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DEPARTMENT OF LABOR

Occupational Safety and Health Administration

29 CFR Part 1926

[Docket ID-OSHA-2007-0066]

RIN 1218-AC01

Cranes and Derricks in Construction

AGENCY: Occupational Safety and Health Administration (OSHA), Labor.

ACTION: Final rule.

SUMMARY: OSHA is revising the Cranes and Derricks Standard and related sections of the Construction Standard to update and specify industry work practices necessary to protect employees during the use of cranes and derricks in construction. This final standard also addresses advances in the designs of cranes and derricks, related hazards, and the qualifications of employees needed to operate them safely. Under this final rule, employers must determine whether the ground is sufficient to support the anticipated weight of hoisting equipment and associated loads. The employer is then be required to assess hazards within the work zone that would affect the safe operation of hoisting equipment, such as those of power lines and objects or personnel that would be within the work zone or swing radius of the hoisting equipment. Finally, the employer is required to

ensure that the equipment is in safe operating condition via required inspections and employees in the work zone are trained to recognize hazards associated with the use of the equipment and any related duties that they are assigned to perform.

DATES: This final rule will become effective [INSERT DATE 90 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER].

The incorporation by reference of specific publications listed in this final rule is approved by the Director of the *Federal Register* as of [INSERT DATE 90 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER].

ADDRESSES: In accordance with 28 U.S.C. 2112(a)(2), the Agency designates Joseph M. Woodward, Associate Solicitor of Labor for Occupational Safety and Health, Office of the Solicitor, Room S-4004, U.S. Department of Labor, 200 Constitution Avenue, NW., Washington, DC 20210, to receive petitions for review of the final rule.

FOR FURTHER INFORMATION CONTACTS: *General information and press inquiries*. Contact Ms. Jennifer Ashley, Director, Office of Communications, OSHA, U.S. Department of Labor, Room N-3647, 200 Constitution Avenue, NW, Washington, DC 20210; telephone (202) 693-1999 or fax (202) 693-1634.

- *Technical inquiries*. Contact Mr. Garvin Branch, Directorate of Construction, Room N-3468, OSHA, U.S. Department of Labor, 200 Constitution Avenue, NW., Washington, DC 20210; telephone (202) 693-2020 or fax (202) 693-1689.
- *Copies of this Federal Register notice*. Available from the OSHA Office of

Publications, Room N-3101, U.S. Department of Labor, 200 Constitution Avenue, NW., Washington DC 20210; telephone (202) 693-1888.

• *Electronic copies of this notice*. Go to OSHA's website (http://www.osha.gov), and select "Federal Register," "Date of Publication," and then "2010."

SUPPLEMENTARY INFORMATION:

Availability of Incorporated Standards. The standards published by the American National Standards Institute (ANSI), the American Society of Mechanical Engineers (ASME), the American Welding Society (AWS), the British Standards Institution (BSI), the International Organization for Standardization (ISO), the Power Crane and Shovel Association (PCSA), and the Society of Automotive Engineers (SAE) required in subpart CC are incorporated by reference into this subpart with the approval of the Director of the *Federal Register* under 5 U.S.C. 552(a) and 1 CFR part 51. To enforce any edition other than the editions specified in subpart CC, the Occupational Safety and Health Administration (OSHA) must publish a notice of change in the *Federal Register* and the material must be available to the public.

All approved material is available for inspection at the National Archives and Records Administration (NARA). For information on the availability of this material at NARA, telephone 202-741-6030, or go to: http://www.archives.gov/federal_register/code_of_federal_regulations/ibr_locations.html. Also, the material is available for inspection at any OSHA Regional Office or the OSHA Docket Office (U.S. Department of Labor, 200 Constitution Avenue, NW., Room N-2625, Washington, DC 20210; telephone 202-693-2350 (TTY number: 877-889-5627)).

I. GENERAL

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II. BACKGROUND

A. History

The Occupational Safety and Health Act of 1970 (84 Stat. 1590, 29 U.S.C. 651 et seq.) (the OSH Act) authorizes the Secretary of Labor to adopt safety and health standards to reduce injuries and illnesses in American workplaces. Pursuant to that authority, the Secretary adopted a set of safety and health standards applicable to the

construction industry, 29 CFR part 1926. Initially, standards for the construction industry were adopted under the Construction Safety Act, 40 U.S.C. 333. Under the Construction Safety Act, those standards were limited to employers engaged in federally-financed or federally-assisted construction projects. The Secretary subsequently adopted them as OSHA standards pursuant to Sec. 6(a) of the OSH Act, 29 U.S. C. 655(a), which authorized the Secretary to adopt established federal standards as OSH Act standards within the first two years the OSH Act was effective (see 36 FR 25232, Dec. 30, 1971). Subpart N of 29 CFR part 1926, entitled "Cranes, Derricks, Hoists, Elevators, and Conveyors," was originally adopted through this process.

The section of subpart N of 29 CFR part 1926 that applied to cranes and derricks was former § 1926.550. That section relied heavily on national consensus standards that were in effect in 1971, in some cases incorporating the consensus standards by reference. For example, former § 1926.550(b)(2) required crawler, truck, and locomotive cranes to meet applicable requirements for design, inspection, construction, testing, maintenance, and operation prescribed in ANSI B30.5-1968, "Crawler, Locomotive and Truck Cranes." Similarly, former § 1926.550(e) required derricks to meet applicable requirements for design, construction, installation, inspection, testing, maintenance, and operation prescribed in ANSI B30.6-1969, "Derricks." Until today, former § 1926.550 was amended substantively only twice. In 1988, former §1926.550(g) was added to establish clearly the conditions under which employees on personnel platforms may be hoisted by cranes and derricks (see 53 FR 29116, Aug. 2, 1988). In 1993, former § 1926.550(a)(19) was added to require that all employees be kept clear of lifted and suspended loads.

Considerable technological advances have been made since the 1971 OSHA standard was issued. For example, hydraulic cranes were rare at that time, but are now prevalent. In addition, the construction industry has updated the consensus standards on which the original OSHA standard was based. For example, the industry consensus standard for derricks was most recently updated in 2003, and that for crawler, locomotive and truck cranes in 2007.

In recent years, a number of industry stakeholders asked the Agency to update subpart N's cranes and derrick requirements. They were concerned that accidents involving cranes and derricks continued to be a significant cause of fatal and other serious injuries on construction sites and believed that an updated standard was needed to address the causes of these accidents and to reduce the number of accidents. They emphasized that the considerable changes in both work processes and technology since 1971 made much of former § 1926.550 obsolete.

In response to these requests, in 1998 OSHA's Advisory Committee for Construction Safety and Health (ACCSH) established a workgroup to develop recommended changes to the subpart N requirements for cranes and derricks. The workgroup developed recommendations on some issues and submitted them to the full committee in a draft workgroup report. (ID -0020.) In December 1999, ACCSH recommended to OSHA that the agency consider using a negotiated rulemaking process as the mechanism to update subpart N. (OSHA-ACCSH1999-4-2006-0187-0035.)

B. The Cranes and Derricks Negotiated Rulemaking Advisory Committee (C-DAC)

In July 2002, OSHA announced plans to use negotiated rulemaking under the Negotiated Rulemaking Act (NRA), 5 U.S.C. 561 et seq., to revise the cranes and derricks standard. The Agency made this decision in light of the stakeholder interest in updating subpart N, the constructive discussions and work of the ACCSH workgroup, ACCSH's recommendation, a positive assessment of the criteria listed in the NRA (5 U.S.C. 563(a)) for the use of negotiated rulemaking, and the Department of Labor's policy on negotiated rulemaking (see "Notice of Policy on Use of Negotiated Rulemaking Procedures by Agencies of the Department of Labor," 57 FR 61925, Dec. 29, 1992). The Agency published a Notice of Intent to Establish a Cranes and Derricks Negotiated Rulemaking Advisory Committee ("C-DAC" or "the Committee")) (see 67 FR 46612, Jul. 16, 2002).

Negotiated rulemaking is a process by which a proposed rule is developed by a committee comprised of members who represent the interests that will be significantly affected by the rule. Section 562 of the NRA defines "interest" as follows:

> "[I]nterest" means, with respect to an issue or matter, multiple parties which have a similar point of view or which are likely to be affected in a similar manner.

By including different viewpoints in the negotiation process, the members of a negotiated rulemaking committee learn the reasons for different positions on the issues as well as the practical effect of various approaches. Each member of the committee participates in resolving the interests and concerns of other members. Negotiation allows interested parties, including members who represent the interests of employers subject to the prospective rule and the employees who will benefit from the safer workplaces the rule will produce, to become involved at an earlier stage of the rulemaking process. As a

result, the rule that OSHA proposes would receive close scrutiny by affected parties at the pre-proposal stage.

The goal of the negotiated rulemaking process is to develop a proposed rule that represents a consensus of all the interests. The NRA defines consensus as unanimous concurrence among the interests represented on a negotiated rulemaking committee unless the committee itself unanimously agrees to use a different definition of consensus. As discussed below, C-DAC agreed by unanimous vote to a different definition: a consensus would be reached on an issue when not more than two non-federal members dissented on that issue.

In the July, 2002, *Federal Register* notice announcing negotiated rulemaking on cranes and derricks mentioned earlier, the Agency listed key issues that it expected the negotiations to address, and the interests that OSHA tentatively identified as being significantly affected by the rulemaking. The key interests were:

— Crane and derrick manufacturers, suppliers, and distributors.
— Companies that repair and maintain cranes and derricks.
— Crane and derrick leasing companies.
— Owners of cranes and derricks.
— Construction companies that use cranes and derricks.
— General contractors.
— Labor organizations representing construction employees who operate cranes and derricks.
— Labor organizations representing construction employees who work in conjunction with cranes and derricks.
— Owners of electric power distribution lines.
— Civil, structural and architectural engineering firms and engineering consultants involved with the use of cranes and derricks in construction.
— Training organizations.
— Crane and derrick operator testing organizations.
— Insurance and safety organizations, and public interest groups.
— Trade associations.
— Government entities involved with construction safety and with construction operations involving cranes and derricks.

In the *Federal Register* notice, OSHA asked for public comment on whether interests other than those listed would be significantly affected by a new rule. It also solicited requests for membership on the Committee. OSHA also urged interested parties form coalitions to support individuals identified for nomination to the Committee.

The Agency noted that the need to limit the Committee's membership to a number that could conduct effective negotiations may result in some interests not being represented on the Committee. OSHA further noted that interested persons had means other than Committee membership available to participate in the Committee's deliberations, including attending meetings and addressing the Committee, providing written comments to the Committee, and participating in Committee workgroups (see 67 FR 46612, 46615, Jul. 16, 2002).

In response to its request for public input, the Agency received broad support for using negotiated rulemaking, as well as 55 nominations for committee membership. To keep membership to a reasonable size, OSHA tentatively listed 20 potential committee members, and asked for public comment on the proposed list (see 68 FR 9036, Feb. 27, 2003). In response to the comments, OSHA added three members to the committee – individuals from the mobile crane manufacturing industry, the Specialized Carriers & Rigging Association, and the outdoor advertising industry (see 68 FR 39879, Jul. 3, 2003).

The members of the Committee, the organizations and interests they represent, and a summary of their qualifications at the time the Committee was formed are in Table 1 below:

Table 1. The Qualifications of C-DAC Members

Stephen Brown, International Union of Operating Engineers (labor)

Title:	Director of Construction Training, International Union of Operating Engineers
Organizations/interests represented:	Organized construction employees who operate cranes and derricks, and work with such equipment
Experience:	Worked in numerous positions in the construction industry over 28 years, including Equipment Operator, Mechanic, and Training Director

Michael Brunet, Manitowoc Cranes, Inc. (manufacturers and suppliers)

Title:	Director of Product Support for Manitowoc Cranes
Organizations/interests represented:	Crane manufacturers, suppliers, and distributors
Experience:	Extensive engineering experience in crane engineering; participated in development of SAE and ISO standards for cranes

Stephen P. Chairman, Viacom Outdoor, Inc. (employer users)

Title:	Vice President (New York) of Viacom Outdoor Group
Organizations/interests represented:	Billboard construction
Experience:	Over 43 years' experience with the construction industry, including specialized rigging

Joseph Collins, Zachry Construction Corporation (employer users);

Title:	Crane Fleet Manager
Organizations/interests represented:	Highway and railroad construction
Experience:	Over 30 years' experience with the construction industry in a variety of positions including crane operator, mechanic, and rigger

Noah Connell, U.S. Department of Labor, Occupational Safety and Health Administration (government)

Title:	Director, Office of Construction Standards and Guidance
Organization/interests represented:	Government
Experience:	22 years experience with government safety and health programs

Peter Juhren, Morrow Equipment Company, L.L.C. (manufacturers and suppliers)

Title:	National Service Manager

Organization/interests represented:	Tower crane distributors and manufacturers
Experience:	22 years' experience with Morrow Equipment Company, L.L.C.

Bernie McGrew, Link-Belt Construction Equipment Corp. (manufacturers and suppliers)

Title:	Manager for Crane Testing, Product Safety, Metal Labs and Technical Computing
Organization/interests represented:	Mobile crane manufacturers
Experience:	Extensive engineering experience in crane engineering

Larry Means, Wire Rope Technical Board (manufacturers and suppliers)

Title:	Rope Engineer
Organization/interests represented:	Wire rope manufacturing industry
Experience:	36 years wire rope engineering experience

Frank Migliaccio, International Association of Bridge, Structural, Ornamental and Reinforcing Iron Workers (labor organization)

Title:	Executive Director for Safety and Health
Organization/interests represented:	Organized construction employees who operate cranes and derricks, and work with such equipment
Experience:	31 years experience in the ironworking industry, including 10 years as Director of Safety and Health Training for the Ironworker's National Fund

Brian Murphy, Sundt Corporation (employer users)

Title:	Vice President and Safety Director
Organization/interests represented:	General contractors; crane owners and users
Experience:	Over 35 years' experience in the construction industry, most of them with Sundt Corp.

George R. "Chip" Pocock, C.P. Buckner Steel Erection (employer users)

Title:	Safety and Risk Manager
Organization/interests represented:	Steel erection crane users and employers
Experience:	Over 22 years experience in the construction and steel erection industry

David Ritchie, St. Paul Companies (trainer and operator testing)

Title:	Crane and Rigging Specialist
Organization/interests represented:	Employee training and evaluation
Experience:	Over 31 years' experience in the construction industry

Emmett Russell, International Union of Operating Engineers (IUOE)(labor)

Title:	Director of Safety and Health
Organization/interests represented:	Organized construction employees who operate cranes and derricks, and work with such equipment
Experience:	Over 32 years' experience in the crane and construction industry, including 10 years in the field as well as over 20 years with IUOE

Dale Shoemaker, Carpenters International Training Center (labor)

Organization/interests represented:	Labor organizations representing construction employees who operate cranes and derricks and who work with cranes and derricks
Experience:	Became a crane operator in 1973; served as a rigging trainer for labor organizations since 1986

William Smith, Maxim Crane Works (lessors/maintenance)

Title:	Corporate Safety/Labor Relations Manager
Organization/interests represented:	Crane and derrick repair and maintenance companies
Experience:	24 years experience in the crane, rigging, and construction industry, both public and private sectors

Craig Steele, Schuck & Sons Construction Company, Inc. (employer users)

Title:	President and CEO
Organization/interests represented:	Employers and users engaged in residential construction.
Experience:	30 years experience in the construction industry with Schuck & Sons Construction Company, Inc.

Darlaine Taylor, Century Steel Erectors, Inc. (employer users)

Title:	Vice President
Organization/interests represented:	Steel erection and leased crane users
Experience:	19 years with Century Steel Erectors, over 12 years in the construction safety field

Wallace Vega III, Entergy Corp. (power line owners)

Organization/interests represented:	Power line owners
Experience:	35 years experience in the power line industry

William J. "Doc" Weaver, National Electrical Contractors Association (employer users)

Organization/interests represented:	Electrical contractors engaged in power line construction
Experience:	Over 53 years electrical construction experience, 37 of which spent in management positions

Robert Weiss, Cranes, Inc. and A.J. McNulty & Company, Inc. (employer users)

Title:	Vice President and Project Manager for Safety
Organization/interests represented:	Employers and users engaged in precast concrete erection
Experience:	20 years experience in the precast and steel erection industry

Doug Williams, C.P. Buckner Steel Erection (employer users)

Title:	President
Organization/interests represented:	Buckner Heavy Lift Cranes
Experience:	32 years experience in the construction industry

Stephen Wiltshire, Sports and Public Assembly Group, Turner Construction Corp. (employer users)

Title:	National Safety Director
Organization/interests represented:	Employers and users of owned and leased cranes
Experience:	28 years experience in construction safety

Charles Yorio, Acordia (Wells Fargo) (insurance)

Title:	Assistant Vice President
Organization/interests represented:	Insurance
Experience:	17 years experience in loss prevention and regulatory compliance

As this summary of qualifications shows, the Committee members had vast and varied experience in cranes and derricks in construction, which gave them a wealth of knowledge in the causes of accidents and other safety issues involving such equipment. The members used this knowledge to identify issues that required particular attention and to devise regulatory language that would address the causes of such accidents. Their extensive practical experience in the construction industry and the other industries

represented on the Committee helped them to develop revisions to the current subpart N requirements.

C-DAC was chaired by a facilitator, Susan L. Podziba of Susan Podziba & Associates, a firm engaged in public policy mediation and consensus building. Ms. Podziba's role was to facilitate the negotiations by: (1) Chairing the Committee's meetings in an impartial manner; (2) Assisting the members of the committee in conducting discussions and negotiations; and (3) Ensuring minutes of the meetings were taken, and relevant records retained; (4) Performing other responsibilities such as drafting meeting summaries to be reviewed and approved by C-DAC members.

C-DAC first met from July 30 to August 1, 2003. Before addressing substantive issues, the Committee developed ground rules (formally approved on September 26, 2003) that would guide its deliberations. (OSHA-S030-2006-0663-0373.) In addition to procedural matters, the ground rules addressed the Committee's decision-making process. C-DAC agreed that it would make every effort to reach unanimous agreement on all issues. However, if the facilitator determined that unanimous consent could not be achieved, the Committee would consider consensus to be reached when not more than two non-federal members (i.e., members other than the OSHA member) dissented; no consensus could be achieved if OSHA dissented.

This consensus process reflects the non-federal members' view that Agency support of the Committee's work was essential. The non-federal members believed that, if OSHA dissented, the Committee's work product likely would not be included in the final rule. Therefore, the Committee members would make every effort to resolve the Agency's concerns using the negotiation process.

Under the ground rules, if C-DAC reached final consensus on some or all issues, OSHA would use the consensus-based language in its proposed standard, and C-DAC members would refrain from providing formal written negative comment on those issues in response to the proposed rule.

The ground rules provided that OSHA could only depart from the consensus-based language by (1) reopening the negotiated rulemaking process, or (2) providing the C-DAC members with a detailed statement of the reasons for revising the consensus-based language, and do so in a manner that would allow the C-DAC members to express their concerns to OSHA before it published the proposed rule. The Committee members also could provide negative or positive comments in response to these revisions during the public-comment phase of the rulemaking. (OSHA-S030-2006-0663-0373.)

A tentative list of issues for the Committee to address was published along with the final list of Committee members (68 FR at 39877, Jul. 3, 2003). At its initial meeting, the Committee reviewed and revised the issue list, adding several issues. (OSHA-S030-2006-0663-0372.) The Committee met 11 times between July 30, 2003 and July 9, 2004. As the meetings progressed, the Committee reached consensus agreement on various issues and, at the final meeting, reached consensus agreement on all outstanding issues.

The Committee's work product, which was the Committee's recommended regulatory text for the proposed rule, is referred to in this notice as the "C-DAC Document." (OSHA-S030-2006-0663-0639.) On October 12, 2006, ACCSH adopted a resolution supporting the C-DAC Document and recommending that OSHA use it as the basis for a proposed standard. (OSHA-ACCSH2006-1-2006-0198-0021.)

OSHA issued a proposed rule based on the C-DAC Document on October 9, 2008 (73 FR 59713, Oct. 9, 2008). In reviewing the C-DAC Document and drafting the proposed rule, OSHA identified several problems in the C-DAC Document. These problems ranged from misnumbering and other typographical and technical errors, to provisions that appeared to be inconsistent with the Committee's purpose, or that were worded in a manner that required clarification. The proposed rule deviated from the C-DAC Document when revisions were clearly needed to validly represent the Committee's purpose or to correct typographical and technical errors. With respect to substantive revisions, the Agency identified and explained these revisions in the portions of the preamble to the proposed rule that addressed the affected provisions. OSHA also prepared a draft of the proposed regulatory language identifying each instance in which the proposed rule differed from the C-DAC Document. In accordance with the ground rules, prior to publication of the proposed rule in the *Federal Register*, OSHA provided the draft showing the revisions to the C-DAC Document, along with its draft of the summary and explanation of the proposed rule, to the C-DAC members.

Additionally, the Agency identified other instances in which the regulatory text drafted by the Committee did not appear to conform to the Committee's purpose, or instances in which a significant issue did not appear to have been considered by C-DAC. In these instances, OSHA retained the regulatory language used in the C-DAC Document, but asked for public comment on whether specific revisions should be made to the proposed regulatory language in the final rule.

The proposed rule set a deadline of December 8, 2008, for the public to submit comments on the proposal. At the request of a number of stakeholders, this deadline was

subsequently extended to January 22, 2009 (73 FR 73197, Dec. 2, 2009). On March 17, 2009, OSHA convened a public hearing on the proposal, with Administrative Law Judge John M. Vittone presiding. The hearing lasted four days, closing on March 20. In addition to Judge Vittone, Administrative Law Judge William S. Colwell presided during the last part of the hearing. At the close of the hearing, Judge Colwell established a posthearing comment schedule. Participants were given until May 19, 2009 to supplement their presentations and provide data and information in response to questions and requests made during the hearing, make clarifications to the testimony and record that they believed were appropriate, and submit new data and information that they considered relevant to the proceeding. Participants also were given until June 18, 2009, to comment on the testimony and evidence in the record, including testimony presented at the hearing and material submitted during the first part of the posthearing comment period.

C. Hazards Associated with Cranes and Derricks in Construction Work

OSHA estimates that 89 crane-related fatalities occur per year in construction work. The causes of crane-related fatalities were recently analyzed by Beavers, et al. (See J.E. Beavers, J.R. Moore, R. Rinehart, and W.R. Schriver, "Crane-Related Fatalities in the Construction Industry," 132 Journal of Construction Engineering and Management 901 (Sept. 2006) (ID OSHA-2007-0066-0012[1]).) The authors searched OSHA's

[1] The term "ID" refers to the column labeled "ID" under Docket No. OSHA-2007-0066 on the Federal eRulemaking Portal, http://www.regulations.gov. This column lists individual records in the docket. Hereafter, this notice will identify each of these records only by the last four digits of the record. Records from dockets other than OSHA-2007-0066 are identified by their full ID number.

Integrated Management Information System (IMIS) database for all fatal accidents for 1997-2003 investigated by OSHA involving cranes in the construction industry. By searching the database for cases using the key words "crane," "derrick," or "boom," they identified 381 IMIS files for the covered year in the federal program states, which include states with about 57% of all workers throughout the country. The authors requested the case files from OSHA so that they could confirm that a crane or derrick was involved in the fatality. Of the 335 case files that OSHA provided, the authors identified 125 (involving 127 fatalities) as being crane or derrick related. From these files, they determined the percentages of fatalities caused by various types of incidents (see Table 2 below).

Table 2. The Causes of Fatalities During the Performance of Hoisting Activities

Struck by load (other than failure of boom/cable)	32%
Electrocution	27%
Crushed during assembly/disassembly	21%
Failure of boom/cable	12%
Crane tip-over	11%
Struck by cab/counterweight	3%
Falls	2%

A study by Suruda et al. examined the causes of crane-related deaths for the 1984-1994 period. (See A. Suruda, M. Egger, and D. Liu, "Crane-Related Deaths in the U.S. Construction Industry, 1984-94," The Center to Protect Workers' Rights (Oct. 1997) (ID -0013).) The authors examined OSHA IMIS data to identify the number of fatal accidents involving cranes, and determined their causes. For the years in question, they found 479 accidents involving 502 fatalities. In the worst year, 1990, 70 deaths occurred. The authors noted some limitations in the data they examined: data for California, Michigan, and Washington state were not available for 1984-1989; the proportion of fatal accidents investigated by OSHA and states having OSHA-approved state plans is

unknown; and some of the investigation reports were not sufficiently detailed to allow the authors to determine the cause of the accident or the type of crane involved.

The Suruda study determined the number and the percentage of fatalities from various causes (see Table 3 below).

Table 3. The Causes of Crane Incidents

Electrocution	198 (39%)
Crane assembly/disassembly	58 (12%)
Boom buckling/collapse	41 (8%)
Crane upset/overturn	37 (7%)
Rigging failure	36 (7%)
Overloading	22 (4%)
Struck by moving load	22 (4%)
Accidents related to manlifts	21 (4%)
Working within swing radius of counterweight	17 (3%)
Two-blocking	11 (2%)
Hoist limitations	7 (1%)
Other causes	32 (6%)

This final standard addresses the major causes of the equipment related fatalities identified in the Beavers and Suruda studies. The following synopsis identifies the sections in the final standard that address the major causes of equipment-related fatalities.

Electrocution hazards are addressed by §§ 1926.1407-1926.1411, which deal power-line safety. These sections contain requirements to prevent equipment from contacting energized power lines. The final standard delineates systematic, reliable procedures and methods that employers must use to prevent a safe clearance distance from being breached. If maintaining the safe clearance distance is infeasible, additional protections are required, including grounding the equipment, covering the line with an insulating sleeve, and using insulating links and nonconductive tag lines.

These procedures and methods are supplemented by requirements for training the operator and crew in power-line safety (see § 1926.1408(g)), and requirements for

operator qualification and certification in § 1926.1427. C-DAC concluded that compliance with these training and certification requirements will not only reduce the frequency of power-line contact, but will give the workers the knowledge they need to help avoid injury in the event such contact occurs.

Fatalities that involve employees being struck or crushed during assembly/disassembly are addressed in §§ 1926.1403-1926.1406. These sections require employers to follow specific safe-practice procedures, and to address a list of specific hazards. Also, assembly and disassembly of a crane must be supervised by an individual who is well qualified to ensure that these requirements of these provisions are properly implemented.

As the above-mentioned studies show, and the Committee's experience confirms, many disassembly accidents occur when sections of lattice booms unexpectedly move and strike or crush an employee who is disassembling the boom. The final standard addresses this hazard in § 1926.1404(f) by prohibiting employees from being under the boom when pins are removed unless special precautions are taken to protect against boom movement.

Accidents resulting from boom or cable failure are addressed in a number of provisions. For example, the standard includes requirements for: proper assembly procedures (§ 1926.1403); boom stops to prevent booms from being raised too far and toppling over backwards (§ 1926.1415, *Safety devices*); a boom-hoist limiting device to prevent excessive boom travel, and an anti two-block device, which prevents overloading the boom from two-blocking (§ 1926.1416, *Operational aids*). Also, the inspection requirements (§ 1926.1412) detect and address structural deficiencies in booms before an

accident occurs. Cable failure will be avoided by compliance with sections such as § 1926.1413, *Wire rope – inspection*, and § 1926.1414, *Wire rope – selection and installation criteria*.

Crane tip-over is caused by factors such as overloading, improper use of outriggers and insufficient ground conditions. Section 1926.1417, *Operations*, includes provisions to prevent overloading. This section prohibits the equipment from being operated in excess of its rated capacity, and includes procedures for ensuring that the weight of the load is reliably determined and within the equipment's rated capacity. Section 1926.1404(q) has requirements for outrigger/stabilizer use that will ensure that outriggers and stabilizers provide stability when a load is lifted. Section 1926.1402 contains requirements to ensure sufficient ground conditions, which will prevent crane tip-over.

The provisions addressing operator training, qualification, and certification also will prevent tip-over accidents by ensuring that the operator is sufficiently knowledgeable and skilled to recognize situations when the crane may be overloaded.

Fatalities that result from workers being struck by the cab or counterweights will be avoided under § 1926.1424, *Work area control*. That section requires that workers who are near equipment with a rotating superstructure be trained in the hazards involved, that employers mark or barricade the area covered by the rotating superstructure, and that the operator be notified whenever a worker must enter that area, and instructed not rotate the superstructure until the area is clear. Protection against being struck by a counterweight during assembly or disassembly is provided by § 1926.1404(h)(9), which

requires the assembly/disassembly supervisor to address this hazard and take steps when necessary to protect workers against that danger.

The final rule addresses a number of equipment failures that can result in the load striking a worker. Such accidents are directly addressed by § 1926.1425, *Keeping clear of the load*, and § 1926.1426, *Free fall/controlled load lowering*. In addition, improved requirements in §§ 1926.1419-1926.1422 for signaling will help avoid load struck-by accidents caused by miscommunication.

Improper operation, including failure to understand and compensate for the effects of factors such as dynamic loading, can also cause workers to be struck by a load. Such incidents will be reduced by compliance with § 1926.1427, *Operator qualification and certification* and § 1926.1430, *Training*. Other provisions, such as those for safety devices and operational aids (§§ 1926.1415 and 1926.1416), and the requirement for periodic inspections in § 1926.1412, will also reduce these accidents.

Protection against falling from equipment is addressed by § 1926.1423, *Fall protection*. That section requires that new equipment provide safe access to the operator work station, using devices such as steps, handholds, and grabrails. Some new lattice-boom equipment must be equipped with boom walkways. The final standard also contains fall-protection provisions tailored to assembly and disassembly work, and to other work. Section 1926.1431, *Hoisting personnel*, addresses fall protection when employees are being hoisted.

OSHA has investigated numerous crane accidents that resulted in fatalities. Below are examples from OSHA's IMIS investigation reports that describe accidents that compliance with this final standard would prevent.

1. February 16, 2004: four fatalities, four injuries. A launching gantry collapsed and fatally injured four workers and sent four other workers to the hospital. The launching gantry was being used to erect pre-cast concrete segments span by span. The manufacturer required that the rear legs and front legs be properly anchored to resist longitudinal and lateral forces that act on the launching gantry. The legs of the launching gantry were not properly anchored. (ID -0017.)

OSHA believes that this type of accident will be prevented by compliance with the provisions of this final standard for assembling equipment. Section 1926.1403 requires that equipment be assembled in compliance with the manufacturer's procedures, or with alternative employer procedures (see § 1926.1406) to prevent the equipment from collapsing. In addition, under § 1926.1404, assembly must be conducted under the supervision of a person who understands the hazards associated with an improperly assembled crane and is well-qualified to understand and comply with the proper assembly procedures.

2. January 30, 2006. One fatality. An employee was crushed by the lower end section of the lattice boom on a truck-mounted crane while working from a position underneath the boom to remove the 2nd lower pin. When the 2nd lower pin was removed, the unsecured/uncribbed boom fell on the employee. (ID -0017.1.)

Section 1926.1404(f) will prevent this type of accident by generally prohibiting employees from being under the boom when pins are removed. In situations in which site constraints require that an employee be under the boom when pins are removed, the employer must implement other procedures, such as ensuring that the boom sections are adequately supported, to prevent the sections from falling on the employee.

3. July 23, 2001: One fatality. Employee failed to extend the outriggers before extending the boom of a service-truck crane to lift pipes. As the employee extended the boom, the crane tipped over on its side, and another employee standing near the truck was struck on the head by the hook block. (ID -0017.10.)

This type of accident will be prevented by compliance with § 1926.1404(q), which contains several provisions to ensure that outriggers and stabilizers are deployed properly before lifting a load. In addition, the operator qualification and certification requirements of § 1926.1427, which ensure that operators understand and follow the safety-requirements for the equipment they are operating, will help prevent this type of accident.

4. March 8, 1999. One fatality. Employees were using a mobile crane to maneuver a load of steel joists. The crane contacted a 7,200-volt overhead power line, electrocuting an employee who was signaling and guiding the load. The crane operator jumped clear and was not injured. (ID -0017.11.)

Section 1926.1408 includes provisions that will prevent this type of accident. This section requires the use of "encroachment prevention" measures to prevent the crane from breaching a safe clearance distance from the power line. It also requires that, if tag lines are used to guide the load, the lines must be non-conductive. Finally, if maintaining the normal clearance distance is infeasible, a number of additional measures must be implemented, one of which is the use of an insulating link between the end of the load line and the load.

These measures protect employees guiding the load in several ways, including: reducing the chance that a crane would contact a power line; employees using tag lines to guide a load from being electrocuted should the load become energized.

5. August 21, 2003. Three fatalities. A crane operator and two co-workers were electrocuted when a truck crane's elevated boom contacted a 7,200 volt uninsulated primary conductor 31 feet above the ground. When the operator stepped from the cab of the truck, a conduction pathway to the ground was established through the operator's right hand and right foot, resulting in electrocution. A co-worker attempted to revive the incapacitated crane operator with cardio-pulmonary resuscitation ("CPR"), while a third co-worker contacted 911, and then returned to the incident location. When the third co-worker simultaneously touched the energized truck crane and the back of the co-worker performing CPR, the resulting pathway conducted the electrical charge through the workers, electrocuting them all. (ID -0017.12.)

The final standard will avoid this type of accident. Section 1926.1408 ensures that a minimum safe distance from the power line is maintained, which prevents equipment from becoming energized. Also, when working closer than the normal minimum clearance distance, the crane must be grounded, which reduces the chance of an electrical pathway through the workers.

In addition, § 1926.1408(g) requires that the operator be trained to remain inside the cab unless an imminent danger of fire or explosion is present. The operator also must be trained in the hazards associated with simultaneously touching the equipment and the ground, as well as the safest means of evacuating the equipment. The crane's remaining crew must be trained to avoid approaching or touching the equipment. The required

training is reinforced by the electrocution warnings that must be posted in the cab and on the outside of the equipment.

6. September 28, 1999: One fatality. A 19-year old electrical instrument helper was at a construction site that was on a manufacturing company's property. A contractor positioned a 50-ton hydraulic crane in an open area that consisted of compacted fill material. This area was the only location that the crane could be situated because the receiving area for the equipment was too close to the property border.

The crane's outriggers were set, but matting was placed only under one of the outrigger pads. As the crane was moving large sections of piping to a new location, the ground collapsed and the crane overturned, striking the helper. (ID -0017.13.)

Section 1926.1402, *Ground conditions*, will prevent this type of accident. Under that section, employers must ensure that the surface on which a crane is operating is sufficiently level and firm to support the crane in accordance with the manufacturer's specifications. In addition, § 1926.1402 imposes specific duties on both the entity responsible for the project (the controlling entity) and the entity operating the crane to ensure that the crane is adequately supported. It places responsibility for ensuring that the ground conditions are adequate on the controlling entity, while also making the employer operating the crane responsible notifying the controlling entity of any deficiency in the ground conditions, and having the deficiency corrected before operating the crane.

7. June 17, 2006: One fatality. A spud pipe, used to anchor a barge, was being raised by a crane mounted on the barge when the hoisting cable broke, causing the headache ball and rigging to on an employee. (ID -0017.3.)

This type of accident can have various causes: an improperly selected wire rope (one that has insufficient capacity); a damaged or worn wire rope in need of replacement; or two-blocking, in which the headache ball is forced against the upper block, causing the wire rope to fail. The provisions of §§ 1926.1413 and 1926.1414 address wire rope inspection, selection, and installation, and will ensure that appropriate wire rope is installed, inspected and removed from service when continued use is unsafe. Section 1926.1416, *Operational aids*, contains provisions to protect against two-blocking.

8. July 13, 1999: Three fatalities. Three employees were in a personnel basket 280 feet above the ground. They were in the process of guiding a large roof section, being lifted by another crane, into place. Winds gusting to 27 miles per hour overloaded the crane holding the roof section; that crane collapsed, striking the crane that was supporting the personnel basket, causing the boom to fall. All three employees received fatal crushing injuries. (ID -0017.4; -0018.)

This type of accident will be prevented by § 1926.1417(n), which requires the competent person in charge of the operation adjust the equipment and/or operations to address the effect of wind and other adverse weather conditions on the equipment's stability and rated capacity. In addition, § 1926.1431, *Hoisting personnel*, requires that, when wind speed (sustained or gust) exceeds 20 mph, employers must not hoist employees by crane unless a qualified person determines it is safe to do so.

9. November 7, 2005: One fatality. A construction worker was crushed between the outrigger and the rotating superstructure of a truck crane. The worker apparently was trying to retrieve a level and a set of blueprints located horizontal member of one of the outriggers when the operator began to swing the boom. (ID -0017.5.)

Section 1926.1424, *Work area control*, will prevent this type of accident. This section generally requires that employers erect barriers to mark the area covered by the rotating superstructure to warn workers of the danger zone. However, workers who must work near equipment with a rotating superstructure must be trained in the hazards involved. If a worker must enter a marked area, the crane operator must be notified of the entry, and must not rotate the superstructure until the area is clear.

10. March 19, 2005: Two fatalities and one injury. During steel-erection operations, a crane was lifting three steel beams to a parking garage. The crane tipped over and the boom collapsed. The boom and attached beams struck concrete workers next to the structure, killing two workers and injuring one worker. The accident apparently occurred because the crane was overloaded. (ID -0017.6.)

Overloading a crane can cause it to tip over, causing the load or crane structure to strike and fatally injure workers in the vicinity of the crane. Section 1926.1417, *Operations*, includes provisions to prevent overloading. This section prohibits employers from operating equipment in excess of its rated capacity, and includes procedures for ensuring that the weight of the load is reliably determined and within the equipment's rated capacity.

The provisions of the final standard addressing operator training, certification, and qualification (§ 1926.1427) will also prevent this type of accident by ensuring that operators recognize conditions that would overload the crane.

11. December 7, 2005. One fatality. Two cranes were used to lower a concrete beam across a river. During the lowering process, one end of the beam dropped below the other end, causing the load's weight to shift to the lower end; this shift in weight

overloaded the crane lifting the lower end, and it tipped over. The lower end of the beam fell into the river, while the higher end landed on a support mat located on the bank of the river, causing a flagger to be thrown into the beam. (ID -0017.7.)

Section 1926.1432, *Multiple crane/derrick lifts—supplemental requirements*, will prevent this type of accident. This section specifies that, when more than one crane is supporting a load, the operation must be performed in accordance with a plan developed by a qualified person. The plan must ensure that the requirements of this final standard are met, and must be reviewed by all individuals involved in the lifting operation. Moreover, the lift must be supervised by an individual who qualifies as both a competent person and a qualified person as defined by this final standard. For example, in the accident just described, the plan must include a determination of the degree of level needed to prevent either crane from being overloaded. In addition, the plan must ensure proper coordination of the lifting operation by establishing a system of communications and a means of monitoring the operation.

12. May 7, 2004: One fatality. An employee, a rigger/operator-in-training, was in the upper cab of a 60-ton hydraulic boom-truck crane to set up and position the crane boom prior to a lift. The crane was equipped with two hoists—a main line and auxiliary. The main hoist line had a multi-sheave block and hook and the auxiliary line had a 285 pound ball and hook. When the employee extended the hydraulic boom, a two-block condition occurred with the auxiliary line ball striking the auxiliary sheave head and knocking the sheave and ball from the boom. The employee was struck in the head by the falling ball. (ID -0017.8.)

This type of accident will be prevented by § 1926.1416, *Operational aids*, which requires protection against two-blocking. A hydraulic boom crane, if manufactured after February 28, 1992, must be equipped with a device that automatically prevents two-blocking.

Also, the final rule, under § 1926.1427(a) and (f), prohibits an operator-in-training from operating a crane without being monitored by a trainer, and without first having sufficient training to enable the operator-in-training to perform the assigned task safely.

13. April 26, 2006: One fatality. A framing crew was installing sheathing for a roof. A crane was hoisting a bundle of plywood sheathing to a location on the roof. As the crane positioned the bundle of sheathing above its landing location, the load hoist on the crane free spooled, causing an uncontrolled descent of the load. An employee was under the load preparing to position the load to its landing spot when the load fell and crushed him. (ID -0017.9.)

Section 1926.1426, *Free fall and controlled load lowering*, will prevent this type of accident. This section prohibits free fall of the load-line hoist, and requires controlled lowering of the load when an employee is directly under the load.

As discussed later in the section titled, *Executive Summary of the Final Economic Analysis; Final Regulatory Flexibility Analysis*, OSHA finds that construction workers suffer 89 fatal injuries per year from the types of equipment covered by this final standard. Of that number, OSHA estimates that 21 fatalities would be avoided by compliance with the final standard. In addition, OSHA estimates that the final standard would prevent 175 non-fatal injuries each year. Based on its review of all the available evidence, OSHA finds that construction workers have a significant risk of death and

injury resulting from equipment operations, and that the risk would be substantially reduced by compliance with this final standard.

The OSH Act requires OSHA to make certain findings with respect to standards. One of these findings, specified by Section 3(8) of the OSH Act, requires an OSHA standard to address a significant risk and to reduce this risk substantially. (See *UAW v. OSHA*, 37 F.3d 665, 668 (D.C. Cir. 1994) ("LOTO").) As discussed in Section II of this preamble, OSHA finds that crane and derrick operations in construction constitute a significant risk and estimates that the final standard will prevent 22 fatalities and 175 injuries annually. Section 6(b) of the OSH Act requires OSHA to determine if its standards are technologically and economically feasible. As discussed in Section V of this preamble, OSHA finds that this final standard is economically and technologically feasible.

The Regulatory Flexibility Act (5 U.S.C 601, as amended) requires that OSHA determine whether a standard will have a significant economic impact on a substantial number of small firms. As discussed in Section V, OSHA examined the small firms affected by this standard and certifies that the final standard will not have a significant impact on a substantial number of small firms.

Executive Order 12866 requires that OSHA estimate the benefits, costs, and net benefits of its standards. The table below summarizes OSHA's findings with respect to the estimated costs, benefits, and net benefits of this standard. As is clear, the annual benefits are significantly in excess of the annual costs. However, it should be noted that under the OSH Act, OSHA does not use the magnitude of net benefits as decision-making criterion in determining what standards to promulgate.

Annual Benefits, Costs, and Net Benefits, 2010 dollars

Annualized Costs*	
Crane Assembly/Disassembly	$16.3 million
Power Line Safety	$68.2 million
Crane Inspections	$16.5 million
Ground Conditions	$ 2.3 million
Operator Qualification and Certification	$50.7 million
Total Annualized Costs:	$154.1 million
Annual Benefits	
Number of Injuries Prevented	175
Number of Fatalities Prevented	22
Property Damage from Tipovers Prevented	7 million
Total Monetized Benefits	$209.3 million
Annual Net Benefits (Benefits minus Costs):	$55.2 million

Source: OSHA Office of Regulatory Analysis.

*Costs with 7% discount rate. Total costs with 3% discount rate: $150.4 million annually.

During the SBREFA process, several Small Entity Representatives expressed concern that the C-DAC Document was so long and complex that small businesses would have difficulty understanding it and complying with it. The SBREFA Panel recommended that OSHA solicit public comment on how the rule could be simplified and made easier to understand. In the proposal, OSHA requested public comment on this issue. The Agency did not receive any comments objecting to the length or clarity of the overall rule, or any comment on how to simplify the final rule. Some commenters recommended that specific provisions be clarified, and these comments are addressed later in this preamble.

III. THE SBREFA PROCESS

Before proceeding with a proposed rule based on the C-DAC Document, OSHA was required to comply with the Small Business Regulatory Enforcement Fairness Act of 1996, 5 U.S.C. 601 et seq. (SBREFA). This process required OSHA to draft an initial regulatory flexibility analysis that would evaluate the potential impact of the rule on small entities (defined as small businesses, small governmental units, and small nonprofit organizations) and identify the type of small entities that may be affected by the rule. In accordance with SBREFA, OSHA then convened a Small Business Advocacy Review Panel ("Panel") composed of representatives of OSHA, the Office of Management and Budget, and the Office of Advocacy of the Small Business Administration. Individuals who were representative of affected small entities (i.e., Small Entity Representatives, or "SERs") were identified for the purpose of obtaining advice and recommendations regarding the potential impacts of the proposed rule.

OSHA provided the SERs with the C-DAC Document and the draft Regulatory Flexibility Analysis, and requested that they submit written comments on these documents. The Agency also drafted questions asking for their views on the specific aspects of the C-DAC Document that OSHA believed may be of concern to small entities.

The Panel conducted two conference calls with the SERs in which the SERs presented their views on various issues. After reviewing the SERs' oral and written comments, on October 17, 2006, the Panel submitted its report summarizing the requirements of the C-DAC proposal and the comments received from the SERs, and presenting its findings and recommendations. (OSHA-S030A-2006-0664-0019.) In its findings and recommendations, the Panel identified issues that it believed OSHA should

address in the proposal (1) through further analysis, and (2) by soliciting public comment. In the proposed rule, OSHA addressed each of the Panel's findings and recommendations in the section pertaining to the issue involved, and also solicited public comment on the issues raised by the Panel. The following table lists the recommendations made by the Panel, and OSHA's responses to these recommendations.

Table 4. SBREFA Panel Recommendations and OSHA Responses

SBREFA PANEL RECOMMENDATION	OSHA RESPONSE
The Panel recommends that OSHA provide full documentation for how it estimated the number of affected small entities and all other calculations and estimates provided in the PIRFA.	OSHA has developed a full preliminary economic analysis (PEA) for the proposal which explains all assumptions used in estimating the costs and benefits of the proposed standard. The Final Economic Analysis (FEA) also explains the changes made to the analysis as a result of comments on the proposed rule, and OSHA's responses to these comments.
The Panel recommends that OSHA reexamine its estimate of crane use in home building, the coverage of crane trucks used for loading and unloading, and the estimates of the number of jobs per crane. Changes in these estimates should be incorporated into the estimates of costs and economic impacts.	OSHA included homebuilding industries in the "Own but Do Not Rent "and "Crane Lessees" industrial profile categories. OSHA has also made a number of additions to the industrial profile to cover firms in general industry that sometimes use cranes for construction work, and has added costs for these sectors.
The Panel recommends that OSHA review its estimates for the direct costs of operator certification and seek comment on these cost estimates.	OSHA sought comments on the estimates and methodology. As a result of these comments, OSHA has increased its estimate of the unit costs of certification.
The Panel recommends that OSHA carefully examine certain types of impact that could result from an operator certification requirement, including reports of substantial increases in the wages of operators; the possibility of increased market power for firms renting out cranes; and loss of jobs for existing operators due to language, literacy, or knowledge problems; and seek comment on these types of impacts. The Panel also recommends studying the impacts of the implementation of operator certification in CA.	OSHA sought public comment on all aspects (including economic impacts, wages, number of operators, demand, etc.) of the operator certification requirements, specifically as it pertains to the State of California. OSHA has included 2 hours of travel time per operator into the unit costs for operator certification. OSHA also increased the unit costs of operator certification as a result of comments. However, based on comments,

	OSHA also reduced the OSHA percentage of crane operators still needing certification. The Agency reviewed data on wage rates for operators in California immediately before and after operator certification was required (Employment Development Department, Labor Market Information Division, State of California, 2007). The data did not show much change in operators' wages. OSHA also evaluated the changes in crane related fatality rates in California and found these had significantly declined after the California certification requirements were put into place.
The Panel recommends that OSHA reexamine its estimates for the amount of time required to assess ground conditions, the number of persons involved in the assessment, and the amount of coordination involved; clarify the extent to which such assessments are currently being conducted and what OSHA estimates as new costs for this rule represent; and seek comments on OSHA's cost estimates.	OSHA sought comment on the methodology used to calculate all of the costs in the PEA, which includes the costs for assessing ground conditions. As a result of these comments, OSHA has added costs for examination of ground conditions. This addition of costs does not change OSHA's conclusion that this standard is economically feasible.
The Panel recommends that OSHA carefully review the documentation requirements of the standard, including documentation that employers may consider it prudent to maintain; estimate the costs of such requirements; seek ways of minimizing these costs consistent with the goals of the OSH Act; and solicit comment on these costs and ways of minimizing these costs.	The Agency describes the documentation requirements, along with cost estimates, in the section of this preamble entitled "OMB Review Under the Paperwork Reduction Act of 1995."
The Panel recommends that OSHA examine whether the inspection requirements of the proposed rule require procedures not normally conducted currently, such as lowering and fully extending the boom before the crane can be used, and removing non-hinged inspection plates during the shift inspection, estimate the costs of any such requirements, and seek comment on these issues.	As explained in the discussion of § 1926.1412, *Inspections*, OSHA's former standard at former § 1926.550 requires inspections each time the equipment is used, as well as thorough annual inspections. In addition, national consensus standards that are incorporated by reference include additional inspection requirements. This final standard would list the inspection requirements in one place rather than rely on incorporated consensus standards. This final standard does not impose significant new

	requirements for inspections. OSHA received comments on the issue of lowering and fully extending the boom before the crane can be used. However, OSHA concludes that the comments were based on a general misunderstanding of the requirements. Section 1926.1413(a) explicitly says that booming down is not required for shift (and therefore monthly) inspections. Similarly, OSHA stated in the proposed preamble (73 FR 59770, Oct. 9, 2008) that it does not believe inspection of any of those items would require removal of non-hinged inspection plates. In the discussion of proposed § 1926.1412, OSHA requested public comment on this point. OSHA finalized § 1926.1412 as proposed because comments did not confirm that non-hinged plates needed to be removed to meet the requirements of a shift inspection.
The Panel recommends that OSHA consider the costs of meeting the requirements for original load charts and full manuals, and solicit comments on such costs.	Previous subpart N, at former § 1926.550(a)(2), required load charts; this is not a new cost. Subpart N did not require manuals. OSHA concludes that most crane owners and operators have and maintain crane manuals, which contain the load charts and other critical technical information about crane operations and maintenance. The Agency determined that the cost of obtaining a copy of a manual should be modest and solicited comment on how many owners or operators do not have full manuals for their cranes or derricks. Few commenters saw this as a major problem.
The Panel recommends that OSHA provide full documentation for its analysis of the benefits the proposed rule are expected to produce and assure that the benefits analysis is reproducible by others.	The Agency placed additional materials in the rulemaking docket to aid in the reproduction of the benefits analysis. The Agency also developed a full benefits analysis (sec. 4 of the FEA) which includes the methodology and data sources for the calculations.
The Panel recommends that OSHA consider and solicit public comment on whether the scope language should be clarified to explicitly state whether forklifts that are modified to perform tasks similar to equipment (cranes and derricks) modified	In the discussion of proposed § 1926.1400(c)(8), OSHA requested public comment on this issue.

in that manner would be covered.	
The Panel recommends that there be a full explanation in the preamble of how responsibility for ensuring adequate ground conditions is shared between the controlling entity, and the employer of the individual supervising assembly/disassembly and/or the operator.	OSHA explained in the discussion of proposed § 1926.1402(e) how the various employers, including the controlling entity, the employer whose employees operate the equipment, and the employer of the A/D director share responsibility for ensuring adequate ground conditions. OSHA did not receive any significant comments on this issue and, therefore, considers this matter resolved.
The Panel recommends that OSHA restate the applicable corrective action provisions (which are set forth in the shift inspection) in the monthly inspection section.	OSHA addressed this recommendation in the discussion of proposed § 1926.1412(e) and requested public comment on the issue. Based on these comments, OSHA concludes that the requirements were clear as proposed, and repeating the provisions will create confusion. Therefore, OSHA did not restate the corrective actions in § 1926.1412(e).
The Panel recommends that OSHA solicit public comment on whether, and under what circumstances, booming down should be specifically excluded as a part of the shift inspection, and whether the removal of non-hinged inspection plates should be required during the shift inspection.	OSHA addressed this recommendation in the discussion of proposed § 1926.1412(d) and requested public comment on the issues raised in the recommendation.
The Panel recommends that OSHA solicit public comment on whether to include an exception for transportation systems in proposed § 1926.1412(a), which requires an inspection of equipment that has had modifications or additions that affect its safe operation, and, if so, what the appropriate terminology for such an exception would be.	OSHA solicited comments on this issue, but the Agency did not receive any significant comments supporting an exception for transportation systems. Based on the analysis of comments received about § 1926.1412(a), OSHA concludes that the inspections of modifications as required by the final rule are sufficient to ensure that safe equipment is used. Therefore, OSHA did include the recommended exclusion in the final rule.
The Panel recommends that OSHA explain in the preamble that the shift inspection does not need to be completed prior to each shift but may be completed during the shift.	In the explanation of § 1926.1412(d)(1) of the proposed rule, OSHA explained that the shift inspection may be completed during the shift. OSHA finalized § 1926.1412(d)(1) as proposed because the comments did not demonstrate how it was safer to deviate from the rule as proposed.
The Panel recommends that OSHA solicit public comment about whether it is necessary to clarify the requirement of proposed § 1926.1412(d)(1)(xi) that the equipment be inspected for "level position."	OSHA requested public comment on this issue and revised the regulatory text of § 1926.1412(d)(1)(xi) to provide more clarity, in response to the comments the Agency received.

The Panel recommends that OSHA solicit comment on whether proposed § 1926.1412(f)(2)(xii)(D) should be changed to require that pressure be inspected "at the end of the line," as distinguished from "at each and every line," and if so, what the best terminology would be to meet this purpose. (An SER indicated that proposed § 1926.1412(f)(2)(xiv)(D) should be modified to "checking pressure setting," in part to avoid having to check the pressure at "each and every line" as opposed to "at the end of the line.")	There is no requirement to check the pressure "at each and every line." The provision simply states that relief valves should be checked for failure to reach correct pressure. If this can be done at one point for the entire system, then that would satisfy the requirement.
The Panel recommends that OSHA solicit public comment on whether proposed § 1926.1412(f)(2)(xx) should be deleted because an SER believes that it is not always appropriate to retain originally-equipped steps and ladders, such as in instances where they are replaced with "attaching dollies."	Section 1926.1412(f)(2)(xx) of the final rule does not require the corrective action to which the SER refers. If an inspection under § 1926.1412(f) reveals a deficiency, a qualified person must determine whether that deficiency is a safety hazard requiring immediate correction. If the inspection reveals that original equipment, such as stairs and ladders, have been replaced with something equally safe, there would be no safety hazard and no requirement for corrective action.
The Panel recommends that OSHA solicit public comment on the extent of documentation of monthly and annual/comprehensive inspections the rule should require.	In the discussion of proposed § 1926.1412(f)(7), OSHA requested public comment on this issue. OSHA finalized § 1926.1412(f)(7) as proposed because the comments did not demonstrate a need to modify the extent of required documentation**.**
The Panel recommends that OSHA solicit public comment on whether the provision for monthly inspections should, like the provision for annual inspections, specify who must keep the documentation associated with monthly inspections.	In the discussion of proposed § 1926.1412(e), OSHA requested public comment on this issue. In response to these comments, OSHA has explained in the final preamble that the employer who performs the inspection must maintain documentation. If another employer wants to rely on this inspection, but cannot ensure completion and documentation of the inspection, then that employer must conduct a monthly inspection.
The Panel recommends that OSHA consider ways to account for the possibility that there may sometimes be an extended delay in obtaining the part number for an operational aid for older equipment and solicit public comment on the extent to which this is a problem.	OSHA addressed this recommendation in the discussion of proposed § 1926.1416(d), and requested public comment on the issue. The Agency did not receive any significant comments.
The Panel recommends that the provision on fall protection (proposed § 1926.1423) be finalized as	Except for a minor change to § 1926.1423(h), which was made for clarity

written and that OSHA explain in the preamble how and why the Committee arrived at this provision.	purposes, OSHA has finalized § 1926.1423 as proposed. OSHA explained the Committee's rationale in the proposed preamble discussion of § 1926.1423.
The Panel recommends that OSHA consider the potential advantages of and solicit public comment on adding provisions to proposed § 1926.1427 that would allow an operator to be certified on a particular model of crane; allow tests to be administered by an accredited educational institution; and allow employers to use manuals that have been re-written to accommodate the literacy level and English proficiency of operators.	OSHA addressed these recommendations in the discussion of proposed § 1926.1427, and requested public comment on the issues raised by the Panel. Based on these comments, OSHA is not permitting certification on a particular crane model because the body of knowledge and skills required to be qualified/certified on a particular model of crane is not less than that needed to be qualified/certified for that model's type and capacity. OSHA is not allowing an institution accredited by the Department of Education (DOE) to certify crane operators solely on the basis of DOE accreditation; such institutions would, like other operator-certification entities used to fulfill Option (1), be accredited by a "nationally recognized" accrediting body. Finally, OSHA is permitting employers to re-write manuals to accommodate the literacy level and English proficiency of operators.
The Panel recommends that OSHA clarify in the preamble how the proposed rule addresses an SER's concern that his crane operator would not be able to pass a written qualification/certification exam because the operator has difficulty in taking written exams.	In the discussion of proposed § 1926.1427(h), OSHA proposed to allow the oral administration of tests if two prerequisites are met. None of the comments explained why the rule as proposed was not effective for evaluating the knowledge of the candidate.
The Panel recommends soliciting public comment on whether the phrase "equipment capacity and type" in proposed § 1926.1427(b)(1)(ii)(B) needs clarification, suggestions on how to accomplish this, and whether the categories represented in Figures 1 through 10 contained in ANSI B30.5-2000 (i.e., commercial truck-mounted crane – telescoping boom; commercial truck-mounted crane – non-telescoping boom; crawler crane; crawler crane – telescoping boom; locomotive crane; wheel- mounted crane (multiple control station); wheel- mounted crane – telescoping boom (multiple control station); wheel-mounted crane (single control station); wheel-mounted crane – telescoping boom (single control station)) should be used.	OSHA received public comments on this issue. In the final preamble discussion of § 1926.1427(b)(1)(ii)(B), OSHA explains that the Agency added a definition of "type" in response to public comment. The Agency also references ANSI crane categories to illustrate the meaning of "type" in this standard.
The Panel recommends that OSHA ask for public	OSHA addressed this recommendation in

comment on whether the rule needs to state more clearly that § 1926.1427(j)(1)(i) requires more limited training for operators of smaller capacity equipment used in less complex operations as compared with operators of higher capacity, more complex equipment used in more complex situations.	the discussion of proposed § 1926.1430(c), and explained that § 1926.1427(j)(1)'s requirement for operator training in "the information necessary for safe operation of the specific type of equipment the individual will operate" addressed the SERs' concern. However, the Agency sought public comment on this issue. OSHA finalized § 1926.1427(j)(1) as proposed because the comments failed to explain how the hazards related to the operation of smaller equipment differed from larger equipment. OSHA then concluded that the comments also were not persuasive as to why operators of smaller capacity equipment should be allowed limited training.
The Panel recommends that OSHA consider and ask for public comment on whether a more limited training program would be appropriate for operations based on the capacity and type of equipment and nature of operations.	OSHA addressed this recommendation in the discussion of proposed § 1926.1430(c) requested public comment on the issue. The comments failed to explain how the hazards related to smaller equipment were any different from larger equipment. OSHA then concluded that the comments also were not persuasive as to why operators of smaller capacity equipment should be allowed limited training.
The Panel recommends that OSHA consider and ask for public comment as to whether the supervisor responsible for oversight for an operator in the pre-qualification period (§ 1926.1427(f)) should have additional training beyond that required in the C-DAC document at § 1926.1427(f)(2)(iii)(B).	OSHA addressed this recommendation in the discussion of proposed § 1926.1430(c). and requested public comment on the issue. In the proposed preamble, OSHA stated that, where a supervisor is not a certified operator, "he/she must be certified on the written portion of the test and be familiar with the proper use of the equipment's controls; the supervisor is not required to have passed a practical operating test." OSHA finalized this requirement without substantive change in § 1926.1427(f)(3)(ii) as proposed because none of the comments demonstrated a need to require additional training for this qualified individual.
The Panel recommends OSHA solicit comment on whether there are qualified persons in the field with the necessary expertise to assess how the rated capacity for land cranes and derricks used on barges and other flotation devices needs to be modified as required by proposed § 1926.1437(n)(2).	In the discussion of proposed § 1926.1437(n)(2), OSHA requested public comment on this issue. Based on these comments, OSHA has concluded that there are qualified persons with dual expertise, and that the requirement in § 1926.1437(n)(2) is necessary for safety when equipment is engaged in duty cycle work.

