generated by use of the bridge crane.

(a-2) The Analysis must cover the full longitudinal and transverse motion range of the bridge crane, the crane weight, and the crane full rated load.

(a-3) If floating platform heel and trim not related to the bridge crane operation is present during the bridge crane operation, include the non-related heel and trim in the Bridge Crane Naval Architectural Heel and Trim Analysis.

(a-4) An RPE or Naval Architect/Marine Engineer must seal and certify (sign) that the Bridge Crane Naval Architectural Heel and Trim meets the analysis requirements.

(b) Bridge Crane Operation at Floating Platform Heel and Trim. The bridge crane manufacturer must verify that the bridge crane may be safely operated at the vessel heel and trim maximums identified by the Bridge Crane NAA.

(c) Floating Platform Heel and Trim Indication. Install a heel and trim indicating device on all bridge crane equipped floating platforms. The bridge crane operator must be able to see the indicating device during the entire bridge crane operation.

(14) Use of Elevating AWPs Onboard Floating Platforms.

(a) Operate the AWPs according to the manufacturer's instructions for service on floating platforms.

(b) AWPs used on floating platforms must have a secondary set of platform controls at ground level.

(c) Do not move AWPs on the platform (driven) during operations with personnel onboard the lift unless it is allowed and addressed in the NAA.

(d) Floating Platform Heel and Trim.

(d-1) When an AWP is used on a floating platform, the floating platform heel and trim must remain within the AWP manufacturer's identified limits for the operation.

(d-2) Properly ballast the floating platform to maintain barge heel and trim within the manufacturer's limits for the AWP operation.

(e) Verification of Floating Platform Heel and Trim.

(e-1) When personnel will be on the AWP, verify the platform heel and trim before any operations.

(e-2) Test the secondary set of platform controls to verify platform heel and trim through the intended range of AWP operations. The test weight must include at least the personnel, materials, tools and equipment involved in each AWP lift.

(f) Operations on Floating Platform During AWP Operation. Do not operate the AWP if the work will affect the floating platform heel and trim beyond the allowable limits.

(15) Safety Devices and Operational Aids. In addition to the requirements of paragraph 16-8.o-q, utilize the following indicators, markings and devices:

(a) Machine heel and trim indicating device. Install this device in the crane cab or at the operator's station (if there is no cab).

(b) Boom angle indicator within clear view of the operator's station.

(c) Floating platform list and trim indicating device as a means for the operator to visually determine the heel and trim of the platform as opposed to the crane.

(d) Draft marks as a means for monitoring both draft and freeboard.

(e) Wind speed and direction indicator located within a clear view of the operator's station.

(f) Anti two-block device (see para 16-8.q).

(16) Portable Remote Controls. If portable remote controls are used for lifting, the operator must do one of the following:

(a) Be directly aware of the vessel heel and trim and the crane machine heel and trim during lift operations.

(b) Be in direct communication with a team member who is directly monitoring vessel heel and trim and the crane machine heel and trim during lift operations.

(17) Inspections. Perform inspections according to paragraph 16-5.l.

(18) Operations.

(a) Operator Lift Planning. Operators must plan lifts in advance, with particular attention to lift radii & boom angle and machine list & trim. Lift planning must address the anticipated range of boom angles, LMI response, and expected LMI warning indicators, if any. (See para 16-7.c)

(b) Operators must monitor the boom tip and the boom angle indicator carefully to ensure that limits of the load chart are not exceeded. The boom angle indicator must respond directly to increasing lift radius resulting from crane trim created by changes to floating platform heel and trim.

(c) Operators should be aware that safety devices such as LMIs do not offer protection from loads generated by relative motions between a floating crane and a fixed object to be lifted. The AHA must address the potential for gross overload and failure mode conditions.

(d) Where portable remote controls are used during lifting, the operator must include procedures to monitor vessel heel and trim and crane machine heel and trim.

(e) Whenever practical, crane use during buoy tending must be limited to lifting the freely suspended buoy clear of the water onto the vessel.