The Panel also recommends that OSHA solicit comment on whether it is necessary, from a safety standpoint, to apply this provision to cranes used only for duty cycle work, and if so, why that is the case, and how "duty cycle work" should be defined.	
The Panel recommends that OSHA consider and ask for comment on whether it would be appropriate to exempt from the rule small sideboom cranes incapable of lifting above the height of a truck bed and with a capacity of not more than 6,000 pounds.	In the discussion of proposed § 1926.1440(a), OSHA requested public comment on this issue. These comments did not provide any specific reason for exempting these small sideboom cranes and, therefore, OSHA has not provided a small capacity sideboom crane exemption from this standard.
The Panel recommends that OSHA solicit public comment on how the proposed rule could be simplified (without creating ambiguities) and made easier to understand. (Several SERs believed that the C-DAC document was so long and complex that small businesses would have difficulty understanding it and complying with it.)	The length and comprehensiveness of the standard is an issue for this rulemaking. In the proposed preamble Introduction, OSHA requested public comment on this issue; however, the Agency did not receive any comments objecting to the length or clarity of the overall rule or offer any suggestions as to how it could be simplified.
The Panel recommends that OSHA consider outlining the inspection requirements in spreadsheet form in an Appendix or developing some other means to help employers understand what inspections are needed and when they must be done.	OSHA will consider developing such an aid as a separate guidance document.
The Panel recommends that OSHA consider whether use of the words "determine" and "demonstrate" would mandate that the employer keep records of such determinations and if records would be required to make such demonstrations.	Some SERs requested clarification as to when documentation was required, believing that the document implicitly requires documentation when it states that the employer must "determine" or "demonstrate" certain actions or conditions. OSHA notes that it cannot cite an employer for failing to have documentation not explicitly required by a standard. See also the discussion under proposed § 1926.1402(e).
The Panel recommends soliciting public comment on whether the word "days" as used in §§ 1926.1416(d) and 1926.1416(e) should be clarified to mean calendar days or business days.	In the discussion of proposed § 1926.1416(d), OSHA requested public comment on this issue. As a clarification in response to the comments received, OSHA determines that the term "days" refers to calendar days.
The Panel recommends that OSHA carefully discuss what is included and excluded from the scope of this standard.	OSHA proposed a scope section, § 1926.1400, and discussed in detail the types of machinery proposed to be included and excluded under this standard. OSHA

	received public comments on this proposed scope, analyzed the comments, and provided more discussion of the scope section in the final preamble.
The Panel recommends that OSHA gather data and analyze the effects of already existing certification requirements.	OSHA obtained and evaluated a study by the Construction Safety Association of Ontario showing that Ontario's certification requirement led to a substantial decrease in crane-related fatalities there. OSHA also examined both economic data of crane operator wage rates before and after the certification requirements, and fatality rates before and after the certification requirements. This data shows that costs disruptions were minimal, and that crane fatalities were significantly reduced as a result of the California certification standard.
The Panel recommends that OSHA consider excluding and soliciting comment on whether equipment used solely to deliver materials to a construction site by placing/stacking the materials on the ground should be explicitly excluded from the proposed standard's scope.	In the discussion of proposed § 1926.1400(c), OSHA requested public comment on this issue. Based on the analysis of the comments received, OSHA recognized an exclusion for delivery materials that should exclude most true deliveries, while avoiding creating a loophole to the standard that would allow materials-delivery firms to engage in extensive construction activities
The Panel recommends that OSHA should consider the information and range of opinions that were presented by the SERs on the issue of operator qualification/certification when analyzing the public comments on this issue.	The information and opinions submitted by the SERs are part of the record for this rulemaking, and OSHA considered them along with the other public comments on the proposed rule.
The Panel recommends that OSHA consider and solicit public comment on expanding the levels of certification so as to allow an operator to be certified on a specific brand's model of crane.	OSHA addressed this recommendation in the discussion of proposed § 1926.1427, and requested public comment on the issue. Based on these comments, OSHA is not permitting certification on a particular crane model because the body of knowledge and skills required to be qualified/certified on a particular model of crane is not less than that needed to be qualified/certified for that model's type and capacity.
The Panel recommends that OSHA consider and solicit public comment on expanding the levels of operator qualification/certification to allow an operator to be certified for a specific, limited type of circumstance. Such a circumstance would be	OSHA addressed this recommendation in the discussion of proposed § 1926.1427(j)(1), and requested public comment on this issue. Though several commenters were in favor of this option,

defined by a set of parameters that, taken together, would describe an operation characterized by simplicity and relatively low risk. The Agency should consider and solicit comment on whether such parameters could be identified in a way that would result in a clear, easily understood provision that could be effectively enforced.	they did not explain how these lifts could objectively be distinguished from lifts generally. Several other commenters indicated that the types of hazards present. and the knowledge needed to address those hazards, remained the same, regardless of the capacity of the crane involved or the "routine" nature of the lift (see discussion of § 1926.1427(a)). Based on these comments, the Agency has not promulgated such a provision.
The Panel recommends that OSHA consider and solicit public comment on allowing the written and practical tests described in Option (1) to be administered by an accredited educational institution.	OSHA addressed this recommendation in the discussion of proposed § 1926.1427(b)(3), and requested public comment on the issue. Several comments were submitted in favor of allowing this option; however, they did not establish that Department of Education (DOE) accreditation would guarantee the same efficacy in certification as accreditation as a personnel certification entity. The hearing testimony of Dr. Roy Swift explained the difference in the types of accreditation and the reasons why DOE accreditation would not adequately address operator certification issues. Therefore, OSHA has finalized this provision as it was proposed.
The Panel recommends that OSHA solicit public comment on making it clear that: (1) an employer is permitted to equip its cranes with manuals re-written in a way that would allow an operator with a low literacy level to understand the material (such as substituting some text with pictures and illustrations), and (2) making it clear that, when the cranes are equipped with such re-written manuals and materials, the "manuals" and "materials" referred to in these literacy provisions would be the re-written manuals.	In the discussion of proposed § 1926.1427(h)(1), OSHA requested public comment on this issue. Based on the analysis of the comments received, OSHA concludes that these manuals may not be re-written as recommended because it could cause information important for safety to be omitted.
The Panel recommends that OSHA explain in a Small Business Compliance Guide that the certification/qualification test does not need to be administered in English but can be administered in a language that the candidate can read; and that while the employee would also need to have a sufficient level of literacy to read and understand the relevant information in the equipment manual, that requirement would be satisfied if the material	OSHA will issue a Small Business Compliance Guide after the final rule is issued, and will explain these points in the Guide.

is written in a language that the employee can read and understand..	

IV. SUMMARY AND EXPLANATION OF THE RULE

Authority Citations

For all subparts affected by this rulemaking, the authority citations have been amended to refer to the documentation that permits the promulgation of this rule.

Removal of § 1926.31 and addition of § 1926.6 – Incorporation by Reference

Section 1926.31 of 29 CFR part 1926 provided information about locating documents incorporated by reference into all of the construction standards in that part. The Agency is removing this section and relocating the majority of its text to new 29 CFR 1926.6 for several reasons. First, the change in the location of the section from § 1926.31 to § 1926.6 is for organizational purposes. New § 1926.6 is within 29 CFR 1926 subpart A ("General"), which is a more logical placement than § 1926.31, which is within subpart C ("General Safety and Health Provisions"), and is the same section number (6) as the incorporation reference section for general industry standards: 29 CFR 1910.6. Second, OSHA is relocating the list of all documents incorporated by reference into 29 CFR part 1926 from its previous location in the "Finding Aids" of the CFR to § 1926.6 because the Federal Register is no longer publishing the list in the hardcopy versions of the CFR.[2]

The Agency is restructuring the text previously located in § 1926.31 to make § 1926.6 parallel 29 CFR 1910.6, which lists the documents incorporated by reference into

[2] The list will still be available online at http://www.gpoaccess.gov/ecfr from the link to "Incorporated by Reference."

the general industry standards in 29 CFR part 1910. OSHA is not including the text formerly in 29 CFR 1926.31(b), which could be read as implying that OSHA intended to incorporate into its standards, without following the procedures specified in 1 CFR part 51, revised versions of documents previously incorporated by reference.

OSHA determined that the addition of § 1926.6 and the removal of § 1926.31 are not subject to the procedures for public notice and comment specified by sec 4 of the Administrative Procedures Act (5 U.S.C. 553), sec. 6(b) of the Occupational Safety and Health Act of 1970 (29 U.S.C. 655(b)), and 29 CFR part 1911. New § 1926.6, like the § 1926.31 it replaces, is a rule of agency organization, procedure, or practice within the meaning of 5 U.S.C. 553(b)(3)(A), and the addition of § 1926.6 constitutes a technical amendment that does not affect or change any existing rights or obligations. No member of the regulated community is likely to object to it. In conclusion, OSHA finds good cause that the opportunity for public comment is unnecessary within the meaning of 5 U.S.C. 553(b)(3)(B), 29 U.S.C. 655(b), and 29 CFR 1911.5.

In addition to relocating the list of documents from the Finding Aids list, OSHA is adding to the list of documents incorporated by reference those documents that are newly incorporated by reference in these final rules. The Federal Register approved these documents, which are listed as follows, for incorporation by reference as of [INSERT DATE 90 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER]: *ANSI B30.5-1968; ASME B30.2-2005; ASME B-30.5-2004; ASME B30.7-2001; ASME B30.14-2004; AWS D1.1/D1.1M:2002; ANSI/AWS D14.3-94; BS EN 13000:2004; BS EN 14439:2006; ISO 11660-1:2008(E); ISO 11660-2:1994(E); ISO 11660-3:2008(E); PCSA*

Std. No. 2 (1968); SAE J185 (May 2003); SAE J987 (Jun. 2003); and SAE J1063 (Nov. 1993).

Subpart L—Scaffolds

Amendments to § 1926.450

The agency is removing the reference to former § 1926.550(g) from this section because former § 1926.550(g) has been redesignated and reserved by this rulemaking. Section 1926.450(a) explains that this section applies to all scaffolds used in work covered by subpart L. Prior to the promulgation of this final rule, it referenced former § 1926.550(g) to explain that § 1926.450 did not apply to crane- or derrick-suspended personnel platforms. Prior to the promulgation of this final rule, former § 1926.550(g)(2) regulated crane- or derrick-suspended personnel platforms. Personnel platforms suspended by cranes or derricks are now regulated by § 1926.1431. This change does not affect the requirements of § 1926.450(a), does not change any existing rights or obligations, and no member of the regulated community is likely to object to it. OSHA, therefore, finds good cause that the opportunity for public comment is unnecessary within the meaning of 5 U.S.C. 553(b)(3)(B), 29 U.S.C. 655(b), and 29 CFR 1911.5.

Subpart M—Fall Protection

Amendments to § 1926.500

Prior to the promulgation of this final rule, § 1926.500(a)(2)(ii) stated that subpart N set forth the workplaces, conditions, operations, and circumstances for which fall protection must be provided for employees working on "certain cranes and derricks."

Because subpart CC now provides comprehensive requirements for the provision of fall protection to workers on equipment covered by subpart CC, the Agency amended § 1926.500(a)(2)(ii) by replacing the reference to subpart N with a reference to subpart CC and deleting the word "certain."

Section 1926.500(a)(3) provided that the requirements for the installation, construction, and proper use of fall protection for construction workers were set forth in § 1926.502 of subpart M, with certain exceptions. OSHA amended § 1926.500(a)(3) to provide an exception for steps, handholds, ladders, and grabrails/guardrails/railings required by subpart CC because the criteria for those forms of fall protection are provided in subpart CC. This exception, § 1926.500(a)(3)(v), also clarifies that §§ 1926.502(a), (c)-(e), and (i) apply unless otherwise stated in subpart CC, and that no other paragraphs of § 1926.502 apply to subpart CC. The exception reduces the extent to which § 1926.502 applies to work covered under subpart CC, and clarifies that subpart CC generally sets forth the criteria for the fall protection systems required under subpart CC.

Section 1926.500(a)(4) stated that § 1926.503 sets forth the requirements for training in the installation and use of fall protection systems, except in relation to steel erection activities. The Agency added the phrase "and the use of equipment covered by subpart CC" at the end of the exception to make clear that the fall protection training requirements in § 1926.503 of subpart M do not apply to fall protection systems when used to comply with subpart CC. Training for fall protection systems required by subpart CC is governed by § 1926.1423(k).

Subpart N—Helicopters, Hoists, Elevators, and Conveyors

The heading of subpart N has been changed to "Helicopters, Hoists, Elevators, and Conveyors." The revision of the heading reflects both the equipment that is now regulated by subpart N and the removal of sections regulating cranes and derricks from subpart N to subpart CC.

Amendments to § 1926.550

Cranes and derricks used in construction had been regulated by § 1926.550. Subpart CC is now the applicable standard for regulating the use of cranes and derricks in construction. Section 1926.550 has been redesignated as § 1926.1501 and reserved.

Amendments to § 1926.553

OSHA revised § 1926.553 to include a new provision, § 1926.553(c). This section explains that § 1926.553 does not apply to base-mounted drum hoists used in conjunction with derricks. Instead, base-mounted drum hoists used with derricks must conform to the requirements of § 1926.1436. This change was made in response to a request by a commenter who wanted to clarify that the requirements for base-mounted drum hoists used with derricks could be found in new subpart CC. (ID -0130.1.) No information was submitted to the record that indicates OSHA should not make the revision to § 1926.553.

OSHA determined that the revision addresses the commenter's concerns regarding the applicability of § 1926.553 and enhances the clarity of the final rule. This revision ensures that base-mounted drum hoists used in the design of derricks meet the updated requirements of ASME B30.7-2001, which is referenced in § 1926.1436. The

older ANSI B30.7-1968, which is referenced in § 1926.553, continues to apply to all base-mounted drum hoists not used in conjunction with derricks.

Subpart O—Motorized Vehicles, Mechanical Equipment, and Marine Operations

Amendments to § 1926.600

This section regulates motor vehicles, mechanized equipment, and marine operations. Prior to the promulgation of this final rule, § 1926.600(a)(6) referenced § 1926.550(a)(15), which has been redesignated and reserved. Because the Agency inadvertently did not propose any revision of § 1926.600(a)(6), OSHA is preserving the same requirements imposed by former § 1926.550(a)(15) pursuant to this section by incorporating language substantively identical to that of former § 1926.550(a)(15) into revised § 1926.600(a)(6). The revision of § 1926.600(a)(6) does not alter any of the substantive requirements of that section, does not change any existing rights or obligations, and no member of the regulated community is likely to object to it. OSHA, therefore, finds good cause that the opportunity for public comment is unnecessary within the meaning of 5 U.S.C. 533(b)(3)(B), 29 U.S.C. 655(b), and 29 CFR 1911.5.

Subpart R—Steel Erection

Amendments to § 1926.753 Hoisting and Rigging

With the exception of former § 1926.550(g)(2), § 1926.753(a) applied all of the provisions of former § 1926.550 to hoisting and rigging during steel erection. Similarly, § 1926.753(c)(4) allowed cranes and derricks to hoist workers on a personnel platform in accordance with all of former § 1926.550 except former § 1926.550(g)(2). Because

former § 1926.550 has been redesignated and reserved, § 1926.753 has been revised to avoid changing the requirements of that section. Section 1926.753(a) applies all of subpart CC except § 1926.1431(a) to hoisting and rigging, and § 1926.753(c)(4) applies all of § 1926.1431 except § 1926.1431(a). These two paragraphs of § 1926.753 reference § 1926.1431(a) because the requirement formerly found in § 1926.550(g)(2) is now contained in § 1926.1431(a) of subpart CC.

Subpart S—Underground Construction, Caissons, Cofferdams, and Compressed Air

Amendments to § 1926.800

This section regulates hoisting unique to underground construction. Prior to the promulgation of this final rule, § 1926.800(t) of this section referenced former § 1926.550(g), which has been redesignated § 1926.1501(g). The Agency intended that the reference to former § 1926.550(g) be replaced by a reference to new subpart CC, but inadvertently omitted that action from the *Federal Register* notice for the proposed rule. To avoid any potential notice issues that might arise if the Agency substituted a reference to subpart CC in place of the prior reference to former § 1926.550(g), the Agency has instead elected to redesignate § 1926.550 as § 1926.1501 in new subpart DD, which has been created for this purpose. The Agency intends to revisit this issue in the near future.

References to former § 1926.550(g) have been replaced with references to § 1926.1501(g). This redesignation of § 1926.550 and the replacement of references do not alter any of the substantive requirements of § 1926.800(t), do not change any existing rights or obligations, and no member of the regulated community is likely to object to it.

OSHA, therefore, finds good cause that the opportunity for public comment is unnecessary within the meaning of 5 U.S.C. 553(b)(3)(B), 29 U.S.C. 655(b), and 29 CFR 1911.5.

Subpart T—Demolition

Amendments to §§ 1926.856 and 1926.858

These sections regulate the use of cranes and in demolition work. Prior to the promulgation of this final rule, §§ 1926.856(c) and 1926.858(b) referenced subpart N, part of which (former § 1926.550) has been redesignated as § 1926.1501. The Agency intended for the reference to subpart N in § 1926.856(c) to be supplemented with a reference to new subpart CC, and intended that the reference to subpart N in § 1926.858(b) be replaced by a reference to new subpart CC, but inadvertently omitted that action from the *Federal Register* notice for the proposed rule. To avoid any potential notice issues that might arise if the Agency substituted a reference to new subpart CC in place of the prior reference to subpart N, the Agency has instead elected to redesignate § 1926.550 as § 1926.1501 in a new subpart DD which has been created for this purpose. The Agency intends to revisit this issue in the near future.

References to subpart N in §§ 1926.856(c) and 1926.858(b) have been supplemented or replaced with references to § 1926.1501. This redesignation of § 1926.550 and the replacement of references do not alter any of the substantive requirements of §§ 1926.856(c) and 1926.858(b), do not change any existing rights or obligations, and no member of the regulated community is likely to object to it. OSHA,

therefore, finds good cause that the opportunity for public comment is unnecessary within the meaning of 5 U.S.C. 553(b)(3)(B), 29 U.S.C. 655(b), and 29 CFR 1911.5.

Subpart V—Power Transmission and Distribution

Amendment to § 1926.952

The subpart V provisions have been changed to reflect the terminology used in the scope section of this standard and its new subpart designation. Accordingly, § 1926.952(c), which referenced subpart N with respect to derrick trucks and cranes, has been revised to reference subpart CC. Prior to this final rule, §§ 1926.952(c)(1)(i) and (ii) addressed minimum clearance distances. Because §§ 1926.1407 through 1926.1411 address minimum clearance distances when clearance distances in Table V-1 would apply to derrick trucks and cranes used in subpart V work, §§ 1926.952(c)(1)(i) and (ii) have been deleted.

In conformance with language in § 1926.1400(c)(4), the agency is adding new § 1926.952(c)(2) into subpart V. It states that digger derricks used for augering holes for electrical poles, placing and removing the poles, or handling associated materials to be installed or removed from the poles must comply with 29 CFR 1910.269. This provision ensures comparable safety requirements exist for digger derricks performing electrical pole work.

What was § 1926.952(c)(2) prior to the promulgation of this final rule has been redesignated § 1926.952(c)(3). Former §§ 1926.952(c)(2)(i) and (ii) listed precautions for operating mechanical equipment closer to energized power lines than allowed by § 1926.950(c). The precautions (using an insulated barrier and grounding the equipment)

that were specified in §§ 1926.952(c)(2)(i) and (ii) are now required under § 1926.1410(d) when equipment used in subpart V work is operated closer than the Table V-1 clearances. Since these precautions are now required by § 1926.1410(d), OSHA is deleting them from subpart V. As a result of that deletion, former §§ 1926.952(c)(2)(iii) and (iv) are redesignated §§ 1926.952(c)(3)(i) and (ii).

OSHA is also adding a note after new § 1926.952(c)(3) to cross-reference the safe harbor in § 1926.1400(g), which provides that employers performing subpart V work have the option of complying with 29 CFR 1910.269(p) in lieu of the requirements in §§ 1926.1407 through 1926.1411 of new subpart CC. For additional information, see the discussion of § 1926.1400(g) in the preamble to this final rule.

Subpart X—Stairways and Ladders

Amendment to § 1926.1050 Scope, application, and definitions applicable to this subpart.

This section applies the provisions of subpart X to all stairways and ladders used in construction. However, C-DAC concluded that the OSHA requirements of subpart X did not account for the characteristics of the equipment that would be regulated by subpart CC. OSHA agreed with the committee and, accordingly, is amending § 1926.1050(a) to explain that subpart X does not apply to integral components of equipment covered by subpart CC. It further explains that only subpart CC establishes the circumstances when ladders and stairways must be provided on equipment covered by subpart CC. This revision is also discussed in the preamble section for § 1926.1423(c).

Appendix A to Part 1926 Designations for General Industry Standards Incorporated into Body of Construction Standards.

OSHA modified Appendix A to part 1926. Before the promulgation of this final rule, Appendix A referred to former § 1926.550(a)(19), which has been redesignated and reserved. Therefore, the reference to this section and the reference to the general industry standard it incorporated, § 1910.184(c)(9), have been deleted. This deletion is a technical and conforming change, does not change any existing rights or obligations, and no member of the regulated community is likely to object to it. OSHA, therefore, finds good cause that the opportunity for public comment is unnecessary within the meaning of 5 U.S.C. 553(b)(3)(B), 29 U.S.C. 655(b), and 29 CFR 1911.5

29 CFR 1926 Subpart CC

The Agency is promulgating Subpart CC for regulating the use of cranes and derricks in construction. Cranes and derricks used in construction had been regulated by § 1926.550. Accordingly, § 1926.550 has been redesignated and reserved.

Section 1926.1400 Scope

As explained in the proposed rule, C-DAC decided to describe the scope of the rule with both a functional description ("power-operated equipment used in construction that can hoist, lower, and horizontally move a suspended load") together with a non-exclusive list of the types of existing equipment that are covered.[3] By defining the scope

[3] The scope of the standard with respect to some of the listed equipment is further delineated in the section of the standard that specifically relates to that equipment (for example, § 1926.1436, *Derricks* and § 1926.1438, *Overhead & Gantry Cranes*).

in this way, C-DAC tried to provide the clearest possible notice as to the equipment that is covered by the standard while also including new and/or other existing equipment that is similar to the listed examples.

One commenter objected to this approach, believing that the approach does not provide the regulated community with clear notice of the bounds of the regulated equipment. (ID -0286.1.) This commenter recommended that OSHA avoid this perceived notice problem by limiting the scope of the standard to equipment described in ASME B30 standards. It recommended adding the words "and is described in American Society of Mechanical Engineers ASME B30 standards" at the end of the first sentence of proposed paragraph (a) of this section.

OSHA disagrees with this commenter that paragraph (a), when read together with the list of exclusions in paragraph (c) of this section, does not provide clear notice as to what equipment is covered and what is excluded. As explained earlier, paragraph (a) is designed to make clear the types of existing equipment that are covered while also covering newly- developed equipment that is similar to the listed examples. The approach suggested by the commenter would limit any coverage of newly developed equipment to any such equipment that might be included in an unspecified future ASME B30 standard, without the opportunity for OSHA to assess that equipment to determine whether its exemption from subpart CC would be appropriate. OSHA concludes that this approach may unduly limit the scope of subpart CC. In addition, it would contradict the intent of C-DAC with respect to several specific types of equipment. For example, at least three types of covered equipment that meet the functional definition in paragraph

(a), dedicated pile drivers,[4] digger derricks (see the discussion of digger derricks below under paragraph (c)(4)), and straddle cranes are not covered in ASME B30 standards, while the ASME B30 standards include equipment (e.g., stacker cranes) not covered under this standard. Thus, adopting the commenter's suggestion would exclude certain equipment that C-DAC intended to include and would introduce ambiguity over whether certain types of equipment that C-DAC intended to exclude are included. Where the commenter has not made a compelling argument as to why the standard would be improved by adopting the ASME standards, OSHA defers to C-DAC's expertise on this issue.

A commenter objected to defining the scope of the standard in terms of types of equipment, saying that it represented an unexplained departure from OSHA's practice of describing the scope of construction standards in terms of conditions and practices. (ID -0203.1.) Contrary to this commenter's belief, OSHA has often defined construction standards in terms of equipment. See, e.g., subpart L, "Scaffolds." Indeed, this rule for cranes and derricks replaces a previous rule for cranes and derricks at former § 1926.550, the scope of which was also defined in terms of types of equipment.

Several commenters asked OSHA to clarify the meaning of "construction" as it is used in paragraph (a) of this section. (ID -0147.1; -0165.1; -0214.1; -0235.1.) Some of these comments asked OSHA to clarify whether the use of lifting equipment to deliver materials to a construction site is covered under the standard. That issue is addressed below and is clarified in a new § 1926.1400(c)(17). One commenter noted that OSHA

[4] The proposed rule explained in detail why C-DAC decided to include dedicated pile drivers under this rule even though they are not traditionally considered to be cranes or derricks (see 73 FR 59727, Oct. 9, 2008).

draws a distinction between construction work and routine maintenance and asked for examples of activities that fall under "construction" and under "maintenance." (ID -0147.1.) OSHA notes that considerable guidance on this distinction is already available. Several interpretive documents that discuss the distinction between construction and maintenance in the context of specific inquiries and issues are available on OSHA's website. See, e.g., November 18, 2003, Letter of Interpretation to Raymond V. Knobbs, Minnotte Contracting Corporation, available at www.osha.gov; February 1, 1999, Letter of Interpretation to Randall A. Tindell, Williams Power Company, available at www.osha.gov; August 11, 1994, Memorandum from James W. Stanley, Deputy Assistant Secretary, available at www.osha.gov.

Two commenters objected to the inclusion of overhead and gantry cranes on the basis that such cranes are rarely used in construction and that a number of the most significant provisions of the standard, such as those covering ground conditions and proximity to power lines, do not apply to overhead and gantry cranes. (ID -0122.0; -0191.1.) OSHA agrees that overhead and gantry cranes that are installed in general industry workplaces and used only incidentally for construction work in such facilities should be covered under the general industry standard. This final standard accommodates this objective by providing, in § 1926.1438, that overhead and gantry cranes that are permanently installed in a facility are covered by the general industry standard even though used in construction work, such as renovating the facility in which they are installed. However, under § 1926.1438, overhead and gantry cranes that are not permanently installed in a facility, such as a launching gantry used in the construction of a bridge, are covered by this standard. Such cranes are intended to be used for

construction work, present many of the same hazards as other equipment used in construction work, and are properly regulated under this construction standard.

No other comments were received objecting to the inclusion of items on the non-exclusive list in paragraph (a).

Several commenters asked that construction work performed in certain industries be excluded from the standard. The industries making such requests include railroads (ID -0170.1; -0176.1); shipbuilders (ID -0195.1); electric utilities (ID -0203.1; -0215.1); and companies that install signs in buildings under construction (ID -0189.1). For all of these industries, the commenters identify what they believe are specific problems in applying the standard to their activities and suggest that the most direct way of solving those problems is to exclude them from the standard entirely. For the following reasons, OSHA declines to exempt construction work performed by employers in these industries from the scope of this standard.

Two commenters ask that work along railroad rights-of-way be excluded from the standard. (ID -0170.1; -0176.1.) They claim that a number of provisions in the proposed rule are not suitable for railroad operations, including: (1) the operator qualification/certification requirement because no current certifying organization tests for the type of cranes used by railroads; (2) the requirements for ground conditions, work area control, and level positioning; and (3) the requirement for a dedicated channel if electronic signals are used. They also say that most such work is maintenance rather than construction. OSHA concludes there is merit in some of the specific concerns raised by these commenters and addresses those concerns in the sections of the standard pertaining to them. However, OSHA sees no basis for excluding work along railroad rights-of-way

from this rule. Some such work, such as the replacement or renovation of automotive bridges over railroads, is plainly "construction work" that is appropriately regulated under this construction standard.

Several commenters raised concerns with the effect that this rulemaking would have on electric utilities, including: (1) the limited exclusion for digger derricks used in the industry; (2) the proposed requirement that employers performing subpart V work show that it is infeasible to maintain the normal clearance from energized power lines before they can use the less restrictive clearances in subpart V; (3) application of the operator qualification/certification requirement to the industry; and (4) the duties imposed on utility employers when other employers operate equipment near power lines owned or operated by the utility employers. (ID -0201.1; -0203.1; -0215.1.) The commenters suggest that all of these issues can be resolved by excluding utilities entirely from the standard.

OSHA does not agree that this limited group of concerns justifies completely excluding utilities from this standard. The use of cranes in utility construction work has always been subject to the construction crane standards (see § 1926.952(c)), and these commenters have not advanced a persuasive argument to discontinue this practice. The specific issues addressed by these commenters with respect to the application of this rule to electric utilities will be addressed below in sections dealing with those issues.

A commenter that operates shipyards in three states asks that shipyards be excluded from the standard. (ID -0195.1.) This commenter states that it currently has an excellent crane safety program that is based on general industry and shipyard standards, and asserts that its program would be adversely affected by the need to administer a

separate program for the "small percentage of lifts" that would fall under the construction standard. The commenter notes that the proposed standard has partially addressed its concern by providing that overhead and gantry cranes that are permanently installed in a facility are subject to the general industry standard for such cranes rather than this proposed construction standard. It states that shipyards "could potentially" use other types of cranes to support construction activities at its sites.

OSHA finds that the proposed rule appropriately addressed this issue. Overhead and gantry cranes are one of the most common type of crane used in shipyards and, as the commenter notes, § 1926.1438 allows employers with permanently installed overhead and gantry cranes to continue to follow the general industry standard. Moreover, 29 CFR 1915.2(a), provides that the shipyard standards "apply to all ship repairing, shipbuilding and shipbreaking employments and related employments." Therefore, some work that would otherwise be considered construction work and subject to subpart CC is in fact included in such "related employments." Therefore, subpart CC will likely affect shipyards only to a limited extent.

While it is understandable that the commenter may find it more convenient to administer a single program addressing only the general industry and shipyard standards, it has not substantiated its claim that the integration of this standard into that program or implementation of an additional program addressing this standard would not improve safety. The Agency notes that the commenter's construction operations have historically been subject to part 1926 subpart N.

A representative of employers who install signs in buildings asks that sign erection be excluded from the standard. (ID -0189.1.) This commenter says that sign

erection is low-risk work because most signs are relatively light (rarely exceeding 2,000 pounds) and the equipment used is "light duty" equipment with relatively simple operating controls. For heavier signs, it states that sign installers typically hire crane companies that employ certified and professional crane operators. The commenter notes that proposed § 1926.1441 would exempt equipment with a rated capacity of 2,000 pounds or less from the standard but says this would not provide the industry with relief because sign installers must use higher capacity cranes due to the reach needed to install signs. Although it asks for complete exclusion, the commenter makes clear that its objection pertains to the requirement for operator qualification/certification in § 1926.1427. It asks for less stringent requirements for its industry, such as employer self-certification and a broader range of training and certifying entities, such as accredited educational institutions.

OSHA declines to exempt sign installation from the standard. Using cranes for sign installation on construction sites involves the same hazards as when used for other purposes. Examples include installation of signs near power lines; operation of the crane at an extended radius due to the need for long reach, which can heighten the risk of tip-over; the risk to the sign installers of losing the load; failures due to poor equipment condition or miscommunication between the operator and signal person. Finally, the commenter's objections to the operator qualification/certification requirements for its industry parallels objections raised by others and will be addressed in the discussion of § 1926.1427.

A commenter representing the propane gas industry says that industry does not use cranes in "construction work" and asks OSHA to "affirm" this in the final rule. (ID -

0198.1.) The commenter asserts that the industry installs propane storage tanks ranging from 120 to 5,000 gallons capacity using truck-mounted cranes to lift and place the tanks onto supports.

From this limited description of the industry's use of cranes, it is likely that at least some of the industry's work is construction work. If the site at which the tank is installed is a building under construction, installation of a propane tank would qualify as construction work, just as the installation of an air conditioning unit on that site would be construction work. At the other extreme, replacing a small tank at an existing site with a new tank of the same capacity would be considered general industry work. In sum, based on the information provided, it appears that some of the industry's work is construction work and some is general industry. OSHA therefore cannot "affirm" that the propane industry is excluded from the standard.

For the foregoing reasons, OSHA is promulgating paragraph (a) as proposed except for a grammatical correction to clarify that the standard applies to only equipment used for construction activities. Employers who use covered equipment for both general industry work and construction work would not be required to comply with subpart CC when the equipment is used for general industry work and not construction work.

Paragraph (b)

Proposed paragraph (b) of this section provided that equipment covered by paragraph (a) remains within the scope of the standard when used with attachments that are either "crane-attached or suspended." As defined in § 1926.1401, an "attachment" is "any device that expands the range of tasks that can be done by the equipment. Examples

include, but are not limited to: an auger, drill, magnet, pile-driver, and boom-attached personnel platform." C-DAC decided to include such attachments, even though they might not use the crane's hoisting mechanism, to avoid the confusion that would result if the equipment moved in and out of coverage of the rule as attachments are put on and taken off. Furthermore, most of the operational characteristics and hazards of the equipment remain the same while the attachment is in use. No comments were received regarding this paragraph, and it is being promulgated as proposed.

Paragraph (c)

Proposed paragraph (c) of this section listed machinery that would be specifically excluded from the scope of the rule. As discussed below, several of these proposed exclusions generated public comment.

Proposed paragraph (c)(1) provided that machinery otherwise included under § 1926.1400(a) but "converted or adapted for non-hoisting/lifting use" is excluded. Power shovels, excavators and concrete pumps are listed as nonexclusive examples of such "conversions/adaptations" or modified machinery.

A commenter suggested that OSHA consider including concrete pumping trucks because they are configured as cranes and suspend loads over a distance. (ID -0178.1.) C-DAC considered this issue but decided not to include them. While a concrete pumping truck does pose some of the same hazards as a crane, its load (i.e., the concrete being pumped) is carried in a piping system affixed to its boom, rather than being suspended. Consequently, it does not fit the functional definition in paragraph (a) of this section. This commenter noted that, like a crane, a concrete pumping truck may have outriggers

or be located near a power line. However, this standard is designed to address the hazards that are specific to cranes and derricks rather than to address stability and power line clearance issues for all types of construction equipment.

A commenter asked that a type of equipment for which it holds patent rights, the "Linemaster Robotic Arm," be excluded. (ID -0209.1.) According to the commenter, this equipment is a hydraulically powered, boom mounted, rotating and telescopic robotic arm that is used to separate live power lines from poles. The commenter states that crews using the robotic arm use a crane only as a non-hoisting support machine, and that the crane cannot be used to lift or haul materials because its winch line is removed. The commenter believes that such equipment should be excluded under paragraph (c)(1) because the crane has been converted to a non-hoisting use.

OSHA does not agree with this commenter. As discussed above, under paragraph (b) of this section, equipment otherwise covered by the standard remains covered when used with attachments that are either "crane-attached or suspended." The description of the robotic arm supplied by the commenter suggests that the robotic arm fits within paragraph (b). As explained above, paragraph (b) is designed to avoid having equipment move in and out of coverage as attachments are added and removed. Excluding a crane when a robotic arm is attached would be inconsistent with that objective. Moreover, as the preamble to the proposed rule stated, even when a crane is being used for a non-hoisting purpose, its hoisting capability is still present, and most of its operational characteristics and hazards remain the same while the attachment is in use.

For those reasons, and those explained in the preamble to the proposed rule, paragraph (c)(1) is promulgated as proposed (see 73 FR 59729, Oct. 9, 2008).

Proposed paragraph (c)(2) excluded power shovels, excavators, wheel loaders, backhoes, loader backhoes, and track loaders. It provided that such machinery is also excluded when used with chains, slings or other rigging to lift suspended loads. These types of material handling machinery were excluded even though, when used to lift suspended loads, they present hazards similar to those associated with equipment covered by the proposed rule. However, C-DAC proposed to exclude them because it determined that the differences between the equipment included in the standard and the material handling machinery that is excluded are such that one standard could not be readily designed to suit both. OSHA agrees. It should be noted that another construction standard, § 1926.602 in subpart O – Motor Vehicles, Mechanized Equipment, and Marine Operations, covers the material handling equipment that is excluded from this standard. No comments were received concerning paragraph (c)(2), and it is promulgated as proposed.

Proposed paragraph (c)(3) excluded automotive wreckers and tow trucks "when used to clear wrecks and haul vehicles" (see explanation at 73 FR 59729, Oct. 9, 2008). No comments were submitted on this paragraph, and it is promulgated as proposed for the reasons provided in the preamble to the proposed rule.

Proposed paragraph (c)(4) would have excluded service trucks with mobile lifting devices that are designed specifically for use in the power line and electric industries when those trucks are used either to auger holes to set power and utility poles or to handle associated materials that will be installed or removed from utility poles. A digger derrick, or radial boom derrick, is an example of such a truck.

This machinery is currently covered by subpart N, with the exception of certain provisions, by virtue of § 1926.952(c). We note that ASME B30.5-2004 excludes digger derricks and "cranes manufactured specifically for, or when used for, energized electrical line service" from the scope of that industry consensus standard.

Digger derricks are a specialized type of equipment designed to install utility poles. They are equipped with augers to drill holes for the poles and with a hydraulic boom to lift the poles and set them in the holes. The booms can also be used to lift objects other than poles, and electric utilities use them both to place objects on utility poles and for general lifting purposes at worksites such as utility substations. (ID -0139.1.) Digger derricks have rated capacities as high as 36,000 pounds. (ID -0369.1.) When electric utilities are finished with them, they sell them to other construction companies. (ID -0341.)

Since its promulgation in 1972, subpart V ("Power Transmission and Distribution") has excluded digger derricks from certain requirements of subpart N. C-DAC considered whether to continue special treatment of digger derricks used in subpart V work and proposed to exclude digger derricks used in Subpart V work from the standard to the extent they are used to auger holes and to handle associated materials to be installed on or removed from utility poles. C-DAC determined that such an exclusion was appropriate because of the "narrow, specialized range of activities and circumstances in which such trucks are used" (73 FR 59729, Oct. 9, 2008).

Most of the commenters on this issue favored an exclusion for digger derricks but asked that the proposed exclusion be broadened to all uses of digger derricks by electric utilities. (ID -0129.1; -0139.1; -0144.1; -0162.1; -0200.1; -0215.1; -0217.1; -0226.)

Several noted that the proposed exclusion would lead to the incongruous result in that digger derricks would move in and out of coverage depending on the task they are performing. Noting that most of the exclusions developed by C-DAC applied to types of equipment rather than specific tasks, a commenter stated that C-DAC contradicts itself by proposing a task-related exclusion instead of an equipment-related exclusion. (ID -0200.1.) One commenter recommended that the proposed exclusion be extended to the setting and removal of poles. (ID -0209.1.) Another opposed any exclusion for digger derricks because digger derricks work in proximity to power lines. (ID -0092.20.)

Some commenters suggested that any exclusion for digger derricks should also apply to other industries. One stated that a similar exclusion should apply to digger derricks used to auger holes and set poles in the telecommunication industry. (ID -0234.) Another contended that it would be inconsistent to exclude a digger derrick used to set an electric utility pole but not a telecommunications pole. (ID -0129.1.) The same commenter also said that digger derricks are used to set poles for outdoor lighting along roadways and indicated that the exclusion should apply to such use. A commenter in the railroad industry said that the exclusion should apply to digger derricks used in the railroad industry to install utility and communication signal poles. (ID -0176.1.)

Certain commenters criticized the description of the equipment in proposed paragraph (c)(4), which described the equipment subject to the exclusion as "service trucks with mobile-lifting devices designed specifically for use in the power line and electric service industries, such as digger derricks (radial boom derricks)." One objected to the limitation that the equipment be "designed specifically for use in the power line and electric service industries" on the basis that employers should not be required to

show the purpose for which their equipment is designed. (ID -0215.1.) Another, a witness at the public hearing, stated that the term "service truck" used in the proposal has no commonly understood meaning in the industry. (ID -0342.)

OSHA agrees with these commenters that the description of the excluded machinery should be clarified and is using the term "digger derrick" exclusively to describe the equipment that is subject to the exclusion. The term "digger derrick" is well understood in the industry and is the only term used to describe the equipment by the ANSI standard applicable to such equipment, ANSI/ASSE A10.31-2006, Safety Requirements, Definitions, and Specifications for Digger Derricks. Accordingly, OSHA concludes that using "digger derrick" without reference to the purpose for which the equipment is designed or synonyms such as "service truck" is the clearest way to describe the exclusion. The Agency notes that despite its name, a "digger derrick" is not a "derrick" as defined in § 1926.1436(a). Thus, the additional requirements applicable to derricks in § 1926.1436 do not apply to digger derricks, and the exception from operator certification requirements in § 1926.1427(c) for derrick operators does not apply to operators of digger derricks included within the scope of § 1926 subpart CC.

OSHA also agrees with the majority of commenters who argued that the exclusion should be broadened so that it encompasses all digger derrick work on electric utility poles. Digger derricks are specifically intended to be used for augering holes for utility poles, placing the poles in the holes (and removing them when necessary), and handling materials being installed on or removed from the poles. Excluding all of these uses will minimize the incongruous result of having digger derricks move in and out of coverage while they are being used for their intended purposes at the same worksites. OSHA also

agrees with those commenters who argued that the exclusion should encompass similar work on poles carrying telecommunication lines, since the rationale described above is equally applicable.

In addition, OSHA has drafted the exclusion in the final rule so that it is based on the type of work done with the digger derrick, rather than the industry classification of the employer performing the work. For example, digger derricks used by a railroad to install poles for telecommunication lines would be excluded.

When digger derricks are used in the operation and maintenance of existing electric power lines, they are subject to the general industry standard at § 1910.269. OSHA is currently conducting another rulemaking designed to avoid inconsistencies between subpart V of the construction standards, which applies to power line construction work, and § 1910.269 (see 70 FR 34821, Jun. 15, 2005). Pending the completion of that rulemaking, digger derricks excluded from this rule will be subject to the same requirements regardless of whether they are used for work subject to subpart V or work subject to § 1910.269. To ensure that digger derricks excluded from this rule (Subpart CC) are subject to appropriate safety requirements, OSHA is including language in § 1926.1400(c)(4), and is amending subpart V, to explicitly state that the activities from which digger derricks are excluded from subpart CC are subject to applicable provisions of § 1910.269. Those rules include § 1910.269(p) (mechanical equipment), § 1910.269(a)(2) (training), and § 1910.269(l) (work on or near exposed energized parts).

Similarly, digger derricks used in general industry telecommunication work are subject to the general industry standard at § 1910.268. Section 1910.268 includes requirements for working near energized power lines and requirements pertaining to the

operation of the equipment, such as the need to comply with manufacturer load ratings. The requirements applicable to digger derricks under the general industry telecommunications standard (§ 1910.268) are comparable to those in the general industry electric utility standard (§ 1910.269). Accordingly, to ensure that comparable safety requirements apply to digger derricks during pole work, OSHA is including language in final § 1926.1400(c)(4) stating that § 1910.268 applies when digger derricks are used in construction work for telecommunication service. Section 1910.268 includes requirements for working near energized power lines and requirements pertaining to the operation of the equipment, such as the need to comply with manufacturer load ratings.

In addition, § 1926.952(c)(2) is also being amended to conform subpart V to § 1926.1400(c)(4).

While OSHA agrees that the limited exclusion recommended by C-DAC should be broadened in this manner, the Agency does not agree that the exclusion should encompass all uses of digger derricks in electric utility construction work, as some commenters suggested. Digger derricks are specifically designed to be used to install and remove utility poles. However, their lifting ability is not limited to utility poles, and the record shows that they are used by electric utilities for general lifting work, such as setting transformers in substations.

Their use with utility poles falls within the "narrow, specialized range of activities and circumstances" that led C-DAC to develop the proposed exclusion (see 73 FR 59729, Oct. 9, 2008). But when digger derricks are used for general lifting purposes, the hazards are the same as when other equipment of similar capacity is used for general lifting, and the exclusion developed by C-DAC is not appropriate for such work. OSHA determines

that an exclusion limited to augering holes, setting and removing poles from those holes, and handling associated material to be installed on or removed from the poles will provide employees with an appropriate level of protection while accommodating the unique uses for which digger derricks are designed. It will also minimize the practical problems associated with equipment moving in and out of coverage at the same worksite.

OSHA recognizes that excluding digger derricks only when they are used for pole work would mean that the same machinery might be excluded for some work but covered when it is used at different worksites. However, the general lifting work done at those other worksites would be subject to this standard if done by other types of lifting equipment, and the same standards should apply as apply to that equipment. OSHA concludes that excluding digger derricks only for the work for which they are primarily designed and used is a reasonable approach. It accommodates the considerations that led C-DAC to propose a partial exclusion while treating digger derricks used for other construction work the same as other, similar equipment used for such work.

OSHA also declines to extend the exclusion broadly to installation of all poles for outdoor lighting along roadways, as one commenter suggested. OSHA notes that some poles that carry electric and telecommunication lines also have street lights installed on them, and use of digger derricks to install such lights would qualify for the exclusion to the extent that the employer complies with either §§ 1910.268 or 1910.269. It is unclear whether, and to what extent, digger derricks are used to install other types of poles used for lighting alone which do not carry electric power lines or telecommunication lines. Many such poles are installed on aboveground concrete bases rather than set in holes in the ground, and it is unclear whether and to what extent digger derricks are used to install

them. In this regard, OSHA notes that the commenter asking for the exclusion to be extended to light poles represents equipment manufacturers, and no company that installs lighting poles suggested such an exclusion. To the extent that some light pole installation would not be covered by either §§ 1910.268 or 1910.269, extending the exclusion to such work would leave the excluded work without coverage by an appropriate general industry standard and leave workers without the protection they receive when performing electric utility or telecommunication work.

OSHA disagrees with the comment that digger derricks should not be excluded at all because of the danger of power line contact. As discussed above, the digger derrick exclusion is limited to situations in which certain general industry standards apply, and those general industry standards, both §§ 1910.268 and 1910.269, contain requirements for protecting against power line contact.

Proposed paragraph (c)(5) specifically excludes machinery originally designed as vehicle mounted aerial lifts and self-propelled elevating work platforms. The language of this provision reflects C-DAC's intent to differentiate between equipment with an attachment such as a personnel platform pinned to the boom, which is within the scope of the proposed rule, and machinery originally designed to be configured only as an aerial lift, which is excluded. Another standard, § 1926.453, addresses aerial lifts. The only comments to address this exclusion supported retaining it. (ID -0129.1; -0312.1.) Accordingly, paragraph (c)(5) is promulgated as proposed.

Proposed paragraph (c)(6) excluded telescopic/hydraulic gantry systems. C-DAC excluded this machinery because it presents hazards that differ in many respects from those presented by the equipment covered by this standard. As a result, many provisions

of this standard would not be workable or needed for this equipment, and hazards unique to this type of machinery would not be addressed. In the proposed rule, OSHA noted that the Specialized Carriers & Rigging Foundation recently issued a voluntary consensus standard for telescopic/hydraulic gantry systems. (73 FR 59730, Oct. 9, 2008; ID -0027.) As no comments on this exclusion were received, paragraph (c)(6) is promulgated as proposed.

Under proposed paragraph (c)(7), stacker cranes were excluded. C-DAC noted that these cranes are rarely used in construction, and their configuration is too unlike other equipment covered by the proposed standard to warrant inclusion. No comments on this exclusion were received, and paragraph (c)(7) is promulgated as proposed.

Paragraph (c)(8) of the proposed rule excluded "powered industrial trucks (forklifts)." C-DAC proposed to exclude such machines because forklifts are mostly used in a manner that does not involve suspended loads and would often require different responses to the hazards presented than are provided in this standard.

OSHA solicited public comment on whether the scope language should be modified to explicitly state that forklifts modified to perform tasks similar to cranes are covered. Two commenters stated that the inclusion in paragraph (a) of this section of multi-purpose machines when configured to hoist and lower by means of a winch or hook would include forklifts that are modified to perform tasks similar to a crane. (ID -0205.1; -0213.1.) Several other commenters argued that forklifts should be excluded even if they are configured to perform tasks similar to cranes and suggested adding specific language to that effect. (ID -0187.1; -0231.1; -0232.1) These commenters noted that forklifts are regulated under a different section, § 1926.602(c), and believed that § 1926.602(c) was

better suited to the hazards presented by such equipment than this standard. One commenter stated that the challenges facing modified forklift operators are fundamentally different from the challenges facing crane operators, thus the standards regulating them should also be fundamentally different. (ID -0231.1.)

The comments submitted on this issue highlight the need for greater clarity. This standard applies to equipment that can hoist, lower and horizontally move a suspended load. First, as a preliminary matter, the standard does not apply to forklifts used exclusively in their most traditional form: placing the forks underneath a load and using the forks to lift or lower the load. With a "suspended" load, the forks (or modified lifting device) would be above the load.

Second, OSHA has included paragraph (c)(8) to exclude forklifts when used to suspend a load from its forks. OSHA recognized that a forklift could technically meet the criteria of subpart CC coverage whenever it is used to suspend a load from its forks (such as by hanging the load from a chain wrapped around the forks), hoist it vertically by raising or lowering the forks, and move the load horizontally by moving the entire forklift. Under such a scenario the forks are used as the primary support for a load suspended directly from the forks, but OSHA concludes that these forklifts warrant an exception from the scope of this subpart CC because they do not utilize the components in the same manner as other equipment covered by this standard. In contrast, a piece of equipment covered by this standard manipulates suspended loads by utilizing components such as winches, booms, jibs, gantries, and trolleys. Outriggers and stabilizers are also often needed to stabilize the equipment while hoisting a load.

Third, OSHA is revising paragraph (c)(8) to clarify that the forklift exclusion applies only to forklifts that do not meet the definition of multi-purpose machines covered under subpart CC (those that are configured to hoist and lower (by means of a winch or hook) and horizontally move a suspended load). This standard covers multi-purpose machines because they are configured with the above-mentioned components (winches, booms, jibs, gantries, trolleys, stabilizers, etc.), even though they also have a dual function. OSHA recognizes that a powered industrial truck could be modified so that it would qualify as a multi-purpose machine, such as by adding an after-market boom and hook attachment in addition to the fork attachment. It is the Agency's intent that forklifts that are capable of multiple configurations are treated as multi-purpose machines and excluded from coverage of subpart CC only as set forth in § 1926.1400(a). A forklift with a boom attachment affixed to its forks that uses a hook to raise and lower the load like a crane would be covered by subpart CC. However, as noted in the preamble to the proposed rule, a forklift would be excluded from the coverage of subpart CC when its sole means of suspending a load is a chain wrapped around the forks.

Proposed paragraph (c)(9) excluded mechanics' trucks with hoisting devices when used in activities related to equipment maintenance and repair. One commenter stated that similar trucks are used in the power line industry for tasks such as installing transformers and suggested that such equipment should also be excluded. (ID -0144.1.) However, as explained in the proposed rule, this provision was not intended to exclude mechanics' trucks when used to hoist materials during construction work but only to provide a limited exception when they are used for equipment maintenance and repair activities. Their use in this manner is similar to the way automotive wreckers and tow

trucks, which are excluded under paragraph (c)(3) of this section, are used. OSHA determines that this exclusion should be limited in the manner stated in the proposed rule, and paragraph (c)(9) is promulgated as proposed.

In proposed paragraph (c)(10), machinery that hoists by using a come-a-long or chainfall was excluded for the reasons explained in the preamble to the proposed rule (see 73 FR 59730, Oct. 9, 2008). No comments were received on this provision, and it is promulgated as proposed.

Proposed paragraph (c)(11) excluded dedicated drilling rigs. This exclusion received substantial attention during the C-DAC negotiations and was discussed at length in the proposed rule (see 73 FR 59730, Oct. 9, 2008). OSHA requested public comment on issues related to this exclusion. No written comments were submitted but, in testimony at the public hearing, a trade association supported the proposed exclusion. (ID -0341.) Accordingly, paragraph (c)(11) is promulgated as proposed.

Proposed paragraph (c)(12) excluded "gin poles when used for the erection of communication towers." (See discussion at 73 FR 59730, Oct. 9, 2008). A commenter stated that this exclusion should be extended to also cover gin poles used to erect electrical transmission towers and lines, but gave no supporting rationale or information. (ID -0209.1.)

The use of gin poles for erecting communications towers is highly specialized; the communication tower industry has developed a detailed consensus standard that specifically addresses their use in that application.[5] However, the Agency is unaware of a

[5] See ANSI/TIA – 1019 (2004), *Structural Standards for Steel Gin Poles Used for Installation of Antenna Towers and Antenna Supporting Structures*, which contains detailed provisions for installing and using gin poles to erect communication towers.

similar degree of specialization and development of safe practices for gin poles used for erecting electrical transmission towers. Accordingly, OSHA lacks a basis for extending the exclusion to work other than that covered in proposed paragraph (c)(12); paragraph (c)(12) is promulgated as proposed with the addition of the word "when" before "used" to clarify that the exclusion does not apply when gin poles previously used to erect communication towers are used for other purposes.

Proposed paragraph (c)(13) excluded tree trimming and tree removal work from the scope of the proposed rule. One commenter favored the exclusion as written (ID -0040.1), but another suggested limiting the exclusion to tree trimming performed for maintenance and including tree trimming related to construction (ID -0172.1). The latter commenter stated that tree trimming related to construction is particularly dangerous because the weight of the pick is uncertain and the ground conditions to support the equipment may be inadequate.

C-DAC agreed to exclude tree trimming and removal because the vast majority of the tree care industry's work does not take place in construction and is therefore governed by general industry standards. OSHA continues to agree that this is a valid reason for the exclusion. OSHA is promulgating paragraph (c)(13) as proposed.

Proposed paragraph (c)(14) excluded anchor handling with a vessel or barge using an affixed A-frame. Two commenters suggested that the vessels to which this paragraph pertains should be excluded even when used for purposes other than anchor handling to avoid having the vessels move in and out of coverage depending on how they are used. (ID -0376.1; -0383.1.) These commenters stated that such vessels are sometimes used for

dredging operations and suggested rewording the exclusion to state: "Anchor handling or dredge related operations with a vessel or barge using an affixed A-frame."

OSHA is adopting these commenters' suggestion and their recommended wording of paragraph (c)(14). As explained in the proposed rule, C-DAC agreed to the exclusion in proposed paragraph (c)(14) because its Cranes on Barges Work Group concluded that the requirements of this rule could not readily be applied to the specialized equipment listed in the exclusion. That rationale favors the broader exclusion recommended by the commenters.

Proposed paragraph (c)(15) excluded roustabouts because C-DAC concluded that the proposed standard was similarly unsuited to address these devices (see 73 FR 59731, Oct. 9, 2008). No commenters addressed this issue, and paragraph (c)(15) is promulgated as proposed.

Paragraph (c)(16) excludes helicopter cranes. Such cranes are regulated under §1926.551 of subpart N, which is not affected by this final rule and continues in effect. C-DAC and OSHA did not intend to cover helicopter cranes under this subpart. However, such cranes fit the description in § 1926.1400(a) of the equipment covered by this rule in that they are power-operated equipment that can hoist, lower, and horizontally move a suspended load. To avoid any uncertainty over whether they are subject to this rule or to § 1926.551, OSHA is explicitly excluding them from this rule through paragraph (c)(16).

Paragraph (c)(17) Delivery of Material to Construction Sites

It is common for material that is to be used in construction work to be delivered to the construction site on a truck equipped with a lifting attachment that is used either to place the materials on the ground or to place them on the structure. For example, articulating/knuckle-boom truck cranes are often used to deliver bundles of drywall to the site and then move the bundles from the truck up to a floor of the building under construction. To the extent these cranes are used in "construction work," they fall within the scope of this final rule as defined in § 1926.1400(a).

OSHA has long taken the view that an employer who delivers materials to a construction site is not engaged in "construction work" if that employer's work once at the site is limited to simply placing/stacking the materials on the ground. OSHA requested comment from the public on whether the final rule should include an explicit exclusion to this effect (see 73 FR 59731, Oct. 9, 2008).

Most commenters on this issue favored such an exclusion to clarify that such equipment was not being used in construction. (ID -0145.1; -0147.1; -0165.1; -0184.1; -0206.1; -0218.1; -0232.1; -0233.1; -0235.1; -0299.1.) Certain commenters expressed the view that any such exclusion should also extend to delivery of materials onto structures at the construction site because, in their view, this was also not a construction activity. (E.g., ID -0184.1; -0233.1; -0235.1.) Some of these commenters represented employers who deliver building materials such as lumber, drywall, and roofing materials. (See, e.g., ID -0184.1; -0233.1.) Others represented employers in the heating, ventilation, air conditioning, and refrigeration (HVACR) industry. (ID -0165.1; -0235.1.) Several of the commenters pointed to the operator training and/or certification requirements in § 1926.1427 of the proposed rule as particularly burdensome given the distinctions between

delivery activities and what they characterized as the more complex activities typically associated with the equipment covered by the proposed rule. (ID -0165.1; -0184.1; -0218.1; -0231.1; -0233.1; -0235.1.)

OSHA notes some commenter confusion regarding instances when the construction materials are not delivered to the curb or a stockyard but instead to a designated area on the construction site where the materials are staged/organized to facilitate hoisting activities. In these scenarios, OSHA construction standards apply. See, e.g., Letter to Johnson (2/6/08) (stacking of materials), Letter to Reynolds (1/5/01) (delivery of materials onto structure). When hoisting equipment is used to arrange the materials in a particular sequence for hoisting or to lift materials onto a structure that is under construction, it is being used to expedite work that is integral to the construction process and is, therefore, construction work. However, to remain consistent with existing compliance guidance, this final rule states that when lifting equipment is used solely to deliver building supply materials from a supplier to a construction site by placing/stacking the materials on the ground, without arranging the materials in a particular sequence for hoisting, OSHA does not regard the delivery process as a construction activity. OSHA believes that this limited and conditional exclusion will exclude this equipment when used to perform such deliveries and address the concerns of commenters who only deliver construction materials to the ground.

Construction typically consists of a process of assembling and attaching (or in some cases, disassembling) a vast variety of materials to form a building or other

structure.[6] In building construction, those materials typically include small, individual items (a few examples include: nails, lumber, pipes, duct work sections, electrical items, sheet goods), large individual items (a few examples include: structural steel or precast concrete columns and beams), and prefabricated structural and building system components (a few examples include: roof trusses, precast concrete wall sections, and building machinery such as boilers, pumps, and air handling equipment). All of these items must be delivered to the jobsite and unloaded from the vehicle delivering them before they can be used in the building or structure.

C-DAC indicated that to facilitate the assembling or attaching of such items, cranes and derricks are often used to hoist and hold, support, stabilize, maneuver, or place them. Sometimes they are used to place items in a convenient location for subsequent use. For example, they are often used to place a bundle of steel decking sheets onto the structure for later "shaking out" (i.e., after being landed on the structure, workers "break" the bundle and distribute the decking sheets for subsequent attachment). One of OSHA's construction standards contains specific requirements related to the landing and placing of such bundles (see § 1926.754(e)(1)).

Sometimes cranes and derricks are used to place an item in a specific location for immediate attachment. For example, cranes are typically used to precisely place steel columns on concrete footings, which involves aligning holes at the column's base with anchor rods/bolts in the footing so that the column can be secured to the footing. In building and bridge construction, cranes are often used to precisely place precast concrete

[6] Construction also includes the deconstruction or demolition of a portion, or all, of a structure.

members so that workers can attach them to other precast members (or sometimes to a structural steel frame).

Cranes are also used to place precast concrete components so that other items can be connected to them. For example, in utility and sewer construction, precast concrete manholes or vaults are placed for proper alignment with utility pipes; in residential construction, precast concrete septic systems are placed for proper location in an excavation. Clearly, such movement and placement of material by cranes and derricks is integral to the construction process, and the fact that this may be done by the vehicle that delivered the material to the site does not make it a non-construction activity.

Cranes are also commonly used to hoist building materials onto a structure for subsequent use. Although this is also a construction activity,[7] OSHA determines that a limited exclusion for articulating/knuckle-boom truck cranes used for such work is appropriate to minimize having this equipment move in and out of coverage of this rule.

The record shows that articulating/knuckle-boom truck cranes are often used to deliver sheet goods (e.g., drywall), or packaged materials (e.g., roofing shingles) to construction sites and that it is common for the delivery to be made onto the structure. Delivering material to a structure can pose a hazard that is typically not present when material is placed on the ground: when the boom is extended, as when lifting the material to an upper floor, the possibility of exceeding the crane's rated capacity, with the resultant possibility of boom collapse and crane tipover, is present. A representative of a

[7] Moving building materials onto a structure for subsequent use is an integral part of the construction process. This is the case whether the materials are brought onto the structure by hand, with the aid of a crane after the materials had been previously delivered to the ground, or by the same equipment that brought them to the site. See e.g., January 5, 2001, Letter of Interpretation to Mr. Jeff Reynolds, Division Safety Manager Pacific Supply, available at www.osha.gov.

material delivery trade association testified that articulating/knuckle-boom cranes are equipped with automatic safety systems that detect whether the crane is close to being overloaded and automatically prevent such overloading. (ID -0341; -0380.1; -0381.1)

The representative described a test on a crane with a load of 2,900 pounds and a maximum extension of 78 feet, 11 inches, and said that the automatic device preventing the boom from extending beyond its maximum safe length for that load and angle of 46 feet. (ID -0341.) Thus, with a load that is typical of the loads that are often delivered, the hazard of the crane collapsing exists with the boom at far less than its maximum possible extension. Another representative of the material delivery industry, also noted the presence of such devices on the equipment used by its members and, while it asked for such equipment to be exempt completely from this rule, alternatively suggested an exemption for equipment with such devices installed. (ID -0184.1.)

OSHA is, to a large extent, adopting the commenter's suggestion. The overloading and subsequent collapse of cranes is one of the primary hazards this final rule seeks to address. The trade association witness's testimony shows that the potential for collapse is present when articulating/knuckle-boom cranes are used to deliver materials onto a structure. The industry has, however, addressed this hazard by equipping such cranes with automatic overload prevention devices. Therefore, OSHA is excluding articulating/knuckle-boom cranes used to deliver materials onto a structure from the final rule, but only when the cranes are equipped with properly functioning automatic overload prevention devices. Without such a device, the crane is subject to all provisions of this final rule. It should be noted that electrical contact with power lines is another serious hazard covered by the final rule. The limited exemption for

articulating/knuckle-boom cranes used for certain construction operations also exempts this equipment from the requirements for operations near power lines contained in the final rule. When performing an exempt operation, this equipment (like must of the other exempt equipment and operations) will be covered by revised § 1926.600(a)(6).

OSHA is limiting this exclusion to the delivery of sheet goods and packaged materials including, but not limited to: sheets of sheet rock, sheets of plywood, bags of cement, sheets or packages of roofing shingles, and rolls of roofing felt. The placement of other materials on a structure under construction is the type of core construction activity this rule seeks to address, and excluding the hoisting and movement of other types of materials, such as precast concrete members, prefabricated building sections, or structural steel members, would severely reduce the rule's effectiveness. Moreover, equipment used to lift these types of materials on construction sites is rarely, if ever, used for non-construction activities on those sites and does not often present the problem of equipment moving in and out of coverage when used for different activities.

OSHA is also limiting the exclusion by making it clear that it does not apply when the 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. For example, while placing a package of shingles onto the roof of a structure would fall within the exemption, suspending the shingles in the air and moving them to follow the progress of the roofer would not. When the crane is being used to facilitate the construction activity, it has exceeded the "delivery" of goods and is therefore engaged in a process that is more complex than the scenarios addressed by the commenters who supported an exclusion for materials delivery. OSHA is also concerned that exempting

this activity would provide an incentive for employers to use materials delivery cranes for other purposes, thereby undermining the rationale for the materials delivery exclusion.

In particular, OSHA declines to exclude the handling of HVACR units, as some commenters urged. Using a crane to deliver HVACR equipment is an example of using a crane to hoist and position a component of the building's mechanical systems, which is an integral part of the construction process. According to one industry commenter, during a typical installation of a large commercial rooftop HVACR unit, a mobile crane delivers the equipment to its intended location on the roof, where an HVACR technician connects the equipment to the ventilation system. (ID -0165.1.) Thus, unlike sheet goods and packaged materials, which are not placed in their location of final use by the delivery vehicle, delivery of HVACR equipment may be integral to its installation. Like the hoisting and movement of other building components, use of cranes and derricks to move HVACR equipment falls squarely within this rule.

OSHA also received a comment from a representative of the precast concrete industry requesting the exclusion of equipment used to deliver materials such as concrete manholes, septic tanks, burial vaults, concrete block, and concrete pipe. (ID -0299.1.) This commenter stated that their portion of the precast concrete industry solely delivers materials to a construction site, and believed that they simply supply materials for a construction project but are not involved in actual construction. (ID -0299.1.)