(f) Keep bilges as dry as possible to minimize the adverse effect of free surface (sloshing liquid).

(g) Where crane mats are required for a stable and level work surface for crane operations, the matting material must be in good condition and of adequate thickness, width, and length to completely support the crane. Place the mats perpendicular to the crane travel path and as close to each other as possible. Have a spotter guide the crane when it moves on the mat surface to prevent the crane from traveling off of the crane mats and beyond the NAA limits.

(19) Standard Lift Plan (SLP). Plan all lifts to avoid procedures that could result in configurations where the operator cannot maintain safe control of the lift. Develop an SLP according to paragraph 16-7.c.

aa. Overhead and Gantry Cranes. (16-8.aa)

(1) The requirements in this paragraph 16-8.aa are supplemental requirements for temporary or permanent overhead and gantry cranes. The requirements apply to overhead/bridge cranes, semi gantry, cantilever gantry, wall cranes, storage bridge cranes, and other LHE having the same fundamental characteristics regardless of how it travels (such as, on tracks, wheels), unless otherwise specified.

(2) Assemble all load bearing foundations, anchorages, runways, and rail tracks following the crane manufacturer's instructions and ASME B30.2 or B30.17, as applicable.

(3) Plainly mark the rated load of the crane on each side of the crane.

(a) If the crane has more than one hoisting unit, mark each hoist or each of the load blocks.

(b) Markings on the bridge, trolley, and load block must be legible from the ground or floor.

(4) Warning Device. Except for floor-operated cranes, install an alarm or other effective warning signal on each crane equipped with a power traveling mechanism.

(5) Maintain proper clearance between the crane and any structure or object, any parallel running cranes, and any cranes operating at different elevations.

(6) Make any necessary contact with runway stops or other cranes with extreme care and caution. The operator must do so with particular care for the safety of persons

on or below any of the cranes involved. The operator must be sure that all persons on the other cranes are aware of what is happening.

(7) Operators of outdoor cranes must secure them when leaving.

(8) When the wind-indicating alarm of a cab-operated outdoor crane sounds, stop all crane operations and properly secure and store the crane during the excessive wind conditions.

(9) Signal persons must properly use the applicable hand signals.

bb. Monorails and Under Hung Cranes. (16-8.bb)

(1) Construct and install crane runways, monorail tracks, track supports, and track control devices following the crane manufacturer's instructions and ASME B30.17.

(2) Plainly mark the rated load of the crane on each side of the crane.

(a) If the crane has more than one hoisting unit, mark each hoist or each of the load blocks.

(b) Markings on the bridge, trolley, and load block must be legible from the ground or floor.

(3) Signal persons must properly use the applicable hand signals.

cc. Derricks. (16-8.cc)

(1) For permanent fixed locations, provide the following load anchoring data to the USACE supervisor/KO or COR. For non-permanent installations, this data must be prepared by a QP.

(a) Guy Derricks.

(a-1) Maximum horizontal and vertical forces when handling rated loads with the particular guy slope and spacing stipulated for the application.

(a-2) Maximum horizontal and vertical forces at the guy when handling rated loads with the particular guy slope and spacing stipulated for the application.

(b) Stiffleg Derricks.

(b-1) Maximum horizontal and vertical forces at the mast base when handling rated loads with the particular stiffleg slope and spacing stipulated for the application.

(b-2) Maximum horizontal and vertical forces at the stifflegs when handling rated loads with the particular stiffleg arrangement stipulated for the application.

(2) Derrick booms, load hoists, and swinger mechanisms must be suitable for the derrick work intended and must be anchored to prevent displacement from imposed loads.

(3) When rotating a derrick, avoid sudden starts and stops and limit the rotational speed so that the load does not swing out beyond the radius at which it can be controlled make sure to use tagline(s).

(4) Do not allow the boom and hoisting rope systems to twist.