OSHA agrees that in circumstances where the equipment is used solely to deliver these types of concrete materials from a supplier to a construction site by placing/stacking the materials from the delivery vehicle to the ground in, for example, a storage or staging area, without arranging the materials in a particular sequence for

subsequent hoisting, the equipment is not being used for a construction activity. However, if the equipment is used to hoist, hold, support, stabilize or place precast concrete material as part of the installation process, it is engaged in a construction activity and would be subject to this rule. For example, a truck-mounted articulating crane may be used to maneuver a precast component such as a vault or concrete pipe from the truck to its installation point in an excavation. As previously discussed, such use is a typical construction activity.

To summarize, when a delivery vehicle is used solely to deliver building supply materials from a supplier to a construction site by placing/stacking the materials on the ground, without arranging the materials in a particular sequence for hoisting, the equipment is not being used for a construction activity and is not subject to this rule. When an articulating/knuckle-boom truck crane that brings material to a site is used to transfer building supply sheet goods or building supply packaged materials from the vehicle onto a structure, the activity is a construction activity but the crane is excluded from this rule if it is equipped with a properly functioning automatic overload prevention device and satisfies the other requirements of the exception in § 1926.1400(c)(17). All other equipment that falls under § 1926.1400(a) is subject to this rule when delivering materials onto a structure.

OSHA is including in the final rule a new § 1926.1400(c)(17) to clarify the circumstances under which material delivery is subject to the rule. Paragraph (c)(17)(i) excludes from the scope of this standard an articulating/knuckle-boom truck crane that delivers material to a construction site when it is used to transfer materials from it to the ground, without arranging the materials in a particular sequence for hoisting.

Paragraph (c)(17)(ii) contains the exclusion for an articulating/knuckle-boom truck crane that delivers material to a site when it is used to transfer building supply sheet goods or building supply packaged materials from it onto a structure, using a fork/cradle at the end of the boom. This provision conditions this exclusion on the truck crane being equipped with a properly functioning automatic overload prevention device and lists examples of the sheet goods or packaged materials that qualify for the exclusion, stating that these 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. These are typical building supply materials that pose a reduced risk of falling when being lifted by the truck crane because of their configuration and/or packaging, and because the truck crane was designed to safely handle this type of material.

Any delivery activities not excluded under paragraphs (c)(17)(i) and (ii) are subject to the standard. However, to avoid any possible ambiguity on this point, OSHA has included paragraph (c)(17)(iii). Paragraphs (c)(17)(iii)(A) – (C) list explicit activities for which the exclusion does not apply. Paragraph (c)(17)(iii)(D) is included to avoid any possible implication that paragraphs (c)(17)(iii)(A) – (C) represent an exclusive list of delivery activities that are subject to the final rule.

Paragraph (d)

Paragraph (d) of this section is included because there are some types of equipment for which only limited requirements apply, and others where there are special requirements that supplement, rather than displace, the other requirements in the rule. To avoid confusion, this paragraph establishes that all parts of the rule apply unless a provision specifically identifies other parts of the rule as inapplicable, or identifies the

only provisions of the standard that are applicable. No comments were received on this paragraph, and it is promulgated as proposed except that "subpart CC" replaces the phrase "this standard" from the proposed rule.

Paragraph (e)

Proposed paragraph (e) of this section provided that the duties of controlling entities[8] are not limited to the duties specified in §§ 1926.1402(c), 1926.1402(e) and 1926.1424(b). The paragraphs referenced in this provision listed specific duties imposed on controlling entities under this rule. Paragraph (e) was included to avoid any implication that the listing of certain duties placed on controlling entities by this rule displaces the duties placed on them under OSHA's multi-employer policy.

Several commenters questioned OSHA's authority to enforce its multi-employer policy against controlling entities as well as the provisions in the proposed rule that would impose specific duties on controlling entities. (ID -0166.1; -0197.1; -0214.1; -0232.1.) OSHA explained in detail in the proposed rule why it has such authority (see 73 FR 59731-59733, Oct. 9, 2008). Paragraph (e) is promulgated as proposed.

Paragraph (f)

Paragraph (f) requires that where a provision in the rule directs an operator, crewmember or other employee to take a specified action, it is the employer's responsibility to establish work rules to require the relevant employees to take that action, and to effectively communicate and enforce those work rules. This paragraph clarifies

[8] The definition of "controlling entity" is explained in the discussion of § 1926.1402(c).

the employer's obligations with regard to such provisions. No comments on this paragraph were received, and it is being promulgated as proposed with only a minor grammatical correction.[9]

Paragraph (g)

Some commenters requested that OSHA provide a complete exemption from subpart CC for subpart V work. As discussed in § 1926.1410(k), OSHA has addressed their concerns through exclusions from specific requirements of the rule.

Most employers engaged in construction work under subpart V are also engaged in general industry work under § 1910.269, which covers the operation and maintenance of electric power generation, transmission, and distribution installations. The requirements for mechanical equipment in § 1910.269(p) are at least as protective as the requirements in §§ 1926.1407-1926.1411 of subpart CC. Therefore, OSHA determines it is appropriate to give employers doing subpart V work the option of complying with § 1910.269(p) in lieu of the requirements in §§ 1926.1407-1926.1411 of this final rule. This decision has been codified in paragraph (g) of this section and a note referencing this new paragraph has been added to § 1926.952(c)(3).

Paragraph (h)

Paragraph (h) notes that § 1926.1402, *Ground conditions*, does not apply to cranes used on railroad tracks that are part of a general railroad system that is regulated

[9] For clarity, OSHA is substituting references to "shall" in the proposed rule with "must" in this final rule to remove any implication that the sentence is descriptive, rather than imperative.

by the Federal Railroad Administration. OSHA added paragraph (h) to this section of the final rule to aid the public in finding this exception. (See discussion of this provision at § 1926.1402(f).)

Section 1926.1401 Definitions

OSHA includes a number of definitions to clarify the meaning of terms used in this subpart. Many of the defined terms are commonly used in the industry, and C-DAC in most instances relied on standard industry sources or its own understanding of how terms are used in the industry to help ensure that the definitions would be readily understood by employers and employees. Industry sources on which C-DAC relied include existing OSHA standards, consensus standards, and "A Glossary of Common Crane and Rigging Terms" (Specialized Carriers and Rigging Foundation 1997) ("SC&RF Handbook") (ID -0019). OSHA includes other definitions to ensure that certain terms used in the proposed standard have a precise, unambiguous meaning.

One commenter noted that definitions as proposed were not identical to those in certain consensus standards and requested they be changed to match. (ID -0178.1.) The commenter cited to various consensus standards, including ANSI A10.31-2006, ANSI A10.28-1998, ANSI A10.33-1998, and ANSI Z359.0-2007. The commenter did not explain why the definitions as proposed were inappropriate nor how the change would improve safety. As noted above, consensus standards were utilized as a resource in developing the definitions for this subpart. OSHA disagrees with the commenter's position that the definition must match consensus standards. OSHA established definitions that would work in the framework of the equipment covered by this subpart,

would coordinate with other OSHA standards and provide a foundation for enforcing the requirements of this subpart. As a result, OSHA is not making modifications to definitions based on this commenter's request.

A few definitions in this final rule have been modified from or added to those in the proposed rule. Those definitions are: A/D director; Assembly/Disassembly; Builder; Controlling entity; Digger derrick; Duty cycle; Freeboard; Hoist; Load moment (or rated capacity) indicator; Load moment (or rated capacity) limiter; Nationally recognized accrediting agency; Positioning device system; Range control limit device; Repetitive lift; Tower crane; Type; Upperworks; and Wire rope.

The reasons for these additions or modifications are discussed in the preamble at the location indicated in Table 5 below, with the exception of the definition for hoist, which is discussed below.

OSHA received one comment on the definition of "hoist" in the proposed rule. (ID -0122.0.) This commenter expressed concern that the proposed definition would exclude hoists that utilized wire rope or chains. To address this concern, OSHA modified the definition of "hoist" in the final rule to refer to "a line" rather than "rope." The use of the more general term "line" is intended to refer to any material (e.g. rope, wire rope, chain, etc.) used to connect the hoist to that which is being hoisted.

Definitions that did not receive comment are adopted for the reasons set forth in the preamble of the proposed rule (see 73 FR 59733-59739, Oct. 9, 2008).

The preamble location for discussion of all definitions provided in § 1926.1401 can be found in Table 5 below.

Table 5. Index of Defined Terms

Term	Location of Preamble Discussion	Term	Location of Preamble Discussion
A/D director	§ 1926.1404(a)	Load	§ 1926.1401
Articulating crane	§ 1926.1401	Load moment (or rated capacity) indicator	§ 1926.1416(e)(4)
Assembly/ Disassembly	§ 1926.1403	Load moment (or rated capacity) limiter	§ 1926.1416(e)(4)
Assist crane	§ 1926.1404(h)(4)	Locomotive crane	§ 1926.1401
Attachments	§ 1926.1400(b)(2)	Luffing jib limiting device	§ 1926.1416(d)(2)
Audible signal	§ 1926.1419(b)	Marine hoisted personnel transfer device	§ 1926.1431(b)(2)(iii)
Blocking	§ 1926.1404(h)(2)	Marine worksite	§ 1926.1431(b)(2)(iii)
Boatswain's chair	§ 1926.1431(o)	Mobile cranes	§ 1926.1401
Bogie	§ 1926.1435	Moving point-to-point	§ 1926.1423(e)(1)
Boom (equipment other than tower crane)	§ 1926.1401	Multi-purpose machine	§ 1926.1400(a)
Boom (tower cranes)	§ 1926.1435(e)(5)(ii)	Nationally recognized accrediting agency	§ 1926.1427(b)(1)(i)
Boom angle indicator	§ 1926.1416(d)(1)(i)(A)	Non-conductive	§ 1926.1407(b)(2)
Boom hoist limiting device	§ 1926.1416(d)(1)	Operational aids	§ 1926.1416
Boom length indicator	§ 1926.1416(e)(3)	Operational controls	§ 1926.1417(b)(2)
Boom stop	§ 1926.1416(a)(2)	Operator	§ 1926.1401
Boom suspension systems	§ 1926.1404(h)(7)	Overhead and gantry cranes	§ 1926.1438
Builder	§ 1926.1436(c)	Paragraph	§ 1926.1401
Center of gravity	§ 1926.1404(h)(6)	Pendants	§ 1926.1404(h)(8)
Certified	§ 1926.1431(e)(5)	Personal fall	§ 1926.1423(g)

welder		arrest system	
Climbing	§ 1926.1435(b)(7)	Portal cranes	§ 1926.1415(a)(1)
Come-a-long	§ 1926.1400(c)(10)	Positioning device system	§ 1926.1423
Competent person	§ 1926.1401	Power lines	§ 1926.1407-1411
Controlled load lowering	§ 1926.1426(d)	Procedures	§ 1926.1401
Controlling entity	§ 1926.1402(c)	Proximity alarm	§ 1926.1407(b)(3)
Counterweight	§ 1926.1404(h)(9)	Qualified evaluator (not a third party)	§ 1926.1428(a)(2)
Crane/derrick	§ 1926.1400	Qualified evaluator (third party)	§ 1926.1428(a)(2)
Crawler crane	§ 1926.1401	Qualified person	§ 1926.1401
Crossover points	§ 1926.1413(a)(3)(iii)	Qualified rigger	§ 1926.1425(c)(3)
Dedicated channel	§ 1926.1420(b)	Range control limit device	§1926.1408(a)
Dedicated pile-driver	§ 1926.1439(a)	Range control warning device	§ 1926.1407(a)(3)
Dedicated spotter (power lines)	§ 1926.1407(b)	Rated capacity	§ 1926.1401
Digger derrick	§ 1926.1400(c)(4)	Rated capacity indicator	§ 1926.1416(e)(4)
Directly under the load	§ 1926.1425(e)(1)	Rated capacity limiter	§ 1926.1416(e)(4)
Dismantling	§ 1926.1405	Repetitive lift	§1926.1414(e)(2)
Drum rotation indicator	§ 1926.1416(e)(5)(ii)	Repetitive pickup points	§ 1926.1413(a)(3)(iii)
Duty cycle	§ 1926.1414 (e)(2)	Running wire rope	§ 1926.1413(a)(2)(ii)(A)
Electrical contact	§ 1926.1407-1411	Runway	§ 1926.1431(k)(12)(ii)(A)
Employer-made equipment	§ 1926.1437(m)(4)	Section	§ 1926.1401
Encroachment	§ 1926.1407-1411	Side-boom crane	§ 1926.1440
Equipment	§ 1926.1400	Special hazard warnings	§ 1926.1417(c)(1)

Equipment criteria	§ 1926.1412(b)(1)(i)	Stability (flotation device)	§ 1926.1437(m)
Fall protection equipment	§ 1926.1423(e)	Standard Method	§ 1926.1419(c)
Fall restraint system	§ 1926.1423(d)-(e), (g)	Such as	§ 1926.1401
Fall zone	§ 1926.1425(b)	Superstructure	§ 1926.1424(a)(1)
Flange points	§ 1926.1413(a)(3)(iii)	Tag line	§ 1926.1407(b)(2)
Floating cranes/derricks	§ 1926.1437	Tender	§ 1926.1437(j)(3)
For example	§ 1926.1401	Tilt-up or tilt down operation	§ 1926.1425(e)
Free fall (of the load line)	§ 1926.1426(d)	Tower crane	§ 1926.1401
Free surface effect	§ 1926.1437(m)(5)(ii)	Travel bogie (tower cranes)	§ 1926.1435(d)(2)(iv)
Freeboard	§ 1926.1437(m)(2)	Trim	§ 1926.1437(e)(1)
Hoist	§ 1926.1401	Two blocking	§ 1926.1416(d)(3)
Hoisting	§ 1926.1401	Type	§ 1926.1427(b)(1)(ii)(B)
Include/ including	§ 1926.1401	Unavailable procedures	§ 1926.1417(b)
Insulating link/device	§ 1926.1408(b)(4)(v)	Up to	§ 1926.1401
Jib stop	§ 1926.1415(a)(3)	Upperstructure	§ 1926.1424(a)(1)
Land crane/derrick	§ 1926.1437	Upperworks	§ 1926.1424(a)(1)
List	§ 1926.1437(e)(1)	Wire rope	§ 1926.1413

Section 1926.1402 Ground conditions

The Committee determined that the failure to have adequate ground conditions is a significant crane safety problem. Adequate ground conditions are essential for safe equipment operations because the equipment's capacity and stability depend on such conditions being present. In the Committee's view, there are two key problems regarding ground conditions: (1) equipment is commonly brought on site by a subcontractor, who typically has neither control over ground conditions nor knowledge of hidden hazards, and (2) the entity that usually does have such authority – the controlling entity – may not

have the expertise to know what changes are needed to make the ground conditions suitable for equipment operations. This section is designed to address these problems so that ground conditions will be made sufficient for safe equipment operations.

One commenter asserted that, with respect to digger derricks, the ground conditions provision should be changed. In particular, the commenter stated that the Committee should incorporate by reference secs. 7 through 10 of ANSI/ASSE A10.31-2006, *Safety Requirements, Definitions, and Specifications for Digger Derricks; American National Standard for Construction and Demolition Operations*. (ID -0178.1.) In addition, the commenter asserted that the ANSI/ASSE standard "addresses worksite selection that is clearer than what OSHA has proposed. For example, the proposed rule does not recognize the danger that ditches can have on placement, which is a common occurrence."

OSHA first notes that these suggestions apply only to digger derricks and thus interprets the comment as a recommendation that digger derricks be treated differently than other equipment under § 1926.1402. As we noted in the preamble to the proposed rule, the Committee determined that the failure to have adequate ground conditions is a significant safety problem. The Committee's determination that this safety problem exists for various types of equipment is underscored by the application of § 1926.1402 to nearly all equipment covered by this subpart. In addition, where the Committee intended for certain equipment to be exempted from § 1926.1402, it indicated that expressly (see, e.g., § 1926.1440, *Sideboom Cranes*). OSHA defers to the expertise of the Committee on this issue.

Secondly, OSHA has reviewed ANSI/ASSE A10.31-2006 and found that it is substantively distinguishable from § 1926.1402. Specifically, the two standards differ in the assignment of responsibilities. ANSI/ASSE A10.31-2006 divides responsibilities among digger derrick dealers/installers, owners, users, and operators. Notably, controlling entities (who often do not fall into any of the ANSI/ASSE A10.31-2006 categories) are assigned no responsibility at all. Furthermore, the discussion of worksite conditions is included only in sec. 10, *Responsibilities of Operators*. ANSI/ASSE A10.31-2006 places the responsibility of examining ground conditions entirely on the operator. Also, ANSI/ASSE A10.31-2006 does not require that the ground condition requirements be met before the equipment is installed; it requires only that the worksite be surveyed before the digger derrick is used. In sum, OSHA concludes that § 1926.1402 is more effective than ANSI/ASSE A10.31-2006 and declines to incorporate ANSI/ASSE A10.31-2006 by reference.

The Agency disagrees with the commenter that § 1926.1402 fails to adequately address ditches. The hazard posed by a ditch is that the ground is less firm in the area adjacent to it. Under § 1926.1402, the ground must be sufficiently firm to provide "adequate support" for the equipment. The section as proposed therefore addresses this hazard.

Paragraph (a) Definitions

Paragraph (a) provides definitions of key terms used in this section. The term "ground conditions" is defined as the ability of the ground to support the equipment (including slope, compaction and firmness). The Committee determined that slope,

compaction and firmness are the key factors that are involved in the ability of the ground to support the equipment.

"Supporting materials" is defined as meaning blocking, mats, cribbing, marsh buggies (in marshes/wetlands), or similar supporting materials or devices. Such materials typically help to distribute the load of the crane over a broad area and/or assist in leveling the equipment. The list in the definition of examples of such materials is nonexclusive – it includes similar materials and devices that would serve the same purpose(s).

The one comment that was received that referenced this provision is addressed in the discussion below of § 1926.1402(b). (See ID -0178.1.)

Paragraph (b)

Under paragraph (b) of this section, the equipment is prohibited from being assembled or used[10] unless ground conditions are firm, drained, and graded to a sufficient extent so that, in conjunction (if necessary) with the use of supporting materials, the equipment manufacturer's specifications for adequate support and degree of level of the equipment are met. A crane's stability depends (in part) on the crane being level, and "degree of level" is a term used in the industry to describe the manufacturer's specification for how level the crane must be. The Agency determined that the text of the proposed rule did not make it clear that the drainage requirement did not apply to marshes/wetlands. Accordingly, the final rule's text has been modified to clearly state that this is the only exception. All other conditions related to have a stable surface for the equipment is applicable.

[10] Note that "used" is not limited to use of the equipment at a fixed location; it also includes when the equipment is traveling with a load.

In the Committee's experience, crane tip-over incidents caused by inadequate ground conditions are a significant cause of injuries and fatalities. For example, on September 28, 1999, a 19 year old electrical instrument helper was killed by a crane that overturned because insufficient care was taken to ensure that the ground under the crane was firm and that the crane's outriggers were properly supported. (ID -0017.13.) Conditions that enhance the chance of such accidents include ground that is wet or muddy, poorly graded, or that is loose fill (or otherwise disturbed soil) that has not been compacted. The Committee determined that requiring adequate ground conditions will prevent many of these accidents. The exception for marshes and wetlands is included because the Committee was aware that, in many instances, the draining of marshes/wetlands is prohibited or restricted by environmental laws and there are devices available (such as marsh buggies) that are designed to provide adequate support to cranes in such areas.

One commenter suggested that the term "level" could be confusing and suggested that it be defined as "less than one degree of grade change or as required by the manufacturer." (ID -0178.1.) OSHA finds this comment unpersuasive. The suggested language is circular because it does not use the term "level" by itself; it refers to "the equipment manufacturer's specifications for . . . degree of level of the equipment." The reason the provision refers to the manufacturer's specification in this regard is that it is the manufacturer that establishes the load chart, and the load chart is valid only for the parameters, including degree of level, established by the manufacturer.

At the public hearing, a representative of the railroad industry raised an issue that OSHA determines could be the source of some confusion. The commenter indicated that

the railroad industry regularly has to work in out-of-level conditions, since some sections of track are not level. (ID -0342.) The commenter explained that the manufacturers of track-mounted cranes provide specialized load charts which take into account these out-of-level conditions.

The manufacturers of these cranes apparently specify that the cranes can be used in certain out-of-level circumstances, as evidenced by their provision of load charts for those conditions. Therefore, the use of equipment in accordance with manufacturer specifications regarding degree of level would meet § 1926.1402(b)'s requirement because the provision permits use of the equipment in accordance with those specifications.

Paragraph (c)

Under § 1926.1402(c), the controlling entity has several specific duties regarding ground conditions. OSHA's authority to impose these duties is discussed in detail in the preamble to the proposed rule (see 73 FR 59731-59732, Oct. 9, 2008), and the Agency re-asserts the same authority with respect to the final rule. As it did with respect to the proposed rule, the Agency is again stating that the duties imposed on the controlling entity through the promulgation of this final rule are supplemental to, and do not displace, controlling entity duties under OSHA's multi-employer policy. (See § 1926.1402(e), discussed below; 73 FR 59731, Oct. 9, 2008).

"Controlling entity" is defined in § 1926.1401 as "an employer that is a prime contractor, general contractor, construction manager or any other legal entity which has the overall responsibility for the construction of the project – its planning, quality and

completion." This definition, which generally mirrors the definition of "controlling contractor" in the steel erection standard, 29 CFR part 1926, subpart R, reflects the core principle of general supervisory control over the construction site. In this final rule, OSHA is clarifying the definition to make it clear that the controlling entity must be an employer.

Section 1926.1402(c)(1) requires the controlling entity to ensure that ground preparations necessary to meet the requirements in paragraph (b) of this section are provided. The Committee determined that it is necessary to specify who will have ground condition responsibility because in many instances the parties are unable to agree on who will have (or has) that contractual responsibility, with the result that often no one corrects inadequate ground conditions.

In the Committee's view, the crane user and operator typically do not have the equipment or authority to make such preparations. In contrast, the controlling entity, due to its control of the worksite, has the requisite authority and is in the best position to arrange for adequate ground conditions. The Committee was concerned, however, that some controlling entities may lack the expertise to recognize when ground conditions are inadequate. To address this concern, the Committee developed § 1926.1402(e).

One commenter said that adequate site assessment requires defining ground bearing capacity compared to loading of the machine, along with soil testing and proper analysis for ground conditions. (ID -0143.1.) As explained in the preamble of the proposed rule, C-DAC considered, but rejected, including specification requirements regarding the soil conditions (see 73 FR 59739-59740, Oct. 9, 2008). This reflected the view that most sites and circumstances do not require sophisticated soil testing. In light

of C-DAC's decision not to add new testing or soil specifications, the many variables that may affect ground conditions, and the existing body of law and OSHA guidance relating to testing duties under the Agency's multi-employer policy, the Agency concludes that it is appropriate to allow the controlling entity flexibility in the manner in which it satisfies its duties under § 1926.1402 and the multi-employer policy.

Under § 1926.1402(c)(2), the controlling entity is required to inform the user of the equipment and the equipment operator of the location of hazards beneath the equipment set-up area (such as voids, tanks, and utilities, including sewer, water supply, and drain pipes) that are identified in documents (such as site drawings, as-built drawings, and soil analyses) that are in the possession of the controlling entity. These underground hazards can compromise the ability of the ground above them to support the equipment. In the experience of members of the Committee, because of the hidden nature of these hazards, accidents have occurred when cranes have been set up above such hazards and a portion of the ground has given way.

In developing this provision, the Committee was mindful that the controlling entity often possesses documents obtained or developed during the ordinary course of business that identify the location of such hazards. Under the provision as proposed, if the controlling entity has such a document, whether at the site or at an off-site location, it is required to inform the equipment user and operator of the location of the hazard as identified in it. If the controlling entity does not possess the information, it is not required to obtain it from another source. The Committee concluded that requiring the controlling entity to obtain such information from other sources would, in effect, require

it to arrange for testing. As explained above, the Committee determined such a duty would be unduly burdensome and unnecessary.

Some commenters indicated that clarification is needed regarding whether the controlling entity is required to possess particular documents. (ID -0166.1; -0214.1.) OSHA agrees that additional clarification is needed and is making two changes in the final text of paragraph (c)(2) of this section. Both of these clarifications are consistent with the rationale of the rule that the controlling entity need only share information that it possesses, and that the controlling entity has no obligation under § 1926.1402 to seek out additional information not in its possession.

First, OSHA is replacing the proposed phrase "available to the controlling entity" with "in the possession of the controlling entity, whether at the site or off-site." As explained in the preamble to the proposed rule,

> [i]n developing this proposed provision, the Committee was mindful that the controlling entity often has access to documents that may identify the location of such hazards. . . . Under this proposed provision, if the controlling entity has such a document, whether at the site or at an off-site location, it would be required to inform the equipment user and operator of the location of the hazard as identified in it. If the controlling entity does not possess such a document, it would not be required to obtain it from another source.

The phrase "available to" may be interpreted as including documents that the controlling entity does not already have in its possession but has the ability to obtain, i.e., procure, from other entities. As is evident from the proposed rule explanation quoted above, the intent is to apply the duty only with respect to information that is already in the controlling contractor's possession, whether at the site or off-site.

Second, OSHA is revising the text of paragraph (c)(2) of this section to emphasize that the employer's existing responsibilities under OSHA's multi-employer policy are not

changed by this new rule. As noted above and in the preamble to the proposed rule, the duties provided in § 1926.1402 supplement, and do not displace, the controlling entity's duties under the multi-employer policy.[11] The multi-employer policy reflects the Secretary's reasonable interpretation of the OSH Act and requires controlling employers to exercise reasonable care to prevent and detect violations on the site. See OSHA CPL 02-00-124, *Multi-Employer Citation Policy*, Dec. 10, 1999. Under this policy, the controlling employer has a duty to address hazards the employer either creates or controls, regardless of whose employees are threatened by the hazard. See, e.g. *Universal Const. Co., Inc. v. Occupational Safety and Health Review Comm'n*, 182 F3d 726, 730 (10th Cir. 1999). Implicit in those duties is a duty to notify employees of hazards the controlling employer controls and has already detected, particularly where such notification would prevent a violation. As noted in the preamble to the proposed rule, requiring employers to include hazard information needed by downstream employees is a necessary and appropriate means to ensure that the employees are apprised of all hazards to which they are exposed. (See 73 FR 59731, Oct. 9, 2008; see also *American Petroleum Institute v. OSHA*, 581 F.2d 493, 510 (5th Cir. 1978).) (OSHA may require upstream employers to warn downstream employees of concealed hazards

[11] The Agency anticipates that the majority of controlling entities will also be controlling employers for the purposes of the multi-employer policy. However, even to the extent that a controlling entity does not also meet the definition of a controlling employer, the Agency has the authority to require the controlling entity to comply with the requirements of § 1926.1402. (See discussion of authority at 73 FR 59731-59732, Oct. 9, 2008.) With respect to the controlling entity's duty to warn the operator and other users of the equipment about hidden ground condition hazards, § 1926.1402(c) constitutes OSHA's exercise of its authority to "prescribe the use of labels or other appropriate forms of warning as are necessary to insure that employees are apprised of all hazards to which they are exposed . . . and proper conditions and precautions of safe use or exposure." 29 U.S.C. § 655(b)(7).

when the upstream employer knows of those hazards under remedial purpose of the OSH Act and OSHA's broad authority to prescribe warning labels under 29 U.S.C. § 655(b)(7)).

OSHA is therefore clarifying in paragraph (c)(2) that the controlling entity still must share both documentary and non-documentary information about other hazards when the hazards are "known to the controlling entity." This requirement only applies to hazard information already in the possession of the controlling entity, and does not require the controlling entity to obtain any additional information. For example, if the controlling entity is setting up non-crane equipment and discovers during the course of that work that there is an undocumented void in the area where the crane is to be set up, the controlling entity would be required to share that information with the crane operator. Although this requirement extends beyond the "documents" specified in the proposed rule, it is consistent with the rationale provided in the proposed rule and is supported by those commenters who favor this provision: C-DAC sought to distinguish between information in the possession of the controlling entity, and information that must be sought out by the controlling entity. Thus, to comply with § 1926.1402(c)(2) of the final rule, the controlling entity has no duty to seek out new information not already in its possession; it is only required to share information already in its possession, whether or not such information is contained in a document.

OSHA received several comments about whether these responsibilities should rest with the controlling entity as it is defined in § 1926.1401 (prime contractor, general contractor, construction manager or any other legal entity which has the overall responsibility for the construction of the project – its planning, quality and completion).

One commenter sought clarification on whether a construction manager/general contractor or a site/project owner is considered the controlling entity where the latter contracts with the former but retains responsibility for oversight of certain matters (e.g., quality control, safety). The commenter also wanted to know if the site/project owner is still responsible for inspecting ground conditions under § 1926.1402 if the construction manager/general contractor is the controlling entity. (ID -0107.1.) As explained above, the "controlling entity" is the entity which has the overall responsibility for the construction of the project – its planning, quality and completion. Where this responsibility is split among several entities, there may not be a controlling entity. In that case, § 1926.1402(d) applies: whichever employer has authority to make or arrange for ground preparations is required to ensure that the necessary ground preparations are made. If more than one entity each possesses this authority, then OSHA holds each of those entities separately liable for the duty to ensure that the necessary ground preparations are made.

Some commenters suggested that the provision is unclear as to which hazards, i.e., known or unknown, the controlling entity is required to disclose. (ID -0166.1; 0214.1.) The purpose of this requirement is to ensure that the user of the equipment and the operator are informed of hazards that might not be known to them, because they are beneath the set-up area, but are known to the controlling entity. In other words, under this provision, the controlling entity must examine information in its possession (such as site drawings, as-built drawings, and soil analyses) to see if there are hazards beneath the set-up area. If there are hazards identified in those documents, or if the controlling entity has already identified other hazards not in those documents, the controlling entity must

inform the user and operator of the hazards. As explained above and in the proposed rule preamble, new § 1926.1402 does not place any new requirements on the controlling entity to discover hazards that are not already known to it (see 73 FR 59741, Oct. 9, 2008). The Agency concludes that the provision's language adequately reflects this intent.

One commenter suggested that § 1926.1402(c) be replaced with a section that would simply encourage a cooperative meeting between the controlling entity, the employer using the crane, and the employer best situated to control and prepare the ground conditions. (ID -0218.1.) OSHA determines that such a change would merely replicate the status quo, an arrangement which the Committee found to be inadequate for ensuring adequate ground conditions.

Several commenters argued that the crane operator, not the controlling entity, should be required to obtain information about the location of hazards beneath the equipment set-up area. (ID -0165.1; -0179.1; -0191.1; -0197.1; -0214.1; -0232.1; -0235.1; -0285.1.) These comments fell into one of two groups.

The first group argued that some controlling entities are either not engaged in construction work,[12] may have little to no expertise concerning ground conditions in general, or may hire subcontractors to work at a remote location of which the controlling entity may have little knowledge. (See, e.g., ID -0147.1; -0165.1; -0232.1; -0235.1.) This group appears to read § 1926.1402(c)(1) to mean that the controlling entity must personally determine and provide the ground conditions necessary to meet the requirements in § 1926.1402(b).

[12] In most cases entity that meets the definition of "controlling entity" will be engaged in construction.

C-DAC considered the concern that some controlling entities would not have the expertise needed to determine if ground conditions were adequate. The final rule therefore addresses this concern in two ways. First, paragraph (c)(1) provides that the controlling contractor is responsible for "ensuring" that these ground conditions are provided. In other words, if the controlling contractor is not familiar with the crane's requirements or with the ground conditions at the particular site, then it must make sure that someone who is familiar with those requirements and conditions provides what is required by § 1926.1402(b). Second, under § 1926.1402(e), if the A/D director or operator determines that ground conditions are inadequate, the controlling entity will, through a discussion, obtain the relevant information. (See discussion of 1926.1402(e) at 73 FR 59741, Oct. 9, 2008).

One of the commenters suggested that § 1926.1402(c) be revised to place requirements on either the controlling entity or a competent person designated by the controlling entity. (ID -0191.1.) As explained above, § 1926.1402, as promulgated, does not preclude a controlling entity from using a competent person to provide the information it needs to meet its responsibilities under this section. However, C-DAC's experience indicates that it is important to ensure that one entity with the authority to address ground condition hazards has the responsibility to do so. To permit a controlling entity to divest itself of its ground condition responsibilities would unduly fragment responsibility for ground conditions, thus defeating one of the goals of the section.

The second group argued that the rule may result in situations that are beyond the capacity and responsibility of certain subcontractors. (See, e.g., ID -0165.1; -0191.1; -0235.1.) One commenter suggested that the definition of "controlling entity" be revised

"to reflect that subcontractors and others who have little to do with the overall project including site conditions and do not have the expertise to determine compliance with crane manufacturer specifications are not included in the definition, purpose, or requirements of a controlling entity." (ID -0191.1.) These commenters also argued that, because such subcontractors do not know or control the site conditions, the responsibilities in § 1926.1402(c) should fall on the crane owner or operator. The other two commenters were concerned about the effect of the rule on heating, ventilating, air conditioning, and refrigeration (HVACR) contractors in particular. (ID -0165.1; -0235.1.)

These commenters have misunderstood § 1926.1402(c). For example, an HVACR contractor, if contracted to do only HVACR work and is not in control of the entire work site, would not be the controlling entity, and would be subject to the limited requirements in § 1926.1402(d) only if it had authority to make changes to the ground conditions.

One commenter requested that the term "user of the equipment" be defined. (ID -0214.1.) OSHA determines this term does not need to be defined in § 1926.1401, since its meaning is sufficiently clear. "User of the equipment" refers to the employer that is using the equipment to perform a task. For example, a drywall installation employer engaged in erecting precast wall panels would be a "user of the equipment" if that employer directs a crane to hoist the panels into place. Similarly, an employer installing wooden roof trusses would be a "user of equipment" if that employer directs a crane to place the trusses on the structure. A general contractor handling several subcontracting areas, but not the controlling entity for the worksite, would also be a "user of equipment"

if it directs its subcontractors to use a crane to hoist materials. In the latter example, the general contractor and the subcontractor would each be a "user of equipment."

Paragraph (d)

In the event that no controlling entity exists, § 1926.1402(d) provides that the requirement in § 1926.1402(c)(1) must be met by the employer that has authority at the site to make or arrange for ground preparations needed to meet the requirements of § 1926.1402(b). For example, if the employer who hires the crane has the authority to get the ground prepared in the absence of a controlling entity, the responsibility for complying with § 1926.1402(b) would fall to that employer. However, that employer would not be required to comply with § 1926.1402(c)(2) because the information required to be disclosed under § 1926.1402(c)(2) is not likely to be available to that employer.

One commenter suggested that paragraph (d) of this section be revised to read that the requirements in § 1926.1402(c)(1) must be met by a competent person designated by the employer that has authority at the site to make or arrange for ground preparations needed to meet the requirements of § 1926.1402(b). (ID -0191.1.) As explained above with respect to a similar suggestion regarding § 1926.1402(c), OSHA determines this would have the effect of unduly fragmenting the responsibility for ground conditions, which is contrary to the intent of the provision.

For the reasons above, OSHA is promulgating § 1926.1402(d) as proposed.

Paragraph (e)

Proposed § 1926.1402(e) established a mechanism for a controlling entity to obtain information from the A/D director or the equipment operator about insufficient ground conditions and the preparations needed to correct the problem. Specifically (as discussed above in the context of § 1926.1402(c)(1)), if the A/D director or equipment operator determines that ground conditions do not meet the criteria in § 1926.1402(b), that person's employer is required to have a discussion with the controlling entity regarding the ground preparations needed so that, with the use of suitable supporting materials/devices (if necessary), the requirements in § 1926.1402(b) can be met.

The Committee determined that, in some instances, the controlling entity may lack the expertise needed to know what ground preparations may be needed. In such cases, it is necessary for the information it needs to be provided by the A/D director or operator, who has that expertise, so that the preparations needed for safe crane operations can be made. The Committee concluded that, in such circumstances, such a discussion would make it more likely that the requirements in § 1926.1402(b) would be met, which, as discussed above, is necessary for safe crane operations.

One commenter suggested that the provision will encourage disputes. The commenter suggested that rental companies would not accept a controlling entity's ground conditions unless the controlling entity purchases services from the rental company to improve them. (ID -0105.1.)

OSHA determines that the commenter's concerns are unwarranted. Section 1926.1402(e) is a mechanism for a controlling entity to obtain information to facilitate its compliance with § 1926.1402(c)(1). Once ground conditions meet the criteria in §

1926.1402(b), the controlling entity is not required to make further improvements, even if the rental company objects.

For the reasons above, OSHA is promulgating § 1926.1402(e) as proposed, with the substitution of the word "director" for the word "supervisor" to be consistent with the change made and discussed in § 1926.1404.

Paragraph (f)

At the public hearing, a representative of the railroad industry explained that, in his experience, railroads use cranes to: remove, replace or renew rails; build bridges; handle materials; and to pick up and repair railroad cars. (ID -0342.) In addition, the witness explained that the railroad industry uses a variety of construction equipment, some on the tracks (locomotive cranes, rubber-tired off-road cranes that are capable of being used on the tracks) and others off the tracks (rubber-tired off road cranes, truck cranes, and service trucks). (ID -0342.) The witness estimated that 95% of railroad industry crane operations take place on or around railroad tracks. (ID -0342.)

One commenter expressed concern about the application of § 1926.1402 to the railroad industry's use of cranes and requested an exemption for the use of cranes on and alongside tracks. (ID -0176.1; -0292.1.) The commenter expressed two specific concerns. First, that, unlike most construction sites, a railroad construction site may include many miles of railroad track. The commenter elaborated that the time and cost associated with locating and checking site drawings and soil analyses – which the commenter said may arguably be available to the railroad industry – for thousands of

miles of track would be "exorbitant" and would "not appreciably lower the risks to the crane operator." (ID -0176.1.)

As for the cost associated with locating and checking documents, § 1926.1402 does not require the controlling entity to possess or acquire any particular documents or other information, but requires that the controlling entity share any information about underground hazards that it has in its possession with the crane user and operator. As explained above, OSHA has replaced "available to" with "in the possession of" to make this clear.

The commenter also suggested that there is no need to apply § 1926.1402 to cranes used by railroads along track rights of way because the Federal Railroad Administration (FRA) has regulations that specify minimum requirements for roadbeds and areas immediately adjacent to roadbeds that concern the ground conditions underneath and alongside the track, as well as requirements for how the track must be laid.

The Federal Railroad Administration has established requirements for the ballasts beneath railroad tracks,[13] limited requirements for the roadbed,[14] and requirements for the

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[13] The FRA regulations for the ballast (the foundation for most railroad tracks) can be found at 49 CFR 213.103 and 213.334, depending on the class of track. The provisions are otherwise identical, and provides:

> Unless it is otherwise structurally supported, all track shall be supported by material which will—
> (a) Transmit and distribute the load of the track and railroad rolling equipment to the subgrade;
> (b) Restrain the track laterally, longitudinally, and vertically under dynamic loads imposed by railroad rolling equipment and thermal stress exerted by the rails;
> (c) Provide adequate drainage for the track; and
> (d) Maintain proper track crosslevel, surface, and alignment.

[14] FRA requirements address issues other than ground support in the area adjacent to the track roadbed. Specifically, 49 CFR 213.31 requires that each drainage or other water

track surface.[15] The failure of any one of these elements (the ballast, the roadbed or sub-grade, or the track) is detrimental to the effectiveness of the system as a whole. These provisions are designed to, in concert, enable trains to travel safely, and involve conditions adjacent to the track only to the extent that they affect track stability.

The comment is persuasive to the extent that it pertains to cranes that operate on railroad tracks that are part of the general railroad system of transportation because FRA's regulations address ground support for the tracks.[16] Therefore, OSHA has decided to exempt from the requirements of § 1926.1402 cranes used on railroad tracks that are part of the general railroad system of transportation subject to FRA regulation. To effectuate this change from the proposed rule, OSHA has added § 1926.1402(f), which exempts cranes that are designed for use on railroad tracks and that are being used on tracks regulated by the Federal Railroad Administration requirements at 49 CFR 213. In addition, OSHA has exempted railroad tracks and their underlying support from the ground conditions inspection requirements in § 1926.1412(d)(1)(x).

The commenter also stated that the FRA has regulations that "concern[] the ground conditions . . . alongside the track." (ID -0176.1.) The only aspects of the ground

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carrying facility under or immediately adjacent to the roadbed be maintained and kept free of obstruction, to accommodate expected water flow for the area concerned. Section 213.37 requires the control of vegetation on railroad property which is on or immediately adjacent to roadbeds to prevent fires, maintain visibility and signals, and to prevent interference with other duties.

[15] 49 CFR 213.51 et seq. contains requirements for the gage, alignment, and surface of the track.

[16] The general railroad system of transportation is defined as "the network of standard gage track over which goods may be transported throughout the nation and passengers may travel between cities and within metropolitan and suburban areas." Appendix A to 49 CFR part 209. If a railroad that is part of the general railroad system of transportation operates over track that is confined to an industrial installation, that plant trackage is also considered part of the general railroad system of transportation.

conditions of the area adjacent to the track roadbed addressed by the FRA regulations are drainage and vegetation.[17] An area with adequate drainage can nonetheless present problems for equipment set-up with respect to slope, compaction and firmness, as well as have hazards beneath the set-up area. For this reason, the Agency has decided not to exempt equipment used alongside railroad tracks. Therefore, for example, a rubber tired off-road crane designed for use on tracks would be exempted from § 1926.1402 while being operated on the tracks, but would be subject to the requirements of §1926.1402 if used adjacent to the tracks.

Sections 1926.1403 - 1926.1406 Assembly and Disassembly

Sections 1926.1403 through 1926.1406 set out requirements designed to ensure the safety of employees while equipment is assembled and disassembled (and, in the case of tower cranes, during erecting, climbing and dismantling). C-DAC members indicated that, in their experience, the failure to adequately address hazards associated with these processes is a significant cause of injuries and fatalities. The Committee also concluded that the most effective way to reduce these injuries and fatalities would be to have a standard that comprehensively addresses these hazards (see also the Agency's discussion of fatality data associated with assembly/disassembly at 73 FR 59741-59742, Oct. 9, 2008).

Note that the term "procedures," which is used in the assembly/disassembly provisions, is defined to include (but is not limited to) instructions, diagrams, recommendations, warnings, specifications, protocols and limitations (see § 1926.1401).

[17] See the description of FRA requirements that relate to the area adjacent to the track roadbed in footnote 11.

The operation of an "assist" crane used to help in the assembly/disassembly process is not covered by the assembly/disassembly requirements but is covered by the other sections of this standard.[18]

One commenter suggested that the Agency clarify whether §§ 1926.1403 through 1926.1406 apply to activities that modify or increase the height of the crane such as "jumping." (ID -0156.1.) "Jumping" (or "climbing") refers to the process of adding mast sections to a tower crane to increase its height. In many cases a tower crane is first erected and used at one height, and then as the height of the structure being built increases, the height of the tower crane is increased in stages to keep pace with it.

Irrespective of whether the crane is initially erected to its full height, or is "jumped" in stages, the process of increasing the height of the crane is an assembly/erection process. Sections 1926.1403 through 1926.1406 apply whenever the crane's height is modified. To ensure that this intent is reflected in the standard, OSHA has added a sentence to the definition of "assembly/disassembly" in § 1926.1401 to this effect.

In proposed § 1926.1401, "assembly/disassembly" was defined to mean "the assembly and/or disassembly of equipment covered under this standard." With regard to tower cranes, 'erecting and climbing' replaces the term 'assembly,' and 'dismantling' replaces the term 'disassembly.' C-DAC did not originally include a definition of "assembly/disassembly," but OSHA included this definition in the proposed rule to avoid any implication that §§ 1926.1403-1926.1406 do not apply to tower cranes because the terms "assembly" and "disassembly" are not commonly used in the industry in referring

[18] However, the rigging requirements in §§ 1926.1404(r) and 1926.1425(c)(3) apply to the rigging used by the assist crane.

to tower cranes. Instead, the words "erecting," "climbing," and "dismantling," are used, and the definition of "assembly/disassembly" makes it clear that §§ 1926.1403-1926.1406 also apply to tower cranes.

Section 1926.1403 Assembly/Disassembly – selection of manufacturer or employer procedures

Final § 1926.1403 requires that when assembling or disassembling equipment (or attachments), the employer must comply with all manufacturer prohibitions applicable to assembly and disassembly and must also comply with either manufacturer procedures, or employer procedures, for assembly and disassembly. Employer procedures may be used only where the employer can demonstrate that the procedures used meet the requirements in § 1926.1406 and may not be used during rigging if the employer uses synthetic slings, as explained in the discussion below regarding § 1926.1404(r).

Two commenters suggested that only manufacturer procedures for crane assembly/disassembly be allowed. (ID -0151.1; -0305.1.) One of these commenters clarified its comment at the hearing (ID -0343) and confirmed this clarification in post-hearing submissions (ID -0387.1) that they did not believe the assembly/disassembly procedures should be limited to just manufacturer procedures. The commenter suggested using a procedure designed by a registered professional engineer or by a qualified person. (ID -0387.1.) Note that § 1926.1406(b) of the final rule requires employer procedures to be developed by a qualified person.

As explained in the proposed rule preamble, the Committee members discussed whether employers should be required to comply with the manufacturer's procedures, or

if deviations from those procedures should be allowed. The Committee determined that deviations should be allowed for two reasons. First, manufacturers' procedures are typically designed for use in "ideal" environments: large, flat, dry, unencumbered open areas. However, in C-DAC's experience, such conditions are not typical, especially in urban areas. Consequently, employers are currently unable to implement those procedures in those situations. Second, members were of the view that there is often more than one way to safely assemble and disassemble a crane, and that it is unnecessary to mandate that in every case the manufacturer procedures be used. The inclusion of specific requirements in the standard that employer procedures must meet (see § 1926.1406) addresses the concern that those procedures ensure worker safety.

Another commenter suggested that employer procedures not be allowed for climbing operations unless approved by the manufacturer. (ID -0137.1.) As explained in the discussion below regarding § 1926.1404(r), the Agency has decided to require manufacturer procedures to be used with regard to the use of synthetic slings. Since the commenter has not provided information substantiating the need for manufacturer approval with respect to deviation from climbing procedures, the Agency is unaware of any basis to conclude that the requirements in §§ 1926.1403 and 1926.1406 would be inadequate to ensure the safety of employer procedures in this regard. Therefore, OSHA has decided not to adopt the commenter's suggestion.

Another commenter suggested that if the Agency is going to allow employer procedures, a written copy should be required to be kept on the job site for the use of the entire crew. (ID -0178.1.)

The final rule requires that the A/D director understand the assembly/disassembly procedures. In addition, the A/D director must review the assembly/disassembly procedures prior to starting the assembly/disassembly process unless the A/D director is experienced in having used them on the same type and configuration of equipment and is able to recollect the procedures such that review is unnecessary. (See § 1926.1404(b).) Furthermore, before beginning assembly/disassembly operations, the A/D director must determine that the crew members understand their tasks and the associated hazards, as well as any hazardous positions/locations that they need to avoid. (See § 1926.1404(d).) These requirements ensure that both the A/D director and crew members understand the assembly/disassembly procedures that are going to be undertaken.

C-DAC declined to require the procedures to be in writing and at the site. In some cases, the procedures are not complex and are very familiar to the A/D director. In such cases C-DAC determined that having them in writing is not necessary. In other cases, such as where the procedures are complex, the equipment is new to the employer, or the A/D director has not often assembled/disassembled the equipment, there is an inherent incentive for the employer to have them in writing. In such instances, OSHA expects that the employer will have written procedures on site to facilitate meeting the requirements in §§ 1926.1404(b) and (d). The Agency therefore finds that it is not necessary to have a requirement that they be in writing and at the site.

Lastly, a commenter suggested that this section incorporate by reference the ANSI/ASSE A10.31 American National Standard, Safety Requirements, Definitions and Specifications for Digger Derricks. (ID -0178.1.) Because the commenter did not

explain how incorporating this standard would make the final rule more effective, OSHA has decided not to incorporate ANSI/ASSE A10.31 into § 1926.1403.

In the proposed rule, § 1926.1404(n) set forth the requirement (now set forth in this section) that an employer must comply with manufacturer prohibitions. The Agency decided that this important caveat to § 1926.1403 would be better understood if it was moved to this section. Therefore, § 1926.1404(n) is now reserved and its text is integrated in this section.

Additionally, OSHA has substituted an "or" in place of the "and" separating "assembling" and "disassembling" to clarify that the listed requirements apply when the employer is assembling or disassembling. Finally, a reference to § 1926.1404(r) has been added to § 1926.1403(b) to clarify when employer procedures may not be used.

Section 1926.1404 Assembly/Disassembly – general requirements (applies to all assembly and disassembly operations)

Paragraph (a) Supervision – competent –qualified person

Section 1926.1404(a) requires assembly/disassembly to be directed by a person who meets the criteria for both a competent person and a qualified person, or by a competent person who is assisted by one or more qualified persons ("A/D director"). Where the assembly/disassembly is being performed by only one person, that person must meet the criteria for both a competent person and a qualified person. For purposes of this standard, that person is considered the A/D director.

Section 1926.1401 defines "A/D director" as "an individual who meets this standard's requirements for an A/D director, irrespective of the person's formal job title

or whether the person is non-management or management personnel." C-DAC constructed the definition in this way to make clear that it is the substance of the individual's qualifications, and not his or her job title or position in the company hierarchy, that determines whether the person is qualified to act as an A/D director.

In the proposed rule, OSHA used the term "A/D supervisor." Some commenters objected by written submission and at the hearing to the use of the word "supervisor" in this provision. (ID -0182.1; -0199.1; -0172.1; -0341.) They were concerned that the use of this term would imply that anyone who serves in this role under § 1926.1404 would be considered a supervisor under the National Labor Relations Act ("NLRA").[19] Their objections are rooted in the fact that the word "supervisor" is used and defined in the NLRA. The commenters' only objection to § 1926.1404(a) was the use of the term "supervisor"; they did not object to the actual duties or prerequisites spelled out in the proposed rule applicable to this individual/ team. Several commenters suggested that the word "supervisor" be replaced with the term "designated individual" and that the regulatory text be amended to definitively indicate that OSHA has no intention of creating NLRA implications by use of the term. (ID -0182.1; -0199.1; -0172.1.)

The use of "supervisor" in this rule would not be determinative of supervisor status under the NLRA.[20] Nonetheless, OSHA understands the commenters' concerns that workers in the industry may be confused by the use of this term. However, the term "designated individual," suggested by a labor representative and other commenters, could

[19] 29 U.S.C. 159-169 (1935).

[20] With "A/D supervisor," OSHA was merely creating a descriptive term for use solely in the application of an OSHA standard. OSHA's use of the term is a less significant designation for the purposes of the NLRA than even a job title, which is itself not determinative under the NLRA. See, e.g., *N.L.R.B. v. St. Mary's Home, Inc.*, 690 F.2d 1062, 1066 (4th Cir. 1982) ("As the [NLRB] itself has put it, 'job titles are meaningless).

also cause confusion, since it is ambiguous as to whether that person had been granted the authority to correct hazards. Such ambiguity in the minds of the A/D crew members regarding the authority of the A/D supervisor would undermine the effectiveness of the provision itself.

Therefore, OSHA has decided to use the term "A/D director." "Director" is not a defined term in the NLRA nor does it have any particular significance as a job title with respect to NLRA jurisprudence. Furthermore, like "A/D supervisor," it is consistent with C-DAC's intent to use a term that conveys the concept of authority to oversee the assembly/ disassembly process. To remain consistent with this new term, in § 1926.1404(a)(1), OSHA has replaced the word "supervised" with "directed."

The A/D director has to meet the definition of both a "competent" and "qualified" person as OSHA defines those terms.[21] The Committee determined that having an A/D director overseeing the assembly/disassembly process who had both the authority to correct a hazard and who had the expertise of a qualified person was necessary to ensure the safety of the operation. Several commenters strongly endorsed the new A/D director requirement, believing the addition will improve workplace safety. (See, e.g., ID -0343.)

A commenter asserted that the qualifications for A/D directors are too abstract and allowed for too much interpretation. The commenter suggests that the qualifications

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[21] Section 1926.1401, *Definitions*, defines a "competent person" as: "one who is capable of identifying existing and predictable hazards in the surroundings or working conditions which are unsanitary, hazardous, or dangerous to employees, and who has authorization to take prompt corrective measures to eliminate them." Section 1926.1401 defines a "qualified person" in this proposed standard as: "one who, by possession of a recognized degree, certificate, or professional standing, or who by extensive knowledge, training, and experience, has successfully demonstrated his ability to solve or resolve problems relating to the subject matter, the work, or the project." These definitions are essentially the same as the definitions in §§ 1926.32(f) and 1926.32(m).

for an A/D director should be more similar to the requirements for operator certification in § 1926.1427. (ID -0137.1.)

C-DAC thoroughly discussed the necessary qualifications for an A/D director and determined that the best option for ensuring employee safety during assembly/disassembly was to require an A/D director to be both a qualified and a competent person. (See ID -0321.5.) Furthermore, the terms qualified person and competent person and their definitions are well established and well recognized in the construction industry. For these reasons, OSHA is deferring to the judgment of the Committee and is not making the suggested change.

Paragraphs (b) Knowledge of the procedures and (c) Review of the procedures

Section 1926.1404(b) requires that the A/D director understand the assembly/disassembly procedures. In addition, § 1926.1404(c) requires the A/D director to review the procedures immediately prior to starting the process unless the director's experience in having used them on the same type and configuration of equipment, and recollection and understanding of the procedures is such that it makes their review unnecessary.

These two sections work together to ensure that an experienced A/D director understands the procedures. Even if an A/D director has experience, he/she must still meet the knowledge requirement in § 1926.1404(b). For example, if an A/D director configured a type of crane a number of years ago and no longer remembers the procedures applicable to such a crane, he/she does not fall within the experienced A/D

director exception, and must, accordingly, review the procedures immediately prior to starting the process.

No comments were received on these provisions. They are promulgated as proposed except that, in addition to a grammatical clarification, § 1926.1404(c) now contains a clearer knowledge requirement to clarify the interplay between §§ 1926.1404(b) and 1926.1404(c), as described above.

Paragraph (d) Crew instructions

Under this provision, before beginning assembly/disassembly operations, the A/D director would have to ensure that the crew members understand their tasks and the associated hazards, as well as any hazardous positions/locations that they need to avoid.

No comments were received on this provision. It is promulgated as proposed except that "ensure" replaces "determine," to better represent the role of the A/D director.

Paragraph (e) Protecting assembly/disassembly crew members out of operator view

Section 1926.1404(e) requires that before a crew member goes to a location that is out of view of the operator and is either in, on, or under the equipment, or near the equipment (or load) where the crew member could be injured by movement of the equipment (or load), the crew member must inform the operator that he/she is going to that location. Where the operator knows that a crew member went to a location covered by paragraph (e)(1) of this section, the operator must not move any part of the equipment (or load) until the operator is informed in accordance with a pre-arranged system of communication that the crew member is in a safe position. An example of such a system

would be the use of a signal person who gives an all-clear signal to the operator once the signal person sees that the employee has exited the hazard area. Another example would be where the employee in the hazard area is equipped with a portable air horn and, in accordance with a pre-arranged horn signal system, sounds an appropriate signal to the operator that the employee has exited the hazard area. To be effective, the pre-arranged signal system needs to be designed so that this all-clear signal could not be confused with a horn signal from some other employee for another purpose.

One of the hazards identified by the Committee is an operator swinging or moving the crane/derrick when assembly/disassembly personnel are in a crush/caught-in-between zone and out of the operator's view. The Committee concluded that an effective and practical means of preventing these accidents would be through a communication procedure that would provide key information to, and coordination between, the operator and these workers.

One Committee member suggested that instead of requiring that the crew member directly inform the operator of his/her location, the rule should permit the crew member to provide this information to the operator through a third person. For example, the crew member would instruct his/her foreman to radio the information to the operator. OSHA requested public comment on this suggestion in the preamble of the proposed rule (see 73 FR 59743, Oct. 9, 2008).

Several commenters stated that the requirements should remain as originally proposed and the Agency should not allow notification through a third person. (ID -0205.1; -0213.1; -0182.1; -0187.1; -0379.1.) One commenter believed that third party notification could result in miscommunication or delays. (ID -0226; -0357.1.)

One commenter testified that introducing a third person into the communications link would not present any danger so long as there was some verbal confirmation. (ID -0344.)

OSHA agrees with C-DAC and the majority of the commenters. Indirect communication between the crane operator and the employee working out of view, through an intermediary, would increase the potential for miscommunication. Therefore, the Agency has not changed the provisions to allow third party notification.

Commenters raised additional issues regarding § 1926.1404(e). Proposed § 1926.1404(e) provided two methods to assure that employees would not be injured while working outside of the operator's view. Under proposed § 1926.1404(e)(2)(i), the operator would give a warning that is understood by the crew member as a signal that the equipment (or load) is about to be moved and would allow time for the crew member to get to a safe position. Under proposed § 1926.1404(e)(2)(ii), the operator was prohibited from moving any part of the crane until informed, in accordance with a pre-arranged system of communication, that the crew member is in a safe position.

Two commenters raised concerns regarding crew members actually hearing warnings that were given in accordance with proposed § 1926.1404(e)(2)(i). One commenter suggested that the operator should be required to confirm that the employee has moved to a safe location prior to initiating crane movement. (ID -0292.1.) Another commenter suggested that a prearranged communications system should be required because audible warnings can be drowned out by ambient noise. (ID -0122.)

These comments identified two flaws in proposed § 1926.1404(e)(2)(i) that were not addressed by C-DAC. First, a crew member may not hear a warning signal that the

equipment or load is about to move and may not respond appropriately. Second, the crew member may hear the warning signal but be unable to move from his/her position. This would leave the crew member exposed to struck-by and crushing hazards. As a result, the Agency has revised the provision by deleting the option that was in proposed § 1926.1404(e)(2)(i). Proposed § 1926.1404(e)(2) is otherwise included as proposed except for one grammatical correction.

Paragraph (f) Working under the boom, jib or other components

Section 1926.1404(f) requires that when pins (or similar devices) are being removed, employees must not be under the boom, jib, or other components, except where the employer demonstrates that site constraints require employees to be so positioned. In such instances the A/D director must implement procedures that minimize the risk of unintended dangerous movement and minimize the duration and extent of exposure under the boom. An example of such procedures is provided in non-mandatory Appendix B.

Paragraph (g) Capacity limits

This provision requires that the rated capacity limits for loads imposed on the equipment, each of its components (including rigging), lifting lugs and equipment accessories being assembled or disassembled not be exceeded. The provision applies "during all phases of assembly/disassembly." (See the discussion of this provision at 73 FR 59744, Oct. 9, 2008.) Note that where an assist crane is being used during the assembly/disassembly of another crane/derrick, the requirements for rated capacity

during operations must be met under § 1926.1417(o), *Compliance with rated capacity*, with respect to the assist crane.

No comments were received on this provision. It is promulgated as proposed except for one grammatical correction.

Paragraph (h) Addressing specific hazards

Section 1926.1404(h) requires that the A/D director supervising the assembly/disassembly operation address known hazards associated with the operation with methods to protect the employees from them, and provides a list of specific hazards that are likely to cause serious injury or death. The A/D director must consider each hazard, determine the appropriate means of addressing it, and oversee the implementation of that method.

No comments were received on this provision. It is promulgated as proposed with a grammatical clarification and the addition of the words "which include" at the end of the introductory language to acknowledge the employer's existing responsibility under § 5(a)(1) of the OSH Act (the "general duty clause") to address other recognized hazards not listed in this paragraph.

Paragraph (h)(1) Site and ground bearing conditions

This provision works in conjunction with § 1926.1402, which addresses ground conditions for both assembly/disassembly and use of the equipment, including ground condition criteria. Section 1926.1404(h)(1) requires the A/D director to assess the ground conditions for conformance with those criteria, and to assess the site for suitability for

assembly and disassembly. (See the discussion of this provision at 73 FR 59744, Oct. 9, 2008.) No comments were received on this provision; it is promulgated as proposed.

Paragraphs (h)(2) Blocking material and (h)(3) Proper location of blocking

These two provisions address the hazards associated with inadequate blocking. Section 1926.1404(h)(2) requires the size, amount, condition and method of stacking the blocking to be sufficient to sustain the loads and maintain stability. Section 1926.1404(h)(3) requires that when used to support booms or components, blocking must be appropriately placed to protect the structural integrity of the equipment, and prevent dangerous movement and collapse.

"Blocking" (also referred to as "cribbing") is defined in § 1926.1401 as "wood or other material used to support equipment or a component and distribute loads to the ground. Typically used to support latticed boom sections during assembly/disassembly and under outrigger floats." This definition is from A Glossary of Common Crane and Rigging Terms, a publication by the Specialized Carriers & Rigging Foundation ("SC&RF Handbook"). (ID -0035.)

Proper blocking plays an important role in assembly/disassembly safety by reducing the risk of injuries from unplanned movement or the collapse of equipment. (See the discussion of blocking at 73 FR 59744, Oct. 9, 2008.)

One commenter suggested including a strength requirement for blocking. (ID -0053.1.) OSHA determines that the provision as proposed, which requires that the "size, amount, condition and method of stacking blocking must be sufficient to sustain the loads

and maintain stability," appropriately addresses blocking strength. Therefore, OSHA has not made a change to the wording of the provision in this regard.

The version of paragraph (h)(3) in the proposed rule was applicable only to lattice booms and components. In the proposed rule's preamble, OSHA asked for public comment on whether the provision should also apply to other types of booms and components (i.e., those for hydraulic cranes). (See the discussion of this provision at 73 FR 59745, Oct. 9, 2008.)

Several commenters stated that proper blocking is necessary for hydraulic cranes in addition to lattice boom cranes. (ID-0213.1; -0205.1; -0118.1.) In addition, hearing testimony also indicated that there is a need for this requirement to apply to hydraulic cranes because they are sometimes assembled or disassembled, at least partially, in the field. (See ID -0343.1.)

OSHA has concluded that the requirement is necessary for both hydraulic and lattice boom cranes and components. At times, portions of hydraulic cranes are assembled and disassembled in the field and need proper blocking. As a result, the word "lattice" in the proposed provision's language has not been included in the final rule so that the provision applies to hydraulic cranes and components as well as lattice boom cranes and components.

Paragraph (h)(4) Verifying assist crane loads

This paragraph requires that, when using an assist crane, the loads that will be imposed on the assist crane at each phase of assembly/disassembly must be verified in accordance with § 1926.1417(o)(3). The purpose of this requirement is to avoid

exceeding the assist crane's rated capacity. "Assist crane" is defined in § 1926.1401 as "a crane used to assist in assembling or disassembling a crane." When used for this purpose, an "assist crane" is subject to all applicable provisions of this standard, including the requirement of § 1926.1417(o) that it not be used in a manner that exceeds its rated capacity. (See the discussion of this provision at 73 FR 59745, Oct. 9, 2008.)

No comments were received on this provision; it is promulgated as proposed except that the purpose of the requirement is now included above in the preamble, rather than in the rule text, to increase the clarity of the requirement.

Paragraph (h)(5) Boom and jib pick points

This provision would require the A/D director to address the hazard of using improper boom and jib pick points. Specifically, the points of attachment of rigging to a boom/jib or boom/jib section(s) must be suitable for preventing structural damage. Such damage could compromise structural integrity and, in some cases, may not be immediately noticed. If that component were nonetheless used, the boom/component could fail.

The points of attachment also need to facilitate the safe handling of these components. (See the discussion of this provision at 73 FR 59745, Oct. 9, 2008.) No comments were received on this provision; it is promulgated as proposed.

Paragraph (h)(6) Center of gravity

In a variety of instances the method used for maintaining stability during assembly/disassembly depends on supporting or rigging a component (or set of

components) so that it remains balanced throughout the process. In such instances the A/D director is required to identify the center of gravity of the load. (See the discussion of this provision at 73 FR 59745, Oct. 9, 2008.) No comments were received on this provision. It is promulgated as proposed except for one grammatical change.

Paragraph (h)(7) Stability upon pin removal

This paragraph requires that each of the following must be rigged or supported to maintain stability upon the removal of the pins: boom sections, boom suspension systems (such as gantry A-frames and jib struts), and components. "Boom suspension system" is defined in § 1926.1401 as "a system of pendants, running ropes, sheaves, and other hardware which supports the boom tip and controls the boom angle." This definition is the same as that for "boom suspension" in the SC&RF Handbook. (See the discussion of this provision at 73 FR 59745, Oct. 9, 2008.)

No comments were received on this provision; it is promulgated as proposed except that the conjunctive "and" is substituted for "or" to make it clear that all three of the listed items (boom sections, boom suspension systems, and components) must be properly rigged, not just any one of those.

Paragraph (h)(8) Snagging

As explained in the preamble to the proposed rule, "snagging" occurs when pendant cables hung alongside the boom are caught ("snagged") on the pins, bolts, or keepers as the operator raises the boom (see 73 FR 59746, Oct. 9, 2008.) Snagging could damage the cables or other equipment and result in injury. This paragraph requires that

suspension ropes and pendants not be allowed to catch on the boom or jib connection pins or cotter pins (including keepers and locking pins). The definition for pendants can be found in § 1926.1401. This definition is similar to that in the SC&RF Handbook, but with the addition of the reference to "bar type" pendants. (See the discussion of this provision at 73 FR 59746, Oct. 9, 2008). No comments were received on this provision; it is promulgated as proposed.

Paragraph (h)(9) Struck by counterweights

Final § 1926.1404(h)(9) requires the A/D director to address the potential for unintended movement from inadequately supported counterweights and from hoisting counterweights. "Counterweight" is defined in § 1926.1401 as a "weight used to supplement the weight of equipment in providing stability for lifting loads by counterbalancing those loads." This definition is taken from the SC&RF Handbook. (See the discussion of this provision at 73 FR 59746, Oct. 9, 2008.)

No comments were received on this provision; it is promulgated as proposed except that OSHA has replaced the adjective "unexpected" with "unintended" to remain consistent throughout this section.

Paragraph (h)(10) Boom hoist brake failure

This provision addresses a hazard that can occur both during assembly and disassembly, although it is more typically a hazard during assembly. In many older cranes the boom hoist brake mechanism has an external or internal mechanical brake band that operates by pressing against the hoist drum. As the configuration of the crane

changes and, for example, more boom is added, this type of boom hoist brake may slip unless it has been adjusted to hold the extra weight. The Committee was concerned that the inability of an unadjusted brake to hold the increased load will not be evident until the additional boom section(s) has been added and the operator attempts to rely on the brake in a subsequent phase of the operation. If the operator does not first raise the boom a small amount after the section has been added (with the crew clear of the boom) to test the brake, employees could be injured later in the process when the operator manipulates the boom and finds that he/she is unable to brake it.

To address this hazard, the employer is required to test the brake to determine if it can hold the load. In many cases, if it is insufficient, an adjustment to the brake will correct the problem. If it remains insufficient, the employer is required to use a boom hoist pawl, other locking device, back-up braking device, or another method of preventing dangerous boom movement (such as blocking or using an assist crane to support the load) from a boom hoist brake failure.

The Agency was concerned that the text of the proposed provision was not sufficiently clear regarding the timing of this brake test, so it solicited public comment on this issue. OSHA's interpretation was that the test would need to be done immediately after each section (or group of sections) is installed, and after all sections are in place (see 73 FR 59746, Oct. 9, 2008).

One commenter recommended revising the provision to specify that the brake be tested prior to the commencement of lifting. (ID -0214.1.) However, two other commenters wrote that the regulatory text should remain as is and should not specify when to perform the brake test. They point out that C-DAC's intent in § 1926.1404(h)

was to identify hazards and require that they be addressed by the A/D director. C-DAC designed § 1926.1404(h) so that, for the most part, the A/D director could determine the procedures (or how to implement specified requirements) that would be best suited in each situation to protect against those hazards. They also state that, in some cases, the specific procedure that OSHA referred to in the proposed rule preamble could result in a greater hazard. (ID -0205.1; 0213.1.)

OSHA agrees that specifying an overly-detailed procedure to address this hazard would be inappropriate given the myriad of circumstances in which this issue may arise. However, the Agency also determined that the proposed rule's regulatory text did not identify the purpose of the provision with sufficient clarity. Therefore, the final standard does not specify that the test has to be performed at a certain time that is tied to the installation of any particular section, but instead requires a test whenever the A/D director will be relying on the boom hoist brake to function properly. In short, the test needs to be performed, prior to reliance being placed on the brake, and the test needs to accurately account for the loads that will be placed on the brake. The provision in the final rule, therefore, requires the boom hoist brake to be tested prior to each time reliance on the boom hoist brake is anticipated.

Paragraph (h)(11) Loss of backward stability

The Committee identified three points during the assembly/disassembly process at which there is a heightened risk of loss of backward stability. These are: when swinging the upperworks, during travel, and when attaching or removing equipment components. Therefore, under this provision, before any of these occur, the A/D director is required to

consider whether precautions need to be instituted to ensure that backward stability is maintained. No comments were received on this provision. However, OSHA is not including the drawing described as Figure 1 in the proposed rule. See the discussion of the removal of this figure below in § 1926.1405. Except for the removal of any reference to figure 1, OSHA is promulgating the provision as proposed.

Paragraph (h)(12) Wind speed and weather

Section 1926.1404(h)(12) requires the A/D director to address hazards caused by wind speed and weather to ensure that the safe assembly/disassembly of the equipment is not compromised.

The Committee considered the option of establishing a maximum wind speed, as well as the option of incorporating ANSI's provisions regarding wind speed. However, it determined that selecting any one particular speed as a maximum would be arbitrary because of the variety of factors involved. For example: different cranes and crane types vary with respect to the "sail" area they present; an assembly process involving use of an assist crane may require lower wind speeds than one in which no assist crane is used; and assembly/disassembly operations done "in the air" (that is, with the boom elevated in the air, without ground support for the boom) may require lower wind speeds than a boom assembled/disassembled on the ground. The Committee ultimately decided that a better approach would be to have the A/D director determine the maximum safe wind speed under the circumstances.

Other weather conditions that can affect the safety of assembly/disassembly would include, for example, ice accumulation on crane components. Ice can both add to

the weight of the components and create slippery, dangerous surfaces on which employees work. The A/D director must address weather conditions that affect the safety of the operation. No comments were received on this provision; it is promulgated as proposed with a slight rewording for clarity.

Paragraph (i) [*Reserved*.]

Paragraph (j) Cantilevered boom sections

Members of the Committee determined that a common mistake in assembly/disassembly is cantilevering too much boom. When too much boom is cantilevered, structural failure can occur in components such as the mast/gantry, boom sections and lifting lugs. Employees may be struck by falling components from this type of failure. To prevent accidents from cantilevering too much boom during assembly/disassembly, this provision requires manufacturer's limitations on cantilevering not to be exceeded.

If the manufacturer's limitations are not available, the employer is required to have a registered professional engineer (RPE) determine the appropriate limitations, and to abide by those limitations. The Committee concluded that in such cases there would need to be a requirement that the RPE's determination be in writing to ensure that the assessment has been done.

This provision is promulgated as proposed with one grammatical correction to make it clear that it is the limitations that must not be exceeded.

Paragraph (k) Weight of components

As with any load to be lifted by a crane/derrick, the weight of the components must be available to the operator so that the operator can determine if the lift can be performed within the crane/derrick's capacity. This requirement applies irrespective of whether the component is being hoisted by the crane being assembled/disassembled or by an assist crane.

No comments were received on this provision. OSHA is promulgating this provision largely as proposed, but has modified the text to make it clear that assembly/disassembly is prohibited when the weight of each of the components is not readily available.

Paragraph (l) [*Reserved*.]

Paragraph (m) Components and configuration

This provision deals with the selection of components that will be used to comprise the crane/derrick, the configuration of the equipment, and its inspection upon completion of assembly. (See the discussion of this provision at 73 FR 59747, Oct. 9, 2008.)

No comments were received on this provision. However, to be consistent with the requirements of § 1926.1403, the word "prohibition" has been added to § 1926.1404(m)(1)(i); otherwise, it is promulgated as proposed with the addition of commas to clarify that this paragraph only applies to the selection of components and

configuration to the extent that either one affects the capacity or safe operation of the equipment.

Note that another section (§ 1926.1434) allows cranes/derricks to be modified under certain circumstances. To the extent a crane/derrick is modified in accordance with § 1926.1434, the employer is not required to follow the manufacturer's original instructions, limitations and specifications regarding component selection and configuration regarding those modifications. Instead, under § 1926.1404(m)(1)(ii), the employer is required to follow the component selection and configuration requirements approved in accordance with § 1926.1434.

Paragraph (n)

For clarity, OSHA has reserved this paragraph and incorporated its substance in § 1926.1403, as explained above in the discussion regarding § 1926.1403. (See the discussion of this provision at 73 FR 59747, Oct. 9, 2008.)

Paragraph (o) Shipping pins

This provision requires reusable shipping pins, straps, links and similar equipment to be removed. Once they are removed they must either be stowed or otherwise stored so that they do not present a falling object hazard. No comments were received for this paragraph; it is promulgated as proposed.

Paragraph (p) Pile driving

This provision prohibits equipment used in pile driving operations from having a jib attached. An attached jib could be dislodged during pile driving operations and cause structural damage to the boom, potentially causing the boom to fail or diminishing its capacity. (See the discussion of this provision at 73 FR 59748, Oct. 9, 2008.) No comments were received on this provision; it is promulgated as proposed.

Paragraph (q) Outriggers and Stabilizers

This paragraph specifies requirements regarding outriggers. (See the discussion of this paragraph at 73 FR 59748, Oct. 9, 2008.)

OSHA received several comments with regard to § 1926.1404(q)(2) in relation to stabilizers. One commenter stated that it is necessary to add the term "stabilizers" to the regulatory text for the provision to properly apply to articulating cranes. (ID -0206.1.) The commenter explains that, as opposed to outriggers, which are designed to take all load off of the tires, stabilizers are designed to relieve some, but not all, of the sprung weight for the purpose of increasing the stability of the vehicle. The commenter believes that the provision as written in the proposed rule would lead to improper use of stabilizers in such a way that is dangerous and against manufacturer recommendations. A second commenter emphasized that cranes equipped with stabilizers (and not outriggers) do not raise the wheels off the ground. (ID -0292.)

OSHA agrees with the commenters that it is necessary to address stabilizers in § 1926.1404(q). With the exception of § 1926.1404(q)(2), the term "stabilizers" has been added so that each provision also applies to stabilizers. Section 1926.1404(q)(2) does not

apply to stabilizers because they are not designed to remove all weight from the vehicle's wheels.

One comment was received in regards to § 1926.1404(q)(4). Under that provision, each outrigger must be visible to the operator or to a signal person during extension and setting. The commenter suggested that the requirement be modified so that it would also apply to the retraction of outriggers. (ID -0053.1.) The commenter indicated that employees can be subject to crushing and pinching hazards during outrigger retraction and this would be less likely to occur if it the outrigger had to be visible to the operator or signal person during retraction.

OSHA agrees that crushing and pinching hazards exist during outrigger retraction. However, § 1926.1404(q) is designed to prevent the overturning of the crane; it does not address the crushing and pinching hazards posed by operation of the equipment in struck-by or crushed/by locations outside the operator's view. The final rule contains other provisions that are designed to address such hazards. (See, e.g., § 1926.1404(e).) Therefore, the Agency is not incorporating the commenter's suggestion into § 1926.1404(q) and is promulgating the provision largely as proposed.

Paragraph (r) Rigging

This paragraph specifies requirements regarding rigging during the crane assembly/disassembly process. It includes a requirement for a qualified rigger and sets forth specifications regarding the use of synthetic slings.

C-DAC did not focus on the proper use of synthetic sling rigging during the crane assembly/ disassembly process, primarily because another standard – 29 CFR 1926

Subpart H (Materials handling, storage, use, and disposal) – already addresses some of the hazards associated with the use of synthetic slings in construction.

However, after C-DAC completed its work, a catastrophic crane collapse resulted in a reevaluation of subparts N and H with regard to synthetic slings and rigging expertise. On March 15, 2008, a tower crane in New York City collapsed, killing six construction workers. OSHA's investigation of that incident focused on the use of synthetic slings to hold a bracing collar that was being installed.

The Agency determined that neither subpart H (Rigging equipment for material handling) nor subpart N specifically address the hazard posed when a synthetic sling is used in a manner causing compression or distortion of a sling, or when the sling is in contact with a sharp edge. The Agency asked for public comment on whether to prohibit using synthetic slings altogether in the assembly/ disassembly process or, alternatively, to require padding or similar measures to protect the slings from being damaged (see 73 FR 59742, Oct. 9, 2008).

Commenters generally opposed prohibiting the use of synthetic slings during assembly/disassembly, as long as appropriate precautions are taken. (See, e.g., ID -0205.1; -0213.1; -0343.) Specifically, commenters stated that synthetic slings have the advantage of helping to prevent damage to equipment components, but need to be protected from cuts, compression, distortion and reduction of capacity, by the use of "softeners" (i.e., padding). (See, e.g., ID -0187.1; -0343.) One commenter testified that it does not oppose synthetic slings if they are listed in the manufacturer's procedures or if they are not specifically prohibited by the manufacturer. (ID -0343.) Some commenters also emphasized the need for such slings to be properly rated and inspected. (See, e.g.,

ID -0226.) Another commenter recommended requiring rigging equipment for material handling to be inspected. One commenter advocated prohibiting synthetic slings used in conjunction with tower crane erection, unless the manufacturer specifically allows their use. (ID -0156.)

Commenters also suggested adding requirements regarding the qualifications and training of riggers. Specifically, several commenters suggested requiring certification of riggers similar to operator certification requirements in § 1926.1427. (ID -0126; -0132.1; -0136; -0204.1; -0311.1; -0362.1.) One commenter opposed certification, but supported requiring training. Another suggested third party certification or licensing of supervisors. (ID -0156.1.) Another advocated employer qualification of riggers. (ID -0197.1.)

OSHA acknowledges that synthetic slings have certain advantages, such as preventing damage to equipment components, and no commenters advocated a prohibition in all instances. OSHA has therefore decided not to prohibit the use of synthetic slings in assembly/disassembly. There must, however, be adequate safeguards for their use.

OSHA agrees with the comment that stressed the importance of inspecting slings. However, as § 1926.251(a)(1) already requires that all rigging equipment be inspected, no additional requirement is needed in subpart CC regarding the inspection and removal of synthetic slings.

The Agency finds that it is vital that synthetic slings be protected from abrasive, sharp or acute edges, since any of those conditions can damage a synthetic sling, resulting in a failure. Also, based on its review of the record, the Agency concludes that such slings must be protected from configurations that could cause compression or distortion

of the sling, since that can also cause failure. For example, wrapping a synthetic sling through a V-angled junction point of steel members in a tower mast section can cause the sling to compress and distort under load, compromising its capacity.

As was demonstrated by the March 2008 collapse in New York City, such protection is needed whenever the object that is in contact with the sling – whether it is a load or something else, such as a crane component used to anchor the sling – has such an edge or configuration. Therefore, OSHA is including a requirement in the final § 1926.1404(r)(2) to protect employees from such synthetic slings hazards when used in assembly/disassembly.

OSHA also learned from its investigation of the March 2008 collapse that it is vital that synthetic slings be selected and used properly. In particular, the sling manufacturer's recommendations must be observed strictly as the capacity ratings set by the manufacturer are highly dependent on the sling being used as specified by the manufacturer. (See ID -0336.) Consequently, employers, even with the assistance of a qualified rigger, will typically not have the ability to develop safe alternative procedures regarding their use. Therefore, the Agency is including a requirement in the final § 1926.1404(r)(3) (also noted in § 1926.1403(b)) that when a synthetic sling is used during assembly/disassembly, the sling manufacturer's instructions, limitations, specifications and recommendations must be followed.

Note that § 1926.1403 requires that the employer "comply with all applicable manufacturer prohibitions." Therefore, if a manufacturer prohibits the use of synthetic slings during assembly/disassembly, OSHA prohibits that use of such slings. Furthermore, while § 1926.1403 requires the employer to comply with either the

manufacturer's or the employer's assembly/disassembly procedures (see § 1926.1403(a) and (b)), employer procedures may be used only if the employer meets a two-prong test. First, the employer must not be using synthetic slings. Second, the employer must demonstrate that its procedures meet the requirements in § 1926.1406.

There may be cases in which the equipment manufacturer does not prohibit the use of synthetic slings during assembly/disassembly, but identifies wire rope slings in its procedures. In such cases, the employer may only use synthetic slings if it establishes and implements its own procedures under § 1926.1403(b) and can demonstrate that those procedures, including the use of synthetic slings, meet the criteria requirements in § 1926.1406.

As noted above, several commenters advocated adding a requirement that rigging be performed by qualified riggers. One local government stated that although rigging operations are critical to completing crane work, rigging operations involve a high level of risk if not performed properly. (ID -0362.1.) The local government's experience supports the proposition that human error causes most rigging accidents. (ID -0362.1.) The New York crane collapse and the subsequent OSHA investigation further highlight the dangers associated with improper rigging during assembly/disassembly, and the need to address this hazard was supported by all of the commenters who addressed this issue. OSHA notes that although several commenters pointed to the need for qualified riggers early on in the comment process, and again during the hearing, no one expressed any disagreement about the need to address the hazard by requiring riggers to be qualified. This means of addressing the hazard is consistent with the means that C-DAC applied when it identified a hazard related to rigging in § 1926.1425(c), and the Agency relies on

C-DAC's expertise in selecting the appropriate method to address a rigging hazard. OSHA is therefore requiring in § 1926.1404(r)(1) that all rigging for crane assembly/disassembly be performed by a qualified rigger.

Finally, the fact that the commenters did not limit their suggestions on rigging qualifications to rigging synthetic slings leads the Agency to conclude that all rigging done for assembly/disassembly, irrespective of type, is a safety-critical function. One person testified about how he was involved with improper rigging which led to the death of his coworker. He stressed the importance of having qualified riggers, stating that in his experience most of the accidents he has seen and been involved with or investigated have involved problems with rigging. (ID -0343.)

After considering the record, OSHA is including the qualified rigger requirement in the final rule and it applies to all rigging used for assembly/disassembly.

Section 1926.1405 Disassembly – additional requirements for disassembly of booms and jibs (applies to both the use of manufacturer procedures and employer procedures)

Section 1926.1405 requires that none of the pins in the pendants be removed (partly or completely) when the pendants are in tension. In addition, none of the pins (top or bottom) on boom sections located between the pendant attachment points and the crane/derrick body are to be removed, partly or completely, when the pendants are in tension. None of the pins (top or bottom) on boom sections located between the uppermost boom section and the crane/derrick body are to be removed, partly or completely, when the boom is being supported by the uppermost boom section resting on the ground (or other support). Finally, none of the top pins on boom sections located on

the cantilevered portion of the boom being removed (the portion being removed ahead of the pendant attachment points) are to be removed (partly or completely) until the cantilevered section to be removed is fully supported. (See the discussion of these requirements at 73 FR 59748, Oct. 9, 2008.)

The Committee determined that many of the accidents associated with cranes occur during the removal of pendant, boom and jib pins. The Committee determined that accidents typically occur because of a failure to recognize that, in certain situations, particular pins are "in tension." If partly or fully removed while in that state the result can be unplanned movement of a component or the collapse of the boom or jib.

Consequently, the Committee concluded that the removal of pendant, boom section and jib pins warrants heightened attention. This section focuses on protecting employees from these hazards during the dismantling of booms and jibs, either when disassembling the crane/derrick or when changing the length of a boom or jib. To make clear that "dismantling" includes activities such as shortening a boom, final § 1926.1401 defines "dismantling" to include "partial dismantling (such as dismantling to shorten a boom or substitute a different component)."

In this section, the Committee identified particular scenarios that, in the experience of many of the Committee members, pose specific hazards in disassembly if the wrong pins (that is, pins that are in tension) are partly or completely removed. The Committee concluded that the failure to follow the provisions would very likely result in unintended movement and/or collapse of the components. OSHA agrees that these requirements will help to prevent unintended movement or collapse of booms or jibs as they are being disassembled.

Several comments were received regarding the illustrations in this section of the proposed rule. Two commenters noted the illustration of a tower crane in figure 2 of the proposed rule and suggested it be replaced with a mobile crane. (ID -0205.1; -0213.1.) Two commenters recommended that figures 4 and 6 be changed such that no pins would be permitted to be removed without blocking the entire boom. (ID -0131.1; -0292.) Specifically, these commenters did not believe that the bottom boom connecting pins could be removed due to the weight of the cantilevered boom exerting force on these bottom connecting pins. They stated that if there was sufficient clearance between the connecting lugs to enable the pins to be removed, the boom could move downward upon the removal of the pins.

Based upon C-DAC's expertise, OSHA determines that figures 2, 4 and 6 in the proposed rule were accurate depictions as to blocking, but the proposed arrows may have been confusing to the extent that commenters incorrectly understood that the removal of pins would be allowed where arrows did not appear. To avoid confusion, OSHA is not including any of the assembly/disassembly figures from the proposed rule in the final rule.

Section 1926.1406 Assembly/Disassembly – employer procedures – general requirements

Section 1926.1406 sets requirements that must be met if an employer elects to use its own procedures for assembling and disassembling a crane/derrick instead of those of the manufacturer. (See the discussion of this provision at 73 FR 59748, Oct. 9, 2008.)

One commenter wrote that, to ensure safe assembly and disassembly, employer procedures must not be allowed. In the preamble to the proposed rule, OSHA explained its rationale and the basis of C-DAC's recommendation that employer procedures be allowed where they meet the specified criteria in § 1926.1406. (See full discussion at 73 FR 59742, 59748, Oct. 9, 2008). The commenter did not challenge the rationale or provide any evidence of why employer procedures that comply with § 1926.1406 would be insufficient. The Agency is therefore adopting § 1926.1406 as proposed for the reasons explained in the preamble to the proposed rule, with several minor clarifications.

In § 1926.1406(a), the phrase "assembly/disassembly" replaces "assembling or disassembling" to make this section consistent with other sections of the rule. Also in § 1926.1406(a), OSHA has removed the phrase "are designed to" to increase clarity. In § 1926.1406(a)(1), the phrase "any part" replaces "all parts" to make it clear the duty to prevent dangerous movement in any part of the equipment. This provision is otherwise promulgated as proposed with several grammatical corrections.

Sections 1926.1407 - 1926.1411 Power lines

Introduction

Final §§ 1926.1407 through 1926.1411 contain requirements designed to help ensure the safety of employees while cranes/derricks are being assembled, disassembled, operated, or while they travel under power lines.

Previously, subpart N, in former § 1926.550(a)(15), addressed power line hazards by specifying the minimum distance that must be maintained between a crane and an energized power line. For lines rated 50 kilovolts (kV) or below, the minimum distance

was 10 feet; for lines over 50 kV, the minimum distance was generally 10 feet plus 0.4 inches for each 1 kV over 50 kV (we will refer to this subpart N requirement in this preamble as the "10-foot rule").

However, the subpart N provisions, which instructed employers to maintain a minimum clearance distance, did little by way of requiring employers to implement measures to help prevent operators from inadvertently breaching that distance. The only preventative measure in subpart N was a requirement, in former § 1926.550(a)(15)(iv), to use a spotter "where it is difficult for the operator to maintain the desired clearance by visual means." In discussing how to reduce power line fatalities, the Committee determined that a systematic, proactive approach to preventing power line contact is needed (see the Agency's explanation for the need for these provisions in the proposed rule preamble at 73 FR 59748-59750, Oct. 9, 2008).

Brief overview of requirements

The standard requires the implementation of a systematic, proactive approach to dealing with the hazard of power lines. This approach is comprised of the following steps: (1) Identify the work zone and assess it for power lines – determine how close the crane could get to them. The employer has the option of doing this assessment for the area 360 degrees around the crane or for a more limited, demarcated area; (2) If the assessment shows that the crane could get closer than a trigger distance – 20 feet for lines rated up to 350 kV (50 feet for lines rated over 350 kV) – then requirements for additional action will be triggered.

The voltages given in the final rule are phase-to-phase system voltages on the power lines. It should be noted that the system voltages for power lines generally take three forms. First, there is the actual voltage on the line. This voltage varies from one moment to the next as conditions on the power line change. Second, there is the nominal voltage on the line that is used to designate its voltage. The actual operating voltage varies above and below this voltage. (See the definition of "voltage, nominal" in subpart K of the Construction Standards, § 1926.449.) Third, there is the maximum operating voltage on the line. This represents the maximum voltage that can appear on a power line and is 5 percent above the nominal voltage on the line. (See IEEE Std. 516-2009.) For purposes of the final rule, the power line voltage is the maximum operating voltage for that line. This approach, which is consistent with the determination of minimum approach distances in § 1910.269,[22] ensures that the minimum clearance distance is appropriate when the voltage on the line rises to its maximum. The following table lists the maximum operating voltages over 50 kV for power line systems commonly found in the U.S.

Nominal Voltage Range (kV)	Maximum Operating Voltage (kV)[1]
46.1 to 72.5	72.5
72.6 to 121	121
138 to 145	145
161 to 169	169
230 to 242	242
345 to 362	362
500 to 550	550
765 to 800	800

Source: 29 CFR 1910.269 Table R-6 and Appendix B to that section
Note 1: This is the "voltage" of the power line for the purposes of the final rule.

[22] For further information, see Appendix B to § 1910.269.

Unless the power lines are deenergized and grounded, encroachment/ electrocution prevention measures have to be implemented to prevent the crane from breaching a minimum clearance distance and protect against electrocution. The employer is allowed to choose among several minimum clearance distance options.

For example, for lines up to 350kV, the minimum clearance distance options would be: (1) 20 feet; or (2) the distance specified in Table A of § 1926.1408 for the line's voltage (Table A is the "10-foot rule"; see discussion of Table A in discussion of § 1926.1408); or (3) a distance closer than what is specified in Table A.

However, there are limitations to the availability of some of these options, and the number of mandatory encroachment prevention (and other) measures increases when using a clearance distance closer than Table A.

A commenter stated that use of the term "employer" was confusing when there are multiple employers on a given construction site, and raised the issue of whether each employer was responsible for employing its own dedicated spotter and its own set of barricades and similar safety measures. (ID -0143.1.)

In general, except where otherwise specified in this standard, the requirements of this standard apply to employers whose employees are exposed to hazards addressed by this standard, and also to other employers in certain situations as explained in OSHA's multi-employer policy (see OSHA CPL 02-00-124, *Multi-Employer Citation Policy*, Dec. 10, 1999). For example, with respect to situations in which barricades, a dedicated spotter, or other measures are required under §§ 1926.1407-1926.1411, each such employer is responsible for ensuring that the required measures are in place. However, that does not mean that each employer is required to install or provide duplicate sets of

those measures. In multiple employer worksites, one employer may rely on measures provided by another employer as long as those measures meet the requirements of the standard.

Several commenters asked that OSHA specify in the standard that utility owner/operators may charge fees for the services they are required to perform under the standard. (ID -0155.1; -0203.1.) For example, where the employer uses § 1926.1408(a)(2)(iii)'s Option (3) for setting the clearance distance (i.e., the clearance distance under Table A), under § 1926.1408(c), the utility owner/operator must provide requested voltage information within two working days of the request.

The standard does not address the issue of fees; the Agency determined that fees will generally be addressed as a contractual matter between the parties involved.[23]

Section 1926.1407 Power line safety (up to 350 kV) – assembly and disassembly

The requirements in § 1926.1407 address the hazards of assembling and disassembling equipment near power lines up to 350 kV. The requirements in § 1926.1407 are similar in most respects to the requirements in § 1926.1408, which address operations of equipment near power lines.

One commenter suggested that OSHA amend § 1926.1407 to include cranes used to assist the assembly and disassembly of other cranes. (ID -0131.) As OSHA noted in the preamble to the proposed rule, when an assist crane is used during the assembly or disassembly of another crane/derrick, the use of the assist crane, with respect to power

[23] Note that in the Regulatory Flexibility Analysis, OSHA has assumed that the cost of providing this information would be passed on to the employer requesting the information, not the utility owner/operator. See section V.B of this preamble.

line safety, would be considered "operations" and therefore covered by § 1926.1408 (or, for power lines over 350 kV, § 1926.1409). This is because the assist crane has already been assembled and is being used for a crane operation. Therefore, use of the assist crane must comply with § 1926.1408 during the assembly/disassembly process rather than with § 1926.1407.

In contrast, a crane that is not yet fully assembled is often used to complete its own assembly. For example, a crane is often used to load its own counterweights. Similarly, it may unload its counterweights in its own disassembly process. Such activities would be covered under § 1926.1407 since it is being assembled/disassembled. Therefore, the provision is promulgated in the final rule without change.

Paragraph (a)

Under this paragraph, before beginning assembly or disassembly, the employer must determine if any part of the crane, load or load line (including rigging and lifting accessories) could get, in the direction or area of assembly, closer than 20 feet to a power line.

As stated in the preamble of the proposed rule, the phrase "in the direction or area of assembly/disassembly" was included to address the fact that, in some cases, the assembly or disassembly of a crane takes place not just in an "area," that is, a fixed portion of the work site, but also in a "direction." For example, when disassembling a crane, the disassembly process takes place in an area that includes the area under and around the boom's path as it is lowered to the ground (in most, but not all cases, the boom is lowered to the ground for the disassembly process). Under this provision, the

employer must assess the proximity that the boom will be in to the power line in its path of travel to (and on) the ground.

Two commenters expressed confusion about the meaning of the phrase "in the direction or area of assembly/disassembly." (ID -0122; -0178.1.) C-DAC's intent in including this phrase was to ensure that employers make the initial 20-foot clearance assessment based on not only the area which the crane equipment occupies at the beginning of the assembly/disassembly process, but also with respect to other areas radiating from the initial area, both horizontally and vertically, that will be occupied as the equipment components are added, removed, raised, and lowered during the assembly/disassembly process. For example, when assembling a lattice boom crane, the "area" involved will expand as boom sections are added.[24] This area expands in the "direction" in which the boom sections are added. The power line assessment has to be made for the portion of the site that will be involved as these boom sections are added.

As stated in the preamble to the proposed rule, "direction" includes the direction that, for example, the boom will move as it rises into the air after the boom has been assembled on the ground. For example, the boom, when fully assembled on the ground, may be more than 20 feet from a power line. However, when raising it from the ground, it may get closer than 20 feet. Accordingly, under this language, the "direction" that the boom will travel as it is raised must also be evaluated for proximity to power lines.

Another example is the assembly of a tower crane. As tower sections are added, the assembly process may reach a point where components are closer to power lines than when the process began. That "direction" of assembly upwards must also be evaluated.

[24] This also occurs with telescopic extensible boom cranes when a "dead man section" is added to the boom.

If an employer determines that the 20 foot "trigger" determination is positive, then the employer is required to take additional steps. Specifically, the employer must meet the requirements under either Option (1), Option (2), or Option (3) of § 1926.1407(a).[25] Some commenters were concerned that the three compliance options in § 1926.1407(a) could be construed as a prioritization of compliance preferences, e.g., a preference for deenergization over the other options. (ID -0203.1; -0214.1.) In response, OSHA wishes to clarify that the three options are in no particular order. In the Agency's view they represent three adequately protective compliance methods. The standard offers employers the flexibility to select the method most suitable for each specific work situation.

Paragraph (a)(1) Option (1)

An employer choosing Option (1) of this section will protect against electrocution by having the power lines deenergized and visibly grounded. Where the employer elects this option, it will not have to implement any of the encroachment/electrocution prevention measures listed in § 1926.1407(b). This option helps to minimize the electrical hazards posed by power lines.[26]

[25] If no part of the crane, load or load line could come closer than 20 feet to a power line, the employer is not required to take any further action under this section. However, the employer may encounter a situation where it needs to get closer than anticipated to the power lines during the assembly/disassembly process. In such a case the employer is required to go back and conduct a new 20 foot "trigger assessment."

[26] Grounding the lines helps minimize the electrical hazard from possible reenergizing of the lines; however, some voltage will still appear on the line until the circuit protective devices open the circuit. In addition, under certain conditions, the circuit protective devices will not open the line, and the voltage will remain.

A number of commenters confirmed the Committee's determination that because of the time and cost considerations in arranging for the utility owner/operator[27] to deenergize and ground the line, deenergizing and grounding has not been routinely done. (ID -0155; -0203; see the discussion in the proposed rule preamble of deenergizing and grounding with regard to proposed § 1926.1408(a)(2)(i), 73 FR 59755, Oct. 9, 2008.)

Therefore, OSHA continues to conclude that providing other safe and practical options in the final rule will help to reduce unsafe practices in the industry. Those other options (Options (2) and (3) in § 1926.1407(a)) combined with § 1926.1407(b) are designed to be effective protection against the hazards of electrocution.

One commenter requested that OSHA provide guidance on whether written confirmation of deenergization and grounding from the utility owner/operator will be required. (ID -0214.1.) He further recommended that the requested guidance should be set forth in the regulatory text rather than in the preamble if OSHA expects employers to obtain a written confirmation. OSHA did not determine that written confirmation is necessary. As long as the utility owner/operator confirms that the line is deenergized and it is visibly grounded, employee safety is assured. Thus, the final rule does not require written confirmation that the line is deenergized.

For a discussion of comments related to the requirement for visible grounding, see the section later in this preamble addressing § 1926.1408(a)(2)(i).

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[27] OSHA notes that the phrase "utility owner/operator" reflects scenarios where utilities may not be operated by an owner but by some entity other than the owner. Therefore wherever the phrase "utility owner/operator" is used in the standard or in the preamble it is meant to apply to utility owners or utility operators. The final rule also uses the word "utility" in its broadest sense. It includes traditional utilities as well as other entities (such as steel or paper companies) that own or operate the power lines.

One commenter suggested that in some situations deenergizing and grounding could place the utility owner/operator in conflict with other federal and state regulatory requirements. (ID -0203.1.) The commenter did not provide information for OSHA to consider regarding any specific conflicts, and OSHA has not identified any such conflicts. Moreover, in the event that such a conflict does arise, the employer could choose, as an alternative to deenergizing, Options (2) or (3) as described below.

This paragraph is being adopted without change from the proposal.

Paragraph (a)(2) Option (2)

Under Option (2) (§ 1926.1407(a)(2)), the employer is required to maintain a minimum clearance distance of 20 feet. To help ensure that this distance is not breached, the employer has to implement the encroachment prevention measures in § 1926.1407(b). Under this option, no part of the equipment, load or load line, including rigging and lifting accessories, is permitted closer than 20 feet to the power line.

Employers using this option will have to stay further away from the power line than had been required under subpart N's 10-foot rule (employers wanting to use the 10-foot rule would have to use Option (3), discussed below).[28] However, an advantage of this option to many employers is that they do not have to determine the voltage of the power line; they only have to determine that the line voltage is no more than 350 kV.

Under the old subpart N formula, an employee was required at most to maintain a 20-foot distance away from a power line. Under the new option, employees are required to stay at least 20 feet away from the power line, so the Committee determined that there

[28] As discussed above, the 10-foot rule requires varying clearance distances increasing with voltage with clearance distances that begin at 10 feet.

would be no diminution of safety under this new option. In fact, in the Committee's experience, most power lines encountered by most employers have voltages that, under the current subpart N formula, require a minimum clearance distance of 10 feet. Therefore, use of this option will result in a higher margin of safety. Employers who do not need to get closer than 20 feet to assemble/disassemble the crane could use this option and would be saved the step of obtaining the line voltage.

As noted above, in addition to maintaining a minimum clearance distance of 20 feet, employers using this option are required to implement the encroachment prevention and other measures specified in § 1926.1407(b).

Paragraph (a)(3) Option (3)

Under Option (3) (§ 1926.1407(a)(3)), the employer is required to maintain a minimum clearance distance in accordance with Table A of § 1926.1408. Under Table A, depending on the voltage of the power line, the minimum clearance distance ranges from 10 feet to 20 feet for lines up to 350 kV. Under this option the employer is required to determine the line's voltage.

As a practical matter, in the Committee's experience, the power lines most typically encountered by most employers would require a minimum clearance distance of 10 feet under Table A. As a result, employers can assemble/disassemble equipment closer to power lines under this option than under Option (2).

Table A is based upon the same formula that was used in subpart N (the 10-foot rule) and is similar to Table 1 in ASME B30.5-2004. Unlike subpart N, which had required employers to calculate the minimum clearance distance from a formula, Table A

sets forth specified clearance distances in a readily understood table and requires no calculations. In addition to maintaining the minimum clearance distance specified in the Table, employers using this option are required to implement the encroachment prevention and other measures specified in proposed § 1926.1407(b).

Several commenters verified C-DAC's determination that obtaining voltage information in practice can often be difficult and time-consuming. (ID -0118; -0143.1; -0146.1; -0155.1.) OSHA determines that providing a mechanism under § 1926.1407(a)(2) ("Option (2)") to proceed with construction operations without having to obtain voltage information from utilities provides employers with a viable alternative to obtaining voltage information without compromising the safety of workers. This section of the final rule provides a mechanism by which employers can, using Table A, perform work with clearance distances of less than 20 feet. It is promulgated as proposed. [29]

Paragraph (b) Preventing encroachment/electrocution

Once an employer has determined that some part of the crane, load or load line could come within the trigger distance of 20 feet of a power line (see § 1926.1407(a)), if it chooses either Option (2) or (3) of § 1926.1407(a) it is required to implement encroachment prevention measures to help ensure that the applicable minimum clearance

[29] The proposed regulatory text for § 1926.1407(a)(3)(i) used the phrase "minimum clearance distance" while that for § 1926.1407(a)(3)(ii) used "minimum approach distance." For consistency, OSHA has, in § 1926.1407(a)(3)(ii), changed the phrase "minimum approach distance" to "minimum clearance distance." Provisions in § 1910.269 and proposed subpart V of 29 CFR 1926 use the phrase "minimum approach distance." OSHA believes that employers who are covered by those standards are familiar with that term. In contrast, the Agency believes that employers that do not perform electric power work will better understand the term "minimum clearance distances." OSHA considers the terms "approach distance" and "clearance distance" to be interchangeable; no substantive distinctions are intended.

distance (20 feet under Option (2) or the Table A distance under Option (3) is not breached.[30]

Most of the measures in this paragraph are designed to help the employer maintain the appropriate clearance distance and thereby prevent electrical contact while in the process of assembling or disassembling equipment. One of the measures is designed to prevent electrocution in the event of electrical contact.

Paragraph (b)(1)

Under paragraph (b)(1) of this section, the employer is required to conduct a planning meeting with the Assembly/Disassembly Director[31] (A/D Director), operator, assembly/disassembly crew and other workers who will be in the assembly/disassembly area (including the area of the load). This planning meeting must include reviewing the location of the power line(s) and the steps that will be implemented to prevent encroachment and electrocution.

In the planning meeting, the employer is required to select a protective measure from paragraph (b)(3) of this section (see discussion below) and review all the measures that will be used to comply with this section.

The purpose of the meeting requirement is to ensure that the operator and other workers who will be in the area understand these measures and how they will be implemented. That understanding is important to their successful implementation.

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[30] Alternatively, under Option (1), the employer could have the lines deenergized and grounded. If Option (1) were selected, no further action under this section would be required.

[31] As explained in the preamble accompanying § 1926.1404, the term "assembly/disassembly director" replaces the proposed term "assembly/disassembly supervisor."

Because of the critical nature of these measures, and the seriousness of the consequences to the safety of the employees if they are not implemented correctly, the Committee concluded that it is necessary for there to be a structured process by which the employer communicates this information.

As noted below, a planning meeting to discuss implementing encroachment prevention measures is also required under § 1926.1408(b)(1). Refer to the preamble section related to that provision for a discussion about public comments received regarding responsibilities for ensuring that such a meeting takes place. That discussion is equally relevant to this section. With the exception of the use of the term "director" instead of "supervisor," as explained above, this section is promulgated as proposed.

Paragraph (b)(2)

Paragraph (b)(2) of this section requires that where tag lines are used they must be nonconductive. This provision uses two terms that are defined in § 1926.1401. "Tag lines" is defined as "a rope (usually fiber) attached to a lifted load for purposes of controlling load spinning and pendular motions or used to stabilize a bucket or magnet during material handling operations." Thus, one end of a tag line is attached to the load and the other end is held by an employee who controls the load's motion by exerting force on the line.

If the equipment or load were to make electrical contact with a power line while an employee was holding a tag line that was able to conduct electricity, the employee could be electrocuted. The requirement that the tag line be nonconductive is designed to protect against such an event. Section 1926.1401 defines "nonconductive" as meaning

that, "because of the nature and conditions of the materials used, and the conditions of use (including environmental conditions and condition of the material), the object in question has the property of not becoming energized (that is, it has high dielectric properties offering a high resistance to the passage of current under the conditions of use)."

This definition recognizes that it is not only the inherent property of the tag line material that results in it being nonconductive but also the conditions of use. For example, in some cases, if an otherwise nonconductive material were to become wet and therefore able to conduct electricity, it would no longer qualify as nonconductive under this paragraph.

One commenter requested that OSHA specify test procedures to assist employers in making the determination of whether a tag line is nonconductive. (ID -0178.1.) C-DAC considered the utility of setting specifications for materials required to be nonconductive but determined that it would be impractical. American Society for Testing and Materials (ASTM) *Standard Specification for Unused Polypropylene Rope with Special Electrical Properties*, ASTM F1701-05 contains specifications and test methods for live-line rope used in electric power work. These ropes are used to insulate power line workers from energized power lines. Tag lines meeting this standard are acceptable under the final rule. However, to meet the requirement for "nonconductive" tag lines, they need not meet this standard, which requires a degree of insulation beyond that intended by the final rule. In addition, several other OSHA general industry and construction standards call for nonconductive materials, including § 1910.268(n)(13)(ii) (requiring nonconductive measuring devices to measure clearance distances from

overhead power lines), §§ 1910.269(l)(6)(i) and 1910.333(c)(8) (requiring metal articles worn by employees to be rendered nonconductive), and § 1926.955(a)(8) (requiring nonconductive tag lines). In general these and other standards that call for nonconductive materials require the use of insulating material that does not have a voltage rating; thus, there is no need to specify a test method. In fact, setting test criteria for these materials would produce a voltage rating and render them insulating rather than nonconductive. (Because nonconductive materials have no voltage rating, there is still a risk of injury from electric shock should contact occur. However, these materials reduce that risk substantially.) In practice, under dry conditions nonmetallic fiber rope typically satisfies the definition for nonconductive.[32] The Agency concludes that this guidance is sufficient to help employers determine whether their tag lines meet the definition and has therefore, declined to specify test procedures in the final rule. The provision is promulgated as proposed, without change.

Paragraph (b)(3)

Under this paragraph the employer is required to implement one of five listed encroachment prevention measures (§ 1926.1407(b)(3)(i) through (v)). The Committee concluded that the use of any one of these measures, in combination with the required measures listed elsewhere in § 1926.1407(b), would be feasible and effective in protecting against encroachment. Specifically, the employer is required to choose either: (i) the use of a dedicated spotter; (ii) a proximity alarm; (iii) a device that automatically

[32] Wet, muddy, or high humidity conditions can cause such rope to stop being nonconductive. Similarly, the presence of metal or other conductive fibers or conductive sheaths or reinforcement would render the tag line conductive.

warns the operator when to stop (i.e., a range control warning device); (iv) a device that automatically limits the range of movement of the equipment; or (v) an elevated: warning line, barricade, or line of signs, in view of the operator, equipped with flags or similar high-visibility markings. Providing the ability to choose among these options gives the employer flexibility so that it can pick one that is well suited and efficient in the circumstances.

A definition of "dedicated spotter (power lines)" is included in § 1926.1401, *Definitions*. A dedicated spotter must meet the signal person qualification requirements of § 1926.1428 and his/her sole responsibility must be to watch the separation between the power line and the equipment, load line, and load, and to ensure through communication with the operator that the applicable minimum distance is not breached.

When the employer uses a dedicated spotter to prevent encroachment under this section, that person has the critical responsibility of ensuring, through communication with the operator, that the equipment maintains a specified minimum clearance distance from a power line. This definition makes clear that the dedicated spotter cannot have any other responsibilities.[33] The dedicated spotter must have the qualifications required of a signal person under § 1926.1428, discussed below. Those qualifications will ensure that the signal person can communicate effectively with the operator. They also ensure that the signal person is knowledgeable about crane dynamics and therefore is able to

[33] The preamble language of the proposed rule stated that "the dedicated spotter cannot have any other responsibilities that detract him/her from this task." (73 FR 59752, Oct. 9, 2008.) The phrase "that detract him/her from this task" incorrectly implied that a dedicated spotter could have other tasks provided those other tasks did not distract the dedicated spotter from his/her task of maintaining the required separation between the power line and the equipment, the load, and the load line. This implication was incorrect. As stated in the definition section, the dedicated spotter's duty to maintain the required separation from the power line must be his/her "sole responsibility."

recognize situations in which the minimum clearance distance may inadvertently be breached if, for example, the load is stopped quickly while it is being moved near a power line.

One commenter requested that OSHA include a clarification that the dedicated spotter can also be the signal person. (ID -0292.1.) As noted in the definition of "dedicated spotter" quoted above, although the dedicated spotter must be a qualified signal person under the requirements of § 1926.1428, that definition also mandates that the sole responsibility of the dedicated spotter be to ensure the required separation between the power line and the equipment, the load line, and the load (including loading and lifting accessories). Thus, in situations where the equipment operator requires the assistance of a signal person to provide signals related to maneuvering the equipment or the load other than maintaining the required power line clearance distance, a different person must serve as signal person.[34]

The devices listed in §§ 1926.1407(b)(3)(ii) and (iii) are also defined in § 1926.1401. A "proximity alarm," is a device that warns of proximity to a power line and must be listed, labeled, or accepted by a Nationally Recognized Testing Laboratory in accordance with § 1910.7.[35] A Nationally Recognized Testing Laboratory is an organization that has been recognized by OSHA pursuant to § 1910.7 as competent to

[34] If a dedicated spotter also served as a signal person for purposes other than maintaining the clearance distance, the dedicated spotter would be vulnerable to a typical cause of power line contact – focusing on something else and forgetting about, or being distracted from, maintaining the clearance distance.

[35] The C-DAC version of this provision defined proximity alarm as: "a device that provides a warning of proximity to a power line that has been approved by a Nationally Recognized Testing Laboratory." OSHA has modified the provision to conform its language to that used in § 1910.7, the OSHA rule governing nationally recognized testing laboratories, and to explicitly refer to § 1910.7 to make clear that the listing, labeling, or acceptance of a device under this rule must be accord with § 1910.7.

evaluate equipment for conformance to appropriate test standards for that type of equipment. Thus, approval of a proximity alarm by a nationally recognized testing laboratory provides assurance that the device will work as intended. (For a discussion of public comments submitted relating to proximity alarms, see discussion of § 1926.1408(b)(4).) A "range control warning device," is defined in § 1926.1401 and is a device that can be set by an equipment operator to warn that the boom or jib tip is at a plane or multiple planes.

OSHA realized that some of the devices listed in § 1926.1407(b)(3) would not be operational or effective against electrocution during certain phases of the assembly or disassembly process of certain types of cranes. For example, for lattice boom cranes, proximity alarm devices may not be able to be used when the boom is not yet fully assembled; at that point the proximity alarm typically cannot be connected and functioning. Therefore, during certain phases of assembly/ disassembly, one of the other options would need to be used (such as a dedicated spotter) to provide the needed protection.

However, the proposed regulatory text would have permitted an employer to select an option under paragraph (b)(3) of this section irrespective of whether it would be effective under the circumstances. To address this concern, OSHA requested public comment on whether to modify proposed § 1926.1407(b)(3) to preclude the employer from selecting an option that, in the employer's situation, would be ineffective, such as by revising the provision to read:

> (3) At least one of the additional measures listed in this paragraph must be in place. The measure selected from this list must be effective in preventing encroachment. The additional measures are: . . . .

Two of four commenters on this issue supported amending the language of this provision as described above. (ID -0067; -0118.) The two commenters who disagreed with requiring that the chosen method be effective in preventing encroachment thought that this provision would prove problematic for employers; they favored the original wording from the Committee that did not specifically require efficacy. (ID -0205.1; -0213.1.) These latter two commenters did not present any evidence to counter OSHA's concern that some of the listed encroachment prevention measures may not be fully effective under all circumstances. OSHA concludes that prudence dictates amending this provision to require that the selected measure be effective in preventing encroachment; the final rule therefore reflects the change described above.

In situations where an employer chooses the option of using a dedicated spotter to prevent encroachment under § 1926.1407(b)(3), the employer is required to meet the requirements for spotters in § 1926.1407(b)(3)(i). As specified in paragraph (b)(3)(i)(A) of this section, the spotter must be equipped with a visual aid to assist in identifying the minimum clearance distance. The Committee concluded that a visual aid is needed for the spotter because of the difficulty in visualizing the minimum clearance distance boundary in the air.

Under paragraphs (b)(3)(i)(B) – (D) of this section, the spotter must be positioned so that he/she can effectively gauge the clearance distance from the power line; the spotter, where necessary, must use equipment that enables him/her to communicate directly with the equipment operator; and the spotter must give timely information to the operator so that the required clearance distance can be maintained. C-DAC determined that each criterion is needed for the spotter to be able to be effective

One commenter on this provision asked whether an airhorn is appropriate communication equipment for purposes of paragraph (C). (ID -0120.) OSHA determines that an airhorn would not enable the dedicated spotter to communicate with the operator as effectively as a radio, telephone, or other electronic communication device, and, in any event, might not be an effective means of communication on a noisy construction site; therefore, OSHA does not consider use of an airhorn to constitute compliance with paragraph (C).[36]

Paragraph (c) Assembly/Disassembly below power lines prohibited

This paragraph precludes employers from assembling or disassembling cranes/derricks beneath energized power lines. The Agency agreed with the Committee's conclusion that assembly/ disassembly below energized power lines presents an extreme risk and needs to be prohibited. The assembly/disassembly process necessarily involves moving and hoisting parts of the equipment into place. If some of this work takes place beneath a power line, the risk that a part, load, load line, or other equipment would make electrical contact is very high. Also, in both assembly and disassembly, maneuvering an assembled crane out from under the power lines, or maneuvering a crane that is about to be disassembled under them, itself poses a high risk of such contact.

C-DAC's agreement on this provision indicates a determination by the Committee that, in almost all cases, the employer can plan the assembly/disassembly so that there

[36] The cross-reference to § 1926.1420 originally included in this provision as proposed was deleted in the final rule for consistency with the parallel provisions for dedicated spotters in §§ 1926.1408(b)(4)(ii)(C) and 1926.1410(d)(2)(iii). This is a ministerial change not intended to have any substantive enforcement implications.

will be no need to be beneath power lines. The Committee and OSHA also concluded that, in the very few instances where this is not possible, in light of the extreme risk involved, it is essential that the lines be deenergized and visibly grounded. No comments were received on this provision; it is promulgated as proposed.

Paragraph (d) Assembly/Disassembly closer than Table A clearance prohibited

Assembly and disassembly of cranes/derricks closer than the minimum clearance distance in proposed Table A of § 1926.1408 to an energized power line is prohibited under this paragraph. If assembly or disassembly needs to take place closer than that distance, the employer is required to have the line deenergized and visibly grounded. The rationale for this provision is similar to that discussed above for assembly/disassembly beneath power lines (that rationale is set forth in the discussion in the proposed rule preamble of proposed § 1926.1407(c), 73 FR 59753, Oct. 9, 2008). Engaging in assembly/disassembly activity closer to an energized power line than the Table A distance was considered by the Committee to be too hazardous to be permitted under any circumstances.

This reflects certain inherent characteristics of the assembly/disassembly process that preclude the employer from being able to reliably maintain clearance distances closer than Table A of § 1926.1408. For example, when disassembling a lattice boom, pins that hold boom sections together are removed. Even when done properly, this can release stored kinetic energy and cause the boom section being removed, as well as the remaining sections, to move. It is too difficult to estimate the amount of such potential

movement with the precision that would be necessary when working closer than the Table A distances.

Another example is when assembling a boom, an error in the assembly process may similarly cause unanticipated movement. Using clearances closer than those in Table A would not allow sufficient room in light of the difficulty of predicting the amount of such movement.[37]

This paragraph is being adopted as proposed.

Paragraph (e) Voltage information

This section operates in conjunction with § 1926.1407(a)(3). Under § 1926.1407(a)(3), employers who elect to use Option (3) of § 1926.1407(a) must determine the line's voltage. Under § 1926.1407(e), where the employer asks the utility owner/operator for that voltage information, the utility owner/operator of the line is required to provide the voltage information within two working days of the request.[38]

This reflects a conclusion of the Committee that, in the absence of such a time limitation on the utility owner/operator, in many instances Option (3) § 1926.1407(b) would not be useful because the employer would not be able to get the voltage

[37] In this respect this provision differs from § 1926.1410. As discussed below, § 1926.1410 allows use of minimum clearance distances closer than Table A in some circumstances for crane "operations." In contrast, § 1926.1407(d) reflects a determination by the Committee that there are no circumstances for "assembly/disassembly" when it would be safe for any part of the crane, load or load line (including rigging and lifting accessories) to get closer than the Table A minimum clearance distance.

[38] One commenter suggested that utility owners/operators be required to label all power lines with voltage information. (ID -0143.1.) OSHA rejected this suggestion because it believes the cost of labeling every overhead power line in the country would be prohibitive.

information in sufficient time to be able to use it. Many employers will rely on the utility owner/operator to get this information. The Committee was concerned that an extended delay in getting it would result in employers, to some extent, doing the work anyway without the information. Therefore, for Option (3) § 1926.1407(b) to be viable, the Committee concluded that a reasonable time limitation for the utility owner/operator to respond was needed.[39]

Some utility owner/operators asserted that OSHA cannot require them to provide voltage information because OSHA does not have authority to impose such requirements on an electric utility that does not have employees at the construction site in question. (ID -0166.1; -0203.1; -0226.1.)

OSHA's authority to require that electric utilities disclose voltage information derives from secs. 6(b) and 8(g)(2) of the Act. While sec. 6(b) generally authorizes the Secretary to promulgate and enforce occupational safety and health standards, sec. 6(b)(7) specifically permits the Secretary to "prescribe the use of labels or other appropriate forms of warning as are necessary to insure that employees are apprised of all hazards to which they are exposed . . . and proper conditions and precautions of safe use or exposure." 29 U.S.C. 655(b)(7). Thus, OSHA may include information-gathering requirements among the provisions of a standard. Section 1926.1407(e) falls within the scope of sec. 6(b)(7), because voltage information is necessary to the determination of safe clearance distances for employees who work near power lines.

The Agency previously exercised its authority under sec. 6(b)(7) of the Act to promulgate the Hazard Communication Standard, which requires that chemical

[39] As noted in the introduction, C-DAC included two members from the electric utility industry.

manufacturers and importers provide information for the benefit of downstream employees (see § 1910.1200). As a rationale for these provisions, OSHA explained that chemical manufacturers and importers are in the best position to develop, disseminate, or obtain information about their products (see 48 FR 53280, 53322, Nov. 25, 1983). Similarly, in an early case discussing sec. 6(b)(7), the Fifth Circuit found that "[t]he ability of downstream employers to protect their own employees is also an appropriate consideration in determining where the duty to warn should lie." *American Petroleum Institute v. OSHA*, 581 F.2d 493, 509 (5th Cir. 1978).

Section 8(g)(2) of the Act affords the Secretary additional authority for § 1926.1407(e). According to this section, the Secretary may "prescribe such rules and regulations as he may deem necessary to carry out responsibilities under the Act." The enumerated purposes of the Act indicate that the Secretary's responsibilities include:

- Setting mandatory occupational safety and health standards applicable to businesses affecting interstate commerce (29 U.S.C. 651(b)(3));
- Developing innovative methods, techniques, and approaches for dealing with occupational safety and health problems (29 U.S.C. 651(b)(5)); and
- Providing for appropriate reporting procedures with respect to occupational safety and health which procedures will help achieve the objectives of this Act and accurately describe the nature of the occupational safety and health problem (29 U.S.C. 651(b)(12)).

An electric utility representative asserted that, because employees of electric utilities are not likely to perform work under the circumstances that the standard contemplates, sec. 4(a) prevents OSHA from including requirements that target electric utilities. OSHA

disagrees. Section 4(a) broadly provides that the OSH Act applies "with respect to employment performed in a workplace," 29 U.S.C. 653(a), and does not bar the statute's application to any class of employers. Section 4(a) contains no language to suggest that the Act's application depends on the relationship between the employees at risk and the employer with the power to reduce their risk.

Additionally, the commenter stated that § 1910.12(a) precludes OSHA from regulating electric utilities, because employees of electric utilities will not be present at construction worksites and therefore will not be "engaged in construction."[40] The commenter cites *Reich v. Simpson, Gumpertz & Heger, Inc.*, 3 F.3d 1, 4-5 (1st Cir. 1993), in which the First Circuit relied on the second sentence of § 1910.12(a) as a basis for vacating citations that OSHA had issued to an engineering firm under the multi-employer worksite doctrine.

Simpson, Gumpertz is inapposite; the multi-employer worksite doctrine has no bearing on the validity of § 1926.1407(e), which explicitly holds electric utilities responsible for the distribution of voltage information. A more relevant case is *Sec'y of Labor v. Trinity Indus., Inc.*, 504 F.3d 397 (3d Cir. 2007), in which the Third Circuit upheld information disclosure requirements that are analogous to those in § 1926.1407(e). In *Trinity*, the Third Circuit affirmed OSHA's authority for provisions in the Asbestos Standard for the Construction Industry that require building owners to communicate the presence of asbestos or presumed asbestos-containing materials to certain prospective employers. *Id.* at 402. The court distinguished OSHA's authority to require that specific employers disclose information from the Agency's authority under

[40] It should be noted that utility employees will be at these worksites from time to time to perform work on the power lines.

the multi-employer doctrine to cite a general contractor for violations committed by a subcontractor:

> Unlike the regulations at issue in *Summit Contractors, Inc.*, the regulation at issue here specifically applies to building owners . . . We are not convinced that the Secretary is powerless to regulate in this field, especially given the findings she has made regarding the importance of building owners in the discovery and communication of asbestos hazards.

Id. As *Trinity* confirms, the multi-employer worksite doctrine does not govern the validity of regulatory provisions that require specific employers to provide information. As a result, the interpretation that the multi-employer case law has given to § 1910.12(a) is not controlling in relation to § 1926.1407(e). Moreover, the requirement that electric utilities provide voltage information is not in conflict with the plain language of § 1910.12(a), which states:

> The standards prescribed in part 1926 of this chapter are adopted as occupational safety and health standards under section 6 of the Act and shall apply, according to the provisions thereof, to every employment and place of employment of every employee engaged in construction work. Each employer shall protect the employment and places of employment of each of his employees engaged in construction work by complying with the appropriate standards prescribed in this paragraph.

As the Agency noted in the proposal, the first sentence in § 1910.12(a) makes the construction standards applicable to every employment and to every "place of employment" of every construction employee. The second sentence of § 1910.12(a), by providing that each employer must protect the employment and the places of employment of each of his employees, does not negate the broad reach of the first sentence. The Secretary did not include language to indicate that an employer has obligations only toward his employees and the worksites of his employees.

Furthermore, the history of § 1910.12(a) reveals that the Secretary did not intend for it to limit her authority. Indeed, § 1910.12(a) is located within a subpart entitled "Adoption and Extension of Federal Standards," which the Secretary created to extend her jurisdiction through the adoption of the Construction Safety Act's standards. § 1910.11(a), subpart B. The opening paragraph of subpart B states that the subpart's provisions "adopt and extend the applicability of established federal standards . . . with respect to every employer, employee, and employment covered by the Act." § 1910.11(a). Thus, neither the language nor the context of § 1910.12(a) suggest a conflict with the requirement that electric utilities provide voltage information when employers request it.

The commenter also cites *United States v. MYR Group, Inc.*, in which the Seventh Circuit held that OSHA could not cite a parent corporation for the failure of a subsidiary to train its employees. 361 F.3d 364 (7th Cir. 2004). Yet the court distinguished the facts of that case from circumstances where "[e]ach employer at the worksite controls a part of the dangerous activities occurring at the site and is the logical person to be made responsible for protecting everyone at the site from the dangers that are within his power to control." *Id.* at 367. Consistent with the Seventh Circuit's reasoning, OSHA has placed on utilities the responsibility to inform construction workers about power line voltage, as electric utilities are in the best position to disseminate voltage information.

In summary, OSHA has firmly-established precedent, under part 1926 and beyond, for requiring that an employer with special knowledge of occupational hazards provide information to protect workers. Like the provisions of the Hazard Communication Standard and the Asbestos Standard for the Construction Industry, §

1926.1407(e) imposes requirements on employers who possess essential information and are in the best position to distribute it.