(5) Notify the operator before handling ropes on a winch head. When a winch head is used, the operator must be within reach of the power unit controls.

(6) When securing the boom, engage the dogs or other positive holding mechanisms on the hoist.

(7) When not in use, the derrick boom must be either:

(a) Laid down;

(b) Secured to a stationary member, as directly under the head as possible, by attaching a sling to the load block;

(c) Lifted to a vertical position and secured to the mast (for guy derricks); or

(d) Secured against a stiffleg (for stiffleg derricks).

dd. Handling Loads Suspended from Rotorcraft (see 1926.551 and FAA requirements). Use hand signals according to ASME B30.12. (16-8.dd)

ee. Powered Industrial Trucks (PITs)/Telehandlers. (16-8.ee)

(1) Do not use this equipment to hoist loads unless allowed by the equipment manufacturer and the manufacturer provides the procedures.

(2) Operations involving the use of PITs to raise personnel and/or using rigging to transport or hoist loads or personnel require different operator skills and considerations than the standard PIT operations performed with this equipment. When PITs are used to transport personnel or hoist loads utilizing hooks, eyes, slings, chains, or other rigging, the following requirements apply:

(a) Follow the procedures included in equipment manufacturer’s operating manual.

(b) Equipment operators, riggers, and others involved in the transportation and hoisting operations must provide written proof of qualifications.

(c) Other personnel may also operate this equipment under the specific conditions stated in paragraphs 16-3.a.

(d) Operators must properly use and keep onsite a copy of each manufacturer's load rating capacities or charts for the approved attachments.

ff. Pile Driving Operations. (16-8.ff)

(1) Equip pile drivers with a positive and negative restraint device to prevent accidental hammer disengagement. This prevents the hammer from falling or rising uncontrolled out of the lead and contact with head block or sheaves, if so equipped.

(2) Comply with all manufacturer's instructions, procedures, and recommendations applicable to the operational functions of the equipment, including its use with pile driving attachments. Do not exceed the safe operating speeds or lifting capacity to avoid instability under load. When manufacturer's instructions are not available, the employer must develop and ensure compliance with all procedures necessary for the safe operation of the equipment and attachments.

(a) A QP must develop the procedures for the operational controls.

(b) An RPE must seal and sign the procedures related to the capacity of the equipment.

(3) For LHE pile driving attachments that are used for other than their intended purpose (for example an excavator or forklift modified for pile driving), an RPE must design the attachment. All of the requirements in paragraph 16-8.ff apply.

(4) The operator of this type of equipment must follow the requirements of this manual and must be trained and authorized to operate the pile driving attachment.

(5) Prior to initiating pile driving or extraction operations, the contractor must develop a site-specific safety plan according to paragraph 16-7.e.

(6) With the exception of the pile driver equipment operator (crane/track hoe/forklift), personnel may not stand under the kicker/spotter or directly under, in front of, or closer than 12 feet (3.7 m), or greater if manufacturer specifies, of the pile hammer or pile when the pile is being driven.

(7) Provide the crane/track hoe/forklift operator station protection from falling objects.

(8) Cranes and mechanized equipment used only for pile driving and extracting operations (except telescopic boom cranes), are exempt from the requirements for A2B devices.

(9) Provide guys, outriggers, thrust outs, counter-balances, or rail clamps necessary to maintain stability of the pile-driver rigs.

(10) Pile-Driving Leads.

(a) Assemble pile driving leads using only the approved fasteners and torque values as required by the manufacturer. The leads must be of adequate size, length, and strength to safely accommodate the weight and length of the pile driving hammer, the pile to be driven, and the position (vertical or on a batter) in which they must be used.

(b) Employees may not be on leads or ladders while the pile is being driven.

(c) Do not store anything on the lead landings.

(d) Pile driving leads must have stop blocks to prevent the hammer from being raised against the head block, if so equipped.

(e) Pile driving leads must be free of projections or snags to minimize damage and personnel safety hazards.