The Committee determined that two business days would be a reasonable amount of time to allow the utility owners/operator to respond and be sufficiently short to be useful to the employer requesting the information. Most of the utility owner/operators who submitted comments or testimony on this issue did not indicate that a two-day requirement was unworkable so long as weekends and holidays were excluded from the two-day calculation.[41] (ID -0203.1; -0205.1; -0213.1.) Similarly, although one contractor indicated a desire to be able to obtain power line voltage information immediately at all times through internet services provided by the utility owner/operator (ID -0118.1), other contractors indicated that a two working day time frame was manageable from a construction planning standpoint (ID -0205.1; -0213.1). In light of these comments, OSHA concludes that the proposed two-day requirement to fulfill voltage information requests was a reasonable time frame for both contractors and utility owners/operators.

> In the proposed rule preamble, the Agency noted that the C-DAC provision read:
>
> *Voltage information*. Where Option (3) is used, owner/operators of power lines must provide the requested voltage information within two working days of the employer's request.

In a different context – determining the timeliness of notices of contest to OSHA citations – OSHA defines "working days" to mean "Mondays through Fridays but shall not include Saturdays, Sundays, or Federal holidays." 29 CFR 1903.22(c). Since the term is already defined in an OSHA regulation, the Agency stated that it would apply the same

[41] One electric utility representative at the public hearing did request, however, that the time period for responding to a request be changed to four business days. (ID -0342.)

definition here unless this rule were to specify a different definition and solicited comments on whether the phrase "working days" should be defined differently for purposes of this rule than it is in § 1903.22(c). All comments received on this issue indicated that the § 1903.22(c) definition was appropriate in this context. (ID -0203.1; -0205.1; -0213.1.) Although OSHA is not specifically incorporating the § 1903.22 definition by reference, the Agency intends to rely on that definition for purposes of enforcing § 1926.1407(e). One commenter sought clarification that the two working day time period would start to run on the first full business day after the request for information is received. (ID -0215.1.) This is, in fact, an accurate representation of how this provision will be enforced. If, for example, the utility receives a request for voltage information on Monday, it will have until the end of the business day on Wednesday to provide the necessary information.

Another commenter asked OSHA to provide guidance on whether the voltage information needed to be provided in written form. (ID -0214.1.) Given the inherent difficulties of obtaining written information expeditiously in many construction sites, OSHA concurs with C-DAC's recommendation not to require that voltage information be provided in writing.

Paragraph (f) Power lines presumed energized

This paragraph requires that employers always assume that all power lines are energized unless the utility owner/operator confirms that the power line has been and continues to be deenergized and visibly grounded at the worksite. No adverse comments were received on this provision; it is promulgated as proposed.

Paragraph (g) Posting of electrocution warnings

This paragraph requires the posting of electrocution warnings as follows: one inside the cab in view of the operator and (except for overhead gantry and tower cranes) at least two on the outside of the equipment. The Committee concluded and OSHA agrees that these electrocution warnings are necessary to protect the operator as well as any employees working in the area around the crane by increasing their awareness of the hazard. This provision is similar to sec. 5-3.4.5.2(d) of ASME B30.5-2004. No adverse comments were received on this provision; it is promulgated as proposed.

Section 1926.1408 Power line safety (up to 350 kV) – operations

As discussed with respect to power line safety in assembly/disassembly, the standard requires the implementation of a systematic approach to power line safety for crane/derrick operations. This approach consists of two basic steps. First, the employer must identify the work zone, assess it for power lines, and determine how close the crane could get to them. The employer has the option of doing this assessment for the area 360 degrees around the crane or for a more limited, demarcated area. Second, if the assessment shows that the crane could get closer than a trigger distance – 20 feet for lines rated up to 350 kV – then requirements for additional action are triggered.

Specifically, unless the power lines are deenergized and grounded, encroachment prevention measures have to be implemented to prevent the crane from breaching a minimum clearance distance. The employer is allowed to choose among three minimum clearance distance options. For example, for lines up to 350kV, the minimum clearance

distance options are 20 feet, or the distance specified in Table A of this section for the line's voltage (Table A is the "10-foot rule"; see discussion of Table A below), or a distance closer than what is specified in Table A. However, there are limitations to the availability of some of these options, and the number of mandatory encroachment prevention (and other) measures increases when using a clearance distance closer than Table A.

Paragraph (a) Hazard assessments and precautions inside the work zone.

Before beginning crane/derrick operations, the employer is required to determine if power lines would pose a hazard. The first step in this process is to identify the work zone for which this hazard assessment will be made (§ 1926.1408(a)(1)). The employer has two options for defining the work zone.

Under the first option (§ 1926.1408(a)(1)(i)), the employer is required to define the work zone by marking boundaries and prohibiting the operator from operating the equipment past those boundaries. Examples of how to demarcate the boundaries include using flags or devices such as a range limit device or range control warning device. "Range control warning device" is defined in § 1926.1401 as "a device that can be set by an equipment operator to warn that the boom or jib tip is at a plane or multiple planes."

OSHA noted in the proposed rule that the term "range limit device" was used in proposed § 1926.1408(a)(1)(i) but that no definition of this term was provided in proposed § 1926.1401. OSHA stated that it determined that C-DAC understood a range limit device to be a device that physically limits how far a crane can boom out and the angle within which the boom can swing. OSHA requested public comment on whether a

definition of “range limit device” should be added to § 1926.1401 and, if so, whether the definition described in the proposed rule preamble is appropriate (73 FR 59759, Oct. 9, 2008).

Three commenters responded, endorsing the need for a definition and suggesting language along the lines discussed in the proposed rule. (ID -0118; -0205.1; -0213.1.) OSHA has added a definition for a “range control limit device” that defines it as “a device that can be set by an equipment operator to limit movement of the boom or jib tip to a plane or multiple planes.”

Employers are not permitted to use existing landmarks to demarcate work zone boundaries unless they are marked. For example, a line of trees would be insufficient. Without anything more the trees would not signal a reminder to the operator of there being a boundary that must be maintained. However, adding flags to those trees would be sufficient because the flags would serve as a reminder that the trees are located along a boundary that the operator must not breach.

The boundaries must mark the limits of all crane movement. For example, a work zone could be defined by demarcating boundaries: (1) to the left and right of the operator, to limit the lateral movement of the boom, and (2) in front of the operator, in a line connecting the side boundaries, limiting the boom’s radius.

In identifying the work zone, the employer must consider the entire area in which the crane will need to operate. If the crane will need to be positioned in more than one spot to accomplish its work, or to travel with a load, the employer must consider the total area in which it will need to operate and set the boundaries accordingly.

The second option for identifying the work zone (§1926.1408(a)(1)(ii)) is to define the work zone as the area 360 degrees around the crane, up to the crane's maximum working radius. In other words, under this option, the work zone is the area within a circle, with the crane at the center, and the radius defined by the maximum working radius of the crane. No boundaries would have to be marked under this option since the crane would be permitted to operate in the entire area that it could reach.

Paragraph (a)(2)

Once the employer has identified the work zone according to § 1926.1408(a)(1), it is then required to make the power line hazard assessment. Specifically, it must determine if any part of the crane, load or load line (including rigging and lifting accessories) could come within a "trigger" distance – 20 feet of a power line. This determination must be made based upon the assumption that the crane would be operated up to its maximum working radius (or, if a demarcated boundary is used, the assessment must be made with the assumption that the crane would be operated up to that boundary).

Three commenters expressed concern over OSHA's use of the term "maximum working radius" in describing the methodology for defining the work zone. (ID -0146.1; -0206.1; -0209.1.) Their concern is that using "maximum working radius" would trigger the encroachment-prevention requirements of § 1926.1408(b) on construction sites where the equipment operator has no intention of using the equipment up to the equipment's maximum working distance. Another commenter questioned whether the phrase "any part of the equipment" would include the boom if the boom "could be lowered within 20

feet of a power line even though the working radius will not require encroachment into the 20-foot zone." (ID -0178.1.)

OSHA notes that these concerns are already addressed through a mechanism in the provision as proposed: the employer's ability, under § 1926.1408(a)(1)(i), to define the work zone boundaries and then prohibit operation of the equipment beyond those boundaries. In other words, employers may define the boundary of a work zone at the outer boundary of the intended working radius of any part of the equipment, including the boom.

To illustrate, if an employer is using a crane with a maximum working radius of 100 feet, but intends to extend the crane boom out only 75 feet beyond the center point of the crane, that employer can demarcate the outer boundary of the work zone using such measures as a line of flags, and then prohibit crane operations beyond that 75-foot work zone boundary. Therefore, in the one commenter's example of where the boom could come within 20 feet of a power line but the work does not require it, the employer need not take encroachment-prevention measures if it prohibits working beyond a radius that would bring the boom within 20 feet of the line. OSHA concludes, therefore, that no change to the proposed regulatory language is needed to address these concerns and is promulgating this paragraph as proposed.

If, after defining a work zone, an employer determines that the 20 foot "trigger" determination is positive, then the employer is required to take additional steps. Specifically, the employer must meet the requirements under either, Option (1), Option

(2), or Option (3) of § 1926.1408(a)(2).[42] See above discussion of § 1926.1407(a) for additional information about how OSHA intends to enforce these compliance options.

Section 1926.1408(a)(2) is adopted without change from the proposal.

Paragraph (a)(2)(i) Option (1)

An employer choosing Option (1) of this section will protect against electrocution by having the power lines deenergized and visibly grounded at the worksite. This option minimizes the probability that equipment that contacts the power line will become energized. The power line must be "visibly grounded at the worksite."

One commenter believed that the requirement for visible grounding was "impractical and overly burdensome." (ID -0146.1.) A second commenter believed that this requirement was needed to permit the employer to visually verify that the power line has been deenergized. (ID -0190.0.)

After reviewing these comments, OSHA continues to conclude, as C-DAC did, that visible grounding of the deenergized line is necessary to protect workers. First, it minimizes the voltage that can appear on the power line from a number of causes, including induced current and capacitive coupling, lightning, other energized lines falling onto the power line (for example, where there is a traffic accident involving a motor vehicle striking a utility pole supporting the power line), and accidental reenergizing of

[42] If no part of the crane, load or load line could come closer than 20 feet to a power line, the employer is not required to take any further action under this section. However, the employer may encounter a situation where it unexpectedly needs to increase the size of the work zone. This may occur, for example, as a result of an unanticipated need to change the crane's position or to have the crane operate beyond the original work zone boundaries. In such a case the employer is required to go back to the first step under § 1926.1408(a)(1), re-identify a work zone and conduct a new 20 foot "trigger" assessment.

the lines. It also facilitates the operation of circuit protective devices to deenergize the line after it is reenergized from the last two causes. It also serves as a visual confirmation that the power line has been deenergized. (See discussion of § 1926.1407(a)(1) where OSHA declines to amend the proposal to require written confirmation that the power line has been deenergized.)

Where the employer elects to deenergize the power line, it will not have to implement any of the encroachment/electrocution prevention measures listed in § 1926.1408(b). However, some amount of time is needed to arrange for the utility owner/operator to deenergize and ground the line. Also, in some instances, especially where the construction project is small, the cost of deenergizing and grounding may be a substantial portion of the cost of the project. Because of these factors, deenergizing and grounding, which was also a permissible option under former § 1926.550(a)(15), has not been routinely done. Accordingly, the rule provides other safe and practical options to reduce unsafe practices in the industry. Those other options (Options (2) and (3) in § 1926.1408(a)(2)(ii) and (iii), discussed below) combined with § 1926.1408(b) are designed to afford effective protection against the hazard of electrocution.

Section 1926.1408(a)(2)(i) is adopted as proposed.

Paragraph (a)(2)(ii) Option (2)

Under Option (2) (§ 1926.1408(a)(2)(ii)), the employer is required to maintain a minimum clearance distance of 20 feet. To help ensure that this distance is not breached and that employees are protected from electrocution, the employer is required to implement the encroachment/electrocution prevention measures in § 1926.1408(b).

Employers using this option will have to stay further away from the power line than had been required under subpart N's 10-foot rule (employers wanting to use the 10-foot rule will have to use Option (3) of this section, discussed below).[43] However, an advantage of this option to many employers is that they do not have to determine the voltage of the power line; they only have to determine that the line voltage is not more than 350 kV.

Several commenters verified the Committee's conclusion that obtaining voltage information from utilities can often be difficult and time-consuming. (ID -0118.1; -0143.1; -0146.1; -0155.1.) OSHA determines that by providing a mechanism under § 1926.1408(a)(2)(ii) for employers to proceed with construction operations without having to obtain voltage information, employers will have more flexibility without compromising the safety of workers.

One commenter believed that the maximum clearance distance for this option should be 15 feet instead of the proposed 20 feet because it believed such a distance would be safe for what it described as "relatively small cranes." (ID -0184.1.) However, OSHA does not agree that a distinction based on crane size is justified. When smaller cranes operate near power lines, they present the same hazard as larger cranes and need to take similar precautions. OSHA further notes that smaller cranes, i.e., cranes with shorter booms, will have a smaller work zone than larger cranes and therefore should be better able to avoid coming within the permitted 20-foot clearance and, as a result, may be less likely to trigger the protective steps required under paragraph (a)(2) of this section in any event. Moreover, if OSHA were to adopt a 15-foot minimum clearance distance for this

[43] As discussed above, the 10-foot rule requires varying clearance distances increase with voltage with clearance distances that begin at 10 feet.

option as advocated by the commenter, it would have to make a corresponding reduction in the maximum voltage covered by §§ 1926.1407 and 1926.1408 and a corresponding increase in the minimum voltage covered by § 1926.1409 to retain the protection afforded by the 10-foot rule previously contained in subpart N. Therefore, OSHA has concluded that it would be inappropriate to decrease the proposed 20 foot minimum clearance distance under § 1926.1408(a)(2)(ii); this paragraph is therefore promulgated as proposed.

As noted above, in addition to maintaining a minimum clearance distance of 20 feet, employers using this option are required to implement the encroachment prevention and other measures specified in § 1926.1408(b).

Paragraph (a)(2)(iii) Option (3)

Under Option (3) (§ 1926.1408(a)(2)(iii)), the employer is required to maintain a minimum clearance distance[44] in accordance with Table A of this section.[45] Under Table A, depending on the voltage of the power line, the minimum clearance distance ranges

[44] The proposed regulatory text for this section used the phrase "minimum approach distance" instead of "minimum clearance distance." As pointed out by two commenters the latter phrase is what was used in the proposed § 1926.1407(a)(3)(i) regulatory text. (ID -0205.1; -0213.1). For consistency, OSHA has, in this section, changed the phrase "minimum approach distance" to "minimum clearance distance." Provisions in § 1910.269 and proposed subpart V of 29 CFR 1926 use the phrase "minimum approach distance." OSHA believes that employers who are covered by those standards are familiar with that term. In contrast, the Agency believes that employers that do not perform electric power work will better understand the term "minimum clearance distances." OSHA considers the terms "approach distance" and "clearance distance" to be interchangeable; no substantive distinctions are intended.

[45] The information in Table A of the final rule is similar to information in Table 1 of ASME B30.5-2004. A table with specified clearance distances is more easily applied than the formula set out in former § 1926.550(a)(15). Table A is intended to be a clear way of conveying the minimum clearance distances.

from 10 feet to 20 feet.[46] Under this option the employer is required to determine the line's voltage.

In addition to maintaining the minimum clearance distance specified in the Table, employers using this option are required to implement the encroachment prevention and other measures specified in § 1926.1408(b).

A labor representative urged OSHA to require a minimum clearance distance of 20 feet rather than the lower clearance distances allowed under Table A, in essence eliminating Option (3). (ID -0201.1.) The 20-foot clearance is needed because, in the commenter's view, under the options in the proposal, crane operations can easily encroach on an absolute safe distance from power lines. OSHA does not agree. The clearance distances permitted under Table A are "safe" distances, as indicated by their inclusion in ASME B30.5-2004 as well as the consensus reached by C-DAC. As discussed in the preamble to the proposed rule, the 10-foot rule was not effective under prior subpart N because subpart N provided little guidance as to how to maintain the required clearance. In the proposed rule, OSHA discussed how the provisions of this rule addressed two major problems employers faced in complying with the minimum clearance requirements of former subpart N: (1) the lack of a means to enable operators to judge when the crane was breaching the minimum required clearance distance; and (2) the problem of temporary operator inattention to a power line as he/she concentrated on tasks related to moving the load. (73 FR 59749, Oct. 9, 2008.) The provisions of paragraph (b) of this section, discussed below, are designed to overcome these two problems and ensure compliance with the minimum clearance distances in this rule.

[46] The range referred to here is the range in the part of the table that is applicable up to 350 kV.

Even where Table A permits the clearance distance to be the same as the 10-foot rule of former subpart N, this final rule provides far greater protection against equipment violating the allowed clearance. It does not allow a crane "to very easily encroach" on a safe clearance distance, as IBEW suggests.

The labor representative also proposed more stringent requirements than those currently contained in § 1926.1410 when it is infeasible to maintain the Table A clearances. OSHA addresses this issue below in the discussion of § 1926.1410. Accordingly, paragraph (a)(2)(iii) is promulgated as proposed.

Paragraph (b) Preventing encroachment/electrocution

Once the employer has determined that some part of the crane, load or load line could come within the work zone assessment trigger distance of 20 feet of a power line (see § 1926.1408(a)), if it chooses either Option (2) or (3) (of § 1926.1408(a)(2)(ii) and (iii)), it must implement encroachment prevention measures to help ensure that the applicable minimum clearance distance (20 feet under Option (2) or the Table A distance) under Option (3) is not breached.[47] Most of the measures in this paragraph are designed to help the employer maintain the appropriate distance and thereby prevent electrical contact while operating the equipment. One of the measures is designed to prevent electrocution in the event of electrical contact.

Paragraph (b)(1)

[47] Alternatively, under Option (1) of § 1926.1408(a)(i), the employer could have the lines deenergized and grounded. If Option (1) were selected, no further action under this section would be required.

Under 1926.1408(b)(1) the employer is required to conduct a planning meeting with the operator and other workers who will be in the area of the crane or load. This planning meeting must include reviewing the location of the power line(s) and the steps that will be implemented to prevent encroachment and electrocution.

One commenter raised the issue of who is responsible for ensuring that the planning meeting takes place. (ID -0218.1.) Where encroachment precautions are required under Option (2) or Option (3) (see § 1926.1408(a)(2)(ii) and § 1926.1408(a)(2)(iii)), the employers of the operator and other workers who will be in the area of the equipment or load must ensure that the required planning meeting under § 1926.1408(b)(1) takes place. Other employers at the work site may also be responsible for such compliance in certain situations; see OSHA CPL 02-00-124, *Multi-Employer Citation Policy*, Dec. 10, 1999 for further information.

As discussed below, under this paragraph, certain encroachment/electrocution prevention measures are required (they are listed in § 1926.1408(b)(1) through (3)). In addition, the employer is required to select at least one additional measure from the list in § 1926.1408(b)(4). In the planning meeting, the employer must make that selection and review all the measures that will be used to comply with this section. The purpose of this requirement is to ensure that the operator and other workers who will be in the area understand these measures and how they will be implemented. That understanding is important to their successful implementation. Paragraph (b)(1) is adopted as proposed.

Paragraph (b)(2)

Section 1926.1408(b)(2) requires that where tag lines are used they must be nonconductive. This provision provides additional protection to those employees who would be exposed to electrical hazards in the event that the equipment, load line, tag line or load contacts a power line and the tag line they are holding becomes energized. Note the discussion above related to § 1926.1407(b)(2). This provision is promulgated as proposed.

Paragraph (b)(3)

Section 1926.1408(b)(3) requires elevated warning lines, barricades or a line of signs, in view of the crane operator, equipped with flags or similar high-visibility markings, at 20 feet from the power line (if using Option (2) of § 1926.1408(a)(2)(ii)) or at the minimum clearance distance under Table A (if using Option (3) of § 1926.1408(a)(2)(iii)). The steps required by this provision are designed to remind the operator that there are power lines with associated minimum clearance distances that must be met. Warning lines, barricades or a line of signs in the operator's view equipped with high-visibility markings also indicate to the operator where the minimum clearance distance boundary is located. This serves as one of two layers of protection (the second layer consists of an additional means selected by the employer under § 1926.1408(b)(4), discussed below).

A commenter urged OSHA to reconsider this requirement because there is nothing outside of the traveled roadway to which a warning line, barricade, or line of signs could be affixed. (ID -0114.) OSHA recognizes that this requirement will often require the employer to install a series of poles or other supports to install an elevated

warning line. However, temporary supports are routinely installed on construction sites, and installing them for the purpose of enabling the operator to maintain a safe distance from a power line serves an important safety purpose without being overly difficult or time-consuming.

A visual line on the ground to mark the minimum clearance distance is not permitted under § 1926.1408(b)(3) because an operator would generally not notice or see a line on the ground and because, from where the operator sits, it would be particularly difficult for the operator to extrapolate from that line the location of the boundary in the air. By contrast, visual reminders that are sufficiently elevated from the ground level enable the operator to more accurately judge the distance between the load, load line (including rigging and lifting accessories) or crane and the boundary marked by the elevated warning line.

In reviewing the C-DAC draft of this provision, OSHA realized that there may be situations where the employer would not be able to place such a line so that it would be visible to the operator. In such a case, to have two layers of protection, it would be necessary to require that a dedicated spotter be used in addition to one of the other (non-spotter) methods described below in § 1926.1408(b)(4). Therefore, in the proposed rule, OSHA stated that it was planning to modify the proposed provision by adding the following after the last sentence in § 1926.1408(b)(3):

> If the operator is unable to see the elevated warning line, a dedicated spotter must be used as described in § 1926.1408(b)(4)(ii) in addition to implementing one of the measures described in § 1926.1408(b)(4)(i), (iii), (iv) and (v).

The Agency requested public comment on this issue. Two commenters agreed with the substance of the proposed addition to this provision (ID -0205.1; -0213.1); a

third commenter agreed with the proposed addition but recommended that OSHA go a step further and require a dedicated spotter at all times (ID -0113). For the reasons explained in the discussion of § 1926.1408(b)(4) below, OSHA has decided not to accept this latter recommendation for a dedicated spotter in all cases. The Agency has, however, included the additional regulatory text delineated above in the final rule.

Paragraph (b)(4)

This section sets out a list of five prevention measures, from which the employer must select at least one, when the employer elects to use either Option (2) or Option (3) under § 1926.1408(a)(2). The first four measures are methods for encroachment prevention. The fifth measure is a method of electrocution prevention in the event of electrical contact with a power line. Specifically, the employer is required to choose one of the following: (i) a proximity alarm; (ii) the use of a dedicated spotter; (iii) a device that automatically warns the operator when to stop (i.e., a range control warning device); (iv) a device that automatically limits the range of movement of the equipment; or (once they are available) (v) an insulating link/device, as defined in § 1926.1401.[48]

Proximity alarm performance was the subject of a study conducted by the National Institute for Occupational Safety and Health (NIOSH) published in January 2009, and submitted as an exhibit to this rulemaking. (ID -0141.2.) This study tested the efficacy of two proximity alarm models under various simulated construction conditions. The study indicated that the accuracy of the proximity alarms could be adversely affected by such factors as: (1) operating the equipment with a boom angle and length

[48] See discussion later in this section for an explanation of the delay in the effective date for this provision.

significantly different than that used for the device's last sensitivity adjustment; and (2) operating the equipment on sites with multiple overhead power lines, especially where those power lines had differing voltages or involved intersecting installations. Two other commenters also questioned the efficacy of proximity alarms. (ID -0118.1; -0206.1.)

OSHA shares the concerns expressed by NIOSH and other commenters over the accuracy of currently available proximity alarms.[49] However, such concerns are addressed by the definition of "proximity alarm" in § 1926.1401, which states that the term refers to a device "that has been listed, labeled, or accepted by a Nationally Recognized Testing Laboratory in accordance with § 1910.7." To be so listed, labeled, or accepted, the Nationally Recognized Testing Laboratory (NRTL) must determine that the device works properly by concluding that it conforms to an appropriate test standard. Accordingly, no proximity alarm can be listed, labeled, or accepted by a Nationally Recognized Testing Laboratory (NRTL) in accordance with § 1910.7 until the problems identified by the commenters have been rectified. OSHA concludes that retaining this option in the final rule will provide an incentive for proximity alarm manufacturers to improve these devices to the point where they will meet the definition's criteria.

In situations where an employer chooses the option of using a dedicated spotter, the employer is required to meet the requirements for spotters in § 1926.1408(b)(4)(ii). As specified in § 1926.1408(b)(4)(ii)(A), the spotter has to be equipped with a visual aid to assist in identifying the minimum clearance distance.

Under § 1926.1408(b)(4)(ii)(B)-(D), the spotter has to be positioned so that he/she can effectively gauge the clearance distance from the power line; the spotter, where

[49] Neither of the proximity alarm models tested in the NIOSH study had obtained NRTL listing, labeling, or acceptance.

necessary, must use equipment that enables him/her to communicate directly with the equipment operator; and the spotter must give timely information to the operator so that the required clearance distance can be maintained.

Some commenters recommended that dedicated spotters be required at all times. (ID -0112; -0113.) OSHA declines to impose such a requirement. The Agency determines that allowing the employer to choose from a variety of options for this second layer of protection allows the employer to select a method that it believes would be suitable, increases the likelihood of employer compliance, and will be an effective approach to reducing power line related injuries and fatalities.

One commenter also advocated adding a provision requiring dedicated spotters to pass a visual acuity exam. (ID -0071.) OSHA determines that it is unnecessary to require a specific level of visual acuity. Wherever this standard requires an employer to have an individual perform a particular task, that duty is met only where the individual has the ability to perform the task. If an employer assigns an individual to serve as a spotter, but his/her vision is insufficient to perform the task of a spotter, the employer will not have met the spotter requirement. For additional discussion of spotter requirements see the discussion of § 1926.1407(b)(3)(i) earlier in this preamble.

Section 1926.1408(b)(4)(iii) gives the employer the option of using a device that automatically warns the operator when to stop movement, such as a range control warning device. Such a device must be set to give the operator sufficient warning to prevent encroachment. "Range control warning device" is defined in § 1926.1401 as "a device that can be set by an equipment operator to warn that the boom or jib tip is at a plane or multiple planes."

For example: an employer has chosen the option of maintaining a 20 foot distance from the power line. Under § 1926.1408(b)(4)(iii), it has chosen to use a range control warning device to help maintain that distance. The device would have to be set to alert the operator in time to prevent the boom, load line or load (whichever is closest to the power line) from breaching that 20 foot distance. As a practical matter, the device would have to be set to sound the warning more than 20 feet from the line, since the operator will need some time to react and to account for the momentum of the equipment, load line and load.[50]

Section 1926.1408(b)(4)(iv) gives the employer the option of using a device that automatically limits the equipment's range of motion and is set to prevent encroachment. Such a device can be particularly suitable for tower cranes, for which the swing angle can be programmed so that the operator cannot move the boom or jib past a certain range. While it may be more technically difficult to apply swing limitation devices for use in mobile cranes, the technology may develop so that they could be used in such cranes as well.

The insulating link option that is available under § 1926.1408(b)(4)(v) would not protect against encroachment but would provide protection to employees handling the load against electrocution in the event encroachment did occur. Such a device must be installed between the end of the load line and the load. When so installed, it prevents the load from becoming energized in the event the load line or other part of the equipment makes electrical contact with a power line. Preventing the load from becoming energized

[50] One commenter questioned whether range control warning devices exist. (ID -0151.1.) OSHA has confirmed that some cranes are equipped with such a device.

helps protect riggers, who often guide crane loads manually and who are therefore at high risk of being electrocuted if a load becomes energized.

Some commenters expressed concern about the effectiveness of insulating links. (ID -0206.1; -0378.1.) As stated in § 1926.1401, "Insulating link/device" is defined as "an insulating device that has been listed, labeled, or accepted by a Nationally Recognized Testing Laboratory in accordance with § 1910.7." This definition addresses this concern, since an insulating link used under this provision must have been found by a Nationally Recognized Testing Laboratory ("NRTL") to conform to an appropriate test standard as required in § 1910.7.

Because insulating links previously have not been required by any OSHA standard, OSHA has not yet recognized any testing laboratory as a NRTL for purposes of insulating link listing, labeling, or acceptance. A period of time will be needed to review laboratory requests for such recognition. Once there are NRTLs for testing insulating links, some time will also be needed for the NRTLs to conduct the tests. As a result, where § 1926.1408(b) applies, § 1926.1408(b)(4)(v) will be unavailable as an additional measure in the list contained in § 1926.1408(b)(4) until employers acquire NRTL-approved insulating links. Therefore, during that period, in addition to implementing the requirements in § 1926.1408(b)(1)-(3), the employer must implement at least one of the measures listed in § 1926.1408(b)(4)(i)-(iv).

A commenter suggested that § 1926.1408(b)(4)(v) be deleted because it involves a live line procedure covered under § 1910.269, which, it says, requires a operator to be a qualified worker to get this close to an insulating link. (ID -0161.1.) This commenter misunderstands the provision. Paragraph (b)(4)(v) allows employers to use an insulating

link between the load line and load as an alternative to other protective measures. It has nothing to do with live line procedures under § 1910.269, which is a general industry standard that applies to operation and maintenance of power lines and which has no provision regulating the proximity of an operator or a qualified person to an insulating link.

One commenter pointed out that insulating links do not provide protection for those employees, such as equipment operators, who are in contact with the equipment "upstream" of the insulating link. (ID -0053.1.) That is incorrect. Insulating links serve a dual purpose. They protect a rigger who is handling the load if the equipment upstream of the link makes electrical contact with a power line. And they protect employees who are upstream of the insulating link if the load makes electrical contact with a power line. The workers who are at the greatest risk of electrocution – the riggers who handle the load, are also protected by the requirement for nonconductive tag lines. But the best protection for all workers, and the primary focus of paragraph (b), is to employ effective encroachment prevention measures to prevent electrical contact of any part of the equipment and/or load with a power line. For additional discussion of insulating links, see later in this preamble where OSHA addresses § 1926.1410(d)(4).

Paragraph (b)(5)

Employers engaged in construction of electric transmission and distribution lines, which is addressed by 29 CFR part 1926 subpart V (§§ 1926.950-1926.960), also have to

meet the requirements in § 1926.1408, with several exceptions.[51] The first exception is found in § 1926.1408(b)(5). The other exceptions are discussed elsewhere in this preamble. In accordance with § 1926.1408(b)(5), employers engaged in work involving cranes/derricks that is covered by subpart V are not required to comply with the requirements in § 1926.1408(b)(4). Subpart V applies to the construction of electric transmission and distribution lines and equipment, which includes the alteration, conversion, and improvement of existing lines and equipment. Thus, when employees are engaged in subpart V work near energized lines, by the nature of the job, their full attention is on the power lines. Non-subpart V workers, by contrast, do not work directly with the lines, and their attention is primarily directed elsewhere.

Subpart V contains additional requirements to protect those employees against making electrical contact with the lines. These include requirements in § 1926.950(c) for guarding the line or using insulation (such as insulating gloves) to prevent electrical contact. This paragraph is promulgated as proposed.

Paragraph (c) Voltage information

This section operates in conjunction with § 1926.1408(a)(2)(iii) (Option (3) – Table A clearance). Where an employer elects to use Option (3) (§ 1926.1408(a)(2)(iii)), the employer must, under § 1926.1408(a)(2)(iii)(A), determine the voltage of the power lines. Under § 1926.1408(c), utility owner/operators of these lines must provide the requested voltage information within two working days of the request (see the discussion

[51] As discussed in § 1926.1400, *Scope*, construction of electric transmission and distribution lines is covered under this subpart.

above of § 1926.1407(e) for a description of the public comments received on this requirement and OSHA's resolution of the issues raised by those comments).

As discussed above with respect to § 1926.1407(e), "working days" means Monday through Friday, excluding federal holidays. This provision is promulgated as proposed.

Paragraph (d) Operations below power lines

When a crane operates below a power line, the likelihood of breaching the minimum clearance distance is enhanced by several factors, including the greater difficulty of judging the distance to the power line when it is above the equipment and the fact that in most such situations the operator has to purposely look up to see the line (and therefore is more likely to forget its location or that it is there).

This section addresses this problem by prohibiting any part of a crane, load or load line (including rigging and lifting accessories) from being below a power line unless the employer has confirmed with the utility owner/operator that the power line is deenergized and visibly grounded at the worksite or unless the employer can demonstrate that it meets one of the four exceptions in § 1926.1408(d)(2).

The first exception, § 1926.1408(d)(2)(i), is for work covered by 29 CFR part 1926 subpart V. Subpart V work involves work on the power line itself and commonly requires equipment to operate below a power line. As explained above with respect to § 1926.1408(b)(5), subpart V work does not require all of the precautions required of other work because the full attention of the workers is directed at the power line.

The second exception, § 1926.1408(d)(2)(ii), is for equipment with non-extensible booms and the third exception, § 1926.1408(d)(2)(iii), is for equipment with articulating or extensible booms. These exceptions apply when the uppermost part of the boom (for non-extensible booms) or with the boom at its fullest extension (for extensible booms), will be more than 20 feet below the plane of the power line or more than the Table A minimum clearance distance below the plane of the power line at the boom's most vertical point.[52] Where this criterion is met, it is not possible for the minimum clearance distance to be breached.

The last exception, § 1926.1408(d)(2)(iv), is for situations in which the employer can demonstrate that it is infeasible to comply with § 1926.1408(d)(1), which prohibits any part of a crane, load or load line from being below a power line unless the line is deenergized and visibly grounded. Under this exception, the employer must not only show that compliance with § 1926.1408(d)(1) is infeasible, it must also comply with the requirements in § 1926.1410. Section 1926.1410 governs equipment operations closer than the Table A minimum clearance distances.

Two commenters requested that OSHA define the term "infeasible." (ID -0203.1; -0214.1.) Infeasibility determinations are fact-dependent, and OSHA generally considers compliance with a measure to be infeasible when it is impossible or would prevent performance of the work in question. See OSHA CPL 02-00-148, ch. 5, sec VI.B.2, *Field Operations Manual*, Nov. 10, 1999. OSHA notes that this is not the first standard to incorporate feasibility considerations; the Agency has incorporated feasibility language into many other standards. See, e.g., Fall Protection (§ 1926.502(k)); Permit-Required

[52] The plane of the power line is the horizontal plane that touches the lowest point on the lowest power line.

Confined Spaces (§ 1910.146(d)(5)(i)); Bloodborne Pathogens (§ 1910.1030(f)(3)(ii)); and Electrical Work Practices (§ 1910.333(a)(1)). In letters of interpretation and guidance documents explaining these and other standards, OSHA has elaborated on the meaning of infeasibility in numerous factual contexts. Because infeasibility is a concept of broad applicability in the OSHA context, and its meaning depends on the particular facts present in a given worksite situation, a single definition would not provide useful guidance to employers. Accordingly, the Agency declines to adopt a definition of that term specific to subpart CC. Paragraph (d) is adopted as proposed.

Paragraph (e) Power lines presumed energized

This provision requires employers to assume that all power lines are energized unless the utility owner/operator confirms that the power line has been and continues to be deenergized and visibly grounded at the worksite. This fundamental precaution is essentially the same as it was in subpart N at former § 1926.550(a)(15)(vi). The one commenter on this proposed provision supported it (ID -0161.1); this provision is promulgated as proposed.

Paragraph (f)

Paragraph (f) of this section addresses the danger that employees could receive an electric shock from equipment that is operating near a transmitter or communication tower. During such operation, the equipment can act as an antenna and become energized by the electromagnetic signal emitted from the tower. As proposed, § 1926.1408(f) stated that when the equipment is close enough for an electrical charge to

be induced in the equipment or load, the transmitter must be deenergized or the following precautions taken: the equipment must be grounded, and non-conductive rigging or an insulating link/device must be used.

Previously, subpart N, at former § 1926.550(a)(15)(vii), required that when equipment is close enough to a transmitter tower for an electrical charge to be induced, the equipment had to be grounded and a ground jumper cable used to connect the load to the equipment. In addition, nonconductive poles having large alligator clips or other similar protection had to be used to connect the ground jumper cable to the load. Connecting the load to the grounded equipment dissipated any electrical charge induced in the load. The Committee determined that subpart CC's proposed requirement for nonconductive rigging or an insulating link instead of grounding the load better reflected current industry practice and better protected employees.

The requirement for nonconductive rigging or an insulating link in proposed § 1926.1408(f) was a fundamentally different approach than requiring a ground jumper cable to be connected to the load as was specified in former § 1926.550(a)(15)(vii). The latter connects the load to a ground, while proposed § 1926.1408(f) would have insulated the load from the equipment or employees handling the load.

The Agency requested public comment on whether the proposed requirement was preferable to that in former § 1926.550(a)(15)(vii). Some commenters agreed that the proposed requirements would provide better protection of workers and argued that they were more feasible than the requirements of former § 1926.550(a)(15)(vii). (ID -0205.1; -0213.1.) One commenter believed that § 1926.1408(f) as proposed was inferior to former § 1926.550(a)(15)(vii) because "insulating links are generally rated for

distribution voltages and would not properly protect employees working near power lines."[53] (ID -0209.1.) Another commenter recommended that the proposed § 1926.1408(f) requirements be supplemented with a requirement that any insulating link used be rated for the applicable transmission tower frequencies, and that nonconductive tag lines be used.

The problem addressed by these comments involves how to protect a worker, such as a rigger, who may come into electrical contact with the load. Under the proposed rule, the load would be insulated from the grounded crane to isolate the load from circulating current that could cause it to be energized. However, it may be possible that the load itself could become energized by absorbing energy from the transmitter or communication tower. The former rule addresses this possibility by requiring an electrical connection between the load and the (grounded) equipment. However, in the event there is either a poor electrical connection or a ground that is not fully effective, this method might not provide complete protection. Therefore, OSHA has decided not to require either precaution, but instead to require that any tag line used be nonconductive. This precaution is required in other provisions, discussed above, to protect the rigger from the possibility that the equipment may come into electrical contact with a power line. It will be equally appropriate here. Section 1926.1408(f) is modified accordingly.

OSHA notes that former § 1926.550(a)(15)(vii) of subpart N required employers to provide crews "with nonconductive poles having large alligator clips or other similar

[53] Another commenter opposed the proposed language because it believed that grounding the equipment under the provisions of former § 1926.550(a)(15)(vii) would better protect employees, the crane, and the power line because it would result in a very quick trip of the line. (ID -0144.1.) This comment is not relevant because grounding the crane would not cause the transmitter or communication towers to trip.

protection to attach the ground cable to the load." This requirement protected employees from the electric shock hazard that exists when employees apply grounds. Due to what the Agency determined was an inadvertent oversight on the part of the Committee, the proposed rule did not contain provisions addressing these hazards. Although no commenters raised this issue, OSHA is aware that employees are exposed to serious electric shock hazards when they are attaching grounds in accordance with § 1926.1408(f). For example, when attaching the rigging to the load or the ground to the crane, the crane and load will be energized. OSHA views this condition as a recognized hazard and expects employers to ensure that employees are adequately protected when they are attaching grounds. Employers who fail to properly protect their employees in this regard will, in appropriate circumstances, be subject to citation under the General Duty Clause (sec. 5(a)(1)) of the OSH Act).

It should also be noted that work covered by §§ 1926.1407 and 1926.1410 that is performed near transmitter or communication towers can pose electric shock hazards similar to those addressed by § 1926.1408(f). Due to another oversight by the Committee, however, neither § 1926.1407 nor § 1926.1410 contains provisions addressing these hazards. OSHA considers these to be recognized hazards and will use its enforcement authority under the General Duty Clause, as appropriate, to ensure that employers are taking measures, such as those required in §§ 1926.600(a)(6)(vii) or 1926.1408(f), to protect employees from electric shock and fires while performing work covered by §§ 1926.1407 and 1926.1410 near transmitter or communication towers. OSHA will consider addressing both of these oversights through future rulemaking.

A commenter suggested adding a provision to paragraph (f) whereby the owner of a transmitter communication tower would be required to evaluate whether power level density levels were high enough to endanger employees working near the tower and, if so, implement precautions to prevent them. (ID -0130.1.) The issue raised by this comment is beyond the scope of this rule, which addresses hazards related to the use of equipment and not employee exposure to possible radiation hazards. Such hazards are covered by § 1926.54, *Nonionizing radiation*.

Paragraph (g) Training

Paragraph (g) of this section sets forth training requirements for crane operators and other crew members assigned to work with the equipment. The training topics listed are designed to ensure that both the operator and the other crew members have the information they need to help protect themselves from power line hazards. One commenter suggested that, in addition to the topics listed in the proposed rule, employees working on equipment operating closer than Table A clearance distances also be trained on induction, step and touch potentials, and proper equipment grounding procedures. (ID -0161.1.) Other commenters also recommended training in grounding procedures and in the limitations of the protection that grounding provides. (ID -0131.1; -0155.1.) OSHA concludes that training on induction, step, and touch potentials would get into issues that are highly technical and would not help workers understand what they must do to protect themselves and others. OSHA does, however, agree with the suggestion that workers be trained in proper grounding procedures and in the limitations of the protection that grounding provides. As discussed under § 1926.1410, equipment grounding is one of the

additional precautions required when it is infeasible to maintain the Table A clearances, and training in proper grounding procedures will help ensure the effectiveness of this provision. In addition, employees must understand that grounding may not afford complete protection. Accordingly, OSHA is adding a new § 1926.1408(g)(1)(v) that requires training in the procedures to be followed to properly ground equipment and the limitations of grounding.

In addition, proposed § 1926.1408(g)(1)(i)(E) stated that training was required in the need to avoid approaching or touching "the equipment." In the proposed rule's preamble, OSHA stated that it determined that C-DAC inadvertently failed to add the phrase "and the load" to that provision, since whenever the equipment is in electrical contact with a power line, the load may also be energized. OSHA requested public comment on whether that provision should be modified to correct this omission. Commenters agreed that adding the phrase "and the load" was appropriate. (ID -0051.0; -0205.1; -0213.1.) Therefore, OSHA has made this addition in the final rule.

In the proposed rule, the Agency noted that proposed § 1926.1408(g) did not address the timing and frequency of this training. OSHA requested public comment on whether and, if so, how the standard should address training timing and frequency.

The one commenter on this issue advocated not dictating the timing or frequency of training in this provision. For the final rule, OSHA has decided to cross reference the testing administration requirements of § 1926.1430. That training section requires that employees be evaluated to confirm that they understand the information provided in the training, and that refresher training be provided when, based on employee conduct, there

is an indication that retraining is necessary. Section 1926.1408(g) is modified accordingly.

Paragraph (h)

In the proposed rule, this provision required that where devices originally designed by the manufacturer for use as safety devices, operational aids, or a means to prevent power line contact or electrocution are used to comply with § 1926.1408, they must meet the manufacturer's procedures for use and conditions of use. The Committee concluded that this provision is necessary to ensure that the devices work as intended. No comments were received on this provision, and it is promulgated without change. (See § 1926.1417 for a discussion of OSHA's authority to require compliance with manufacturer procedures.)

Section 1926.1409 Power line safety (over 350 kV)

As proposed, the requirements in §§ 1926.1407 and 1926.1408 would apply to power lines rated over 350 kV in all respects except one: wherever the regulatory text states "20 feet," "50 feet" would be substituted. Therefore, the "trigger" distance that would be used when assessing an assembly/disassembly area or work zone would be 50 feet. In addition, an employer engaged in assembly/disassembly that is using Option (2) of proposed § 1926.1407(a)(2), or an employer engaged in crane operations that is using Option (2) of proposed § 1926.1408(a)(2)(ii), would be required to maintain a minimum clearance distance of 50 feet. This would apply to all power lines rated over 350 kV, including power lines over 1,000 kV.

For power lines over 1,000 kilovolts,[54] employers electing to use Table A of § 1926.1408 in either assembly/disassembly (Option (3) in § 1926.1407(a)(3)) or crane operations (Option (3) in § 1926.1408 (a)(2)(iii)) are required, pursuant to instructions in the Table, to maintain a minimum clearance distance determined by the utility owner/operator or a registered professional engineer who is a qualified person with respect to electrical power transmission and distribution.

In reviewing this regulatory language, OSHA recognized that a minimum clearance distance of 50 feet may be inadequate for the open-ended category of "over 1,000 kV." In fact, at some point in that range, a utility owner/operator or a registered professional engineer may well specify a minimum clearance distance of more than 50 feet. However, as drafted in the proposed rule, employers using Option (2) (in both proposed §§ 1926.1407(a)(2) and 1926.1408(a)(2)(ii)) would only have to maintain a minimum clearance distance of 50 feet. OSHA requested public comment on whether proposed Option (2) is insufficiently protective for power lines rated over 1,000 kV. The one commenter on this issue agreed that the proposed provision was insufficiently protective for power lines carrying voltages greater than 1,000 kV. OSHA agrees and has modified § 1926.1409 in the final rule to conform to the requirement of Table A that the minimum clearance distance for lines over 1,000 kV be determined by the utility owner/operator or a registered professional engineer who is a qualified person with respect to electrical power and distribution. OSHA notes that the minimum distance

[54] OSHA does not believe that there are any electric power transmission lines in the United States that operate at more than 800 kV. However, there may be some power lines associated with research laboratories or other similar facilities that operate at more than 1,000 kV. In addition, it is possible that utilities may install new power lines operating at more than this voltage or may upgrade existing lines to operate at higher voltages.

under Option (2) for voltages between 351 and 1,000 kV is 50 feet. The Agency expects that the distances set by utilities and registered professional engineers in accordance with § 1926.1409(b) will be at least 50 feet.

Section 1926.1410 Power line safety (all voltages) – crane operations closer than the Table A zone

Subpart N did not permit work closer than the 10-foot rule[55] unless the lines were deenergized and visibly grounded or where insulating barriers, separate from the equipment, were erected. However, the Committee recognized that many employers, without meeting the exceptions, nonetheless worked closer than the 10-foot rule. The Committee determined that most employers do not use the option to deenergize and ground because of the time, expense and difficulty in making those arrangements.[56] In addition, the Committee concluded that an "insulating barrier" of the type that is currently available does not, by itself, adequately protect employees because these barriers are only effective for "brush" contact. If there is more than brush contact, they will not protect employees from electrocution because the equipment will damage the device.

To address the insufficient protections provided to employees who work closer than the 10-foot rule, the Committee developed, and OSHA proposed, a new approach,

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[55] As described earlier, the "10-foot rule" is shorthand for the formula in former § 1926.550(a)(15) for minimum clearance distances. Under the 10-foot rule, for lines rated 50 kV or less, work was not permitted closer than 10 feet to an energized power line. For lines rated more than 50 kV, a clearance of 10 feet plus .4 inch for each 1 kV over 50 kV was generally required.

[56] If power lines are deenergized and grounded, power is shut off to the utility owner/operator's customers. As a result, utility owner/operators are understandably reluctant to implement such measures.

which is contained in § 1926.1410. It consists of prerequisites and criteria that apply when work must be conducted closer than the minimum clearance distance specified in Table A of § 1926.1408.

In this case, the Committee's rationale misrepresented existing OSHA enforcement policy under subpart N regarding insulating barriers in two respects. First, current policy recognizes other types of insulating barriers besides the type to which the Committee referred.[57] OSHA also recognizes goal-post-type barriers and, in certain limited circumstances the insulation on insulated power lines operating at 480 volts or less. See, e.g., letters of interpretation dated February 8, 1994, to Mr. Ivan Blood (http://www.osha.gov) and August 9, 2004, to Mr. Mathew McFarland (http://www.osha.gov). Second, the Agency does accept barriers that protect against brush contact under limited circumstances. See, e.g., letter of interpretation dated February 8, 1994, to Mr. Ivan Blood (http://www.osha.gov).

However, as these letters of interpretation recognize, these barriers have their limitations. Because of this, OSHA has concluded that, although the Committee's rationale with respect to § 1926.1410 was slightly flawed by a misunderstanding of subpart N requirements, their reasoning that the provisions of this section are more protective than the former standard still holds.

This section starts out by explicitly prohibiting equipment from operating closer than the distances specified in Table A of § 1926.1408 to an energized power line except where the employer demonstrates compliance with the requirements in § 1926.1410.

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[57] The barriers are known as electrically insulating plastic guard equipment. See ASTM F712-06 *Standard Test Methods and Specifications for Electrically Insulating Plastic Guard Equipment for Protection of Workers*.

Note that, in the discussion below of § 1926.1410, references to a "registered professional engineer" are, in accordance with § 1926.1410(c)(1), references to a registered professional engineer who is a qualified person with respect to electrical power transmission and distribution.

One commenter on the proposed rule asked for clarification regarding who determines whether a professional engineer is such a "qualified person." (ID -0155.1.) Under § 1926.1401, a qualified person is a " person who, by possession of a recognized degree, certificate, or professional standing, or who by extensive knowledge, training and experience, successfully demonstrated the ability to solve/resolve problems relating to the subject matter, the work, or the project." At a given construction site, the employer who is conducting crane operations and who uses the services of the engineer to carry out that employer's responsibilities under this section is responsible for determining whether the registered professional engineer is a qualified person with respect to electrical power transmission and distribution.

Paragraphs (a) and (b)

These paragraphs set forth prerequisites that must be met for the employer to be permitted to operate equipment closer to a power line than the applicable Table A of § 1926.1408 distance. Section 1926.1410(a) requires the employer to determine that it is infeasible to do the work without breaching the minimum clearance distance under Table A. If the employer determines it is infeasible to maintain the Table A distance, under § 1926.1410(b) it also has to determine, after consulting with the utility owner/operator,

that deenergizing and grounding the power line, as well as relocating the line, are infeasible. See discussion of infeasibility determinations in § 1926.1408(d).

Two commenters argued that the requirement to demonstrate infeasibility was unnecessary for electric utility work regulated under subpart V. (ID -0203.1; -0209.1.) After careful review of these comments, OSHA has concluded that it is appropriate for subpart V work to be excluded from the need to show infeasibility under § 1926.1410.

Subpart V applies to the erection of new electric transmission and distribution lines and equipment and the alteration, conversion, and improvement of existing transmission and distribution lines and equipment (§ 1926.950(a)(1)). Construction of new lines generally takes place some distance from existing lines, and the lines themselves are not energized until construction is complete. Hence, clearance distances are usually not an issue for new construction. However, alteration, conversion, and improvement of existing lines necessarily takes place on or near the lines themselves. To enable such work to be done safely, subpart V contains clearance requirements that permit equipment to operate much closer to the lines than either former § 1926.550 or §§ 1926.1408-1926.1409 of this final rule, as well as supplementary protective requirements that must be followed when the subpart V clearance requirements cannot be observed.

Subpart V's clearance requirements are found in Table V-1 of § 1926.950. Subpart V does not require a showing of infeasibility before allowing subpart V work to comply with these shorter clearance distances, and OSHA concludes that the record does not support requiring such a showing under the final rule either. The very nature of work that alters, converts, or improves existing power lines must necessarily be carried out close to those lines, and it would almost always be infeasible for the clearances in §§

1926.1408-1926.1409 to be maintained. As a result, requiring such a finding would be a formality that would not add to worker safety.

It is similarly inappropriate to require a showing that it is infeasible to deenergize and ground the lines or relocate the lines under paragraph (b) of this section for subpart V work. Subpart V provides for deenergizing and grounding as an alternative to live line precautions, but it also recognizes that subpart V work may take place on live lines to avoid power disruptions to the utility's customers and includes precautions for such live line work. Thus, subpart V leaves to the utility employer the discretion to decide whether to deenergize and ground without the need for an infeasibility determination, and OSHA concludes they should continue to have this same discretion under this final rule. OSHA also notes that paragraph (b) of this section requires the employer to consult with the utility owner/operator before deciding that it infeasible to deenergize and ground the lines or relocate them, and it would be anomalous to apply this provision where the utility owner/operator is itself the employer.

For these reasons, OSHA has modified § 1926.1410(c)(2) of the final rule to clarify that paragraphs (a),(b), and (c)(1) of § 1926.1410 do not apply to work covered by subpart V of 29 CFR 1926. Instead, the § 1926.950 Table V-1 minimum clearances apply. Section 1926.1410(c)(2) also explains that employers engaged in subpart V work may work closer than the § 1926.950 Table V-1 distances where both the requirements of § 1926.1410 and § 1926.952(c)(3)(i) or (ii) are met.[58]

[58] OSHA is in the process of updating subpart V requirements. If the Agency makes changes to those provisions that necessitate updating the cross-references in § 1926.1410(c)(2), those changes will be made as part of that rulemaking.

See discussion later in this section regarding other provisions in § 1926.1410 that deal specifically with subpart V work.

Paragraph (c) Minimum clearance distance

After the employer makes the infeasibility determinations required by § 1926.1410(a) and (b), a minimum clearance distance must be established. Under § 1926.1410(c)(1), the employer can establish this distance by either having the utility owner/operator determine the minimum clearance distance that must be maintained or by having a registered professional engineer who is a qualified person with respect to electrical transmission and distribution determine the minimum clearance distance that must be maintained. The Committee believed that either of these sources of this information has sufficient expertise to accurately apply the factors discussed below in setting an appropriate minimum clearance distance.

Commenters objected to requiring the utility owner/operator to be involved in setting the minimum clearance distance. (ID -0161.1; -0162.1.) However, paragraph (c) of this section does not require the utility owner/operator to establish the minimum clearance distance. It gives the employer the option of engaging the utility owner/operator for this purpose but, if the utility owner/operator declines, the employer must engage a registered professional engineer who is a qualified person with respect to electrical transmission and distribution. In no case is the utility owner/operator required to establish the minimum clearance distance.

Under § 1926.1410(c)(1), regardless of whether it is the utility owner/operator or a registered professional engineer that makes this determination, several factors must be

considered when establishing the minimum clearance distance. These factors include, but are not limited to: conditions affecting atmospheric conductivity; time necessary to bring the equipment, load and load line (including rigging and lifting accessories) to a complete stop; wind conditions; degree of sway in the power line; lighting conditions, and other conditions affecting the ability to prevent electrical contact.

A commenter objected to allowing cranes to operate closer to power lines than the "appropriate minimum approach distance to an energized line." (ID -0226.) He further noted that, under the proposed rule, an operator could take equipment closer to power lines than a qualified electrical worker. C-DAC concluded, and OSHA agrees, that workers will be better protected if employers are required to adhere to additional safety precautions when it is infeasible to maintain the Table A clearances. Accordingly, to the extent the commenter recommended that the standard not permit equipment to come within the Table A distances, OSHA rejects this commenter's suggestion.

The same commenter objected to allowing equipment operated by nonelectrical workers to approach closer to power lines than a qualified electrical worker. The rule does not, however, allow this. This section requires the employer to determine a minimum clearance distance that will prevent the equipment from making electrical contact with the line. Although existing subpart V permits employees to take equipment closer to power lines than Table V-1 of §1926.950, the corresponding general industry standard at § 1910.269(p)(4)(i) prohibits the operation of equipment closer than the distances in Tables R-6 through R-10 of § 1910.269. In the proposed revision of subpart V, the proposed rule contains the same prohibition as the general industry standard. As a general matter, OSHA determines that it is not appropriate or safe for nonelectrical

workers to bring equipment closer to power lines than is permitted under § 1910.269(p)(4)(i) for qualified workers. Therefore, the Agency does not expect that distances shorter than those in Tables R-6 through R-10 of § 1910.269 will be adequate "to prevent electrical contact" for purposes of § 1926.1410(c)(1).

Several commenters suggested that when equipment operations closer than the Table A of § 1926.1408 zone are performed, (1) "qualified employees" (as defined under § 1910.269) should be used (ID -0161.1; -0199.1); (2) the equipment should be considered energized (ID -0075.0; -0161.1); and/or (3) the power line should be deenergized (ID -0161.1; -0226.0).

Regarding the "qualified employees" suggestion, OSHA determines that the training required under § 1926.1410(m), discussed below, is more appropriate for construction workers working with cranes and other hoisting equipment than the training required under § 1910.269(a)(2)(ii) for electrical workers. The training required under paragraph (m) focuses on the actions that employees can take to protect themselves when working near potentially energized equipment, while the training under § 1910.269(a)(2)(ii) focuses on safe practices for working on energized lines.

The second suggestion is valid because prudence dictates treating the equipment as energized when it is closer than the Table A distance to an energized power line. However, some provisions of the rule already treat the equipment as energized. These include paragraph (d)(8), which requires barricades around the equipment to prevent unauthorized personnel from entering the work area, and paragraph (d)(9), which prohibits employees from touching the equipment. OSHA determines that no additional

benefit would be gained by a statement to treat the equipment as energized and therefore declines to add such a statement.

The third suggestion misconstrues the standard, which prohibits work within the Table A clearance distances unless the employer can show, among other things, that deenergizing and grounding the line is infeasible. Therefore, except as noted above, § 1926.1410(c) is promulgated as proposed.

Paragraph (d)

Once a minimum clearance distance has been established under § 1926.1410(c), the employer may not proceed without first having a planning meeting with either the owner/operator of the power line or the registered professional engineer to determine what procedures will be implemented to prevent electrical contact and electrocution. In accordance with § 1926.1410(e), these procedures have to be documented and immediately available on-site. In addition, in accordance with § 1926.1410(f) and (g), these procedures have to be reviewed with the operator and other workers who will be in the area of the equipment and the procedures must be implemented (§ 1926.1410(e) – (g) are discussed below).

Section 1926.1410(d) sets out the minimum protective measures that must be included in the procedures set by the employer and utility owner/operator (or registered professional engineer). These procedures need to include more stringent protective measures than those set out in § 1926.1408, because equipment will be in closer proximity to power lines and there is otherwise a greater risk of contacting a power line

and causing electrocution. Therefore, these procedures have to include, at a minimum, those set out in the remainder of this section.

Commenters objected to having the utility owner/operator involved in the planning meeting required by paragraph (d) of this section. (ID -0161.1; -0162.1.) As with paragraph (c) of this section, discussed above, the utility owner/operator is not required to become involved with the decisions that must be made under this section. If the utility owner/operator declines to participate in the planning meeting, the employer must engage a registered professional engineer to help determine the procedures needed to prevent electrical contact. OSHA notes, however, that equipment making electrical contact with a power line can disrupt electrical service as well as create a hazard to employees on the worksite. Therefore, at least in some cases, the utility owner/operator may wish to help develop precautions to prevent such electrical contact.

Paragraph (d)(1)

Under paragraph (d)(1) of this section, for power lines that are equipped with a device that automatically reenergizes the circuit in the event of a power line contact, the automatic reclosing feature of the circuit interrupting device must be made inoperative prior to beginning work. This will help ensure that, in the event of a power line contact and activation of the automatic reclosing feature, the line would not be automatically re-energized. One commenter stated that many circuit interrupting devices currently in use are incapable of having their automatic reclosing mechanisms disabled. (ID -0155.1.)

OSHA verified that fact and has amended § 1926.1410(d)(1) to clarify that the automatic reclosing feature must be made inoperative only if the design of the device permits.[59]

Paragraph (d)(2)

Under paragraph (d)(2) of this section, a dedicated spotter who is in continuous contact with the operator must be used. In addition, the dedicated spotter must be equipped with a visual aid to assist in identifying the minimum clearance distance, must be positioned to effectively gauge the clearance distance, where necessary must use equipment that enables him or her to communicate directly with the operator, and must give timely information to the operator so the required clearance distance can be maintained. For a more in-depth analysis of the dedicated spotter requirement and the public comments received, consult the discussion of §§ 1926.1407(b)(3)(i) and 1926.1408(b)(4)(ii) above. This provision is promulgated as proposed.

Paragraph (d)(3)

Under paragraph (d)(3) of this section, an elevated warning line, or barricade that is not attached to the equipment, positioned to prevent electrical contact, must be used. This warning line or barricade must be in view of the operator either directly or by use of video equipment and must be equipped with flags or similar high-visibility markings. The need for an elevated warning line or barricade is explained above in the discussion of § 1926.1408(b)(3). This provision does not apply to subpart V work.

[59] This revised language is also consistent with the provisions of § 1910.269(q)(3)(iv).

As discussed above in relation to § 1926.1408(b)(3), there may be situations where the operator is not able to see an elevated warning line or barricade. To address such situations, under §§ 1926.1408 and 1926.1409, OSHA changed the regulatory text so that the employer is required to use both a dedicated spotter and one of the other (non-spotter) measures listed in § 1926.1408(b)(4). Because the clearance distances are likely to be significantly smaller than the Table A distances, the Agency determines that more precise means of estimating the clearance distance are necessary. When the operator is not able to see an elevated warning line or barricade when working closer than the Table A clearance distance, it is necessary to provide an additional layer of protection by requiring the use of video equipment to enable the operator to see the warning line or barricade. Therefore, in all cases when working closer than the Table A clearance distance, the operator will have "two sets of eyes" (in addition to other protection required under this section) to ensure that the equipment maintains the minimum clearance distance established under § 1926.1410(c). This paragraph is adopted as proposed.

Paragraph (d)(4) Insulating link/device

Under paragraph (d)(4) of this section, an insulating link/device must be installed at a point between the end of the load line (or below) and the load. As described in the discussion of § 1926.1408, an insulating link is a barrier to the passage of electrical current. When used on a crane, it prevents the load from becoming energized if the boom or the load line makes electrical contact with a power line and prevents the equipment from becoming energized if the load contacts a power line.

As explained in the discussion of § 1926.1408(b)(4)(v), OSHA anticipates that NRTL approval of these devices, which is necessary from them to meet the definition of "insulating link" under § 1926.1401, will not be available for up to one year after the effective date of this rule. OSHA is providing two phase-in periods to allow time for the NRTL recognition process, and to phase in the requirement in a manner that will reduce the economic burden on employers with existing inventories of devices that would qualify as "insulating links/devices," as defined in § 1926.1401, except that they have not been subject to NRTL approval ("non-approved links"). First, OSHA is providing for an alternative measure that will be available to all employers for one year after the effective date of the standard. § 1926.1410(d)(4)(iv). Second, OSHA is allowing employers who have existing inventory of non-approved links to continue to use these links for an additional two years (up to a total of three years after the effective date of the final rule), so long as the same protections required for the alternative measures available during the one-year interim period remain in place. § 1926.1410(d)(4)(v). However, the use of links manufactured after the one-year interim period is prohibited unless they are NRTL-approved as required by the definition of "insulating link/device" in § 1926.1401.

The absence of an insulating link can result in the load becoming energized if the equipment makes electrical contact with a power line or the equipment becoming energized if the load makes electrical contact with a power line. When working inside the clearances permitted under Table A, the danger of such electrical contact is increased. As an interim precaution until insulating links (as defined in § 1926.1401) become available, OSHA is requiring that all employees who may come in contact with the equipment, the load line, or the load, excluding equipment operators located on the

equipment, must be insulated or guarded from the equipment, the load line, and the load. Insulating gloves rated for the voltage involved are adequate insulation for the purposes of this alternative. This interim precaution will provide some degree of protection to employees working near the equipment or load by providing a layer of insulation should the equipment or the load become energized. During the one-year interim period following the effective date of subpart CC, OSHA is encouraging, but not requiring, the use of non-approved links as an extra form of protection (although they cannot be used to satisfy the standard).

OSHA is also providing a separate alternative measure that would apply for an additional two-year transition period (following the first-year interim period, for a total of three years) to address employers who already own or purchase non-approved links. See § 1926.1410(d)(4)(v). Under this alternative, employers with non-approved links would be required to use them in addition to other alternative measures required under § 1926.1410(d)(4)(iv) during the initial one-year interim period. To be eligible for this alternative measure, employers must use and maintain these non-approved links in compliance with manufacturer requirements and recommendations. While OSHA anticipates that NRTL-approved insulating links will be available for purchase within a year after the effective date of subpart CC, the Agency recognizes that some employers will have existing inventories of non-approved links. OSHA is, therefore, allowing employers the additional two years to phase out the use of the non-approved links to reduce the economic burden of replacing the existing inventory of non-approved links.

As noted above, OSHA encourages employers to use non-approved links during the initial one-year interim period as an extra measure of protection, but is not requiring

employers to use them during this interim period. The Agency recognizes that some employers might not already own these devices because OSHA did not mandate their use under subpart N. If OSHA required the use of non-approved links during the initial one-year interim period, these employers would be forced to incur additional costs for devices that could only be used for a fixed period of one to three years.[60] However, once the NRTL-approved links are available for purchase, the cost of purchasing the NRTL-approved links would be a capital investment that could be amortized over the normal life of the insulating link.

Several commenters noted the limitations of insulating links/devices and advocated for the ability to employ alternative measures when necessary. For example, commenters stated that no insulating links/devices were readily available for loads above 60 tons or voltages above 33 kV. (ID -0132.1; -0155.1; -0197.1.) In addition, commenters noted that the added length of rigging that results when insulating links are used can create problems in locations where there is limited overhead clearance. (ID -0132.1; -0155.1; -0197.1.)

Another commenter who manufactures insulating links stated that insulating links are available with lifting capacities of up to 120 tons and voltage capacities of up to 125 kV.[61] (ID -0216.1.) Therefore, OSHA concludes that no changes are necessary to address the objections to the proposed insulating link requirement based on load or voltage capacities. However, OSHA has concluded that some accommodation may be necessary to address conditions associated with electric utility operations in work areas

[60] While the record indicates that these devices are available for rental, it is not clear from the record that all employers would have access to the businesses renting these devices.
[61] Refer to the discussion of § 1926.1408(b)(4)(v) for a description of other comments received concerning insulating links in the context of that provision.

with low overhead clearance from power lines.[62] Accordingly, OSHA has added an alternative to this provision for subpart V operations where use of an insulating link is infeasible. However, this provision should rarely, if ever, be available to employers, as there are several alternatives to using a crane or derrick in this operation including use of an aerial lift with a material handler or a manual hoist. The alternative requires use of alternate electrical safety precautions; specifically, the alternate precautions are those required under the electric power generation, transmission, and distribution regulations applicable to general industry under § 1910.269(p)(4)(iii)(B) or (C). Those precautions require either that the hoisting equipment be insulated for the voltage involved, or that each employee be protected from hazards that might arise from equipment contact with energized lines.[63]

Paragraph (d)(5)

Under paragraph (d)(5) of this section, if the rigging may be closer than the Table A of § 1926.1408 distance during the operation, it must be of the nonconductive type. This provides protection to those employees who would be exposed to electrical hazards in the event that the rigging contacts a power line, which otherwise could energize the rigging and the load.

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[62] The example provided by the commenter was replacement/repair of utility pole transformers. (ID -0155.1.) Such operations frequently involve hoisting transformers onto and off of utility poles immediately beneath power lines. The commenter stated that frequently in those operations there is barely sufficient room for the boom head itself; when an insulating link is added to the load line, the extra 2-3 feet of rigging prevents the hoisting of the transformer to the required elevation. The commenter did not explain why an aerial lift or manual hoist could not be used.

[63] See discussion of this paragraph below under subpart V-work.

One commenter stated that he was unaware of any sling manufacturers who market their slings as being nonconductive, and that there are no test standards for testing the dielectric properties of slings. (ID -0155.1.) As noted in the discussion of tag lines of § 1926.1407(b)(2), C-DAC considered the utility of setting specifications for material required to be nonconductive but determined that it would be impractical, and OSHA has additionally concluded that there is no need to specify test criteria for these materials. The guidance provided for determining whether a tag line is nonconductive applies equally here. Slings made from nonmetallic fibers will meet the standard provided they are not wet, dirty, or have substances on or in them that will conduct electricity. Therefore, OSHA has concluded that the requirement that rigging that may be closer than the Table A distance be nonconductive is appropriate, and the provision is promulgated as proposed.

Paragraph (d)(6)

Under paragraph (d)(6) of this section, if the crane is equipped with a device that automatically limits range of movement, it must be used and set to prevent any part of the crane, load or load line (including rigging and lifting accessories) from breaching the minimum clearance distance established under § 1926.1410(c). This paragraph is promulgated as proposed.

Paragraph (d)(7)

Under paragraph (d)(7) of this section, if a tag line is used it must be nonconductive. This requirement provides additional protection to those employees who

would be exposed to electrical hazards in the event that the equipment contacts a power line and the tag line they are holding becomes energized, or in the event that the tag line itself makes contact with the power line.

Refer to the discussion of § 1926.1407(b)(2) for further explanation of tag line non-conductivity and public comments received on this subject. This provision is promulgated as proposed.

Paragraph (d)(8)

Under paragraph (d)(8) of this section, barricades must be used to form a perimeter at least 10 feet away from the equipment to prevent unauthorized personnel from entering the work area. In areas where obstacles prevent the barricade from being at least 10 feet away, the barricade is required to be as far from the equipment as feasible. This provision, along with §§ 1926.1410(d)(9) and 1926.1410(d)(10), minimizes the likelihood that any more employees than are absolutely necessary to the operation will be near the equipment in the event the equipment, load or load line makes electrical contact with the power line. No comments were submitted on this provision; therefore, it is promulgated as proposed.

Paragraph (d)(9)

Under paragraph (d)(9) of this section, employees other than the operator are prohibited from touching the load line above the insulating link/device and equipment. The reason C-DAC did not extend this prohibition to the operator is that the operator, by being in the cab, is going to be in electrical contact with both the equipment and load

line. However, this assumes that the operator is in fact standing or sitting on the equipment. There may be some situations where this is not the case. For example, some equipment may be operated by pendant control or wireless control; in such cases the operator need not be on the equipment to control it. OSHA requested public comment on this issue.

Commenters agreed that equipment operators operating from the ground via remote controls need to be protected from potential shocks by either (1) using wireless controls that physically isolate the operator from the equipment; or (2) using insulating mats that insulate the operator from the ground. (ID -0062.1; -0162.1.) OSHA agrees with these comments. Although rubber insulating matting is designed for use as a floor covering, the Agency determines that such mats can provide an additional measure of protection for workers operating the equipment from the ground.[64] OSHA has amended paragraph (d)(9) accordingly.

Paragraph (d)(10)

Under paragraph (d)(10) of this section, only personnel essential to the operation are permitted to be in the area of the equipment and the load. In conjunction with §§ 1926.1410(d)(8) and 1926.1410(d)(9), this minimizes the likelihood that any more employees than are absolutely necessary to the operation would be in a position to make electrical contact with the equipment in the event the equipment, load or load line makes

[64] The proposed revision of subpart V also proposed a new construction standard for electrical protective equipment, which would cover rubber insulating matting. Until the subpart V revision is finalized, rubber insulating matting meeting ASTM D178 - 01(2005) *Standard Specification for Rubber Insulating Matting*, meets the requirement in final §1926.1410(d)(9) for insulating mats.

electrical contact with the power line. No comments were submitted on this provision; it is promulgated as proposed.

Paragraph (d)(11)

Under paragraph (d)(11) of this section, the equipment must be properly grounded. As described in the summary and explanation of final § 1926.1408(a)(2)(i) Option (1), in the event the equipment inadvertently makes electrical contact with the power line, proper grounding will protect employees in two ways. First, if the line is equipped with a circuit interrupting device, the grounding facilitates the operation of the device to deenergize the line. However, under some conditions, for example, if there is arcing contact or if the contact is near the end of a power line, the fault current may not be high enough to open the circuit for the power line. Second, in the event an employee on the ground is touching the equipment when it contacts the power line or if the circuit protective device does not operate to deenergize the power line, proper grounding will reduce the danger to the employee by providing an additional, low resistance path to ground for the electric current, substantially lowering the voltage on the equipment while the power line remains energized.[65]

Commenters on this provision stressed the need for worker training on proper equipment grounding procedures and the limitations of the protection that grounding provides. (ID -0131.1; -0155.1; -0161.1.) OSHA agrees. As discussed under §

[65] It should be noted that hazardous potential differences can be created in the ground when a contact occurs, and employees standing close to, but not touching, anything in contact with the power line can still be injured or killed. The requirements in § 1926.1425, *Keeping clear of the load*, which are designed to protect employees from struck or crushed by hazards, will also protect employees from these electrical hazards.

1926.1408(g), OSHA is requiring that the training under that paragraph include training in proper grounding procedures and the limitations of the protection grounding provides. To make clear that the training required under § 1926.1408(g) is also required under this section, OSHA is adding § 1926.1410(m), discussed below, to require that operators and crew assigned to equipment under this section be trained in accordance with § 1926.1408(g). Section 1926.1410(d)(11) is promulgated as proposed.

Paragraph (d)(12)

Under paragraph (d)(12) of this section, insulating line hose or cover-up must be installed by the utility owner/operator except where such devices are unavailable for the line voltages involved. The Committee noted that prior subpart N, at former § 1926.550(a)(15), allowed such insulating barriers to be used as a complete alternative to deenergizing and grounding or to maintaining the applicable minimum clearance distance from the power line. However, the Committee determined that such insulating devices do not provide complete protection because they can be pierced if the equipment makes more than brushing contact with the device. However, the Committee concluded that these insulating devices do provide protection if there is brushing contact and that such devices are useful to supplement the other protective measures provided by the requirements of this § 1926.1410(d).

One commenter on this provision believed that when work is being performed under § 1926.1410 around voltages above which insulating line hose or cover-up are available, OSHA should require that the power line be deenergized and visibly grounded. (ID -0161.1.) Another commenter stated that the Committee correctly limited the use of

line hoses and similar rubber cover-ups as complete protection since it can be pierced, but stated that it was unfortunate that the Committee prohibited the use of other rigid plastic barriers that are effective insulation and are not easily pierced. (ID -0144.1.) Regarding the former comment, OSHA notes that the rule applies only when the employer demonstrates that it is infeasible to deenergize and ground the power line. Also, the provision does not require that line hose or cover-up be made of rubber; if rigid plastic barriers provide effective insulation for the voltage involved, they are permitted by this paragraph. OSHA also notes that rigid plastic barriers (that is, electrically insulating plastic guard equipment) is also intended for brush contact only. (See ASTM F712 - 06 *Standard Test Methods and Specifications for Electrically Insulating Plastic Guard Equipment for Protection of Workers*.) Although this equipment may be able to withstand higher forces, it is easier to displace than rubber insulating line hose. This provision is promulgated as proposed.

Paragraph (e)

Under paragraph (e) of this section, the procedures that are developed to comply with § 1926.1410(d) must be documented and immediately available on-site. This ensures that these procedures are available to be used as a reference while the work is in progress.

No comments on this provision were submitted, and it is promulgated as proposed.

Paragraph (f)

Under paragraph (f) of this section, the equipment user and utility owner/operator (or registered professional engineer) must meet with the equipment operator and the other employees who will be in the area of the equipment or load to review the procedures that are developed under § 1926.1410(d) to prevent a breach of the minimum clearance distance established under § 1926.1410(c). It is important that this review take place so that the operator and other employees understand this critical information and have the opportunity to discuss the procedures with the utility owner/operator or registered professional engineer who developed the procedures.

OSHA notes that proposed § 1926.1410(f) referred only to the utility owner/operator. However, under § 1926.1410(d), the procedures are determined in a planning meeting with either the utility owner operator or a registered professional engineer, and whichever entity helped develop those procedures must also participate in the meeting required under paragraph (f). Therefore, OSHA has modified this paragraph by adding a reference to the registered professional engineer as an alternative to the utility owner/operator.

Several electric utility representatives questioned OSHA's authority to impose these and other requirements upon power line owners and operators. (ID -0162.1; -0166.1; -0203.1; -0226.1.) As stated above in response to similar arguments, this paragraph does not require the utility owner/operator to take any action. Another commenter asked who was responsible for bearing the costs of deenergizing power lines and other safety precautions, and what would happen if a utility owner/operator was unable to meet the equipment user at the requested time. (ID-0155.1) As stated above with respect to compliance costs, OSHA determines that issues of compliance costs and

specific obligations are best handled as contractual matters among the parties involved, and/or as prescribed by local and regional utility regulatory authorities.

Paragraphs (g) and (h)

Under paragraph (g) of this section, the employer must implement the procedures developed in accordance with § 1926.1410(d). And under paragraph (h) of this section, the utility owner/operator (or registered professional engineer) and all employers of the employees involved in the work must identify one person who will direct the implementation of the procedures. This person must direct the implementation of the procedures and have the authority to stop work at any time to ensure safety. As with paragraph (f) of this section, OSHA is adding a reference to the registered professional engineer to paragraph (h) to ensure that the entity that helped develop the procedures participate in the decision required under paragraph (h).

The Committee concluded that, in view of the fact that more than one employer is typically involved in these situations, coordination among the employers of these employees is needed for the protective measures to be effectively implemented. Once the operation is underway, safety-related orders typically need to be given and followed without delay. Since an employee of one employer typically would not immediately follow an instruction from another employer, it is necessary that, before these operations begin, all employees understand that the one designated person will have this authority. For these reasons, the Committee determined that there needs to be one person who all involved in the operation recognize as having this role and authority.

A commenter objected to having the utility owner/operator involved in determining which individual should direct implementation of the procedures, saying that the decision should be made by the contractors. (ID -0155.1.) OSHA notes that this provision is closely tied to paragraphs (d) and (f) of this section, under which the utility owner/operator or registered professional engineer is involved in developing the procedures and in reviewing the procedures with the appropriate employees. At this point, the utility or registered professional engineer is well situated to help identify an individual who is able to direct the implementation of the procedures. As with the other provisions of this section that require the involvement of the utility or a registered professional engineer, the utility has the discretion not to participate, in which case the employer operating the equipment must use a registered professional engineer.

Paragraph (i) [*Reserved*.]

Paragraph (j)

This provision requires the employer to safely stop operations if a problem occurs with implementing the procedures in paragraph (d) of this section or if there is an indication that those procedures are inadequate to prevent electrocution. In addition, this provision requires that the employer either develop new procedures which comply with paragraph (d) or contact the utility owner/operator and have them deenergize and visibly ground or relocate the power line(s) before resuming operations.

Two commenters suggested that the utility might not be able to deenergize the lines for medical or security reasons and asked what would happen in such a case. (ID -

0155.1; -0162.1.) OSHA recognizes that utilities may not be willing or able to discontinue power to their customers, and § 1926.1410(j) permits relocating the line as an alternative to deenergizing.

An electric utility representative requested that OSHA clarify which employer has the responsibility to comply with this provision, stating it should be the equipment operator and not the utility owner/operator. (ID -0161.1.) OSHA notes that this paragraph's requirement for the employer to "safely stop operations" applies to the employer(s) who are conducting the operation, and the requirement for that employer to contact the utility owner/operator after stopping operations makes clear that a utility owner/operator who is not conducting equipment operations near the power line is not the "employer" under this paragraph. OSHA concludes these points are sufficiently clear, and the provision is promulgated as proposed.

Paragraph (k)

Proposed paragraph (k) required that, where a device originally designed by the manufacturer for use as a safety device, operational aid, or a means to prevent power line contact or electrocution is used to comply with § 1926.1410, it must meet the manufacturer's procedures for use and conditions of use. (See § 1926.1417 for a discussion of OSHA's authority to require compliance with manufacturer procedures.) No comments were received on this provision; it is promulgated as proposed.

General Comment

A commenter suggested that OSHA consider requiring a written permit as a precondition to any work being done closer than 20 feet to a power line.[66] (ID -0201.1.) The permit, according to this commenter, should document many of the requirements of this section, including the basis for the employer's infeasibility determinations, the utility owner/operator's or registered professional engineer's determination of a minimum clearance distance, the specific procedures to be followed in performing the work, verification that the employees have received the required training, and other information relevant to the work. The commenter did not explain why it believed such a permit system would result in greater safety, but OSHA infers that the commenter believes that the need to document certain information, such as the basis for the employer's infeasibility findings, will lead to more careful consideration of the factors that enter into the decision that it is necessary to work closer to a power line than is normally permitted and more carefully thought out procedures when such work is done. OSHA is not convinced that a permit system is needed to ensure that employers act carefully under this section. OSHA expects that the stringent precautions required when employers work closer than the § 1926.1408 and § 1926.1409 clearance distances will ensure that an employer will only determine that it is infeasible to work within those distances if there is really no other viable option. Similarly, the requirement that a minimum clearance distance must be determined by a utility owner/operator or registered professional engineer ensures that sound expert judgment will enter into that determination without the need for additional documentation.

[66] This commenter recommended that 20 feet should be the minimum clearance distance for all work and that Table A of § 1926.1408 should be deleted. OSHA explained in § 1926.1408 why it was rejecting this suggestion.

Subpart V work

In the proposed rule, OSHA discussed in detail the compliance duties the rule would impose on employers engaged in subpart V work (see 73 FR 59762-59764, Oct. 9, 2008). Industry representatives objected to some of the changes from the requirements of subpart V. Among other things, they pointed to another ongoing rulemaking in which OSHA proposed to amend subpart V in ways that differ from the changes proposed by C-DAC (70 FR 34821, Jun. 15, 2005).[67]

OSHA proposed requirements in addition to those in subpart V because it had already concluded that the measures required by subpart V for the operation of equipment near power lines are insufficiently protective. (See the discussion of § 1910.269(p)(4) in the preamble to the final rule promulgating the general industry standard on the operation and maintenance of electric power generation, transmission, and distribution installations (59 FR 4320, 4400-4404, Jan. 31, 1994). Although proposed subpart V would require measures that are sufficiently protective, OSHA has not yet adopted it as a final rule. Consequently, the Agency is taking action today to increase the protection currently afforded by subpart V. In doing so, OSHA has also addressed the concerns raised by utility industry representatives.

First, as discussed above, OSHA has made several changes to the final rule in response to comments from the electric utility industry. These include: (1) an expanded exclusion for digger derricks used in utility pole work; (2) deleting the requirement that employers engaged in subpart V work show the infeasibility of complying with the

[67] The subpart V proposed rule was published after C-DAC completed its work.

required clearance distances in §§ 1926.1408 through 1926.1409; and (3) an alternative to the requirement for insulating links under § 1926.1410(d)(4).

In addition, employers engaged in subpart V activities are not required to implement certain other protective measures required by this standard when working near power lines. As discussed above, subpart V work would not be subject to the requirement for an additional protective measure from the list in § 1926.1408(b)(4). Also, subpart V work would not be subject to the prohibition in § 1926.1408(d)(1) against equipment operating under power lines (see discussion above of § 1926.1408(d)(2)(i)). And § 1926.1410(d)(3) provides that an employer engaged in subpart V work closer than the Table A of § 1926.1408 distance is not required to use an elevated warning line or barricade.

In recognition of the fact that much subpart V work necessarily takes place on or near energized power lines, employers engaged in such work may comply with shorter minimum clearance distances than those specified in §§ 1926.1408 and 1926.1409: they must generally adhere to the clearance distances in Table V-1 of § 1926.950. However, § 1926.952(c)(2) (redesignated as § 1926.952(c)(3) as a result of this rulemaking) permits clearances less than those in Table V-1 and includes requirements that must be met when equipment is operating closer to power lines that those distances. To make this clear, § 1926.1410(c)(2) provides: "Employers engaged in subpart V work are permitted to work closer than the distances in § 1926.950 Table V-1 where both the requirements of this

section and § 1926.950(c)(3)(i) or (ii) are met."[68] OSHA is also making conforming amendments to § 1926.952(c)(3), which was formerly designated § 1926.952(c)(2).

Under this section, the precautions previously specified in §§ 1926.952(c)(2)(i) and (ii) are required under § 1926.1410(d) when equipment used in subpart V work is operated closer than the Table V-1 clearances. Since these precautions are now required by § 1926.1410(d), OSHA is deleting them from subpart V as redundant. Therefore, OSHA is including the non-redundant provisions from the proposed rule in the final rule, with proposed § 1926.952(c)(2) redesignated as § 1926.952(c)(3).[69]

One commenter opposed deleting former §§ 1926.952(c)(2)(i) and (ii) because the commenter believed that it would not be confusing to duplicate requirements now found in subpart CC in subpart V. OSHA disagrees. As amended by this rule, § 1926.952(c)(3) states that its requirements are "in addition to" the requirements in § 1926.1410. Restating requirements in § 1926.952(c)(3) that are also found in § 1926.1410 can lead to uncertainty over whether the duplicate requirements are in fact redundant or are separate requirements.[70]

OSHA notes that in this zone, one of the options that an employer engaged in subpart V has under prior § 1926.952(c)(3)(i) is to insulate the equipment. Under § 1926.1410(d)(11), that employer also must ground the equipment. An employer can

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[68] The proposed rule referred to "§ 1926.950(c)(2)(iii) or (iv)." The final rule reflects the changes in numbering to § 1926.950(c)(2) that are made elsewhere in this final rule.

[69] In subpart V, when equipment is considered energized, a number of subpart V requirements are triggered. See, e.g., § 1926.951(c)(1) (restricting use of metal or conductive ladders near energized equipment); § 1926.951(f)(3) (hydraulic tools used on or around energized equipment shall use nonconducting hoses); § 1926.953(c) (materials or equipment shall not be stored near energized equipment if it is practical to store them elsewhere).

[70] Amendments to § 1926.950(c)(1) are discussed in § 1926.1400, *Scope*.

comply with both requirements by using equipment with an insulating boom and grounding the uninsulated portion of the equipment (that is, the portion below the insulated section of the boom).

It should also be noted that, in the subpart V rulemaking, OSHA has proposed to prohibit equipment (other than insulated aerial lifts, which are not covered by this final rule) from being operated closer than the minimum approach distances from power lines. If this prohibition is carried into the final subpart V rule, then the requirements in this final rule relating to work inside the distance in Table V-1 will have no effect.

Finally, § 1926.1400(g) includes a new compliance alternative for subpart V work that has been added to the final rule.

Paragraph (l) [*Reserved*.]

Paragraph (m)

As noted above, the training requirements contained in § 1926.1408(g) are being added to this section as well to assure that employees engaged in activities under this section receive adequate training.

Section 1926.1411 Power line safety –while traveling under power lines with no load

Paragraph (a)

Proposed paragraph (a) provided that this section is designed to protect against electrical hazards while equipment is traveling with no load under power lines on a construction site. It did not address the potential hazards associated with equipment

traveling without a load near power lines. OSHA requested public comment on whether it is necessary to expand the applicability of this section to include equipment traveling on a construction site without a load near power lines.

Two commenters favored broadening the applicability of § 1926.1411 to include equipment traveling near power lines, with "near" being defined as the distances listed in Table T. (ID -0205.1; -0213.1.) One commenter responded that adding an additional set of power line clearance distances to trigger the requirements of § 1926.1411 would be confusing. (ID -0144.1.) A fourth commenter thought that the requirements of § 1926.1411 should extend to cover equipment traveling "along side of" power lines, but did not suggest a definition for the term "along side of." (ID -0155.1.)

After considering these public comments, OSHA concludes that this section should address the hazard of equipment traveling near, as well as under, power lines with no load. If equipment comes into electrical contact with a power line while traveling without a load, the same electrocution hazard is present as when it is operating with a load. The precautions in this section will protect workers against that hazard.

OSHA agrees with the two commenters who suggested that Table T of this section contains appropriate clearances for equipment traveling near, as well as under, power lines. Applying Table T to equipment traveling near power lines will provide a uniform rule for this section and will ensure adequate worker protection. Although the Table T clearance distances are less than those required under Table A of § 1926.1408 during crane operations, additional protection is provided under this section by the requirement in paragraph (b)(1), discussed below, that the boom/mast and boom/mast support system be lowered sufficiently to meet the requirements of this paragraph. With

the boom/mast lowered, the highest point of the equipment will generally be below the plane of the power line, reducing the risk of accidental contact. Moreover, as also noted below, the dedicated spotter requirement of § 1926.1411(b)(4) will be triggered whenever the equipment while traveling will get closer than 20 feet to a power line, thereby providing additional protection against accidental contact.

Accordingly, in the final rule, paragraph (a) applies to "equipment traveling under or near a power line on a construction site with no load." In addition, in the proposed rule, the heading of § 1926.1411 read: "Power line safety –while traveling." In the final rule, OSHA has added the words "under or near power lines with no load" so that the heading more clearly describes the activity to which the section applies.

These requirements apply only to cranes/derricks while traveling on a construction site under or near power lines; they do not apply to equipment while traveling on roads (or in areas) that are not part of a construction site. In addition, this section does not apply to equipment traveling on a construction site with a load. That situation is governed by §§ 1926.1408, 1926.1409, and 1926.1410. To make this clear, OSHA is adding the language to paragraph (a) specifying that §§ 1926.1408, 1926.1409, and 1926.1410, whichever is appropriate, govern equipment traveling on a construction site with a load.

Paragraph (b)

Under paragraph (b)(1) of this section, the boom/mast and boom/mast support system must be lowered sufficiently to meet the requirements of this paragraph. Paragraph (b)(2) specifies that the clearances specified in Table T of this section must be

maintained. The values in Table T, which provides the minimum clearance distances while traveling with no load and a lowered boom, are substantially similar to the values used in sec. 5-3.4.5.5 of ASME B30.5-2004.

In the proposed rule, the heading of Table T read: "MINIMUM CLEARANCE DISTANCES WITH NO LOAD AND BOOM/MAST LOWERED." In addition, each clearance distance in the table was followed by the following parenthetical: "(while traveling, boom lowered)." OSHA determines that the references to the boom in the heading and parentheticals could be confusing. The intent of the table is to establish minimum clearance distances while the crane is traveling, not clearance distances with the boom lowered. As noted in the discussion of § 1926.1411(b)(1), the boom and/or mast must be lowered sufficiently to comply with Table T; it is not a prerequisite to the applicability of Table T. Accordingly, in the final rule, the words "AND BOOM/MAST LOWERED" are deleted from the heading of Table T, and the parentheticals are also removed from the clearance distances in the table.

Section 1926.1411(b)(3) requires the employer to ensure that the effects of speed and terrain are considered so that those effects do not cause the minimum clearance distances specified in Table T to be breached. Sections 1926.1411(b)(1)-(3) are promulgated as proposed.

Section 1926.1411(b)(4) requires the employer to use a dedicated spotter if any part of the equipment while traveling will get closer than 20 feet to a power line. This provision also requires that the dedicated spotter be in continuous contact with the crane operator; be positioned to effectively gauge the clearance distance; where necessary, use equipment that enables the spotter to communicate directly with the crane operator; and

give timely information to the crane operator so that the required clearance distance can be maintained. See the earlier discussion of spotters in §§ 1926.1407 and 1926.1408.

In reviewing proposed § 1926.1411(b)(4), OSHA noted that the language "crane operator" was used rather than "driver." Because § 1926.1411 deals with power line safety while equipment is traveling without a load, OSHA recognized that the language "crane operator" may not be appropriate in all situations. In some cases a crane operator may not be the driver of such equipment on the construction site. Therefore, OSHA solicited comments on whether the language "crane operator" used in proposed § 1926.1411(b)(4) should be changed to "driver" or "driver/operator." The two commenters who addressed this issue supported changing the language to "driver/operator." (ID -0205.1; -0213.1.) Therefore, this change to the regulatory text has been made in the final rule.

Section 1926.1411(b)(5) requires the employer to ensure that, when traveling at night or in conditions of poor visibility, the power lines must either be illuminated or another means of identifying them are used and a safe path of travel is identified. No public comments concerning this provision were received; therefore, it is promulgated as proposed.

Section 1926.1412 Inspections

This section seeks to prevent injuries and fatalities caused by equipment failures by establishing an inspection process that identifies and addresses safety concerns. The reasoning underlying the proposed requirements is discussed at 73 FR 59766-59776, Oct.

9, 2008. The following addresses public comments and differences between the proposed and final rules.

Paragraphs (a) through (j) of this section provide inspection requirements for equipment covered by subpart CC. Those requirements are supplemented by other sections of this standard for specific types of equipment. This section is structured so that certain activities (e.g., equipment modification, repair/adjustment, assembly, severe service, or equipment not in regular use) and the passage of time (e.g., shift, monthly, and annual/comprehensive) trigger the inspection requirements.

The proposed rule specified that the various inspections were to be conducted by either a "competent person" or a "qualified person" depending on the type of inspection. Both terms are defined in § 1926.01. OSHA solicited public comment on whether a protocol similar to that for signal person qualifications in § 1926.28 is needed to ensure that the person who performs these inspections has the requisite level of expertise (73 FR 59766, Oct. 9, 2008). Section 1926.28 establishes qualification requirements for signal persons and requires those individuals to have their qualifications evaluated by a qualified evaluator to act as signal persons under this subpart.

Several commenters responded that there should be a verified testing system to ensure "qualified inspectors" have the requisite knowledge to inspect effectively or that the standard require inspectors to demonstrate that ability. (ID -0182.1; -0187.1; -0226.)

Regarding paragraph (f) of this section (annual/comprehensive inspections of equipment) and § 1926.1413(c) (annual wire rope inspections), a local government further recommended that OSHA require that a government agency or a third party crane inspector licensed or certified by the local government perform the annual inspection.

(ID -0156.1.) The commenter also believed that the individual who inspects an equipment modification in accordance with paragraph (a) of this section must possess a certification from the manufacturer or an independent third party and have the requisite training to inspect modified, repaired, or altered crane components.

In contrast, a utility company and two trade associations did not support revising the final rule to include a more stringent inspector qualification requirement. (ID -0226; -0205.1; -0213.) The two trade associations expressed concerns that the Committee never discussed the required level of knowledge of inspection workers, which, in the commenter's view, means that consensus was not reached on the issue and that the issue should not be included in the final rule.

In response to these comments, OSHA is retaining the qualification requirements for inspectors as specified in the proposed rule but is not mandating that the inspector be assessed by a qualified evaluator, certified, or licensed because there is not sufficient evidence in the record to warrant these additional requirements. A number of current OSHA construction standards, as did former § 1926.550, require inspections to be conducted by competent persons or qualified persons. For example, § 1926.651(k) requires that a competent person conduct a daily inspection of excavations for possible cave-in hazards. OSHA is not aware of evidence in the record indicating that accidents would be prevented if OSHA required inspectors to have additional qualifications or credentials. OSHA disagrees, and concludes that accidents do not occur due to the inability of competent or qualified persons to conduct adequate inspections of cranes under the former standard. Accordingly, OSHA is retaining the requirement in §

1926.1412 that the various required inspections be conducted either by competent persons or qualified persons.

The local government's request that OSHA not preempt local laws and allow local governments to continue to play a role in crane inspections is within the scope of the local government's broader preemption concerns addressed in the discussion of federalism in section V.D of this preamble. However, OSHA notes that § 1926.1412 would not preclude local government inspectors or others who are not employees of the employer responsible for the inspections, from serving as inspectors in compliance with the requirements of this standard. The inspector need only meet the definition of a competent or qualified person in § 1926.1401 (note that a "competent person" must have the authority to take corrective action.)

Paragraph (a) Modified equipment

Paragraph (a) of this section requires an inspection (that includes functional testing of the equipment) to be performed by a qualified person for equipment that has been modified or has additions that affect the safe operation of the equipment prior to initial use after that modification/addition.[71] As proposed, this paragraph did not contain a documentation requirement. An industrial contractor stated that the standard should require documentation of this inspection (as well as the inspections required under paragraphs (b) and (c) of this section, discussed below) but offered no reasons to support

[71] The phrase "modifications or additions" and the term "modifications/additions," as used in this section, have the same meaning (an addition is a type of modification). C-DAC wanted to emphasize that additions are subject to the same approval procedures as other types of modifications. Wherever a form of the word "modification" is used in this preamble, it is a reference to all modifications, including additions.

its suggestion. (ID -0120.) Absent a basis in the record to add such a requirement, OSHA declines to require documentation of the inspections under paragraphs (a), (b), and (c).

Proposed § 1926.1412(a)(1)(ii) stated that "[t]he inspection shall include functional testing." OSHA requested public comment on whether it should modify the provision to limit the functional testing requirement to components that the modification affects or may affect (73 FR 59766-59767, Oct. 9, 2008). Several commenters asserted that functional testing is only necessary to test modifications of the equipment and other affected components. (ID -0205; -0213.) In contrast, a local government asserted that the functional testing should be of the entire crane. (ID -0156.1.)

OSHA is concerned that there may be instances where a modification has an unanticipated effect on the equipment that would not become apparent if the test were limited. Therefore, the Agency has decided to require a functional test of the equipment as a whole. To make this clear, the words "of the equipment" have been added at the end of the sentence of the provision in the final rule.

During the SBREFA process, a Small Entity Representative (SER) suggested adding an exception to § 1926.1412(a) for "transportation systems," by which the SER meant any system dispersing the weight of the crane for movement on a highway. As recommended by the Panel, OSHA solicited public comment on whether to include such an exception and possible language for it (73 FR 59767, Oct. 9, 2008). No comments were submitted on this point. OSHA notes that § 1926.1412 specifies the items that must be inspected, and these items do not include any items dealing with the movement of equipment on a highway.

Paragraph (b) Repaired/adjusted equipment

Paragraph (b) of this section provides that equipment that has had a repair or adjustment that affects the safe operation of the equipment must be inspected by a qualified person prior to initial use after the repair/adjustment. In summary, the qualified person is required to determine if such repairs and adjustments were performed in accordance with manufacturer equipment criteria.

Proposed § 1926.1412(b)(1)(iii) stated that "[t]he inspection shall include functional testing." As in the case of proposed § 1926.1412(a)(1)(ii) discussed above regarding modified equipment, OSHA requested public comment on whether the functional testing required for repaired/adjusted equipment should be limited to testing only those components that are or may be affected by the repair or adjustment (73 FR 59767, Oct. 9, 2008).

Several commenters asserted that functional testing is only necessary to test the repairs or adjustments and other affected components and systems of the equipment. (ID -0205; -0213.) In contrast, one commenter indicated that the functional testing should be of the entire crane. (ID -0156.)

The standard requires that repairs or adjustments of equipment must be done in accordance with the manufacturer's or qualified person's recommendations. Repairs or adjustments are meant to restore equipment to original design specifications and safety factors. Otherwise, OSHA considers the maintenance activity performed a modification of the equipment. In essence, repair or adjustment of a system or component must be consistent with the engineering in the original equipment design. OSHA believes that a

functional test that is limited to only those components that are or may be affected by the repair or adjustment, in conjunction with the inspection required under § 1926.1412(d). Each shift (discussed below), will sufficiently identify a deficient repair or adjustment. OSHA has therefore modified the language of § 1926.1412(b)(1)(iii) in the final rule accordingly.

A commenter stated that § 1926.1412(b) should be structured similarly to § 1926.1434, *Modifications*, in that the employer should be required to consult with the manufacturer before employers perform repairs or adjustments of equipment that relate to safe operation. (ID -0292.) In that case, the commenter stated, no third party would be able to overrule a manufacturer statement that a repair cannot be made. The commenter believed that an employer should only be able to go to paragraph (b)(1)(ii) if the manufacturer is unavailable.

OSHA does not agree with the suggested change. Implicit in the comment is the suggestion that there are instances where a repair cannot be made without compromising the integrity of the equipment. That concern is already addressed by the standard. If the repair cannot meet the criteria in accordance with § 1926.1412(b)(1)(i) (or, if applicable, § 1926.1412(b)(1)(i)), then the requirements in subpart CC for modifications would have to be met. Therefore, OSHA declines to adopt the suggested change.

Paragraph (c) Post-assembly

Paragraph (c) of this section requires a post-assembly inspection of equipment by a qualified person prior to its use. In sum, the provision requires the qualified person to assure that the equipment is configured in accordance with the manufacturer's equipment

criteria. If manufacturer equipment criteria are unavailable, the qualified person must determine whether a registered professional engineer (RPE) is needed to develop criteria for the equipment configuration. If an RPE is not needed, the employer must ensure that a qualified person develops them. If an RPE is needed, the employer must ensure that an RPE develops them. Equipment must not be used until an inspection under this paragraph demonstrates that the equipment is configured in accordance with the applicable criteria. OSHA received no comments on the proposed paragraph; therefore, it is published as proposed.

Paragraph (d) Each shift

Paragraph (d) of this section requires a shift inspection, the first of three regularly scheduled equipment inspections that are required. Specifically, paragraph (d)(1) sets forth the frequency of this inspection, the degree of scrutiny required and the level of expertise required of the person performing this inspection. The paragraph lists the items that are required to be included in this inspection and specifies the corrective action that is required. The purpose of this provision is to identify and address safety hazards before they cause accidents.

A utility company recommended that OSHA revise § 1926.1412(d) to read "each shift the equipment is used…." to clarify that the equipment does not have to be inspected when it will not be used on a shift. (ID -0226.) This suggested change is consistent with the intent of the proposed rule, and OSHA is adding similar language to final rule § 1926.1412(d)(1) to clarify that intent.

One commenter asserted that OSHA should prohibit operation of the equipment until the shift inspection is complete rather than permitting the inspection to be completed during the shift. (ID -0156.1.) A different commenter disagreed. (ID -0143.) OSHA does not agree with this suggestion. While some of the items that must be inspected can readily be inspected before each shift, e.g., cab windows for deficiencies that would hinder the operator's view, others can best be checked while the equipment is operating. For example, one item that must be inspected is control mechanisms for maladjustments that interfere with proper operation. During the shift, such maladjustments may be easier to detect than a check conducted before the equipment is operating. Still others may change during the shift and require additional inspection. For example, if the crane is moved to a new location during the shift, it would be necessary to inspect the ground conditions in that location.

Regarding the frequency of this inspection, an energy utility representative commented that the per-shift crane inspection fails to take into account the frequency or severity of use. (ID -0203.1.) The commenter points out that if a crane is used once during the first shift, and once during the second shift, even if only to lift a minor load, the inspection would have to be conducted twice. The commenter agrees that the per shift inspection may be valuable and necessary on constructions sites where cranes are used continuously for heavy use, but states that the level of inspection should be adjusted to reflect the infrequent use of mobile cranes for construction activities at operating generating plants. The commenter suggests that the final standard should permit employers to use the inspection protocol in ASME B30.5, sec. 5-2.

OSHA does not agree that minimal use during one shift negates the need for a shift inspection during the next shift. Since the completion of the last shift inspection, the equipment could have developed a deficiency or been damaged even if it was used to hoist one load. For example, fluids may expand or freeze, seals may leak due to a change in temperature, structural materials may crack, or electrical components may fail. A deficiency that might not have been apparent earlier might become more readily observable.

Moreover, while some equipment may be used infrequently for construction work, the commenter did not disagree that it may be used heavily for other purposes. When a crack, leak, or other hazard appears, and the equipment is to be used in construction, the source of that hazard is immaterial; the fact that the problem may have developed during non-construction uses does nothing to reduce the safety hazard that would be posed by the use of that equipment in construction. Instead, the multiple uses of some of this equipment, potentially by different employees using it for different purposes, makes it all the more likely that important information might not be shared in a timely manner, and therefore more important to ensure that the equipment is inspected during each shift of construction work. An employer cannot assume that the condition of the equipment has not changed since the completion of the last shift inspection, even if the employer did not use the equipment extensively during that shift. OSHA is convinced that it is reasonable, and not overly burdensome, to require a competent person to complete this inspection of the equipment before or during each shift to ensure it is safe for use.

A competent person is required to perform the shift inspection. A labor management association commented that OSHA should replace "competent person" with "operator" for the purposes of who should perform the visual inspection required by §1926.1412(d). (ID -0172.) As explained in the preamble to the proposed rule, OSHA anticipates that the employer will often use the equipment operator as the competent person who conducts the shift inspection. The operator, in most cases, by virtue of his or her qualification or certification under §§ 1926.1427 and 1926.1430, experience, and familiarity with the equipment, is a competent person. However, the employer has the flexibility to use someone else to conduct the shift inspection as long as that person is a competent person. When the operator does not qualify as a competent person, the employer is required to choose a different person. For these reasons, in the final rule, OSHA is retaining the requirement that a competent person conduct the shift inspection.

A local government requested that the standard require the employer to document the completion and results of the shift inspection. (ID -0156.1.) In addition, it asked that the standard require employers to submit daily logs to the equipment owner at the end of each job that include a list of maintenance and repairs made to the equipment by the user at the jobsite. It also requested that the owner maintain these documents for the life of the equipment and transfer them from owner to owner when sold.

OSHA determines the documentation described by the commenter would be burdensome for the user and owner of the equipment, with no added, industry-recognized, benefit to safe hoisting operations. There is no significant, safety-related evidence in the record to substantiate the documentation requirements the commenter recommended. Therefore, OSHA is not requiring documentation of the shift inspection.

The SBREFA Panel recommended that OSHA solicit public comment on whether, and under what circumstances, booming down should be specifically excluded as a part of the shift inspection, and whether the removal of non-hinged inspection plates should be required during the shift inspection. Section 1926.1413(a)(1), discussed below, explicitly states that booming down is not required as part of the shift inspection for wire rope. C-DAC did not include a similar provision in the general shift inspection provision in § 1926.1412(d) because booming down is not required to observe a deficiency in any of the items requiring inspection under that paragraph. Similarly, OSHA determines that inspection for a deficiency in any of those items does not require the removal of non-hinged inspection plates.

Several commenters submitted comments that indicated a need for OSHA to clarify that it is not usually necessary to boom down to complete a visual inspection of the items listed in §1926.1412(d). (ID -0143.1; -0205; -0213.) In response to the apparent ambiguity suggested indicated by these comments, OSHA is revising § 1926.1412(d)(1), to clarify that booming down is not required routinely. The term "disassembly" was replaced with "taking apart equipment component" in paragraph (d)(1) of this section to avoid any confusion as to whether the provision was addressing disassembly as defined for the application of §§ 1926.1403 through 1926.1406.

Paragraphs (d)(1)(i) through (xiv) set forth the list of items that, at a minimum, a competent person must inspect each shift. Paragraph (d)(1)(x) of the proposed rule listed "[g]round conditions around the equipment for proper support, including ground settling under and around outriggers and supporting foundations, ground water accumulation, or similar conditions."

A railroad association objected to the application of this provision to railroads. (ID -0170.1.) The association commented that the § 1926.1412(d)(1)(x) requirement that an inspector verify the ground conditions around the equipment before each shift makes no sense for a crane moving down the track. OSHA notes that this provision does not require a railroad to inspect the ground conditions along the track if a railroad crane is simply traveling down the track. Section 1926.1402, which contains requirements for ground conditions, makes clear that the conditions being addressed are those where the equipment is operating. To the extent that a railroad crane may move down the track during a construction operation, OSHA determines it is appropriate to require the ground conditions along the track to be inspected to ensure that no hazardous conditions, such as the erosion or other physical degradations of the support for railways, have developed that will adversely affect the support needed for equipment to perform safely during hoisting operations. However, OSHA is adding language to exempt railroad tracks and their underlying support from inspection when those rails are regulated by the FRA. OSHA concludes that the exemption is appropriate because the FRA already regulates the ground conditions for railroad tracks, including specific regulations addressing the inspection of those rails and their support. See, e.g., 49 CFR 213.233 (track inspections) and 213.237 (inspection of rail). For consistency and clarity, OSHA is adding similar language exempting rails regulated by the FRA to paragraph (d)(1)(xiii).

A crane rental company objected to the requirement to inspect ground conditions, stating that there is no similar provision for inspecting ground conditions in the elements of inspections required by ASME B30.5 sec. 5-2.1.2. (ID -0143.1.) It also believes listing this requirement in the elements for shift inspections is confusing and suggests that

this requirement should either be removed or included in § 1926.1402, *Ground Conditions*. As stated in the explanation of the proposed rule, this item was included because ground conditions can change from shift to shift, and sufficient ground support is of critical importance for safety. OSHA is retaining it in this section because it is more appropriately included in the list of items to be inspected than as a stand-alone inspection item in § 1926.1402.

In paragraph (d)(1)(x) in the final rule, OSHA is replacing the word "outriggers" with "outriggers/stabilizers." The term "stabilizers" was added because some pieces of equipment, like articulating cranes, are designed to use stabilizers instead of outriggers to add stability at their bases. A full discussion of the comments that prompted this regulatory text change is provided in the explanation of the rule for § 1926.1404(q).

Proposed § 1926.1412(d)(1)(xi) included among the items to be inspected "the equipment for level position, both shift and after each move and setup." The SBREFA Panel recommended that OSHA solicit public comment about whether it is necessary to clarify the requirement of proposed § 1926.1412(d)(1)(xi) that the equipment be inspected for "level position" by clarifying the amount of tolerance that would be allowed for the equipment to be considered "level." OSHA requested public comment on this issue and several commenters asked OSHA not to specify tolerance limits. (ID -0143.1; 0170; -0205; 0213; -0226.) OSHA notes that § 1926.1402(b), which pertains to ground conditions, requires the equipment, during use, to be level to the degree specified by the equipment manufacturer. For clarity, OSHA is adding language to § 1926.1412(d)(1)(xi) to state that the equipment must be inspected for level position "within the tolerances

specified by the equipment manufacturer's recommendations." OSHA is also adding the words "before each" before shift to clarify the provisions intent.

Paragraphs (d)(2) and (d)(3) require the employer to take corrective action where the competent person identifies a deficiency during inspection. Once the inspector identifies any deficiency in the areas in (d)(1)(i) through (xiii),[72] or pursuant to other equipment-specific inspections (e.g., § 1926.1436(p) (inspection of derricks)), the inspector must immediately determine whether that deficiency constitutes a safety hazard. If so, then equipment operations must cease and the employer must take the equipment out of service, following the tag-out procedure in § 1926.1417(f), and may not use it again until the deficiency has been corrected. This approach reflects C-DAC's determination that not all deficiencies constitute safety hazards. However, regardless of whether the inspector determines that there is a safety hazard, if any deficiency affects a safety device or operational aid, then the employer must take the steps required under §§ 1926.1415, *Safety Devices*, or 1926.1416, *Operational aids*.

OSHA is requiring the procedures in paragraphs (d)(2) and (d)(3) to ensure that the employer stops using unsafe equipment as soon as the safety hazard is identified. The correction procedure set forth in paragraph (d)(2) is similar to that in ANSI B30.5-1968 and ASME B30.5-2004 for their Frequent Inspections. OSHA is requiring a competent person to make the determination to ensure that his or her findings are implemented; i.e., the competent person would have the authority to order the equipment out of service if

[72] Proposed § 1926.1412(d)(2) inadvertently referred to deficiencies in paragraphs (d)(1)(i) through (xiv), but the preamble to the proposed rule explained correctly that it only applied to deficiencies in paragraphs (d)(1)(i) through (xiii) (not (xiv)) (73 FR 59770, Oct. 9, 2008). The text of paragraph (xiv) addresses operational aides and safety devices, which are specifically addressed in paragraph (d)(3). Therefore, in the final paragraph (d)(2), OSHA refer to deficiencies in "paragraphs (d)(1)(i) through (xiii)."

the deficiency constituted a hazard. In the final rule, OSHA has replaced the phrase "removed from service" with "taken out of service," which is the phrase used in § 1926.1417(f), to avoid any ambiguity about the employer's duty to tag out the unsafe equipment.

Paragraph (e) Monthly

Paragraph (e) of this section requires a monthly inspection of the equipment, the second of the three regularly scheduled general inspections that are required by this standard. The monthly inspection is identical in coverage and manner to the shift inspection required by § 1926.1412(d), with one addition discussed below. Thus, the monthly inspection is a visual inspection of the items listed in the shift inspection for apparent deficiencies, conducted by a competent person. However, unlike a shift inspection, the employer must document the inspection and retain the documentation for a minimum of three months.

In addition, under the annual/comprehensive inspection in § 1926.1412(f)(4), the employer is required to identify developing deficiencies that, while not yet safety hazards, need to be monitored. In such cases the employer, under §§ 1926.1412(f)(4) and (f)(6), is required to monitor them in the monthly inspections.

One commenter suggested adding text to the final rule to clarify how the monitoring information would be transferred from annual inspector to monthly inspector, if different. (ID -0226.) The Agency is not modifying the text of the rule as requested, but notes that under paragraph (f)(7)(i) of this section the inspector must document all "items checked and the results of the inspection." Therefore, if the inspector determines

that further monitoring is required, that information would be a "result of the inspection" included in the annual report. The inspector would then be responsible for checking the annual report prior to monthly inspections (see § 1926.1412(f)(6).)

An industrial contractor commented that OSHA should require employers to keep monthly inspection documentation for a minimum of three months or the duration of the project, whichever is longer. (ID -0120.) This commenter did not, however, describe how expanding the retention requirement would produce any significant benefit, and OSHA determines there would be no benefit. The documentation requirement enables the individuals who use the equipment and conduct shift and monthly inspections to assess the results of earlier monthly inspections. Once more than three months have passed since a monthly inspection, the information in the documentation for that inspection will not reflect the current condition of the equipment.

The SBREFA Panel recommended that OSHA solicit public comment on whether the provision for monthly inspections should, like that for annual inspections, specify who must keep the documentation associated with monthly inspections. (The provision for annual inspections states that the documentation must be "maintained by the employer who conducts the inspection.") OSHA requested public comment on the issue raised by the Panel's recommendation. Several commenters believed that OSHA should require the employer who conducts the monthly inspection to maintain the documentation. (ID -0205; -0213; -0214; -0226.)

OSHA agrees that the employer who conducts the monthly inspection should maintain the documentation. This revision clarifies the intent of C-DAC and is consistent with other provisions in this section.

A utility company commented that if the operating employer is not the inspecting employer, the operating employer should be provided with a copy of the inspection if requested. (ID -0226.) This comment suggests that some employers who operate rented equipment are concerned that the required documentation may not be available to them from other parties unless explicitly required in the regulatory text of this final rule. In some cases, one employer owns and operates the equipment used to perform construction activities. It is reasonable to require these employers to maintain the equipment inspection records. However, during the analysis of public comments and testimony, OSHA recognized that there would be situations where an employer rents or uses equipment owned by another party or where multiple employers use the same piece of equipment. The standard allows any employer to conduct the monthly inspection. The employer who conducts the inspection must document the items checked and the results of the inspection and must retain it for a minimum of three months. If employers whose employees use the equipment rely on another employer to conduct, document, and maintain the record of the monthly inspection, it is the responsibility of each employer engaged in construction activities to assure compliance with the standard.

OSHA determines that it is in the interest of all employers who conduct monthly inspections, whether they use or own equipment, to share the inspection results with each employer who uses the equipment. However, employers engaged in construction activities are responsible for assuring compliance with the standard. Therefore, if an employer engaged in construction activities is unable to assure that another employer has conducted the monthly inspection, then the employer engaged in construction activities must conduct a monthly inspection prior to using the equipment. The monthly inspection

is similar to a shift inspection (with the addition of the monitoring of deficiencies that a qualified person deemed not to be a safety hazard in the annual inspection), but, unlike a shift inspection, the monthly inspection must be documented and maintained. Requiring an employer who uses the equipment to conduct a monthly inspection when that employer is unable to determine whether another employer conducted a monthly inspection is an insignificant burden compared to the safety benefit of ensuring this inspection is completed.

The SBREFA Panel also recommended that OSHA restate the corrective action provisions from the shift inspection (§ 1926.1412(d)(2) and (3)) in paragraph (e) of this section. Under § 1926.1412(e)(1), the monthly inspection must be conducted in accordance with § 1926.1412(d) on shift inspections, meaning that the corrective action provisions in § 1926.1412(d)(2) and (3) must also be followed in the monthly inspections. OSHA requested comment on whether the language in § 1926.1412(d)(2) and (3) should be repeated under § 1926.1412(e). Two trade associations believed that clarity would be improved if paragraph (e) of this subpart repeated the corrective actions provisions from the shift inspection paragraph. (ID -0205; -0213.) OSHA disagrees because § 1926.1412(e)(1) explicitly requires this inspection to be done in accordance with § 1926.1412(d). Paragraph (d) immediately precedes paragraph (e), and OSHA concludes that repeating the provisions will create, rather than alleviate, confusion by requiring employers to read two lists that contain identical information.

Paragraph (f) Annual/comprehensive

Paragraph (f) of this section requires an annual (i.e., once every twelve months), general inspection of the equipment, the third of the three regularly scheduled general inspections that are required by this standard. It promotes safety by ensuring that a thorough, comprehensive inspection of the equipment is performed to detect and address deficiencies that might not be detected in the shift and monthly inspections.

Under paragraph (f)(1), a qualified person must inspect the equipment. The Committee specified a qualified person because the items required in the shift inspection must be examined more thoroughly than during the shift or monthly inspections. The Committee, determined, and OSHA agrees, that the higher level of expertise of a qualified person would help to ensure that the inspector was able to identify deficiencies necessitating a greater degree of scrutiny than what would be required in the shift inspection; for example, a deficiency that is not apparent in a visual inspection but is detectable through taking apart equipment components. The Committee's decision to require a qualified person is consistent with COE–EM 385–1–1 (3 Nov 03) and ASME B30.5-2004, both of which call for a qualified person to perform those standards' "periodic" inspections.

OSHA notes that § 1926.1412(f) does not specify the level of scrutiny for the annual/comprehensive inspection. In drafting the proposed rule, OHSA determined that C-DAC intended for this inspection to be more thorough than the visual inspection for apparent deficiencies required of the shift and monthly inspections. OSHA therefore solicited comments from the public as to whether language specifying a higher level of scrutiny (for example, "thorough, including disassembly when necessary") should be added.

A railroad equipment supplier commented that this section does not additionally burden employers if it requires them to open covers to inspect for safety defects that could cause an incident or death. (ID -0124.) Therefore, they were in support of adding stronger language to paragraph (f) of this section to emphasize some disassembly is necessary to complete a thorough inspection of the equipment. In contrast, two trade associations believed that no additional language was need in the regulatory text to specify that a higher level of scrutiny is needed during an annual inspection. (ID -0205.1; -0213.)

OSHA determines that some disassembly of the equipment will be needed for the qualified person to complete the inspection. Therefore, OSHA has revised § 1926.1412(f)(2) accordingly.

The proposed rule did not require the individual who conducts the annual inspection to review any documentation related to the crane prior to or during the inspection. A labor representative suggested two types of documentation they believe the qualified person should review when conducting an annual inspection. (ID -0182.1.) First, the commenter wanted OSHA to include a requirement in paragraph (f) of this section that the inspector contact the manufacturer for any relevant information the manufacturer may have about the equipment. The commenter explains that the manufacturer may have information about recently discovered defects or deficiencies in the equipment or have recommended modification, which inspectors should take into account when performing the annual inspection.

Second, the commenter recommended that OSHA require the inspector to review all available information regarding the history of the piece of equipment. This

information would include annual or periodic inspection reports, which would describe previously discovered defects or previously made modifications, to which the inspector should pay particular attention while conducting a comprehensive inspection.

OSHA declines to impose the requirements suggested by the commenter because the Agency does not agree they would lead to better inspections. The annual inspection requirements are designed to ensure that the inspector thoroughly scrutinizes and evaluates the current condition of critical components of the equipment. Reviewing the maintenance history of the equipment will not further the value of this inspection, for defects previously discovered should have been repaired and defects not present in the past may now exist. For example, if a part such as a ball bearing is replaced with a new part, there is no reason to expect that the bearing will fail. To the contrary, the brand new part is less likely to fail than another ball bearing that has been subjected to heavy use for years. OSHA determines that the inspection will be more valuable if the inspector concentrates on thoroughly inspecting the items listed in the rule to determine whether they currently present any safety defects. Similarly, OSHA is not convinced that contacting the manufacturer will yield valuable information that will advance the annual inspection. OSHA determines that important safety information about their products is provided voluntarily by manufacturers to their customers and that a requirement to contact them each year is not likely to yield any further information of value.

Paragraphs (f)(2)(i) through (xxi) specify the parts of the equipment and the conditions the inspector must look for during the annual inspection. The Committee developed this list based on the members' experience and current industry practice as reflected in current consensus standards for annual/periodic inspections. The Committee

concluded that each item plays an important role in the safe operation of equipment. Only a few of these items require discussion.

Proposed paragraph (f)(2)(xiv) listed "[o]utrigger pads/floats" for excessive wear or cracks." The purpose of the inspection of outrigger pads/floats is to make certain that these pads (which are attached to the outrigger and used to distribute the weight of the load to the ground) will not fail and leave the outrigger without proper support. In the final rule, OSHA is referring to "outrigger or stabilizer pads/floats" because some types of equipment, such as articulating cranes, are designed to use stabilizers instead of outriggers to add stability at their bases. A full discussion of the comments that prompted this regulatory text change is provided in the explanation of the rule for § 1926.1404(q).

Proposed paragraph (f)(2)(xv) listed "slider pads for excessive wear or cracks." The word "cracks" had not been included in the C-DAC Consensus Document for this item, and two trade associations (ID -0205.1; -0213.1) commented that "cracks" should be removed from the provision to be consistent with the intent of C-DAC. After examining how the word came to be included in the proposed rule, OSHA concludes that the word "cracks" was added inadvertently to this provision and, lacking an evidentiary basis to include it, is removing the words "or cracks" from paragraph (f)(2)(xv) in the final rule.

Section 1926.1412(f)(2)(xviii) has been modified from the proposed rule. Upon review of this requirement, the Agency found that it was necessary to clarify this requirement to allow the use of a seat that is equivalent to the original operator's seat. This provision requires the employer to replace the original seat with one that provides

function and safety that is equivalent to the original seat. The text of the final rule has been modified accordingly.

In § 1926.1412(f)(2)(xix) the term "unserviceable" is replacing the term "unusable" to clarify that the operator's seat must be in good working condition to allow the operator to safely work at the controls of the equipment. The text of the final rule has been modified accordingly.

Paragraph (f)(3) requires functional testing as part of the annual/ comprehensive inspection. No comments were received on this provision.

Paragraphs (f)(4) through (6) delineate the follow-up procedures that apply when a deficiency is identified during the annual/comprehensive inspection. The purpose of these provisions is to ensure that a deficiency that is not yet a safety hazard but may develop into one is monitored on a monthly basis, and that a deficiency that is a safety hazard is corrected before the equipment is returned to service.

Paragraph (f)(4) provides that immediately following the identification of a deficiency, the qualified person must determine "whether the deficiency constitutes a safety hazard, or though not yet a safety hazard, needs to be monitored in the monthly inspections." No comments were received and paragraph (f)(4) is promulgated as proposed.

Paragraph (f)(5) requires that equipment with a deficiency identified as a safety hazard by the qualified person be removed from service until the deficiency is corrected. Paragraph (f)(6) requires the employer to check the deficiencies in the monthly inspections that the qualified person had identified as needing monitoring.

In the proposed rule, OSHA discussed an apparent conflict between § 1926.1412(f)(4) and § 1926.1416. Paragraph (f)(2)(v) lists operational aids among the items that must be included in the annual inspection.[73] Section 1926.1416 permits equipment with operational aids that are not functioning properly to continue to be used for limited periods of time as long as specified alternative measures are used while the operational aids are being repaired. By contrast, under § 1926.1412(f)(4), if any deficiency is identified in the annual inspection, the qualified person must make an immediate determination as to whether the deficiency constitutes a safety hazard. If it does, under § 1926.1412(f)(4), the equipment must be removed from service immediately. OSHA requested public comment on whether § 1926.1412(f)(4) should explicitly provide that the corrective action in § 1926.1416 applies if an operational aid is found to be malfunctioning during an annual inspection. Two trade associations agreed that § 1926.1412(f) should state that the corrective action required for malfunctioning operational aids is that specified in § 1926.1416. (ID -0205.1; -0213.1.) OSHA also notes that § 1926.1435(e) specifies the temporary alternative measures that must be implemented when operational aids on tower cranes malfunction, and §1926.1412(f)(5) applies to tower cranes as well as equipment covered by §1926.1416. Paragraph (f)(5) of the final rule is modified accordingly.

[73] Paragraph (f)(2)(v), as proposed and in the final rule, distinguishes between deficiencies that result in "significant inaccuracies" in the operation of any of the safety devices or operational aides, and those that do not. The phrase "significant inaccuracies" reflects the fact that such devices normally operate within a tolerance range. Corrective actions are not required if the inaccuracy is so small as to be irrelevant regarding the safe operation of the equipment. In contrast, significant inaccuracies in these devices could mislead the operator and contribute to actions that could result in the equipment being inadvertently used in an unsafe manner.

Moreover, OSHA is adding text to paragraph (f)(1) of this section to emphasize that paragraphs (d)(2) and (d)(3) of this section do not apply to annual inspections.

Paragraph (f)(7), *Documentation of annual/comprehensive inspection*, requires the employer that conducts the inspection to complete and maintain, for a minimum of twelve months, documentation that contains "[t]he items checked and the results of the inspection," and "[t]he name and signature of the person who conducted the inspection and the date of the inspection." Section 1926.1413(c)(4), which pertains to the annual/comprehensive wire rope inspection, contains a similar documentation requirement. In the proposed rule, the 12-month retention requirement was located in paragraph (f)(7)(iii). OSHA has incorporated that requirement into the introductory sentence to clarify that it is the employer who conducts the inspection who must retain the documents for 12 months. OSHA has also clarified that the date of the inspection, not the date on which the document was signed, must be entered on the document.

During the SBREFA process, several Small Entity Representatives objected to the requirement for documentation of monthly and annual inspections, stating that such documentation would be unduly burdensome and would not, in their opinions, add to worker safety. The Panel recommended that OSHA solicit public comment on the extent of inspection documentation the rule should require. OSHA requested comment on this issue.