(f) Provide a blocking device, capable of supporting the weight of the hammer, for placement in the leads under the hammer at all times while employees are working under the hammer.

Note. Exception. Where it is necessary for an employee to momentarily lean through the leads to guide a pile under the hammer, it is not required that the pile hammer be blocked in the leads.

(g) Inspect the pile driving leads at least weekly. Document the inspection. If the documented findings note any issues or deficiencies that affects the safe use of pile driving leads, then immediately take the equipment out of service and do not use until the unsafe conditions have been corrected.

(h) Swinging leads must have fixed ladders or have bracing configured so that it will function as adequate ladder rungs.

(i) Fixed leads must:

(i-1) Have fixed ladders and, if equipped with decked landings, must have guardrails, intermediate rails, and toe-boards. Install fixed ladders or stairs for access to landings and head blocks.

(i-2) Provide fall protection for any workers exposed to falls of 6 feet (1.8 m) or greater, for work over water, over machinery, or over dangerous operations according to chapter 21. For theses cased, install guardrails or personal fall protection systems, to include certified anchorages.

(i-3) Have a crane boom tip connection that is designed by an RPE.

(11) Do not use dogs on pile-driver hoist drums that automatically disengage when the load is relieved or the drum is rotated.

(12) Install guards across the top of the head block to prevent wire from jumping out of the sheaves.

(13) Securely attach all pneumatic or steam hose connections to pile-driver hammers, pile ejectors, or jet pipes with an adequate length of at least one-quarter (¼) inch (0.6 cm) alloy steel chain to prevent whipping if the joint is broken. The chain must have a 3,250 lbs. (1,474.2 kg) WLL and wire of equal strength may be used.

(14) Hydraulic/pneumatic/steam line controls must include two shutoff valves. One valve must be a quick-acting lever type located within easy reach of the hammer operator.

(15) Hoisting and Moving Pile.

(a) Keep all employees clear of the piling that is being hoisted into the leads.

(b) Perform pile hoisting and driving operations using a closed shackle or other positive attachment that will prevent accidental disengagement of the rigging.

(c) Use taglines for controlling unguided piles and free hanging (flying) hammers.

(d) Lower hammers to the bottom of the leads while the pile driver is being moved.

(16) When driving jacked piles, provide access ladders and bulk headed curbs in all access pits, to prevent material from falling into the pit.

(17) When it is necessary to cut off the tops of driven piles, suspend the pile-driving operations, except where the cutting operations are located at least twice the length of the longest pile cut-off from the driver.

(18) Pile Extraction.

(a) If piling cannot be pulled without exceeding the load rating of equipment, use a pile extractor.

(b) When pulling piling, equip the crane with LMI devices, unless the load can be determined and is within the load rating chart of the crane, and unless the booms are not raised more than 60° above the horizontal.

Note. This requirement does not apply to vibrating-type pulling devices.

(c) Do not pull piling by tipping the crane, releasing the load brake momentarily, and catching the load before the crane has settled.

(d) Rigging. When pulling pile, the hook must have the positive locking safety latch. Secure this latch so that rigging gear roll does not occur.

(19) Floating Pile Drivers (see para 16-8.z).

Note. For operations not covered above, see 29 CFR 1926.603.

gg. Hydraulic Excavators and Wheel/Track/Backhoe Loaders Used to Hoist Loads with Rigging. (16-8.gg)

(1) Personnel may not work in, pass under, or ride in the buckets or booms of operating excavators.

(2) Do not use hydraulic excavating equipment to hoist personnel. Personnel may not ride on loads, hooks, hammers, buckets, or any other hydraulic excavating equipment attachment.

(3) Train excavator operators that use attachments (such as drill rigs, pile driving equipment) on the specific attachments and operations before use.

(4) Do not use hydraulic excavating equipment to hoist loads unless allowed by the equipment manufacturer and the manufacturer provides the procedures.