A local government supported annual/comprehensive inspection documentation. (ID -0156.) It also commented that daily logs should be maintained and submitted to the crane owner to capture when maintenance has been performed on the equipment, and maintained by the equipment owner for the life of the crane. This commenter did not,

however, explain how such a retention requirement would produce safety benefits, and OSHA declines to adopt it.

The Committee determined that the documentation of the annual inspection, signed by the person who conducted the inspection and retained for 12 months, would have several effects. First, it would increase the likelihood that more employers would implement systems for conducting and responding to inspections. Second, the failure to do so would be more readily apparent if a record was not made, and the signature of the person who conducted the inspection would be an inducement to that person to ensure that the inspection was done correctly.

The Agency notes that the three month retention period reflects the Committee's decision to have a retention period that is consistent with Department of Transportation truck inspection documentation requirements.

The documentation of these inspections serves as references that inspectors can use to monitor the condition of items critical to the safe operation of the equipment. It has been a longstanding industry practice to maintain annual inspection documentation as a reference that the inspection was completed, to identify who performed the inspections, and to document the results of that inspection.

Paragraph (g) Severe service

Paragraph (g) of this section requires the employer to inspect the equipment when the severity of use/conditions – "such as loading that may have exceeded rated capacity, shock loading that may have exceeded rated capacity, [or] prolonged exposure to a corrosive atmosphere" – creates a "reasonable probability of damage or excessive wear."

In such instances, the employer is required to stop using the equipment and have a qualified person "inspect the equipment for structural damage;" determine whether, in light of the use/conditions of the severe service, any items listed in the annual/comprehensive inspection need to be inspected and if so, inspect them; and if a deficiency is found, follow the correction/monitoring procedures set forth in § 1926.1412(f)(4)–(f)(6).

Upon review of this paragraph, the Agency determines that § 1926.1412(g)(1) needs clarification; therefore, OSHA added a phrase to the provision requiring that a determination be made to ensure the equipment remains safe for continued use. This revision emphasizes that this inspection must determine the capability of the equipment to operate continuously under severe conditions. No comments were received on this paragraph, and it is promulgated as proposed, with the exception of the clarification to § 1926.1412(g)(1).

Paragraph (h) Equipment not in regular use

Paragraph (h) of this section requires that equipment that sits idle for three months or more be inspected by a qualified person in accordance with the monthly inspection provisions of § 1926.1412(e) before being used. This would ensure that deficiencies that may arise as a result of the equipment standing idle are checked before its subsequent use. The Committee determined that this inspection would need to be done by a qualified person, rather than a competent person, because some of the deficiencies that may arise from sitting idle require the qualified person's higher level of ability to detect and assess.

(See further discussion at 73 FR 59775, Oct. 9, 2008.) No comments were received on this paragraph. It is promulgated as proposed.

Paragraph (i) [*Reserved*.]

Paragraph (j)

Proposed paragraph (j) of this section required that any part of a manufacturer's inspection procedures relating to safe operation that is more comprehensive or has a more frequent schedule than that required by this section must be followed. These inspection procedures include any information provided by the manufacturer. Examples are provided in the provision of the types of items that would be considered to relate to safe operation ("a safety device or operator aid, critical part of a control system, power plant, braking system, load-sustaining structural components, load hook, or in-use operating mechanism"). The proposed paragraph goes on to state: "Additional documentation requirements by the manufacturer are not required."

Several commenters asked that OSHA delete the line in the regulatory text of § 1926.1412(j) that reads "Additional manufacturer documentation requirements need not be followed." (ID -0165; -0232; -0235.) OSHA acknowledges that the intent of this sentence is unclear and is not including it in the final rule.

A safety association and a trade association commented that the thorough and equipment-specific frequency of inspections required by the manufacturer are well suited for the equipment used in their trades. (ID -0184; -0206.) The safety association asserted that compliance with equipment manufacturers' inspection recommendations assure a

greater degree of safety than compliance with a list of shift, monthly, and annual inspections, which may be deficient with regard to thoroughness and frequency. The two commenters asked that OSHA revise § 1926.1412 to allow employer-documented compliance with the inspection recommendations of the equipment manufacturer as an alternative to meeting the requirements of § 1926.1412.

OSHA agrees with the commenters that manufacturer's equipment-specific inspection requirements can help promote safety. For this reason, § 1926.1412(j) provides that any additional inspection requirements recommended by the manufacturer must be followed by employers. However, OSHA does not agree with the commenters regarding their assessment that the minimum inspection requirements and schedules specified in § 1926.1412 are more burdensome for employers who use articulating lifting equipment in particular. There is no evidence in the record that inspections recommended by manufacturers are as thorough as those provided in this section. To the extent that they are, there is no additional burden to employers in requiring them to follow this section than to follow the manufacturer's recommendations.

Paragraph (k)

OSHA determines that the competent person or persons who conduct shift and monthly inspections, and the qualified person who conducts annual inspections, must have access to all written documents produced under this section, during the time for which the employer is required to retain those documents, so that they are made aware of any components of the equipment that may require special attention during their

inspections. Accordingly, OSHA is adding a new paragraph (k) at the end of § 1926.1412.

Section 1926.1413 Wire Rope – inspection

Cranes and derricks use wire rope to lift and support their loads and parts of the equipment. If the rope is worn or damaged, it can break, causing the equipment to fail and/or the load to fall, which can kill or injure workers. Approximately 3% of crane fatalities in construction work result from wire ropes snapping. *J.E. Beavers et al, Crane-Related Fatalities in the Construction Industry*, 132 Journal of Construction Engineering and Management 901, 903 (Sept. 2006). (ID -0011.) Accordingly, C-DAC concluded it would improve crane/derrick safety to establish updated requirements for wire rope inspections.

The definition C-DAC developed for proposed § 1926.1401 defined "wire rope" as "rope made of wire." In the preamble of the proposed rule, OSHA noted that this definition could be read to exclude rope made with a fiber core, which, as discussed below under § 1926.1414, may be used for purposes other than boom hoist reeving. OSHA requested public comment on whether a more appropriate definition would be the following one used by the Specialized Carriers & Rigging Association:

> A flexible rope constructed by laying steel wires into various patterns of multi-wired strands around a core system to produce a helically wound rope.

(73 FR 59739, Oct. 9, 2008.) Three commenters supported this revised definition, and none were opposed. (ID -0187.1; -0205.1; -0213.1.) Accordingly, OSHA is revising the definition in § 1926.1401 to that quoted above.

One of the commenters supporting the revised definition also stated that OSHA should not exclude wire rope with a synthetic or fiber core and should include definitions of these terms. (ID -0187.1.) However, as OSHA explained in the proposed rule, the revised definition is designed to encompass cores other than wire, and OSHA determines it is not necessary to include separate definitions for each type of such rope to make clear that they fall within the definition of "wire rope."

The proposed rule provided for wire rope inspections at the same frequency – shift, monthly, and annually – that would apply for other crane components under § 1926.1412. It also proposed that, like inspections of other components, the shift and monthly inspections be conducted by a "competent person," and the annual inspection by a "qualified person." As discussed below, OSHA is retaining this equivalence of frequency and qualifications in the final rule.

Paragraph (a) Shift inspection

Paragraph (a)(1) of this section of the proposed rule required a shift inspection by a competent person. One commenter recommended that this provision require the shift inspection to be conducted "each shift the equipment is used" rather than "each shift," to clarify that the equipment does not have to be inspected when it will not be used on a shift. (ID -0226.0.) This suggested change is consistent with the intent of the proposed rule, and OSHA is adding similar language to § 1926.1413(a)(1) to clarify that intent.

Another commenter stated that it was unnecessary to require a wire rope inspection each shift. (ID -0203.1.) This commenter believed that per-shift wire rope inspections were an unnecessary burden for employers with good maintenance programs

who have not experienced wire rope failures. The commenter recommended that OSHA adopt the protocol in sec. 5-2.4 of ASME B30.5-2004, which allows the periodic inspection frequency to be determined by a qualified person based on factors that affect rope life.

OSHA rejects this commenter's suggestion which could, at a qualified person's discretion, result in less frequent wire rope inspections than were required under former subpart N. Section 5-2.4.1 of ANSI B30.5-1968, which was incorporated by reference in subpart N, provided for wire rope inspections "once each working day." The current version of B30.5, in sec. 5-2.4.2(a) of ASME B30.5-2004, similarly provides for daily wire rope inspections. The commenter's reference to the provision in ASME B 30.5-2004 that allows the inspection frequency to be determined by a qualified person refers to the type of comprehensive inspection that is similar to the annual inspection required by § 1926.1413(c), not to the shift inspections required under § 1926.1413(a).

As discussed below, the purpose of this inspection is to ensure that deficiencies are identified and that, depending on the competent person's evaluation of those deficiencies, appropriate action is taken. C-DAC wanted to make clear, however, that the inspection was not to be so comprehensive and time-consuming that it would be unrealistic to conduct it for each shift. To clarify that the inspection was one that was reasonable for a shift inspection, the provision states that neither "untwisting (opening of wire rope)" nor "booming down" is required during this inspection. OSHA believes that requiring a realistic level of inspection each shift will encourage compliance and ultimately serve to reduce accidents. No comments were received on this aspect of the proposed rule.

Proposed § 1926.1413(a)(1) referred to wire ropes (running and standing) that are "reasonably likely" to be in use during the shift. OSHA is also removing the word "reasonably" to avoid ambiguity. Accordingly, § 1926.1413(a)(1) is promulgated as proposed except for the minor changes noted above.

Paragraph (a)(2) Apparent deficiencies

Paragraph (a)(1) of this section requires the competent person to conduct a "visual inspection . . .for apparent deficiencies, including those listed in paragraph (a)(2)." Proposed paragraph (a)(2) established three categories (I, II, and III) of apparent wire rope deficiencies. The likelihood that a deficiency is hazardous increases as the number of the category increases from I to III. The basis for categorizing apparent deficiencies in this way was discussed in detail in the proposed rule (73 FR 59776-59777, Oct. 9, 2008). As discussed further below, the category determines the options or "next steps" available to or required of the employer under paragraph (a)(4), *Removal from service*.

The Agency is providing minor clarifications for the two apparent deficiencies that relate to damage from electricity. As proposed, paragraph (a)(2)(i)(C) read: "Electric arc (from a source other than power lines) or heat damage." C-DAC intended that both "electric arc" and "heat" would modify "damage." To make this more clear, OSHA is adding the word "damage" after "electric arc." Proposed paragraph (a)(2)(iii)(B) read: "Electrical contact with a power line." OSHA is adding the word "prior" at the beginning of the paragraph to clarify that the inspector must note a deficiency whenever he or she is aware, through observation or from any other information, that the wire rope has previously made electrical contact with a power line.

OSHA notes that a wire rope can be damaged in two ways from electrical contact. First, if the source of electrical power contacts the wire rope, the electricity can arc to the wire rope and cause a localized burn. The extent of the damage will depend on the amount of electrical energy involved. A low energy arc will typically cause little damage; a high energy arc may cause significant damage. When the arc results from a source other than a power line, the extent of the damage will vary, and the inspector must determine whether the rope is damaged to the extent that repair or replacement is necessary.

If a power line arcs to a wire rope, there will usually be sufficient localized burn damage that the rope must be removed from service. However, a wire rope may make electrical contact with a power line and leave no visible damage. For example, if the load contacts a power line and is not insulated from the wire rope, a large current can flow through the rope. The current may be large enough to damage the internal structure of the rope and weaken it without leaving any visible evidence on the rope itself that this has happened. There is no realistic way to assess the internal damage that such electrical contact has caused to the wire rope. Therefore, C-DAC determined that any wire rope that came into electrical contact with a power line must be removed from service.

Only one comment was submitted regarding proposed paragraph (a)(2). The commenter suggested adding two additional conditions to the list of Category II deficiencies. (ID -0121.1.) The first is where one outer wire is broken at the point of contact with the core of the rope and protrudes or loops out from the rope structure. The second is where one outer wire is broken at the strand to strand contact point and is raised up from the body of the rope or looped out of the rope structure.

OSHA disagrees with the commenter because this commenter did not offer any rationale to justify these additional provisions. Therefore, OSHA is deferring to the expertise of the Committee. Section 1926.1413(a)(2) is promulgated as proposed except for the clarifications noted above.

A "running wire rope" is a wire rope that moves over sheaves or drums. This definition is included in § 1926.1401 of this final rule to make clear the nature of the wire rope that is subject to this inspection provision. These criteria are the same as those contained in sec. 5-2.4.3 of ASME B30.5-2004, and those for running wire ropes and pendant or standing wire ropes are also contained in sec. 5-2.4.2 of ANSI B30.5-1968, which is incorporated by reference in subpart N. One issue that was left unanswered during the Committee discussions is whether these broken wire criteria are equally applicable when using plastic sheaves. The Agency requested public comment on this issue. However, no comments were received. OSHA notes that the proposed broken wire criteria did not depend on the type of sheave involved and would therefore include plastic as well as metal sheaves. Since the paragraph is being promulgated as proposed, the criteria apply regardless of the material of which the sheave is made.

Paragraph (a)(3) Critical review items

Under paragraph (a)(3) of this section, the competent person must give particular attention to certain "Critical Review Items" during the shift inspection (as well as, as discussed below, in the monthly and annual inspections). Proposed paragraph (a)(3)(iii) listed, among the critical review items, "wire rope at flange points, [and] crossover points." These terms were defined in proposed § 1926.1401, ***Definitions***.

One commenter suggested that each wrap of the rope is a crossover point such that the crossover points will line up across the face of the drum. (ID -0121.) The Agency disagrees with this view. As defined in the standard, a crossover point occurs "where one layer of rope climbs up and crosses over the previous layer . . . ." While the rope climbs up at the drum's flange, it does not climb up as it then spools across the previous (lower) layer towards the other flange, i.e., as it wraps across the face of the drum.

In the proposed rule, OSHA noted that the items listed in §§ 1926.1413(a)(3)(iv) and (a)(3)(v) ("Wire rope adjacent to end connections" and "Wire rope at and on equalizer sheaves") are functionally equivalent to items requiring special scrutiny during the annual inspections required in proposed §§ 1926.1413(c)(2)(ii)(C) and (F) ("Wire rope in contact with saddles, equalizer sheaves or other sheaves where rope travel is limited" and "Wire rope at or near terminal ends"). The Agency stated that it planned to revise the language in proposed §§ 1926.1413(a)(3)(iv) and (a)(3)(v) to match the language in §§ 1926.1413(c)(2)(ii)(C) and (c)(2)(ii)(F). This would enable OSHA to delete §§ 1926.1413(c)(2)(ii)(C) and (c)(2)(ii)(F) because § 1926.1413(c)(2)(ii)(A) incorporates by reference the critical review items listed in §§ 1926.1413(a)(3)(iv) and (a)(3)(v), thereby making the items listed in §§ 1926.1413(c)(2)(ii)(C) and (c)(2)(ii)(F) redundant. OSHA did not receive any adverse comment on modifying §§ 1926.1413(a)(3)(iv) and (a)(3)(v) in this manner and modified § 1926.1413(a)(3) accordingly.

Paragraph (a)(4) Removal from service

Paragraph (a)(4) of this section of the proposed rule set out remedial steps to be taken once the competent person performing the inspection identifies an apparent deficiency. Those steps depended upon whether, under § 1926.1413(a)(2), the deficiency falls under Category I, II, or III. Under this approach, immediate removal from service would be required for certain deficiencies, while continued use under prescribed circumstances would be allowed for others before the rope must be removed from service. When removal from service is required, the provisions of § 1926.1417 (Operation) apply, and the inspector must either tag out the entire equipment or the hoist with the damaged wire rope. This approach was adopted by C-DAC because, in the Committee's collective experience, different types of deficiencies warrant different responses, with some deficiencies being so serious that continued use of the rope must be prohibited while other deficiencies may, if adequately evaluated and monitored, allow continued use of the rope for a limited time.

Paragraph (a)(4)(i) applies to Category I apparent deficiencies. Paragraph (a)(4)(i)(B) allows the rope to be severed under some circumstances and the undamaged part to be used. Two commenters suggested that language be added to require the user to verify that the drum will still have at least two wraps of rope around it when the block is lowered to its lowest position. (ID -0122; -0178.1.) The concern of these commenters is that shortening the rope too much might not leave enough rope to allow a sufficient margin of safety (two wraps) to remain on the drum and prevent the rope from becoming disconnected from the drum.

Another provision of the final rule, § 1926.1417(t), addresses this potential safety hazard by requiring that neither the load nor the boom be lowered below the point where

less than two full wraps of rope remain on their respective drums. Normally, newly installed ropes are long enough to ensure compliance with § 1926.1417(t) when the load or boom are in their lowest positions, and these commenters are concerned that shortening the rope could result in the rope becoming disconnected if the remaining part of the rope is not long enough to always ensure that two wraps remain on the drum.

OSHA agrees with this comment and is adding language to paragraph (a)(4)(i)(B) (and also to paragraphs (a)(4)(iii)(B) and (c)(3)(i)(B) of this section, which contain a similar provision) to specify that if a wire rope is shortened under this paragraph, the employer is required to ensure that the drum will still have two wraps of wire rope when the load and/or boom is in its lowest position.

OSHA also notes that paragraph (a)(4)(i)(B) twice refers to power line contact in the phrases "other than power line contact" and "repair of wire rope that contacted an energized power line is also prohibited." OSHA is concerned that these phrases could be misleading in a paragraph devoted to remedial steps for a Category I deficiency, as power line contact can never be a Category I deficiency. It is a Category III deficiency that requires immediate replacement of the rope. To avoid any implication that power line contact could be a Category I deficiency and that a competent person could determine that the rope does not constitute a safety hazard under paragraph (a)(4)(i), OSHA is deleting the words in proposed paragraph (a)(4)(i)(B) referring to power line contact.

Paragraph (a)(4)(ii) applies to Category II apparent deficiencies. In paragraph (a)(4)(ii)(A), OSHA is removing the references to safety hazards to make it clear that utilization of this option (compliance with manufacturer requirements) mandates removal of the rope from service whenever the manufacturer's criteria for removal from service

are met, without the employer making an independent determination as to whether the rope is a safety hazard.

Paragraphs (a)(4)(ii)(B) and (C) allow the employer the option of either removing the wire rope from service or to implement the measures as described in paragraph (a)(4)(i)(B) above. In addition, OSHA is adding a cross-reference to § 1926.1417 (Operation), which includes a number of separate requirements that are triggered if the equipment is taken out of service.

The proposed rule would have allowed Category II wire-rope deficiencies[74] to remain in service up to 30 days when using specified alternative measures. Under former subpart N, these deficiencies would have resulted in removing the wire rope immediately from service. However, OSHA relied on C-DAC's expertise and proposed the provision as recommended by the Committee.

The Agency received comments regarding the alternative measures proposed for Category II wire-rope deficiencies from three commenters. All of the commenters objected to allowing continued use of wire rope with Category II deficiencies. Two of the commenters stated that the proposed option to continue using wire rope with the proposed alternative measures relaxed both national consensus standards and the instructions of wire rope manufacturers. (ID -0122.0; -0178.1.) They believed allowing the employer to use the damaged wire rope in service up to 30 days was a dangerous precedent because it based employee protection on conditions that could be difficult for a qualified person to assess accurately.

[74] These measures were proposed at §§ 1926.1413(a)(4)(ii)(B) and 1926.1413(a)(4)(iii).

The third commenter (a crane manufacturer), which had a representative on C-DAC, also objected to the continued use of wire rope with Category II deficiencies. (ID -0292.1.) This commenter noted that such deficiencies indicate that the wire rope does not meet the "acceptable life" criteria accepted by the wire-rope industry. Further, the commenter noted that, if the wire rope continued to be used with the Category II deficiencies, "failure could occur without further indication."

OSHA finds these comments persuasive with respect to the protection of employee safety. The integrity of the wire rope is critical to the safety of any lift performed by equipment covered by this subpart. For example, a break in the rope can result in a dropped load which endangers employees on the worksite. Based on these comments and the requirements of former subpart N, OSHA is changing the requirements in the final rule for wire rope with Category II deficiencies. The Agency notes that this revision is consistent with the requirements of former subpart N. Accordingly, the alternative measures outlined in the proposed rule at § 1926.1413(a)(4)(iii) have been deleted and subsequent paragraphs renumbered.

Paragraph (a)(4)(iii)[75] applies to Category III apparent deficiencies. Two commenters suggested that Category III is unnecessary because paragraph (a)(4)(iv)(B) is the same as for Category I. (ID -0122; -0178.1.) As noted above, the corresponding proposed provision for Category I, paragraph (a)(4)(i)(B), is being changed to remove the references to power line contact. Moreover, Category III differs from Category I because the competent person may decide that rope with a Category I deficiency does not constitute a safety hazard and allow the rope to continue to be used. However, rope with

[75] This was § 1926.1413(a)(4)(iv) in the proposed rule (73 FR 59930, Oct. 9, 2008).

a Category III deficiency must either be replaced or, if the deficiency is localized and did not result from power line contact, be severed and the undamaged part to be used.

As discussed above in relation to paragraph (a)(4)(i)(B), OSHA is changing paragraph (a)(4)(iii)(B)[76] to state that, if the rope is severed and the undamaged portion used, the rope in use must be long enough to ensure that two full wraps remain on the drum at all times.

Proposed paragraph (a)(4)(iv)[77] specified that where a wire rope must be removed from service under this section, the equipment (as a whole) or the hoist with that wire rope must be tagged-out as provided in proposed § 1926.1417(f)(1) until the wire rope is replaced or repaired. No comments were received on this provision, and it is being promulgated as proposed.

A commenter suggested adding that the competent person who conducts the shift inspection must receive such information in writing. (ID -0132.1.) OSHA concludes that the competent person or persons who conduct shift and monthly inspections, and the qualified person who conducts annual inspections, must have access to all written documents produced under this section so that they are made aware of any components of the equipment that may require special attention during their inspections.

Accordingly, OSHA is adding a new paragraph (e) at the end of § 1926.1413 that specifies that all documents produced under this section must be available to all persons who conduct inspections under this section.

Paragraph (b) Monthly inspection

[76] This was 1926.1413(a)(4)(iv)(B) in the proposed rule (73 FR 59930, Oct. 9, 2008).
[77] This was 1926.1413(a)(4)(v) in the proposed rule (73 FR 59930, Oct. 9, 2008).

Proposed paragraph (b) required a monthly inspection of wire rope that would be, in both the level of scrutiny and the expertise required of the inspector, a documented shift inspection.

A commenter pointed out that paragraph (c)(3)(ii) requires that certain deficiencies identified during the annual inspection must be monitored during the monthly inspection and suggested that this requirement be specifically stated in paragraph (b). (ID -0226.) OSHA agrees and is adding paragraph (b)(2), which states that the inspection must include any deficiencies identified in the annual inspection as needing to be monitored.

Paragraph (c) Annual/comprehensive

Proposed § 1926.1413(c) required an annual inspection (at least every 12 months) for wire rope, conducted by a qualified person. The annual inspection would be considerably more thorough and comprehensive than the shift and monthly inspections required by paragraphs (a) and (b) of this section. In addition, it would be conducted by a "qualified person," who would have greater expertise than the "competent person" who must conduct the shift and monthly inspections. The timing and inspector qualifications for the annual wire rope inspection coincide with those for the general equipment annual/ comprehensive inspection. C-DAC believed that the use of corresponding timeframes and personnel will allow inspections to be conducted efficiently and thereby promote effectiveness and compliance.

Under proposed paragraph (c)(1), all apparent deficiencies and critical review items required to be checked in a shift inspection would have to be checked in the

annual/comprehensive inspection (see paragraphs (a)(2) and (a)(3)). No comments were received on this provision, and it is being promulgated as proposed.

Proposed paragraph (c)(2) provided for a more thorough inspection than that required under paragraph (c)(1). Under proposed paragraph (c)(2), a complete and thorough inspection, covering the surface of the entire length of the wire ropes, would be required. One commenter, which had nominated a member of C-DAC, stated that the entire length of the rope needed to be inspected more frequently than annually and suggested that this requirement should be included in the monthly inspection provision. (ID -0 292.1.) This commenter did not provide any evidence to support this assertion or explain why it was deviating from the position its nominee took in favor of the provision in the C-DAC negotiations. This comment is accorded diminished weight in light of this inconsistency of position. OSHA defers to the expertise of the full Committee and is retaining the requirement that the entire length of the rope be inspected during the annual inspection; it is not adding such a requirement to the monthly inspection provision.

As discussed in relation to § 1926.1413(a)(3), OSHA has, in the final rule, modified proposed §§ 1926.1413(a)(3)(iv) and (a)(3)(v) to read the same as proposed §§ 1926.1413(c)(2)(ii)(C) and (F) ("Wire rope in contact with saddles, equalizer sheaves or other sheaves where rope travel is limited" and "Wire rope at or near terminal ends"). Section 1926.1413(c)(2)(ii)(A) now incorporates by reference the critical review items listed in §§ 1926.1413(a)(3)(iv) and (a)(3)(v), thereby making the items listed in §§ 1926.1413(c)(2)(ii)(C) and (c)(2)(ii)(F) redundant.

Two commenters supported keeping paragraphs (c)(2)(ii)(C) and (F), even though they are also included in paragraph (a)(3) of this section, saying that annual inspections

are more comprehensive and, in their view, should be treated separately. (ID -0205.1; -0213.1.) However, the modification made by OSHA does not change the proposed requirements for annual inspections; it only avoids redundant language. Accordingly, OSHA is deleting proposed §§ 1926.1413(c)(2)(ii)(C) and (F) from the final rule and is renumbering proposed paragraphs (D) and (E) to (C) and (D).

Proposed paragraph (c)(2)(iii) established an exception to the timing of the annual/ comprehensive inspection where that inspection is infeasible due to "existing set-up and configuration of the equipment (such as where an assist crane is needed) or due to site conditions (such as a dense urban setting)." The provision sets a timetable for annual/comprehensive inspections in such cases that requires the inspection to be performed "as soon as it becomes feasible, but no longer than an additional 6 months for running ropes and, for standing ropes, at the time of disassembly." The provision reflects C-DAC's concern that, particularly in densely developed urban settings, the inability to boom down would prevent the employer from completing a comprehensive wire rope inspection.

Two commenters objected to the length of the six month period and suggested it be reduced to one month. (ID -0122.0; -0178.1.) Neither commenter provided any evidence of explanation to support its recommendation, so OSHA is deferring to C-DAC's collective judgment and is retaining the six month period in the proposed rule.

Proposed paragraph (c)(3) listed the next steps to be taken once the qualified person performing the annual/comprehensive inspection discovers a deficiency. The qualified person must immediately determine whether the deficiency constitutes a safety hazard. If it does, under proposed paragraph (c)(3)(i), the rope would either have to be

replaced or, if the deficiency is localized, the damaged part may be severed and the undamaged portion may continue to be used. As with paragraph (a)(4)(i)(B), joining lengths of wire rope by splicing would be prohibited.

As discussed under paragraph (b)(3), a commenter recommended that the requirement of paragraph (c)(3)(ii) should be explicitly referenced in the monthly inspection reports, and OSHA has made an addition to paragraph (b)(3) to accomplish this. (ID -0226.) Also, as discussed under paragraph (a)(4)(i)(B), OSHA is adding a requirement to paragraph (c)(3)(i)(B) that at least two full wraps of wire rope must remain on the drum when the load and/or boom is in its lowest position.

Paragraph (c)(4) requires the annual/comprehensive inspection to be documented according to § 1926.1412(f)(7), which is the documentation provision for the annual general inspection. As with other parallel requirements in this section, C-DAC intended to ensure consistency with other recordkeeping requirements and thus facilitate compliance. Section 1926.1412(f)(7), which is incorporated by reference, requires the employer that is conducting the inspection to document and retain for 12 months, "the items checked and the results of that inspection" and "the name and signature of the person who conducted the inspection and the date." No comments were received on paragraph (c)(4), and it is promulgated as proposed.

Paragraph (d)

Proposed § 1926.1413(d) provided that employers may not use rope lubricants that are of the type that hinder inspection.

This provision would prohibit, for example, rope lubricants that are opaque or so dark that they mask the wire rope inside them. A commenter suggested adding to this provision the following sentence: "The rope surface and strand valleys must be cleaned of dirt, lubricant or other material that will hinder inspection." (ID -0121.1.) OSHA determines that this addition is unnecessary. Section 1926.1413 requires various inspections, and the requirement to conduct an inspection inherently means that where foreign material that would prevent the inspection is present, it must be removed. The prohibition against rope lubricants that are of the type that hinder inspection is needed because they are difficult to remove and pose an unnecessary obstacle to compliance. Section 1926.1413(d) is promulgated in the final rule as proposed.

Paragraph (e)

A commenter suggested adding that the competent person who conducts the shift inspection must receive such information in writing. (ID -0132.1.) Similarly, OSHA determines that the competent person or persons who conduct shift and monthly inspections, and the qualified person who conducts annual inspections, must have access to all written documents produced under § 1926.1413. In response to this comment, OSHA is adding paragraph (e) to ensure that persons who conduct inspections have access to documentation required by § 1926.1413 during the period for which those documents must be retained. This documentation serves as a reference for conditions that must be monitored in subsequent inspections. OSHA concludes that this documentation will ensure that only safe equipment is put into service.

Section 1926.1414 Wire Rope – selection and installation criteria

This section sets forth requirements for selecting and installing wire rope. C-DAC determined, and OSHA agrees, that the proper selection and installation of wire rope is integral to the safe operation of equipment that uses such rope. Improper selection or installation could cause the wire rope to fail, resulting in any number of hazards from uncontrolled movement of the equipment or the load. As discussed in the proposed rule, § 1926.1414, in addition to addressing safety concerns related to wire rope selection and installation, provides greater flexibility in the selection process than previous requirements under subpart N (73 FR 59781, Oct. 9, 2008). This flexibility reflects and takes advantage of new developments in wire rope technology.

Paragraph (a)

Proposed paragraph (a) of this section stated that "selection of replacement wire rope shall be in accordance with the requirements of this section and the recommendations of the wire rope manufacturer, the equipment manufacturer, or a qualified person." In the proposed rule, OSHA noted that proposed paragraph (a)'s mention of only "replacement rope" could mislead some readers to conclude that all of § 1926.1414 applies only to replacement rope, whereas C-DAC clearly intended that § 1926.1414 would apply to both original equipment rope and replacement rope. OSHA proposed to reword § 1926.1414(a) to read as follows: "Original equipment wire rope and replacement wire rope shall be selected and installed in accordance with the requirements of this section. Selection of replacement wire rope shall be in accordance with the recommendations of the wire rope manufacturer, the equipment manufacturer, or a qualified person."

OSHA requested public comment on such a revision. OSHA received no comment on proposed § 1926.1414(a) or on its proposed rewording. Accordingly, OSHA modified § 1926.1414(a) of the final rule to reflect the proposed rewording.

Paragraph (b)

The proposed rule, in § 1926.1414(c), included design factors for rotation resistant rope but did not include design factors for standard (that is, non-rotation resistant) rope. In the proposal, OSHA stated its determination that, in light of the importance of design factors for wire rope, the omission of design factors for standard rope was inadvertent (73 FR 59781, Oct. 9, 2008). OSHA proposed to include the design factors for standard rope in sec. 5-1.7.1 of ASME B30.5-2004. OSHA requested public comment on the issue.

Comments were received from two parties, both of whom nominated C-DAC members. (ID -0205.1; -0213.1.) They stated that the omission was intentional, believing that C-DAC did not include design factor criteria for standard wire rope because technology is continually evolving and including design criteria in the rule may hamper future crane operations. The commenters stated that the proposed rule had provisions requiring end users to conform with requirements or criteria established by the wire rope manufacturer, equipment manufacturer, or a qualified person.

OSHA notes that C-DAC determined it was important for this rule to allow flexibility to accommodate future technological changes. The commenters on this issue reiterated that determination, and OSHA shares that concern. Setting unduly restrictive specifications based on current technology could unnecessarily impinge on the use of

future designs. The Agency also concludes, however, that some form of minimum criteria is necessary so that those selecting wire rope have a minimum benchmark available as a reference point.

To meet both of these objectives, the Agency has decided, in the final rule, to add a new paragraph (b) to § 1926.1414 to provide employers with two options with regards to wire rope design criteria. The first option would be to comply with an industry consensus standard (sec. 5–1.7.1 of ASME B30.5-2004) on design factors for standard wire rope. See § 1926.1414(b)(1). This is a well-established benchmark for standard wire rope design factors, and the Agency therefore determined that it is appropriate to include it as an option. Paragraph (c) of sec. 5–1.7.1 is excluded because that deals with rotation resistant rope, which is addressed in § 1926.1414(e).

The second option provides a performance benchmark that is based on the rope's compatibility with the rated capacity of the equipment and on the need to be able to rely on the inspections in § 1926.1413 as an effective means of ensuring the continued safety of the rope. See § 1926.1414(b)(2). Specifically, the design must be sufficient to ensure that, when the equipment is used in accordance with its rated capacity, the employer will be able to prevent a sudden failure of the rope by meeting the inspection requirements in § 1926.1413.

This concept reflects the underlying premise of § 1926.1413 that regular inspection of the rope can prevent catastrophic failure because the rope's degradation will take place over time and will be accompanied by indications of wear. Therefore, if the rope is appropriate for the equipment, the degradation that occurs with use will be

sufficiently gradual so that its development can be identified in the required inspections and the rope can be removed from service before safety is compromised.

Paragraph (c)

The benchmarks in the two options in paragraph (b) of this section do not address an additional design issue, which is the suitability of the wire rope with respect to the proper functioning of the equipment. For example, selecting a rope with a diameter that is too large for a particular machine can result in the rope jumping a sheave. Such a condition could, among other adverse consequences, affect the operator's ability to control the load. Therefore, OSHA has added an additional provision, in new § 1926.1414(c), that requires the rope to be compatible with the safe functioning of the equipment.

Paragraph (d) Boom hoist reeving

With the addition of the two new paragraphs, (b) and (c), OSHA is redesignating proposed paragraphs (b) through (f) of this section as paragraphs (d) through (h) in the final rule.

Proposed paragraph (b) would have prohibited the use of fiber core ropes for boom hoist reeving, except for use on derricks. In the Committee's view, the composition of fiber core ropes makes them prone to degradation that is not completely detectable by normal inspection techniques. Nothing in the record contradicts that conclusion.

One commenter stated that there was no practical reason to allow the use of fiber core ropes for boom hoist reeving on derricks but not in other boom hoist applications. (ID -0121.1.) However, as explained in the proposed rule, the distinction between derricks and cranes is warranted because the sheaves on derricks are smaller than those on cranes and therefore require ropes that can accommodate reverse bending better than ropes used on cranes. Fiber core ropes are more pliable than ropes with a metal core and are therefore suited to applications requiring greater reverse bending, such as use on derricks. Moreover, the distinction between derricks and cranes is consistent with current national consensus standards. The 2004 version of ASME B30.5, in sec. 5.1.7.2(b), prohibits the use of fiber core wire ropes for boom hoist reeving for mobile and locomotive cranes. By contrast, the standard in the ASME B30 series that applies to derricks, ASME B30.6 – 2003, does not prohibit the use of fiber core wire rope for boom hoist reeving. Permitting the use of fiber core ropes for boom hoist reeving on cranes, as the commenter suggests, would reduce protection over that currently considered prudent in the industry, and OSHA is therefore promulgating paragraph (b)(1) as proposed, renumbering it as paragraph (d)(1).

Proposed paragraph (b)(2) prohibited the use of rotation resistant rope for boom hoist reeving except where the requirements of paragraph (c) (renumbered paragraph (e) in the final rule), are met. No comments were received on this paragraph (b)(2), and it is being promulgated as paragraph (d)(2) with the reference to paragraph (c) in the proposed rule changed to paragraph (e)

Paragraph (e) Rotation resistant ropes

Paragraph (e)(1)

Proposed paragraph (c)(1) of this section classified rotation resistant ropes into three "Types" ("Type I", "Type II", and "Type III"). Proposed paragraph (c)(2) specified use limitations and requirements for each type of wire rope. This approach differed from former subpart N, ANSI B30.5-1968 and ASME B30.5-2004, which did not distinguish between types of rotation resistant rope. By distinguishing between different types of rope, the Committee sought to ensure that ropes with different internal structures were subject to appropriate requirements and limitations that would enable them to be used safely. Types I, II, and III, which have different capabilities, were described in proposed paragraph (c)(1).

ASTM A 1023/A 1023M – 02 has a similar classification system, although it divides rotation resistant ropes into "categories" rather than "types." One commenter noted that there is no meaningful difference between the classification in the proposed rule and that in ASTM A 1023. (ID -0060.1.) This commenter urged OSHA to incorporate by reference the ASTM definitions rather than to state the definitions in the final rule. This would, the commenter suggested, avoid confusion among manufacturers and users who rely on the ASTM's classification system.

Although the provisions in the final rule are substantively similar to those in the ASTM standard, the Agency uses the term "category" in the wire rope provisions of subpart CC that relate to the classification of apparent deficiencies (see, e.g., § 1926.1413 (a)(2)). Therefore, to avoid confusion with those provision, OSHA uses the term "type" in classifying rotation resistant rope in § 1926.1414. OSHA concludes that the use of "category" in the ASTM standard would cause considerable confusion if

OSHA were to incorporate the ASTM definitions directly. Accordingly, OSHA is promulgating proposed paragraph (c)(1) as paragraph (e)(1) of the final rule.

Paragraph (e)(2)

Paragraphs (e)(2) of this section sets forth use requirements of the three types of rotation resistant rope in terms of operating design factors (and in some instances activity). The purpose of these provisions is to ensure that the selection of the type of rotation resistant rope is suitable, in terms of safety, to its use.

These requirements are identical to those in proposed paragraph (c)(2). The preamble to the proposed rule explained in detail the basis for setting these design factors for rotation resistant rope (see 73 FR 59782-59783, Oct. 9, 2008). One commenter, stated that rotation resistant ropes should have a design factor of less than 5 only for single engineered lifts, but provided no rationale for this position. No other comments addressed the proposed design factors, and OSHA is deferring to the expertise of C-DAC and incorporating the design factors in paragraph (e)(2) of the final rule.

As discussed in the preamble to the proposed rule, paragraphs (e)(2)(i) – (iv) use the phrase "operating design factor." "Operating" is included to show that the factors specified in these provisions are to reflect how the rope is installed on the specific piece of equipment in which it used. In other words, the operating design factor is calculated based on numerous considerations associated with both the rope's design and how it is installed on the equipment.

The prohibition on the use of rotation resistant rope for duty cycle and repetitive lifts does not apply to Type I rope because the Committee determined that such rope is

significantly more resistant to rotation or torque compared with Types II and III. This reduces Type I's potential for internal wear during use and moves degradation from the inner wires to the outer wires, where damage is more easily detected during wire rope inspections. Accordingly, the Committee concluded that Type I rope can safely be used for duty cycle and repetitive lifts at an operating design factor below 5 (but no less than 3.5), as specified in proposed paragraph (c)(2)(ii). No comments addressed the distinction between the types of wire rope in paragraph (e)(2)(i) of this section.

In the proposed rule, OSHA noted that C-DAC did not include definitions for "duty cycle" or "repetitive lifts." The Agency asked for comment on whether definitions of these terms should be included in § 1926.1401 and proposed definitions that it determined were consistent with C-DAC's understanding and widely understood in the industry. OSHA proposed to define "duty cycle" as "a continuous operation in which approximately the same type and weight of load is handled." It gave dredging with a clamshell as an example of duty cycle work. OSHA proposed to define "repetitive lifts" as "a continuous operation with loads that may vary in size and weight." For an example, it noted that steel erection work typically involves repetitive lifts of various size and configurations of structural steel members.

Three commenters agreed that "duty cycle" and "repetitive lifts" should be defined, and no commenters suggested otherwise. (ID -0205.1; -0213.1; -0226.) The commenters on the subject did not object to OSHA's proposed definition of "repetitive lifts," but two recommended that OSHA's proposed definition of "duty cycle" be replaced with the following:

> A type of crane service in which bulk material is transferred from one point to another by rapidly lifting, swinging, booming, and placing the

> material. Typical types of duty cycle service are dragline, clamshell, grapple, and magnet. This type of service is differentiated from standard crane "lift service" in that cycle times are very short and continuous, often less than 1 minute per load, and loads are lifted and placed in general areas rather than precise positions to permit such rapid cycles.

(ID -0205.1; -0213.1.)

OSHA determines that in most respects the commenters' suggested definition is clearer and better reflects the intent of the Agency. Therefore, OSHA is adopting their definition with only minor modification (the reference to "lifting, swinging, booming and placing" is not necessary, since those actions simply describe typical crane movements). OSHA is therefore adopting a slightly modified version of the definition suggested by the commenters. This definition is being included in § 1926.1401, as is the definition for "repetitive lifts" proposed by OSHA and quoted above.

Paragraph (e)(3)

This proposed paragraph specified additional requirements that must be met when Types II and III rotation resistant wire rope are used with an operating design factor of between 3.5 and 5 (for non-duty cycle, non-repetitive lifts). The Committee concluded that these additional requirements are needed to ensure that use of such ropes would be safe.

Due to renumbering, proposed paragraph (c)(3) corresponds to final paragraph (e)(3). One commenter believed that the reference to "these provisions" in proposed paragraph (c)(3)(iii) was unclear and should be clarified to state whether it refers to the entire subpart CC or to specific provisions. (ID -0214.1.) As used here, "these

provisions" refers to lifts under final paragraph (e)(3). To avoid any ambiguity, "these provisions" is being changed to "§ 1926.1414(e)(3)."

The same commenter who stated in regard to final paragraph (e)(2) that rotation resistant rope should have a design factor of less than 5 only for single engineered lifts recommended that paragraph (e)(3) also be changed to reflect its recommendation. (ID - 0292.1.) OSHA is rejecting that suggestion for the same reason given in relation to paragraph (e)(2). No other objections to proposed paragraph (c)(3) (final paragraph (e)(3)) were received. Accordingly, with the single exception just mentioned in regard to final paragraph (e)(3)(iii), proposed paragraph (c)(3) is being promulgated as final § 1926.1414(e)(3).

Paragraph (e)(4) Additional requirements for rotation resistant rope for boom hoist reeving

Paragraph (e)(4)(i) of this section prohibits rotation resistant rope from being used for boom hoist reeving except where the requirements of paragraph (e)(4)(ii) of this section are met. C-DAC members determined that the general prohibition was necessary because, in their experience, rotation resistant rope used for boom hoist reeving tends to twist and thereby suffer internal damage when it passes over sheaves that are close together. However, C-DAC concluded that safety would not be compromised when rotation resistant rope is used for boom hoist reeving as long as the conditions in paragraph (e)(4)(ii) of this section are met.

The Committee also determined that the exception would serve a practical purpose, especially when using attachments such as luffing jibs. The auxiliary hoist is

typically used as a boom hoist for such attachments, and is normally rigged with rotation resistant rope. The exception enables the employer to avoid the need to change the rope when using such attachments when safety could be assured by meeting the specified conditions for its use.

The conditions under which rotation resistant rope may be used for boom hoist reeving were contained in proposed paragraph (c)(4). No substantive objections to that proposed paragraph were received. Two commenters stated that the phrase "rated capacity" in proposed paragraph (c)(4)(ii)(F) should be replaced with "rated load capacity." (ID -0205.1; -0213.1.) As noted in the proposed rule, the C-DAC proposal attributed the same meaning to both "rated capacity" and "rated load capacity," and OSHA is consistently using the term "rated capacity" wherever C-DAC used either term to avoid any confusion (see 73 FR 59738, Oct. 9, 2008). Accordingly, proposed paragraph (c)(4) is being promulgated as final paragraph (e)(4) without substantive change.

Paragraph (f)

Proposed paragraph (d) of this section specified that wire rope clips used with wedge sockets may only be attached to the unloaded dead end of the rope, except that devices specifically designed for dead ending rope in a wedge socket are also permitted.

The Committee concluded that this provision was necessary to ensure attachment strength, reliability and prevention of cable damage. No comments concerning this provision were submitted, and OSHA is promulgating it as § 1926.1414(f).

Paragraph (g)

Proposed paragraph (e) of this section stated that socketing must be done according to the specifications of the manufacturer of the wire rope or fitting. No comments regarding this provision were received, and OSHA is promulgating it as § 1926.1414(g).

Paragraph (h)

Proposed paragraph (f) of this section specified that seizings must be placed on each side of the point to be cut before the wire rope is cut. It also specified that the length and number of seizings must be in accordance with the instructions of the wire rope manufacturer.

Seizings are needed to hold the wire in the strands and the strands in place during handling while cutting, thereby keeping the rope beyond the area of the cut intact. In the Committee's experience, the instructions and procedures for seizing differ among various wire rope manufacturers. The Committee decided to require employers to follow the manufacturer's instructions because it concluded that wire rope manufacturers have the knowledge and expertise to best determine the length and number of seizings that are needed to maintain the integrity of their wire ropes during cutting. No comments regarding this provision were received, and OSHA is promulgating it as § 1926.1414(h).

Section 1926.1415 Safety Devices

This section sets forth the requirements for equipping cranes and derricks with certain safety devices and prohibits the use of the equipment if those devices are not working properly.

The safety devices addressed by this section are devices that C-DAC determined are essential for the safe operation of cranes and derricks and therefore, required to be present and in proper working order during all equipment operations with no alternative measures permitted. Those devices considered less critical to equipment safety are designated as operational aids and are governed by § 1926.1416. That section allows equipment to continue operating if the operational aid fails or malfunctions but requires certain temporary alternative protective measures in such cases. Those devices designated as safety devices in this section, however, are so essential and integral to safe equipment operation that C-DAC determined that there is no acceptable alternative to having them in proper working order.

Paragraph (a) Safety devices

Paragraph (a) of this section lists the safety devices that are required on all equipment covered by this subpart and specifications and conditions applicable to those devices (including the exemption of certain equipment from the requirements of the listed devices).

Crane Level Indicator: Paragraph (a)(1) requires that a crane level indicator be on all equipment covered under this subpart. C-DAC determined that level equipment is a key factor in ensuring equipment safety. Using a crane level indicator is necessary because it has the requisite accuracy for leveling the equipment. C-DAC members

stressed the need to use a crane level indicator because, if the equipment is not properly leveled, it will not have all the capacities indicated in the load charts. Reliance on the charts in such situations could cause the equipment to overturn or otherwise fail.

Section 1926.1415(a)(1)(i) specifies that a crane level indicator must either be built into the equipment or available on it. One commenter requested clarification of whether the rule allows for the use of a carpenter's level to satisfy the requirements of proposed § 1926.1415(a)(1)(i). (ID -0292.1.)

A carpenter's level of sufficient length (such as a four-foot level), available to the operator, that gives an accurate reading, meets the requirements of this paragraph as proposed; such a level is typically used in the industry for this purpose. Therefore, it is not necessary to revise the text of the rule and OSHA is promulgating paragraph (a)(1)(i) as proposed.

Section 1926.1415(a)(1)(ii) addresses the hazard posed by false readings from non-operational crane level indicators remaining on the equipment. The Agency is requiring built-in (i.e., integral) crane level indicators that are not working properly to be tagged-out or removed. Similarly, removable crane level indicators must be removed from the equipment if they are not working properly. Both requirements are intended to avoid confusion and the operator's inadvertent reliance on a device that is not working correctly. OSHA received no comment on this provision. Therefore, OSHA promulgated it as proposed, with the additional specification that a removable crane level indicator must be removed prior to operation if it is not working properly.

Paragraph (a)(1)(iii) exempts portal cranes,[78] derricks, floating cranes/derricks and land cranes/derricks on barges, pontoons, vessels, or other means of flotation from the requirements of § 1926.1415(a)(1). C-DAC members indicated that these types of equipment are leveled and then fixed in place when installed, precluding the need for a crane level indicator.[79] OSHA received no comment on this provision. Therefore, OSHA is promulgating paragraph (a)(1)(iii) as proposed.

Boom Stops: Paragraph (a)(2) requires boom stops on all equipment except for derricks and hydraulic booms (see the discussion of this provision in 73 FR 59785, Oct. 9, 2008). "Boom stop" is defined in § 1926.1401 as a device that restricts the boom from moving above a certain maximum angle and toppling over backwards. OSHA received no comment on this provision or definition. Therefore, OSHA is promulgating paragraph (a)(2) as proposed.

Jib Stops: Section 1926.1415(a)(3) requires jib stops on all equipment where a jib is attached, except for derricks (see the discussion of this provision in 73 FR 59785, Oct. 9, 2008). The standard defines "Jib stop (also referred to as a jib backstop)" in § 1926.1401 as the "same type of device as a boom stop but used for a fixed or luffing jib." OSHA received no comment on this provision or definition. Therefore, OSHA is promulgating paragraph (a)(3) as proposed.

Foot Pedal Brake Locks: Proposed paragraph (a)(4) required that equipment with foot pedal brakes have locks, except for portal cranes and floating cranes. Such locks

[78] Section 1926.1401 defines "portal crane" as a "type of crane consisting of a rotating upperstructure, hoist machinery, and boom mounted on top of a structural gantry which may be fixed in one location or have travel capability. The gantry legs or columns usually have portal openings in between to allow passage of traffic beneath the gantry."
[79] Note that, § 1926.1437(e) requires barge, pontoon, vessel or other means of flotation list and trim device for floating cranes/derricks and land cranes/derricks.

prevent the unintentional disengagement of a foot pedal brake, which could lead to unintended equipment movement and consequent injuries and fatalities. Due to the physical effort needed to keep the pedal engaged, this is particularly important where the brake is applied for long periods.

The rationale for exempting portal cranes and floating cranes from this requirement discussed by C-DAC was that there are instances in which, due to the pitching of a floating crane and the pitching of the vessel or object in the water with which a portal crane works, the operator may have to immediately release the brake. The concern is that, if the foot pedal brake lock has been activated, the operator may not be able to release the brake quickly enough to prevent the equipment from being overloaded or to prevent unintended movement of the load.

As explained in the proposed rule, upon review of the exemption in the provision, the Agency realized that C-DAC assumed that the locking device would always be of the type that is located on the brake pedal. That type of device can be difficult to disengage, thereby delaying the operator's ability to release the brake. However, there are other types of brake locking mechanisms that do not present this problem (for example, a brake lock that is hand-actuated). This raised the issue of whether the exemption is needed. Consequently, OSHA asked for public comment on whether to change proposed § 1926.1415(a)(4) by deleting the exemption and requiring a hoist brake locking mechanism for all cranes.

OSHA received no comment on this issue. Therefore, OSHA has not included the exemption in the final rule. The final paragraph (a)(4) is published as proposed except that OSHA has removed the phrase "except for portal cranes and floating cranes."

Integral Holding Device/Check Valve: Paragraph (a)(5) requires that hydraulic outrigger jacks have an integral holding device/check valve. Such a device is necessary to prevent the outrigger jack from collapsing in the event of a hydraulic failure. (See the discussion of this provision in 73 FR 59786, Oct. 9, 2008.) OSHA is promulgating this provision as proposed.

Two commenters, both of which had nominated C-DAC members, suggested moving this requirement to § 1926.1433 (Design, construction and testing) due to their belief that an integral holding device/check valve is a design feature. (ID -0205.1; -0213.1.) Neither of these organizations' nominees dissented on this issue. Both organizations indicated in their comments that they supported the recommendations of C-DAC and were not providing any negative comments on provisions that mirrored the C-DAC consensus document. Since this provision is unchanged from the C-DAC consensus document, the Agency assumes that the commenters believe that they are suggesting a non-substantive formatting change.

The commenters are mistaken in that regard. By locating this provision in the *Safety Devices* section of the standard, the employer is required to inspect the integral holding device/check valve (see, e.g., § 1926.1412(d)(1)(xiv)) and, if it is not functioning properly, to not use the crane until it is repaired (see § 1926.1415(b)). If this provision were moved to the *Design, construction and testing* section, it would no longer be considered a safety device. If it was not functioning, it would be left to the competent person conducting the shift and monthly inspections (and the qualified person conducting the annual inspection) to determine if the deficiency constituted a safety hazard (see, e.g., § 1926.1412(d)(2)). C-DAC determined, and OSHA agrees, that an integral holding

device/check valve is essential for the safe operation of hydraulic outrigger jacks and therefore needs to be designated as a safety device.

Rail Clamps and Rail Stops: Paragraph (a)(6) specifies that equipment on rails have rail clamps and rail stops, except for portal cranes. (See the discussion of this provision in 73 FR 59786, Oct. 9, 2008.) OSHA received no comment on this provision. Therefore, it is promulgated as proposed.

Horn: In the proposed rule, a horn was not listed as a safety device. One commenter requested that the standard require a horn. (ID -0156.1.) ASME B30.5-2004 requires that an "audible signal device" be provided, within reach of the operator. OSHA agrees that a horn is an important safety feature; it is typically a standard feature on cranes and is used to warn workers of imminent dangers. Therefore, OSHA has included a horn in the list of safety devices in § 1926.1415(a)(7) of the final rule.

The horn need not be permanently installed on the equipment, but it must be in a location where the operator can access and use it immediately to warn workers of imminent danger. An operator may use a removable device, such as a hand-held air horn that is stored near the operator in a manner that would not interfere with the operation of the equipment, if it satisfies those requirements.

OSHA is also requiring in § 1926.1415(a)(7)(ii) that built-in (i.e., integral) horns be removed or tagged out when they are not working properly. Similarly, a removable horn must be removed from the equipment when it is not working properly. As noted in the previous paragraph, the operator would be permitted to resume operation if an operational horn, such as a hand-held air horn, is added to the cab in the proper location. It is therefore critical that the operator, and operators in subsequent shifts, not be

confused about which horn is operational. A non-operational horn must be tagged out or removed, prior to the resumption of operation, to avoid the operator's inadvertent reliance on the nonoperational horn. The horn is often required when an unexpected hazard presents itself, and the operator must therefore locate and use it quickly.

Paragraph (b) Proper operation required

Paragraph (b) prohibits the operation of the equipment if any of the safety devices listed in this section are not in proper working order. Under OSHA's existing § 1926.20(b)(3), employers must tag out or remove any equipment that is not in compliance with any applicable requirement in part 1926. In § 1926.1417(f), OSHA makes it clear that when equipment is "taken out of service," the employer must place a tag in the cab to provide clear notice to all employees that the equipment is out of service. To avoid any potential ambiguity about whether equipment is "taken out of service" when its operation is prohibited because of an inoperational safety device, OSHA is inserting new text in § 1926.1415(b) and a cross reference to § 1926.1417 (Operation). Specifically, final paragraph (b)(2) requires that equipment be "taken out of service" when one of the safety devices in § 1926.1415 is not operating properly. The general tagout requirement in § 1926.1417(f)(1) will apply whenever any of the safety devices are not operating properly.

The Agency notes that the specific tagout/removal requirements for crane level indicators (§ 1926.1415(a)(1)(ii)) and horns (§ 1926.1415(a)(7)(ii)) are intended to supplement this general requirement. Unlike the safety devices addressed in §§ 1926.1415(a)(2) through (a)(6), which are not as likely to be left on the equipment once

they are non-operational, §§ 1926.1415(a)(1)(ii)) and 1926.1415(a)(7)(ii)) address the additional hazard that non-operational equipment might remain in the cab, and be accidently relied on by the operator, once an operational version of the same device has been placed in the cab.

Section 1926.1416 Operational aids

This section sets forth the requirements for equipping cranes and derricks with certain operational aids. "Operational aids" are defined in § 1926.1401 as "devices that assist the operator in the safe operation of the crane by providing information or automatically taking control of a crane function. These include, but are not limited to, the devices listed in § 1926.1416 ('listed operational aids')."

As discussed above regarding § 1926.1415, OSHA determines that the devices addressed in § 1926.1416 enhance safety. However, they are less essential to the safe operation of equipment than the safety devices addressed by § 1926.1415 because sufficient temporary alternative measures are available. Crane operators historically used these temporary alternative measures as safety precautions prior to the widespread availability and use of these operational aids.

Paragraph (a)

Proposed paragraph (a) of this section provided that the operational aids listed in this section are required on all equipment covered by subpart CC, unless otherwise specified.

Other sections of this rule provide exceptions for various types of equipment. Under § 1926.1435(e)(1), this section does not apply to tower cranes. Instead, the operational aids required for tower cranes are specified in § 1926.1435. Under § 1926.1436(f)(1), §§ 1926.1416(d)(1), (e)(1), and (e)(4) do not apply to derricks.

This section also does not apply to existing equipment manufactured before certain dates. Those dates are keyed either to the time an operational aid was first required by a national consensus standard or to the effective date of the standard. One year after the effective date of this final rule, the proposed rule would have required all operational aids on all equipment, with a single exception: proposed paragraph (e)(4) did not require load weighing or similar devices on derricks.

A trade association asked that articulating cranes be exempt from certain requirements of this section: the requirement for a boom angle or radius indicator in paragraph (e)(1) of this section; the requirement for a jib angle indicator in paragraph (e)(2) of this section; the requirement for a boom length indicator in paragraph (e)(3) of this section; and the requirement for an outrigger position sensor/monitor in paragraph (e)(5)(i) of this section. (ID -0206.1.) As to the first three, the commenter stated that these would not be practical on articulating cranes because of the boom configuration on such cranes. The commenter said that a boom angle indicator or jib angle indicator could not be used because articulating cranes can have up to three boom sections at different angles. Unlike cranes with straight booms, their capacity is determined by the combination of boom angles rather than a single angle. Similarly, the commenter stated, boom length indicators are not practical on articulating cranes because their lifting capacity is based on the position of the boom sections rather than the boom length.

Finally, the commenter asserted that articulating cranes should be exempt from the requirement for outrigger position sensor monitors because such cranes use stabilizers rather than outriggers.

OSHA agrees with the commenter that boom angle indicators, jib angle indicators, and boom length indicators are not appropriate for articulating cranes for the reasons given by the commenter. Accordingly, OSHA is adding § 1926.416(a)(1), which excludes articulating cranes from the requirements in §§ 1926.1416(e)(1), (e)(2), and (e)(3).

OSHA is not exempting articulating cranes from the requirement of § 1926.1416(e)(5)(i). As discussed under § 1926.1404, for certain types of cranes, stabilizers serve the same function as outriggers and, where appropriate, provisions of the proposed rule that applied to outriggers are being changed in the final rule to also apply to stabilizers. One such provision is paragraph (e)(5)(i) of this section, which, as discussed below, has been modified from the proposed rule to require outrigger/stabilizer position sensor monitors rather than outrigger position sensor monitors on equipment manufactured more than one year after the effective date of the standard. As so modified, the provision appropriately applies to articulating cranes.

Another commenter stated that digger derricks do not typically have anti-two blocking devices (paragraph (d)(3)), radius indicators (paragraph (e)(1)), load weighing devices (paragraph (e)(4)), outrigger position indicators (paragraph (e)(6)(i)) , and hoist drum rotation indicators (paragraph (e)(5)(ii).[80] (ID -0155.1.) This commenter does not

[80] The term "digger derrick" is defined in § 1926.1401. As discussed in § 1926.1400, digger derricks are not covered by the standard when used for work related to utility

state that such devices would be impractical on digger derricks but only that they are not currently equipped with the devices. OSHA notes that the ANSI standard applicable to digger derricks, ANSI/ASSE A10.31 – 2006, does not require the devices listed by the commenter. As noted above, this final rule is exempting certain older or existing equipment from the need to be equipped with certain operational aids when the consensus standard for such equipment has not required those devices. Consistent with this policy, OSHA is specifying that only those digger derricks manufactured more than one year after the effective date of this standard must be equipped with anti-two blocking devices, boom angle or radius indicators, and load weighing devices. Under § 1926.1416(e)(5), outrigger position indicators and hoist drum rotation indicators are not required on any equipment until one year after the effective date of the standard, so it is not necessary to single out digger derricks for special treatment for these devices. Accordingly, OSHA is adding § 1926.1416(a)(2) to the final rule, which provides that the requirements in §§ 1926.1416(d)(3), (e)(1), and (e)(4) only apply to those digger derricks manufactured more than one year after the effective date of this standard.

Paragraph (b)

Proposed paragraph (b) of this section stated that operations shall not begin unless the listed operational aids are in proper working order, except where the employer meets specified temporary alternative measures. If the crane or derrick manufacturer specified more protective alternative measures, the employer would have to follow those measures.

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poles but are subject to this final rule when used covered for general lifting activities unrelated to utility poles.

Upon reviewing the proposed paragraph, OSHA believes it does not state its requirement as clearly as possible. As subsequent provisions of this section make clear, employers may only use temporary alternative measures while listed operational aids are being repaired, and then only for limited times. OSHA is rewording paragraph (b) in the final rule to make these requirements clearer.

Two hearing participants requested that, in general, OSHA remove any provision in the proposed rule that would require strict adherence to manufacturer's procedures. (ID -0341; -0342.) Compliance with manufacturer procedures is addressed in the discussion of § 1926.1417. In addition, OSHA determines that the rule addresses the hearing participants' concerns. Employers can fully comply with the standard by maintaining the listed operational aids in proper working order. For brief periods while such aids are being repaired, employers can generally comply by following the temporary alternatives listed in the rule. Only if manufacturers recommend safer alternatives, which OSHA concludes will rarely occur, will employers need to look to those recommendations rather than the precautions specified in the rule.

Paragraph (c)

Paragraph (c) of this section states that 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. Further, if a replacement part is no longer available, a substitute device that performs the same type of function may be used, and the use of such a device is not considered a modification under § 1926.1434, ***Equipment modifications***. Section 1926.1434 applies to

modifications or additions that affect the capacity or safe operation of the equipment except where the requirements of paragraphs (a)(1), (a)(2), or (a)(3) of § 1926.1434 are met. OSHA determines that it is unnecessary to apply § 1926.1434 to the use of a substitute operational aid because, as long as the substitute device works properly, its use will not affect the capacity or safe operation of the equipment. No comments were received on this paragraph, and it is promulgated as proposed.

Paragraph (d) Category I operational aids and alternative measures

The standard categorizes operational aids by the amount of time permitted for the use of temporary alternative measures in place of the listed operational aids. Employers must ensure the repair of Category I operational aids, addressed by paragraph (d), no later than 7 days after the deficiency occurs. Category II operational aids, addressed below by paragraph (e), have a 30-day time limit for repair. Except where noted, C-DAC recommended each of these aids for the reasons set forth below. The Committee further determined that each of the temporary alternative measurers would be safe to use until the deficient operational aid was restored to proper service within the time required under the section. OSHA agrees. (For purposes of clarification, the Agency has added a reference to § 1926.1416(d) noting that the requirements of § 1926.1417(j) are applicable. See further discussion at § 1926.1417(j).)