(5) When hydraulic excavating equipment is used to hoist loads utilizing hooks, eyes, slings, chains, or other rigging the following requirements apply:

(a) Operations involving the use of hydraulic excavating equipment and rigging to hoist loads require different operator skills and considerations than the standard excavating operations routinely performed with hydraulic excavating equipment. Prepare an AHA specific to the hoisting operation following the requirements in paragraph 16-6.d.

(b) Perform an operational test with the selected hydraulic excavating equipment. Keep a copy of the operational test report, including the test procedures and results, at the onsite project office.

(b-1) The operational test must demonstrate that the test load and selected rigging can be safely lifted, maneuvered, controlled, stopped, and landed.

(b-2) The operational test must be representative of the complete cycle of the proposed hoisting operation, including configuration, orientation and positioning of the excavating equipment and the use of identical rigging.

(b-3) The test load must be equivalent to the maximum anticipated load but must not exceed 100% of the manufacturer's load rating capacity for the excavating equipment, as configured.

(c) Perform all rigging operations according to chapter 15.

(d) Do not attach hooks, eyes, slings, chains, or other rigging to, or hang them from, the teeth of a bucket during hydraulic excavator load transporting or hoisting operations.

(e) Perform another operational test if repairs, major maintenance, or reconfiguration on the hydraulic excavating equipment or attachments are needed after the completion and acceptance of an operational test described in paragraph 16-8.gg. This additional operational test must demonstrate that the completed repairs are satisfactory and that the test load and selected rigging can be safely lifted, maneuvered, controlled, stopped, and landed.

(6) Lift loads to the minimum height necessary to clear the ground or other obstacles and carry as low as possible when the equipment is traveling.

(7) Do not lift loads over personnel.

(8) Maintain adequate clearances from electrical sources.

hh. LHE-Supported Personnel (Work) Platforms. Do not use LHE to hoist employees, except where the employer demonstrates that the assembly, use, and disassembly of conventional means of reaching the work area (such as, personnel hoist, ladder, stairway, aerial lift, elevating work platform, scaffold) is more hazardous, or is not possible because of the project's physical features or work site conditions. Document this determination in the Critical Lift Plan following the requirements of paragraph 16-7.c. Perform all hoisting of personnel as required in 29 CFR 1926.1431 (29 CFR 1926 Subpart CC). (16-8.hh)

ii. Certificate of Compliance (CoC). Contractors must submit a CoC for each piece of LHE prior to bringing it onsite. Submit the CoC to the USACE supervisor for approval or to the KO or COR for acceptance. (See para 16-10.b). (16-8.ii)

(1) The CoC must state that the LHE and the rigging equipment meets applicable regulations (to include inspections and tests) as required by the manufacturer and the requirements of this manual. A CP for Crane and Rigging must sign the CoC.

(2) Post the CoC on the LHE.

Note. USACE LHE does not require a CoC Form.

16-9. Figures and Tables.

Table 16-1
Minimum Clearance from Energized Overhead Electric Lines

Voltage (Nominal, kV, AC)	Minimum Clearance Distance
Up to 50	10 feet (3 m)
51 - 200	15 feet (4.6 m)
201 - 350	20 feet (6.1 m)
351 - 500	25 feet (7.6 m)
501 - 750	35 feet (10.7 m)
751 - 1,000	45 feet (13.7 m)
Over 1,000	As establish by the utility owner/operator or RPE who is a QP with respect to electrical power transmission and distribution.

Table 16-2
Minimum Clearance Distance from Energized Overhead Electric Lines While Traveling with No Load

Voltage (Nominal, kV, AC)	Minimum Clearance Distance
Up to 0.75	4 feet (1.2 m)
0.76 - 50	6 feet (1.8 m)
51 - 345	10 feet (3.0 m)
346 - 750	16 feet (4.9 m)
751 - 1,000	20 feet (6.1 m)
Over 1,000	As establish by the utility owner/operator or RPE who is a QP with respect to electrical power transmission and distribution.

Note:
Environmental conditions like fog, smoke or precipitation may require increased clearances.