Both Category I and II have an exception to the repair time limits. For Category I, if the employer documents that it has ordered the necessary parts within 7 days of the occurrence of the deficiency, the repair must be completed within 7 days of receipt of the part. For Category II, if the employer documents that it has ordered the necessary parts

within 7 days of the date on which the deficiency was discovered, and does not receive the part in time to complete the repair in 30 days, the repair must be completed within 7 days of receipt of the part. OSHA determines that these time limits are both feasible and reflective of the amount of time that it is appropriate to rely on the temporary alternative measures in each category.

During the SBREFA Panel process, one Small Entity Representative stated that an extended time limit might be required to determine the appropriate part number for older equipment. Therefore, it might not be possible to order a replacement within 7 days of the occurrence of the deficiency. OSHA sought public comment on the extent to which this is a problem. OSHA further sought comment on how to accommodate employers when the unavailability of a part number hinders them from ordering a replacement part. OSHA did not receive comments on these issues.

The SBREFA Panel also questioned whether the number of "days" for ordering parts and completing repairs for operational aids refers to calendar days or business days. Absent a different definition in the standard, OSHA interpreted the word "days" to mean "working days" which, as discussed above in relation to proposed § 1926.1407(e), would mean Mondays through Fridays, excluding federal holidays. OSHA sought public comment on whether a different definition of "days" should apply under this section.

One commenter stated that the use of the term "days" is unclear. (ID -0143.1.) Two commenters stated it was C-DAC's intention that the term "days" mean calendar days as opposed to business days. The commenters stated that the circumstances in § 1926.1407(e), where the rule uses business days, are unique because power companies are not open/available on weekends.

OSHA concludes that the 7 and 30 day time frames should refer to calendar days. The periods correspond to one calendar week and one typical calendar month, and it is, therefore, easy to determine when the period ends if they mean calendar days. Moreover, referring to "calendar" days will lead to faster repairs and help promote safety. Therefore, OSHA has clarified by adding the word "calendar" before each use of the word "days" in this section; the remainder of paragraph (c) is identical to the proposed rule.

Paragraph (d) lists the required Category I operational aids and the acceptable temporary alternative measures for these aids.

Boom Hoist Limiting Device: Paragraph (d)(1) requires that all equipment manufactured after December 16, 1969, have a boom hoist limiting device. As defined in § 1926.1401, a boom hoist limiting device "disengages boom hoist power when the boom reaches a predetermined operating angle" and also "sets brakes or closes valves to prevent the boom from lowering after power is disengaged." Section 1926.1401 also defines the term "boom hoist limiting device" to include "boom hoist disengaging device, boom hoist shutoff, boom hoist disconnect, boom hoist hydraulic relief, boom hoist kick-outs, automatic boom stop device, or derricking limiter." A boom hoist limiting device automatically prevents the boom hoist from pulling the boom past the minimum allowable radius (maximum boom angle). If the boom hoist pulls the boom past that point, a failure is likely (for example, the boom could buckle from being forced against the boom stop).

The December 16, 1969, date reflects the effective date of ASME B30.5-1968. This was the first national consensus standard to require a boom hoist limiting device,

and C-DAC regarded that date as a reasonable indicator of when the industry began to widely manufacture or equip cranes and derricks with such devices. OSHA agrees. Although the ASME standard only applies to crawler, locomotive, and truck cranes, OSHA is extending this provision to all equipment based on prevailing industry practice.

The standard includes three temporary alternative measures in paragraphs (d)(1)(A)-(C), of which the employer must use at least one if the boom hoist limiting device malfunctions: (A) use of a boom angle indicator; (B) clearly marking the boom hoist cable at a point that will give the operator sufficient time to stop the hoist to keep the boom within the minimum allowable radius; and, (C) if a spotter is used, clearly marking the boom hoist cable at a point that will give the spotter sufficient time to signal the operator and have the operator stop the hoist to keep the boom within the minimum allowable radius. C–DAC recommended these measures because historically they were used by employers prior to the development of the boom hoist limiting device.

In the proposed rule, § 1926.1416(d)(1)(ii) specified that employers must, on a permanent basis, use at least one of these measures for equipment manufactured on or before December 16, 1969 that "was not originally equipped" with a boom hoist limiting device. OSHA notes that equipment not originally equipped with a boom hoist limiting device might have one added later, and that such a piece of equipment should be treated the same as equipment originally equipped with such a device. Accordingly, OSHA has modified § 1926.1416(d)(1)(ii) by replacing "was not originally equipped" with "is not equipped" and removing "on a permanent basis." If and when the equipment is modified to include the limiting device, it would fall under § 1926.1416(d)(1)(i). Until that point,

it would remain under § 1926.1416(d)(1)(ii), and at least one of the measures in paragraphs (d)(1)(A)-(C) would be required at all times.

Luffing Jib Limiting Device: Paragraph (d)(2) requires that equipment with a luffing jib have a luffing jib limiting device. As defined in § 1926.1401, a luffing jib limiting device "is similar to a boom hoist limiting device, except that it limits the movement of the luffing jib." These devices function similarly and are distinguished only as to the type of crane extension they are designed to limit automatically, the jib or the boom. The temporary alternative measures for a luffing jib limiting device are the same as those for a boom hoist limiting device in paragraphs (d)(1)(i)(A)-(C). For clarity, the Agency added the words, "rather than the boom hoist" to paragraph (d)(2)(i).

Anti Two-Blocking Device: Paragraph (d)(3) sets forth the requirements for anti two-blocking devices. Section 1926.1401 defines "two-blocking" as "a condition in which a component that is uppermost on the hoist line such as the load block, hook block, overhaul ball, or similar component, comes in contact with the boom tip, fixed upper block or similar component. This binds the system and continued application of power can cause failure of the hoist rope or other component." As the definition indicates, two-blocking can cause the crane to drop the load, the headache ball, or another component, creating a hazard to employees below. When hoisting personnel, an anti two-blocking device had been required by former § 1926.550(g)(3)(ii)(C) since October 3, 1988, but was not otherwise required under subpart N. OSHA concludes that requiring the use of anti two-blocking devices will reduce the number of crane-related injuries and fatalities.

There are two forms of anti two-block devices: an automatic prevention device or a warning device. The automatic prevention device automatically stops two-blocking

from occurring. The warning device warns the operator when two-blocking is about to occur. OSHA determines that an automatic prevention device provides better protection than a warning device for employees, since it automatically stops two-blocking. As discussed below, the standard ultimately requires automatic prevention devices on all equipment manufactured after February 28, 1992, under a phase-in schedule. The standard takes into account of the date the national consensus standard, ASME B30.5, began to require such devices for telescopic boom cranes, and that B30.5 continues to allow lattice boom cranes to be equipped with either automatic prevention devices or warning devices.

ASME B30.5, effective February 28, 1992, states that telescopic boom cranes must have automatic prevention devices. For lattice boom cranes, ASME B30.5 states that they must have two-block protection but allows greater flexibility, allowing them to be equipped with either automatic prevention devices or warning devices. The additional protection for telescopic boom cranes in the ASME standard reflects the fact that such cranes are more likely to two-block because telescoping the boom out (an action that does not occur with lattice boom cranes) moves the boom's block closer to the load end of the hoist cable, which can cause two-blocking.

Because February 28, 1992 is the date that ASME B30.5 first stated that telescopic boom cranes must have anti two-block devices and is when the industry first began widely manufacturing or equipping such cranes with such devices, proposed paragraph (d)(3)(i) requires automatic prevention devices on all telescopic boom cranes manufactured after February 28, 1992. However, because ASME B30.5 allows lattice boom cranes to have either an automatic prevention device or a warning device since

February 28, 1992, paragraph (d)(3)(ii)(A) gives employers the option of using either device on lattice boom cranes manufactured between February 28, 1992, and one year after the effective date of this standard.

OSHA concludes that an automatic prevention device provides better protection than a warning device because it directly addresses the hazard, rather than alerting an operator and requiring an additional step by the operator to address the hazard. Therefore, lattice boom cranes manufactured more than one year after the effective date of this standard must be equipped with an automatic prevention device.

Paragraph (d)(3)(ii)(C) excludes lattice boom equipment used during certain activities from the anti two-block requirements of (d)(3)(A) and (B). The provision exempts lattice boom equipment when used for dragline, clamshell (grapple), magnet, drop ball, container handling,[81] concrete bucket, marine operations that do not involve hoisting personnel, and pile driving work. C-DAC indicated that most of these operations involve heavy repetitive motion, and anti-two-block devices used during these activities consistently malfunction (that is, the device "trips" even though two-blocking has not occurred) and are frequently damaged.

However, note that § 1926.1437(f)(1) requires anti two-block devices on floating cranes/derricks and land cranes/derricks on barges when hoisting personnel or hoisting over an occupied cofferdam or shaft. The Agency determines that cranes need anti two-block devices to prevent employees from being dropped and to prevent loads from

[81] In most situations hoisting containers are regulated under 29 CFR part 1918; this standard applies to hoisting containers only where that activity is construction work. For example, hoisting a container of construction material from a ship onto a concrete pier that is part of a bridge construction project is a construction activity covered by this standard.

striking employees in the confined work environment of a cofferdam or shaft. These safety considerations outweigh any concern for damage to a device or unnecessary "tripping" during marine operations.

The temporary alternative measures available when an anti two-block device on a lattice-boom crane or derrick malfunctions are to clearly mark the cable so that it can easily be seen by the operator at a point that will give the operator sufficient time to stop the hoist to prevent two-blocking, or to use a spotter to warn the operator to stop the hoist.

For telescopic boom cranes, the temporary alternative measures required are to clearly mark the cable so that it can easily be seen by the operator at a point that will give the operator sufficient time to stop the hoist to prevent two-blocking and to use a spotter when extending the boom. OSHA determines that the alternative measures for telescopic boom cranes must require the use of a spotter when extending the boom because two-blocking can occur even when the cable hoist is not being operated. As noted above, telescoping the boom out moves the boom's block closer to the load end of the hoist cable, which can cause two-blocking. A mark on the hoist cable in such instances will not warn the operator that two-blocking is about to occur. Therefore, when extending the boom, a spotter is required.

The proposed rule did not address the issue of anti two-block protection for articulating cranes. Many such cranes are equipped with forks at the end of the boom and do not have the potential for two-blocking. However, those equipped with a load hoist present the same potential for two-blocking as other cranes with load hoists. A trade association pointed out that the ASME standard for articulating cranes, ASME B30.22-

1998, first required two-block protection effective December 31, 1999. (ID -0206.1.) OSHA infers that articulating cranes with boom hoists manufactured after December 31, 1999, were routinely equipped with automatic two-block protection after that date. Therefore, to treat such cranes in a manner similar to lattice boom cranes and telescopic boom cranes, OSHA is adding § 1926.1416(d)(3)(iii) to the final rule.

Paragraph (e) Category II operational aids and alternative measures.

Paragraph (e) of this section lists the required Category II operational aids and the acceptable temporary alternative measures for these aids. If any of these aids is not working properly, it must be repaired no later than 30 days after the deficiency occurs. As noted above, if the employer documents that it has ordered the necessary parts within 7 calendar days from the occurrence of the deficiency, and does not receive the part in time to complete the repair in 30 calendar days, the repair must be completed within 7 calendar days of receipt of the part. (For purposes of clarification, the Agency has added a reference to § 1926.1416(e) noting that the requirements of § 1926.1417(j) are applicable. See further discussion at § 1926.1417(j).)

Boom Angle or Radius Indicator: Paragraph (e)(1) requires a boom angle or radius indicator that is readable from the operator's station on all equipment. Section 1926.1401 defines "boom angle indicator" as "a device which measures the angle of the boom relative to the horizontal." This definition is identical to that in the SC&RF Handbook. It is necessary to know the boom angle to determine the crane's capacity from its load chart. The temporary alternative measure is to measure the radii or boom angle with a measuring device.

Jib Angle Indicator: Paragraph (e)(2) requires a jib angle indicator on all equipment with a luffing jib. The temporary alternative measure is to measure the radii or jib angle with a measuring device.

Boom Length Indicator: Paragraph (e)(3) requires a boom length indicator on all equipment equipped with a telescopic boom. Section 1926.1401 defines a "boom length indicator," as a device that, "indicates the length of the permanent part of the boom (such as ruled markings on the boom) or, as in some computerized systems, the length of the boom with extensions/attachments." OSHA did not receive any comments on the definition and is promulgating it as proposed. The operator must know the length of the boom because it affects the crane's capacity, as shown on the load chart. At least one of the following must be used as a temporary alternative measures: mark the boom with measured marks to calculate boom length; calculate boom length from boom angle and radius measurements; or measure the boom with a measuring device.

Load Weighing and Similar Devices: Proposed paragraph (e)(4) required load weighing and similar devices on all equipment with a rated capacity over 6,000 pounds and manufactured after March 29, 2003 (except derricks; a comparable provision for derricks is in § 1926.1436(f)(3), discussed below). The framework of this proposed paragraph was similar to the approach taken in sec. 5-1.9.9.2 of ASME B30.5-2004, respecting these aids. The proposed standard permitted employers to choose to outfit its equipment with either a load weighing device, load moment (or rated capacity) indicator, or a load moment or rated capacity limiter. The latter two terms are defined in § 1926.1401. All three devices are intended to help the operator avoid exceeding the equipment's rated capacity and thereby prevent the crane from tipping over.

This proposed provision was limited to equipment (other than derricks) manufactured after March 29, 2003. That was the date when ASME B30.5 first called for all mobile cranes with a rated capacity over 6,000 pounds to be equipped with load weighing devices. The proposed provision was thus keyed to the date when the industry first began widely manufacturing or equipping mobile cranes with load weighing or load moment devices.

A trade association pointed out that ASME B30.5 does not apply to articulating cranes and that the applicable consensus standard, ASME B30.22, does not require the devices specified in paragraph (e)(4). (ID -0206.1.) The commenter stated, however, that these are likely to be required by the 2010 update of ASME B30.22.

As discussed in § 1926.1400, evidence in the record shows that many articulating cranes are currently equipped with automatic overload prevention devices which, like the devices specified in this section, are designed to avoid the possibility of tipover. Therefore, the tipover hazard addressed by paragraph (e)(4) can be addressed for newly-manufactured articulating cranes by requiring such cranes to be equipped with either automatic overload prevention devices or one of the devices specified in paragraph (e)(4). To achieve this objective, OSHA is therefore revising proposed paragraph (e)(4). The requirement in proposed paragraph (e)(4) is revised to exclude articulating cranes and is renumbered paragraph (e)(4)(i) in the final rule. New paragraph (e)(4)(i) includes temporary alternative measures based on calculations from sources recognized by the industry. The proposed rule had provided for calculations based on a "reliable" source or calculation method, or "by other equally reliable means." To avoid the potentially

subjective interpretations of "reliable," OSHA is instead requiring that the measurements be from a source typically relied on in the industry.

A new paragraph (e)(4)(ii), applicable to articulating cranes, is added. This new paragraph requires articulating cranes manufactured more than one year after the effective date of the standard to be equipped with either an automatic overload prevention device, a load weighing device, a load moment (or rated capacity) indictor, or a load moment (or rated capacity) limiter. Paragraph (e)(4)(ii) will protect workers against articulating cranes tipping over while giving employers a choice of means to achieve this objective. The temporary alternative measure required under paragraph (e)(4)(ii) is the same as that required under paragraph (e)(4)(i).

A commenter informed OSHA that New York City requires a load weighing or similar device on cranes manufactured after December 30, 1993, and requested that the final rule allow local governments to impose stricter requirements. (ID -0156.1.) Whether local governments can impose stricter requirements than provided under this final rule is discussed under federalism in section V.D of this preamble.

Proposed paragraph (e)(5) required two future operational aids – an outrigger position sensor/monitor and a hoist drum rotation indicator – on all equipment manufactured more than one year after the effective date of this standard.[82] As discussed in § 1926.1404, certain types of equipment are equipped with stabilizers rather than outriggers, and OSHA is modifying the language of proposed "outrigger" provisions to clarify that such provisions also apply to equipment with stabilizers. Therefore,

[82] The proposed rule would have required these aids on equipment manufactured after January 1, 2008. Here, as elsewhere, OSHA believes that devices not commonly installed on equipment should be not be required until more than one year after the effective date of the final rule.

paragraph (e)(5)(i) is being reworded in the final rule to apply to equipment with stabilizers as well as outriggers. Paragraph (e)(5)(ii), which requires hoist drum rotation indicators, is promulgated as proposed.

One commenter stated that deadman controls should be required on all cranes. (ID -0156.1.) Section 1926.1435(d)(2)(viii) requires that tower cranes have deadman controls, but C-DAC did not determined these should be required on other types of cranes. This commenter has not stated why it believes such controls are needed for safe operation of other types of cranes. Accordingly, OSHA defers to C-DAC's judgment that deadman controls should not be required on cranes other than tower cranes.

Section 1926.1417 Operation

Section 1926.1417 addresses hazards associated with general operation of equipment covered by this standard. Previously, 29 CFR part 1926, subpart N primarily addressed safe operation by incorporating national consensus standards and manufacturer recommendations. For example, former § 1926.550(b)(2) required crawler, truck, and locomotive cranes to comply with the operation requirements of ANSI B30.5-1968. The provisions in this section are designed to update such requirements, make them more comprehensive, and state them in a way that is clear and enforceable.

Paragraph (a)

Paragraph (a) of this section requires employers to comply with the manufacturer procedures applicable to the operational functions of all equipment covered by this standard, including the use of equipment with attachments. "Procedures" is defined in §

1926.1401 to include, but not be limited to, “instructions, diagrams, recommendations, warnings, specifications, protocols, and limitations.”

Two commenters opposed this provision. The first, a representative from the building industry, stated that it was “problematic” to “literally require employers to become familiar with and obey to the letter any thing written by a manufacturer related to a crane, no matter how unwise, unnecessary, or infeasible.” (ID -0232.1.) The commenter also explained that crane manufacturers fear tort liability, which causes them to over-warn in their manuals, and suggested that employers needed to be able to use common sense to separate over-warning from serious recommendations. The commenter argued further that this provision constituted a delegation of authority inconsistent with the U. S. Constitution and the Occupational Safety and Health Act, and was unsupported by the rulemaking record. A building industry trade association agreed with the building industry representative’s points and advocated amending this provision to require operation of equipment in a manner “consistent with manufacturers’ recommendations.” (ID -0214.1.) It also believed that the costs of complying with this provision would be excessive.

OSHA disagrees with the suggestion that this provision is problematic because of the possibility that some equipment manufacturer may conceivably develop procedures which are “unwise, unnecessary, or infeasible.” Neither commenter provided any specific examples or data in support of this assertion, and it is unreasonable to think that crane manufacturers would develop such procedures. Like all product manufacturers, crane manufacturers want satisfied customers and repeat business, and OSHA has no basis to conclude, as the commenters suggests, that they will alienate their customers by

recommending unnecessary procedures that will reduce the usefulness and productivity of their products. Moreover, there are sound reasons to determine that following manufacturer procedures will result in both the safe and productive use of cranes. The manufacturer of a large and complex piece of machinery such as a crane is thoroughly familiar with the machine's design, components, and capabilities and is well-positioned to develop the procedures that enable the crane to be used effectively and safely. The commenters provided no basis for OSHA to conclude that allowing crane users to pick and choose which manufacturer recommendations to follow will promote safety, and OSHA does not believe this is the case. Moreover, C-DAC's members had vast experience in crane manufacturing and use and were well-positioned to determine whether compliance with manufacturer's recommendations will promote crane safety. They concluded that it would. In the absence of additional evidence, OSHA defers to C-DAC's experience.

OSHA also finds no merit in the building industry representative's assertion that compliance with manufacturer recommendations should not be required because manufacturers "over-warn" out of liability concerns. The best way for manufacturers to avoid liability for accidents involving their products is to recommend the precautions that are needed to prevent such accidents, so their concern for tort liability is fully consistent with the objective of this standard.

Regarding the delegation of authority issue, OSHA notes that provisions similar to this one, including provisions in the prior cranes standard in former § 1926.550, have

withstood judicial scrutiny on every occasion on which they have been challenged.[83] See, e.g., *Associated Builders & Contractors v. Miami-Dade County*, 594 F.3d 1321; *Associated Builders & Contractors, Inc. v. Brock*, 862 F.2d 63, 68-69 (3d Cir. 1988); *Towne Constr. Co. v. Occupational Safety & Health Review Comm'n*, 847 F.2d 1187, 1189 (6th Cir. 1988) (finding the physical impossibility of requiring OSHA independently to set safety standards for every industry job classification and industrial substance in the country justifies reliance on the fruits of private efforts as governmental standards).

The requirement in § 1926.1417(a) to comply with manufacturers' operating procedures is essentially the same as that imposed by former § 1926.550(a)(1) of the prior rule. As the commenter from the building industry notes, former § 1926.550(a)(1) was upheld against a challenge that requiring compliance with manufacturer's specifications and operating limitations is an illegal delegation of authority to private persons. (ID -0232.1, citing *Towne Construction*, 12 BNA OSHC 2185 (OSHRC 1986) *aff'd* 847 F.2d 1187 (6th Cir. 1988).) The Review Commission and the Sixth Circuit found that the prior rule's delegation to manufacturers was circumscribed by other regulatory requirements governing the design and construction of cranes. (See, e.g., 12 BNA OSHC at 2186 noting design specifications in 29 C.F.R. 1910.180(c)(1) applied to cranes covered by former § 1926.550.) The final rule contains design, construction and testing requirements that are more comprehensive than those applicable under the prior

[83] Among the many OSHA standards requiring compliance with manufacturer information are: § 1910.134, UI; § 1910.184, *Slings*; § 1910.265, *Sawmills*; § 1915.113, *Shackles and hooks*; § 1910.217, *Mechanical power presses*; § 1926.451, *Scaffolds: General requirements*; § 1926.302, *Power-operated hand tools*; and § 1917.43, *Powered industrial trucks*.

rule. These limitations on manufacturers' discretion are sufficient to defeat a facial delegation challenge. 12 BNA OSHC at 2186, 847 F.2d at 1189. See also *Associated Builders and Contractors*, 2010 WL 276669 *3 (OSHA's adoption of consensus specifications for safe operation of cranes "conforms with an intelligible principle" and is therefore valid). To require OSHA to independently determine and codify every safety procedure for every configuration of every make and model of crane or other equipment covered by this standard, as well as every attachment or device that could be used with that equipment, would be unrealistic, inefficient, and contrary to all jurisprudence on this issue. In light of C-DAC's recommendations to include manufacturer procedures in subpart CC, and based on the record as a whole, OSHA concludes that requiring compliance with manufacturer procedures is an efficient and appropriate means of ensuring safe maintenance, assembly and disassembly, configuration, and operation of equipment covered by this subpart. Therefore, OSHA is incorporating manufacturers' procedures and recommendations into § 1926.1417, and several other provisions of this standard, where the Agency determines that it is the most effective and appropriate way to accomplish the OSH Act goals.

Two commenters objected to OSHA's inclusion of manufacturer "recommendations" in the definition for equipment criteria. (ID -0205.1; -0213.1.) The commenters, however, provide no justification for distinguishing manufacturer recommendations from other manufacturer procedures. C-DAC determined that manufacturer recommendations were an appropriate means of ensuring the safe use of equipment, and OSHA agrees. Manufacturer recommendations, like procedures,

specifications, prohibitions, etc., instruct the user how to use the equipment safely and in a manner most consistent with the equipment's design.

Moreover, there is nothing novel in OSHA's reliance on manufacturer recommendations. A number of OSHA standards already require compliance with manufacturer recommendations. See, e.g., § 1910.134, *Respirator protection*; § 1910.184, *Slings*. As noted above, the former crane standard (in former § 1926.550(a)) replaced by this final rule included a broad prohibition based solely on manufacturer recommendations: "Attachments used with cranes shall not exceed the capacity, rating, or scope recommended by the manufacturer." Yet no court has invalidated an OSHA standard requiring compliance with manufacturer recommendations, even though several containing such language have been challenged. The commenters offer no new compelling legal arguments for why OSHA should delete provisions requiring compliance with manufacturer recommendations, and do not identify a meaningful distinction between a manufacturer's recommendation, procedure, instruction, or specification. Accordingly, OSHA is requiring compliance with manufacturer recommendations as proposed.

Finally, with respect to the suggestion to permit alternate procedures provided they are "consistent with" manufacturers' procedures, the Agency concludes that amending this provision in that manner would be unacceptable because it would lead to uncertainty over what procedures are "consistent with" the manufacturers' recommended procedures. Therefore, this provision is promulgated as proposed.

Paragraph (b) Unavailable operation procedures

Under paragraph (b)(1) of this section, in the event that the manufacturer procedures for operation are unavailable, the employer will be required to develop procedures necessary for the safe operation of the equipment and its attachments. The employer will also be required to ensure compliance with such procedures. "Unavailable procedures" is defined in § 1926.1401 as procedures that are no longer available from the manufacturer, or have never been available from the manufacturer. For instance, procedures that are in the employer's possession but are not on the job site, would not be considered unavailable under §§ 1926.1417(b) and 1926.1441(c)(2), where the same term is used.

An example of a situation where procedures might be unavailable is old equipment where the manufacturer is no longer in business. Even where the original manufacturer became part of another company that is still in business, in some cases the successor company no longer has the original manufacturers' procedures for that equipment. In such instances the employer will be required to develop and follow substitute procedures.

Paragraphs (b)(2) and (b)(3) of this section specify qualifications criteria for those who develop two aspects of the substitute procedures. Under § 1926.1417(b)(2), procedures for the operational controls will have to be developed by a qualified person. As defined in § 1926.1401 of this standard, "operational controls" are levers, switches, pedals and other devices for controlling equipment operation. A qualified person has the requisite level of expertise to develop such procedures in light of both the complexity of the factors that must be considered and the nature of the operational controls.

Under paragraph (b)(3), operational procedures related to equipment capacity would have to be developed and signed by a registered professional engineer familiar with the equipment. The type and complexity of engineering analysis that is needed to develop safe procedures related to capacity necessitates that this work be done by a registered professional engineer (RPE). In addition, because capacity is so critical to safe operation, a signature by the RPE is needed to ensure that this work is done with the requisite care. No comments were submitted on this provision; therefore, it is promulgated as proposed.

Paragraph (c) Accessibility of procedures

Paragraph (c)(1) of this section requires employers to provide the operator with ready access in the cab to the procedures applicable to the operation of the equipment, including the following: rated capacities (load charts), recommended operating speeds, special hazard warnings, and the instructions and operator's manual.

For the purposes of this standard, "special hazard warnings" are warnings of site-specific hazards (for example, proximity of power lines). This term is defined in § 1926.1401 to differentiate these site-specific warnings from all other general hazard warnings which are common to typical construction worksites.

Previously, former § 1926.550(a)(2) of subpart N required rated capacities, recommended operating speeds, and special hazard warnings to be posted on the equipment, and instructions and warnings to be visible at the operator's station. Unlike § 1926.1417(c)(1) of this standard, it did not require the operator's manual to be accessible to the operator.

OSHA concludes that the information in these materials, including the operator's manual, is essential for safe crane operation. C-DAC determined that this information is needed to help the operator avoid performing operations beyond a crane's capacity and recommended operating speed, and by increasing operator awareness of special hazards related to a specific piece of equipment. In addition, C-DAC determined that this information needs to be available to the equipment operator in the cab so that the operator can obtain the information as the need arises. If the information were not available in the cab, operations would have to be delayed for the operator to leave the cab and obtain the information elsewhere (or for someone else to obtain them and bring them to the operator). The prospect of such a delay would serve as a disincentive to obtaining the information and increase the chance that operations would proceed without it.

A building industry trade association stated its belief that to the cost of obtaining and maintaining manufacturers procedures applicable to operation of the equipment would be excessive, and stated that OSHA's contention that such costs would be "modest" was not supported by the rulemaking record. (ID -0214.1.) This commenter did not provide any substantiation for this claim. Based on the absence of this support, and on the absence of other comments raising a cost objection related to this requirement, OSHA concludes that the cost of obtaining and maintaining manufacturers' procedures for equipment operations is not generally viewed as significant, especially when weighed against the potential economic and human costs of a crane accident. Moreover, as noted below, the trend toward providing operating manuals and procedures via digital media and over the internet is substantially lowering costs for acquiring and maintaining such

information. Therefore, OSHA defers to C-DAC's experience and is promulgating this provision as proposed.

It has become increasingly common for equipment to be supplied by manufacturers with load capacities in electronic form. Because of the potential for an electronic or other failure to occur that would make that information inaccessible, § 1926.1417(c)(2) addresses a situation in which electronic or other failure makes such information unavailable. Under this paragraph, where load capacities are available in the cab only in electronic form and a failure makes the load capacities inaccessible, this paragraph requires that the operator immediately cease operations or follow safe shut-down procedures until the load capacities become available again (in electronic or other form). No comments were submitted on this provision; therefore it is promulgated as proposed.

Paragraph (d)

This paragraph requires that operators refrain from engaging in any practice that would divert their attention while operating the crane. This includes the use of cell phones except when cell phones are used for signal communications. Operating a crane is a complex task that requires an operator's full attention to be performed safely. This paragraph addresses the risk that an accident can occur if the operator's full attention is not directed toward that task.

During the hearing, a witness from a lumber trade association described the practice in which the operator controls an articulating boom crane with a forklift attachment via remote controls and then assists with the off-loading of the materials. (ID

-0341.) He expressed concern that the operator's participation in the off-loading of the crane would violate § 1926.1417(d)'s prohibition on "any practice that diverts his/her attention while actually engaged in operating the crane." (ID -0341.) As a result, his company would need to use an additional person for the delivery, raising costs. (ID -0341.)

Section 1926.1417(d) would not necessarily prohibit the activity that the witness described. If the operator uses the remote controls to position the articulating crane and lock it into position before off loading the materials, and does not simultaneously operate the controls and offload the materials, the operator would not be "actually engaged in operating the crane" at the same time as he is off-loading the crane. The operator would also not be considered to "leave the equipment unattended" so long as the operator has immediate access to the remote controls. See discussion of § 1926.1417(e) below. No other comments were submitted on this provision; therefore it is promulgated as proposed.

Paragraph (e) Leaving equipment unattended

Paragraph (e)(1) of this section specifies when the operator must be at the controls for safety-related reasons. These include making necessary adjustments to keep the load in a safe position, moving the load where necessary for reasons of safety (such as for the safety of employees working with or near the load), and responding to emergencies that may arise during lifting operations. Previously, under 29 CFR part 1926, subpart N, the operator of a crawler, locomotive, or truck crane was prohibited from leaving the controls while a load is suspended.

In the experience of C-DAC members, this requirement was routinely breached when the load is "held suspended," that is, without need for adjustment of the load's or the equipment's position for an extended period. In such circumstances, the operator does not need to manipulate the controls for the period of time that the load is suspended and it was a common practice for the operator to leave the controls. To address this problem, C-DAC proposed that OSHA establish criteria that allow the operator to leave the controls when it is safe to do so rather than to simply continue the existing rule unchanged. (Note that the suspension of working gear, such as slings, spreader bars, ladders, and welding machines, is addressed separately in § 1926.1417(e)(2).)

Several commenters from the materials delivery industry noted that various types of equipment in that industry can be operated by remote control and expressed concern that § 1926.1417(e)(1) would prohibit the use of those remote controls and thereby require additional personnel to perform the same task. (ID -0184.1; -0206.1.) To be clear, the new standard does not prohibit the use of remote controls. During the hearing on this rulemaking, a witness from a lumber trade association testified that the use of portable radio remote controls is common, and provided examples of operators with their remotes strapped around their waists or their shoulders. (ID -0341; -0345.13.) He explained that the "operator is physically located at the same location as the remote control and is therefore able to perform controlled operations as quickly as an operator who is seated at the top seat controls" and "can also be positioned to ensure that there's no obstructed view." (ID -0341.) Such use would not be prohibited. Where an operator takes the remote controls out of the cab, keeps the controls within reach in the same manner as if in the cab, and is able to use the remote controls to control the equipment as

effectively as if in the cab, the operator has not left the controls within the meaning of § 1926.1417(e). Therefore, the operator is not subject to the conditions of §§ 1926.1417(e)(1)(i) through (iv).

Section 1926.1417(e) requires that the operator not leave the controls while the load is suspended except when four conditions, outlined in §§ 1926.1417(e)(1)(i) through (e)(1)(iv), are met. OSHA has revised the introductory text to make it clear that each one of the conditions in §§ 1926.1417(e)(1)(i) through (e)(1)(iv) must be met for the operator to leave the controls.

Paragraph (e)(1)(i) requires the operator to remain adjacent to the equipment and not engage in any other duties. This paragraph will not only prevent unauthorized use of the crane by persons who are not competent crane operators but also allow the operator to quickly access the controls in case the equipment or load inadvertently moves.

Paragraph (e)(1)(ii) requires the load to be held suspended for a period of time exceeding normal lifting operations. As explained above, these are instances when the load is "held suspended," that is, without need for adjustment of the load's or the equipment's position – for an extended period. These are circumstances in which the operator will not need to manipulate the controls. Such circumstances must be for a period of time in excess of the periods that occur during normal lifting operations.

For example, during the construction of a structure, a large subassembly is being attached to another part of the structure. After the subassembly has been initially connected, it is held suspended (that is, without need for adjustment of position) for support for several hours while the final connections are made. This period exceeds

normal lifting operations. In this example, the criterion of § 1926.1417(e)(1)(ii) would be met.

Another, contrasting example is the following: A steel structure is being erected. When installing the steel beams, the operator holds the beam suspended (typically for several minutes) while it is initially connected. Holding the beam suspended in such instances is a normal part of the steel erection process. In this example the criterion in § 1926.1417(e)(1)(ii) would not be met and the operator can not leave the controls.

Paragraph (e)(1)(iii) requires the competent person to determine that it is safe for the operator to leave the controls and implement measures necessary to restrain the boom hoist and telescoping, load, swing, and outrigger functions. This provision addresses the hazard of inadvertent movement while the controls are unattended.

Paragraph (e)(1)(iv) requires barricades or caution lines, and notices to be erected to prevent all employees from entering the fall zone. Furthermore, under this paragraph no employees would be permitted in the fall zone, including those listed in §§ 1926.1425(b)(1) through (3), (d), or (e). This is necessary because the added margin of safety that results from the operator being at the controls would not be present in these circumstances.

A labor representative recommended retention of the previous prohibition of leaving any unattended loads suspended because it believed that the four conditions for the exemption were unclear and unenforceable. (ID -0199.1.) Specifically, the commenter stated that (1) the term “adjacent to the equipment” needed to be further explained or quantified; (2) further guidance was need to explain the meaning of the phrase “a period of time exceeding normal operations;” (3) the Agency needs to clarify

that the equipment operator can be the "competent person" referred to in this section; and (4) the proposed requirement to erect barriers or caution lines to prevent employees from entering fall zones are infeasible in many construction zones.

Regarding the commenter's first two points, in light of the extreme variability of equipment types, loads lifted, and construction site conditions, OSHA determines it is not possible to use more precise language without making the rule underinclusive and/or overinclusive. Specifying a precise distance in lieu of saying "adjacent to the equipment," and a precise time in lieu of "a period of time exceeding normal operations," as the commenter suggests, would not be practical in light of the numerous variables that affect these distances and times on construction sites. OSHA also rejects the commenter's suggestion that the previous prohibition be retained if it is not possible to use more precise language. OSHA concludes that this is an area where employers can be afforded flexibility without detracting from safety, and that the limited conditions under which it is permissible to leave a suspended load unattended will accomplish this objective.

Regarding the third point, the answer is "yes," an equipment operator can be a "competent person" for purposes of this section if he or she meets the requirements of the § 1926.1401 definition of that term. Finally, where conditions in a construction site exist that prevent erection of barriers or caution lines as prescribed by this section, § 1926.1417(e) prohibits employers from using this exception to the general prohibition of leaving suspended loads unattended.

Proposed paragraph (e)(2) stated that the provisions in paragraph (e) do not apply to working gear, which includes slings, spreader bars, ladders, and welding machines, where the load is not suspended over an entrance or exit.

The Agency noted in the proposal that the reference to paragraph (e) was a drafting error and that the appropriate reference was to paragraph (e)(1). In addition, the provision as proposed contained two incidences of the word "not" which could lead to confusion. Therefore, the Agency noted in the proposal that it was considering changing the language to state that the provisions in § 1926.1417(e)(1) do not apply to working gear where the working gear is suspended over an area other than an entrance or exit.

In the proposed rule, OSHA noted that it was common practice for employers to leave lightweight items suspended overnight to prevent theft and stated that this provision was only intended to apply to working gear whose weight was negligible relative to the capacity of the equipment. Four commenters believed that the proposed wording of § 1926.1417(e)(2) was overly broad to accomplish this purpose because it did not limit the weight of the suspended working gear relative to the capacity of the equipment and could therefore allow a load that placed a significant strain on the equipment to be suspended overnight. (ID -0122.1; -0172.1;-0 178.1; -0199.1.) OSHA agrees with these commenters that this provision should be clarified and, in the final rule, has made explicit what was stated in the preamble to the proposed rule: that the provision only applies where the weight of the working gear is negligible relative to the lifting capacity of the equipment.

Paragraph (f) Tag-out

Paragraph (f)(1) Tagging out of service equipment/functions

Where the employer has taken the equipment out of service, this paragraph requires that the employer place a tag in the cab stating that the equipment is out of service and is not to be used. Where the equipment remains in service but the employer has taken a function out of service, this paragraph requires that the employer place a tag in a conspicuous position stating that that function is out of service and is not to be used. This paragraph is designed to prevent hazards associated with workers inadvertently attempting to use out-of-service equipment or a function that is out of service.

Paragraph (f)(2) Response to "do not operate"/tag-out signs

If there is a warning sign on the equipment or starting control, paragraph (f)(2)(i) of this section prohibits the operator from activating the switch or starting the equipment until the sign is removed by someone authorized to remove it or until the operator can verify that (A) no one is servicing, working on, or otherwise in a dangerous position on the machine, and (B) the equipment has been repaired and is working properly. Similarly, under § 1926.1417(f)(2)(ii), when there is a warning sign on any other switch or control, the operator will be prohibited from activating that switch or control until the sign has been removed by an individual authorized to remove it, or until the operator meets the two requirements of § 1926.1417(f)(2)(i), described above.

These provisions will prevent two types of hazards. First, since the machine is out of service, there is a risk that an employee servicing, working on, or otherwise in a dangerous position on it is not expecting it to be activated and would be injured if it were activated. Second, if an employee does not know that the equipment is malfunctioning or

has a function that is not working properly, an employee could inadvertently try to operate it with the result that the equipment will not work as intended, causing unintended movement or a collapse.

Subpart N of the former rule addressed this issue through sec. 5-3.1.3g of ANSI B30.5-1968, which states: "If there is a warning sign on the switch or engine starting controls, the operator shall not close the switch or start the engine until the warning sign has been removed by the person placing it there." Instead of requiring that the sign be removed by the person who placed it, § 1926.1417(f)(2) permits it to be removed by an authorized person and, as an alternative, permits the operator to start the equipment after verifying that no worker is in a dangerous area and that the equipment has been repaired and is working properly. OSHA concludes that either alternative would achieve the safety purpose of the tag-out because it would ensure that a knowledgeable and responsible person, either the operator or another authorized person, verifies that repairs are complete and all workers are in a safe position before the equipment can be started.

As discussed above, the operator will be permitted to start equipment that is tagged out, or activate a tagged-out switch, only if the procedures specified in § 1926.1417(f)(2)(i) are met. In reviewing this provision during the proposal stage, the Agency noted that these procedures were not as comprehensive as those in the general industry standard for the control of hazardous energy (lockout/tagout), which are listed in §§ 1910.147(e)(3)(i) through (iii).[84] The Agency requested public comment on whether

[84] Section 1910.147 is not applicable to construction (see § 1910.147(a)(ii)(A)).

procedures similar to those in §§ 1910.147(e)(3)(i) through (iii)[85] would be feasible and appropriate for cranes/derricks used in construction.

Two commenters opposed broadening the requirements along the lines of the requirements in §§ 1910.147(e)(3)(i) through (iii), stating that the general industry standards were not appropriate for cranes and derricks used in construction. (ID -0205.1; -0213.1.) A third commenter believed that the § 1910.147(e)(3) procedures were feasible and appropriate. (ID -0144.1.) A fourth commenter recommended that the tag-out requirements be upgraded to a lock-out requirement to provide greater worker protection. (ID -0199.1.) A fifth commenter agreed that a lock-out requirement would provide superior protection to the proposed tag-out proposal, but that locking out was not feasible on some equipment, especially older equipment. (ID -0187.1.) That commenter recommended that the requirement be upgraded to a lock-out requirement where feasible, but remain a tag out procedure where lock out was not feasible. Upon consideration of all these comments, OSHA concludes that the record does not clearly indicate that adding a lock-out requirement as suggested by the last two commenters is needed to ensure safety and, as the one commenter noted, would not be feasible on all equipment. Instead, the Agency concludes that the tag-out requirement in the proposed rule contains clear and concise restrictions on the conditions under which equipment can be brought back into

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[85] These general industry provisions state:

> (i) Verification by the employer that the authorized employee who applied the device is not at the factory;
> (ii) Making all reasonable efforts to contact the authorized employee to inform him/her that his/her lockout or tagout device has been removed; and
> (iii) Ensuring that the authorized employee has this knowledge before he/she resumes work at that facility.

Section 1910.147(e)(3)(i) through (iii).

service and will ensure that equipment is not started when employees are in a danger zone. Therefore, this section is promulgated as proposed.

Paragraph (g)

This paragraph requires the operator to verify, before starting the engine, that all controls are in the proper starting position and that all personnel are in the clear. Requiring operators to check that all controls are in their proper starting positions will prevent unintended movement of the equipment when the engine is initially started. Similarly, requiring operators to ensure that all personnel are in the clear is will prevent personnel from being injured in the event that some aspect of the equipment moves upon start-up. No comments were submitted on this paragraph; therefore it is promulgated as proposed.

Paragraph (h) Storm warning

When a local storm warning has been issued, this paragraph requires the competent person to determine whether it is necessary to implement manufacturer recommendations for securing the equipment. This provision was designed to prevent hazards that could arise from severe weather including inadvertent movement and crane collapse. High-speed winds in particular can affect both the crane and the load, reducing the rated capacity of the crane and affecting boom strength. No comments were submitted on this paragraph; therefore it is promulgated as proposed.

Paragraph (i) [*Reserved*.]

Paragraph (j)

Under paragraph (j)(1) of this section, when the operator determines that an adjustment/repair is necessary, the operator is required to promptly inform, in writing, the individual designated by the employer to receive such information, as well as the next operator in cases where there are successive shifts. OSHA revised the organization of the proposed provision for clarity. This reorganization involved removing the introductory sentence that operators be familiar with the equipment and its proper operation because this sentence merely described an enabling condition necessary for operators to identify any necessary repairs and adjustments.

This paragraph addresses the need to identify problems that may develop with the equipment during operations. Early recognition of such problems by the operator will help prevent accidents that could result from continued operation of equipment that needs adjustment and/or repair. In the Committee's experience, operators who are familiar with the equipment and its proper operation can recognize such equipment anomalies and problems. By requiring that information about needed adjustments and/or repairs be provided to the individual designated by the employer to receive it, this paragraph will facilitate the correction of those problems.

The rule does not specify any particular job title for the person to whom the operator would be required to provide this information because different employers may assign the responsibility of receiving such information to different job classifications.

Providing this information to the next operator in cases where there are successive shifts (that is, shifts that have no break between them) will ensure that the next operator is aware of this information and will be able to take appropriate action.

One commenter recommended that the information be transmitted in written form. (ID -0132.1.) OSHA agrees with this comment primarily because written information would be more easily passed on between shifts. OSHA has, therefore, revised § 1926.1417(j) to specify that the notification of necessary adjustments or repairs must be in writing.

Additionally, OSHA added § 1926.1417(j)(2) to require employers to notify, at the beginning of each shift, all affected employees of any necessary adjustments or repairs. This requirement will allow all employees affected by the operation of the equipment to be notified of any outstanding repairs or adjustments, and provides them with information about alternative measures implemented by the employer. Affected employees are any employees exposed to equipment-related hazards; such employees include, but are not limited to, any employee in the fall zone of the load, signal persons, riggers, operators, load handlers, and lift directors. OSHA concludes that this provision is necessary to allow employees to adjust their work practices following implementation of the alternative measures.

The Agency finds this modification to be consistent with the requirements throughout this subpart with respect to sharing information about equipment-related hazards. This added provision merely requires employers to take the information acquired under § 1926.1417(j)(1) and distribute it to affected employees. Employers may distribute this information by any effective means available.

Paragraph (k)

This paragraph prohibits safety devices and operational aids from being used as a substitute for the exercise of professional judgment by the operator. Such devices and aids do not displace the need for operators to apply their professional judgment because the devices and aids can malfunction and lead to the types of safety hazards they are designed to prevent. No comments were submitted on this paragraph; therefore it is promulgated as proposed.

Paragraph (l) [*Reserved*.]

Paragraph (m)

If the competent person determines that there is a slack rope condition requiring re-spooling of the rope, this paragraph requires that before starting the lift, it must be verified that the rope is seated on the drum and in the sheaves as the slack is removed. This will prevent a loose coil of rope from becoming cross-coiled on the drum, a portion of the rope coming off the drum altogether, or the rope being pulled alongside (instead of seating in) a sheave. Each of these conditions can lead to sudden failure of the rope. No comments were submitted on this paragraph; therefore it is promulgated as proposed.

Paragraph (n)

This paragraph requires the competent person to adjust the equipment and/or operations to addresses the hazards posed by wind, ice and snow on equipment capacity

and stability. In the proposed rule, the person would have been required to "consider the effect" of those elements, but OSHA is clarifying in the final rule that the competent person must actually take steps such as re-calculating a lower load capacity, stabilizing the equipment, or even postponing a lift. Wind can reduce capacity by imposing loads on the equipment, which can also reduce stability. Ice and snow can also reduce capacity and stability when it accumulates on the equipment. There are numerous variables involved in determining the effects of wind, ice and snow in any particular circumstance, (for example, the extent to which the crane is operating below its rated capacity, the sail effect presented by the load, the rate at which ice or snow is accumulating, and whether the snow is wet or light). No comments were submitted on this paragraph; therefore it is promulgated as proposed with the one change noted above.

Paragraph (o) Compliance with rated capacity

Section 1926.1417(o)(1) requires employers to ensure that equipment is not operated beyond its rated capacity. Overloading a crane or derrick can cause it to collapse, with potentially catastrophic consequences. This basic safeguard has long been recognized in the industry as crucial and is designed to prevent such accidents. (See additional discussion at 73 FR 59792, Oct. 9, 2008).

Section 1926.1417(o)(2) requires employers to ensure that operators are not required to operate the equipment in a manner that would exceed its rated capacity, in violation of § 1926.1417(o)(1) above. This provision reinforces the general prohibition of § 1926.1417(o)(1) by making it a separate violation for an employer to expressly require an operator to exceed the equipment's rated capacity. It is designed to avoid a

situation where an employer pressures an operator to conduct a lift that exceeds the equipment's rated capacity to avoid the time and expense associated with bringing in larger capacity equipment.[86]

In the experience of C-DAC members, employers sometimes will attempt to lift loads that exceed a crane's rated capacity in the belief that the rated capacity is sufficiently conservative to perform the lift. In some such cases, the employer assumes that a safety factor is built into the capacity rating and that the crane actually has a higher capacity than its rating. In the C-DAC discussions of this issue, members explained that while equipment capacity ratings are developed with consideration of a safety factor, that safety factor is not intended by the manufacturer to be treated as excess capacity. There are numerous, complex considerations used by manufacturers in setting the capacity rating. Employers cannot safely assume that, in any particular situation, they will not need the benefits conferred by the safety factor.

There continue to be a significant number of injuries and fatalities resulting from equipment overturning. Although it has long been a requirement not to exceed the equipment's rated capacity, a significant number of overturning incidents are caused by exceeding rated capacity. A study of fatal accidents involving cranes in the U.S. construction industry for 1984-1994, based on investigations of reported accidents conducted by OSHA and states with OSHA-approved safety and health programs, showed that 22 deaths resulted from overloaded cranes. A. Suruda, M. Egger, & D. Liu, "Crane-Related Deaths in the U.S. Construction Industry, 1984-94," p. 12, Table 9, The

[86] In some instances the overcapacity problem can be avoided by repositioning the crane (for example, by moving the crane so that the lift can be performed at a higher boom angle). However, even in those instances some time (and associated expense) is involved.

Center to Protect Workers' Rights (Oct. 1997). (ID -0013.) By stressing the need both to comply with the rated capacity and to separately preclude employers from requiring operators to exceed the rated capacity, paragraphs (o)(1) and (o)(2) should prevent this type of accident. No comments were received on these paragraphs, and they are promulgated as proposed.

Another cause of injuries and fatalities from overturning equipment is the use of unreliable information on load weight. OSHA concludes that one of the ways these incidents can be reduced is to require that load weight be verified by a reliable means.

Under § 1926.1417(o)(3), Load weight, the operator is required to verify that the load is within the rated capacity of the equipment by using the procedures in either § 1926.1417(o)(3)(i) or (ii). Under § 1926.1417(o)(3)(i), the weight of the load must be determined in one of three ways: from a source recognized by the industry, by a calculation method recognized by the industry, or by other equally reliable means. An example of verifying the load weight from a source recognized by the industry would be where the load is mechanical equipment and the weight is obtained from its manufacturer. The proposed rule had provided for the weight of the load to be based on a "reliable source." To avoid the potentially subjective interpretations of "reliable," OSHA is instead requiring in the final rule that the measurements be from a source typically relied on in the industry.

An example of a calculation method recognized by the industry would be the following: The load is a steel I-beam. After measuring the thickness of the steel and the I-beam's other dimensions, the operator uses an industry table that shows weight per linear foot for a beam of these dimensions. The operator then calculates the beam's

weight using that information. In the proposed rule calculations would be based on a "reliable source." To avoid the potentially subjective interpretations of "reliable," OSHA is instead requiring in the final rule that the calculations be based on a source typically relied on in the industry.

If the weight of the load is determined under § 1926.1417(o)(3)(i), the information about how the load weight was determined must be provided to the operator, prior to the lift, upon the operator's request. This provision is included to help ensure that the operator has the information necessary to verify that the load is within the rated capacity of the equipment.

One commenter suggested that this section be amended to specifically include as a reliable source the personal experience of the operator with loads of similar size and materials. (ID -0232.1.) OSHA rejects that suggestion because it is not convinced by any evidence in the record that all operators, regardless of whether the operator is experienced or has been on the job for a few weeks, are capable of producing an accurate, reliable estimate of the load weights.. For example, an operator may have recently lifted precast concrete sections that, based on date provided by the manufacturer, weighed 5 tons each. The operator may be called upon to lift other precast concrete sections of unknown weight that are actually 10% heavier than those lifted earlier. It is unlikely that the heavier sections would be significantly different in appearance than those that weigh 10% less, and the operator may mistakenly underestimate the weight of the sections if permitted to estimate load weight based on his or her personal experience with loads of similar size.

Paragraph (o)(3)(ii) establishes an alternative procedure that does not require the employer to determine the actual weight of the load under certain circumstances. Under paragraph (o)(3)(ii), the operator would have to begin hoisting the load to determine if it exceeds 75 percent of the maximum rated capacity at the longest radius that will be used during the lift operation, using a load weighing device, load moment indicator, rated capacity indicator, or rated capacity limiter. If the load does not exceed 75 percent of the maximum rated capacity, the lift can be conducted without determining the weight of the load. This verification procedure[87] incorporates a sufficient margin of error and would be adequate to ensure that the crane's rated capacity will not be exceeded. If, however, the load does exceed 75 percent of the maximum rated capacity, then the operator may not proceed with the lift until he/she verifies the weight of the load in accordance with § 1926.1417(o)(3)(i). No comments were received on this paragraph, and it is promulgated without change from the proposed rule.

Paragraph (p)

This paragraph requires that the boom or other parts of the equipment not contact any obstruction. No comments were submitted on this paragraph, and it is promulgated as proposed.

[87] The operator would still be required to use his or her professional judgment in determining whether the load exceeds the capacity of the equipment. As discussed above, proposed § 1926.1417 (k) would prohibit sole reliance by the operator on an operational aid, such as a load weight device, for ensuring that the equipment's capacity will not be exceeded. The procedure in proposed § 1926.1417(o)(3)(ii) is a verification procedure – it would verify that the operator's estimate is at least correct in terms of not exceeding 75% of the equipment's rated capacity (at the longest radius that will be used). If, for example, the load weight device yields a figure that is significantly below what the operator estimates to be the true weight, the operator would need to reliably determine the weight of the load before proceeding with the lift.

Paragraph (q)

This paragraph requires that the equipment not be used to drag or pull loads sideways. This is to prevent the sideloading that occurs when a load is dragged or pulled sideways. Sideloading can buckle the boom, damage the swing mechanism, or overturn the crane (such as when the boom is at a high angle). No comments were submitted on this paragraph, and it is promulgated as proposed.

Paragraph (r)

Paragraph (r) of this section applies to wheel-mounted equipment and requires that no loads be lifted over the front area, except as permitted by the manufacturer. Wheel-mounted equipment typically is not designed to lift loads over the front area. Equipment that is not so designed will likely tip over or otherwise fail when lifting loads over the front area. If the equipment is specifically designed for loads to be lifted over the front area (such as where equipped with a front outrigger for support and stabilization for this purpose), the operator must follow the manufacturer's procedures for doing so. No comments were submitted on this paragraph; it is therefore promulgated as proposed.

Paragraph (s)

Each time an operator handles a load that is 90% or more of the maximum line pull, § 1926.1417(s) requires the operator to test the brakes by lifting the load a few inches and applying the brakes. In duty cycle and repetitive lifts where each lift is 90% or more of the maximum line pull, this requirement applies to the first but not to

successive lifts, because the operator would have already determined from the initial test that the brakes are sufficient. The brake test required by this paragraph is designed to ensure that the brakes are sufficient to handle loads close to their design capacity before lifting the load high off the ground. No comments were submitted on this paragraph, and it is promulgated as proposed.

Paragraph (t)

This paragraph requires that neither the load nor the boom be lowered below the point where less than two full wraps of rope remain on their respective drums. This provision is designed to ensure that the rope is not unspooled to the point where the rope would become disconnected from the drum. No comments were submitted on this provision, and it is promulgated as proposed.

Paragraph (u) Traveling with a load

Paragraph (u)(1) of this section prohibits traveling with a load if the practice is prohibited by the manufacturer. If the manufacturer does not prohibit this practice, the equipment may travel with a load, but only if the requirements of paragraph (u)(2) are met. Paragraph (u)(2) of this section sets forth three procedures that employers would have to follow when traveling with a load: a competent person must supervise the operation; the determinations of the competent person must be implemented; and for equipment with tires, the tire pressure specified by the manufacturer must be maintained.

During discussions of this issue, C-DAC members noted the dynamic effects of traveling with a load impose additional and/or increased forces on crane components.

Unless the crane has been designed to handle these types of forces and force levels, they can cause component failure, collapse, instability or overturning. The Committee concluded that the manufacturer has the expertise to ascertain its equipment's capabilities. Therefore, the Committee recommended that where the manufacturer has prohibited traveling with the load, the operator must comply with such a determination to ensure safety. (For additional explanation, see 73 FR 59794, Oct. 9, 2008.) No comments were submitted on these provisions and they are promulgated as proposed.

Paragraph (v)

This paragraph requires that rotational speed of the equipment be such that the load does not swing out beyond the radius at which it can be controlled. Like paragraph (q) of this section, discussed above, this provision is designed to prevent the hazard of sideloading, which occurs when the load swings to either side of the boom tip, rather than its appropriate position directly beneath the boom tip. When the load is not directly under the boom tip, sideloading occurs and decreases capacity. This hazard can lead to tip-over or boom failure. No comments were submitted on this paragraph, and it is promulgated as proposed.

Paragraph (w)

This paragraph requires that a tag or restraint line be used if necessary to prevent the load from rotating if that would be hazardous. No comments were submitted on this paragraph, and it is promulgated as proposed.

Paragraph (x)

This paragraph requires that the brakes be adjusted in accordance with manufacturer procedures to prevent unintended movement. This requirement applies to all brakes on equipment covered by this standard, including brakes used to control the lowering of the load and those used to stop the equipment while it is traveling. C-DAC noted that improper adjustment can cause a delay in the onset of braking after the operator attempts to activate the brake and can also diminish the brake's capacity. Brakes are critical to the safe operation of the equipment and must be properly adjusted to serve their safety function. (See additional explanation at 73 FR 59795, Oct. 9, 2008.) No comments were submitted on this paragraph; it is promulgated as proposed.

Paragraph (y)

This paragraph requires that the operator obey a stop or emergency stop signal, regardless of who gives the signal. Any person on a worksite may observe a hazardous condition that is not visible to or recognized by the crane operator and that can only be avoided if the equipment stops immediately, so it is imperative that the operator respond immediately to any such signal by anyone. No comments were submitted on this paragraph; it is promulgated as proposed.

Paragraph (z) Swinging locomotive cranes

Pursuant to this paragraph, a locomotive crane must not be swung into a position where railway cars on an adjacent track could strike it, until it is determined that cars are not being moved on the adjacent track and that proper flag protection has been

established. The Agency is including this paragraph to prevent contact between the locomotive cranes and railway cars, and notes comparable requirements in § 1910.180(i)(6) and sec. 5–3.4.4 of ANSI B30.5-1968. No comments were submitted on this paragraph, and it is promulgated with only one modification. The proposed rule incorporated an additional determination of whether it would be "reasonably foreseeable" that other railway cars on an adjacent track could strike the locomotive crane. OSHA concludes that when a locomotive crane swings into a position where it is physically possible for a railway car on an adjacent track to strike it, a hazard is present and the additional language would serve only to generate confusion about the appropriate response to that hazard. The concepts of reasonableness and forseeability are typically raised during legal processes and would be factored into those processes in accordance with law.

Paragraph (aa) Counterweight/ballast

Section 1926.1417(aa)(1) contains counterweight/ballast requirements that apply to equipment other than tower cranes and are intended to prevent unintended movement, tipover, and collapse. As noted in § 1926.1417(aa)(2), requirements regarding counterweight/ballast for tower cranes are found in § 1926.1435(b)(8).

Section 1926.1417(aa)(1)(i) requires that equipment not be operated without the counterweight or ballast in place as specified by the manufacturer.

Section 1926.1417(aa)(1)(ii) prohibits the employer from exceeding the maximum counterweight or ballast specified by the manufacturer for the equipment. Exceeding that maximum could result in component failure, which could cause

unintended movement, tipover or collapse. No comments were submitted on this provision, and it is promulgated as proposed.

Section 1926.1418 Authority to stop operation

This section provides that whenever there is a concern as to safety, the operator has the authority to stop and refuse to handle loads until a qualified person has determined that safety has been assured. Section 1926.1401 defines "qualified person" as a person who, by possession of a recognized degree, certificate, or professional standing, or who by extensive knowledge, training and experience, successfully demonstrated the ability to solve/resolve problems relating to the subject matter, the work, or the project.

Section 1926.1418 continues the long-standing requirements under subpart N and current consensus standards. (See former § 1926.550(b)(2), incorporating by reference ANSI B30.5-1968, sec. 5-3.1.3(d).[88]) As discussed in the proposed rule preamble, a capable equipment operator is highly knowledgeable in matters affecting equipment safety and is well qualified to determine whether an operation presents a safety concern (see 73 FR 59795-59796, Oct. 9, 2008). Under the provision, operations would be prohibited from resuming "until a qualified person had determined that safety has been assured," meaning that operations could resume only after the qualified person either: (1) assesses the factors that led the operator to stop and refuse to handle the load and

[88] Current consensus standards specify that an operator with a safety concern must raise that concern with a supervisor before proceeding with a lift. See sec. 5-3.1.3(d) of ASME B30.5-2004, "Mobile and Locomotive Cranes," sec. 2-3.1.7 of ASME B30.2-2001, "Overhead and Gantry Cranes," sec. 3-3.1.3(d) of ASME B30.3-1996, "Construction Tower Cranes," sec. 6-3.2.3 of ASME B30.6 - 2003, "Derricks," and other standards in the ASME B30 series.

determines that there is not, in fact, a safety hazard, or (2) after corrective action has been taken, determines that there is no longer a safety hazard.

One commenter argued that OSHA lacks the authority to promulgate § 1926.1418.[89] (ID -0232.1.) First, the commenter contended that the provision exceeds the Agency's standards-setting authority under sec. 3(8) of the OSH Act. Second, it expresses concern that § 1926.1418 circumvents the limitations on OSHA's ability to grant employees (i.e., crane operators) stop-work authority. In support of its position, the commenter cited the U.S. Supreme Court opinions in *Industrial Union Dep't, AFL-CIO v. American Petroleum Institute*[90] and *Whirlpool Corp. v. Marshall*[91].

OSHA disagrees with the commenter's contention that OSHA lacks the authority to promulgate § 1926.1418. Under sec. 3(8) of the OSH Act and applicable case law,[92] the Agency has broad authority to promulgate standards that are reasonably necessary or appropriate to provide safe or healthful places of employment. In *Whirlpool Corp.*, the U.S. Supreme Court stated that the Act "does not wait for an employee to die or become injured."[93] Section 1926.1418 is an essential mechanism for preventing fatalities and injuries. It enables the person who has the expertise to recognize a safety concern and is best positioned to act quickly to do so where such a concern arises.[94]

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[89] The commenter nominated a C-DAC member who did not dissent on this section of the standard. The commenter has not explained why it has changed its position from the one taken by their C-DAC member during negotiations. In light of the unexplained inconsistency of its position, the Agency accords diminished weight to the commenter's comment and is hesitant to rely on it to undermine the product of the negotiation.
[90] 448 U.S. 607 (1980).
[91] 445 U.S. 1 (1980).
[92] E.g., *Indus. Union Dep't, AFL-CIO*, 448 U.S. at 611–12.
[93] 445 U.S. at 12.
[94] As stated above, current consensus standards manifest the industry's recognition of the necessity for a crane operator to have such authority. In concert with § 1926.1400(f), §

OSHA also disagrees with the commenter's contention that § 1926.1418 impermissibly grants stop-work authority, as well as a different commenter who asserted that the wording of the provision is too vague and could lead to an abuse of the operator's authority. Both commenters suggested that OSHA limit the operator's authority to specific reasons involving a potential violation of a requirement in subpart CC. (ID -0218.1; 0232.1.)

The provision does not authorize an operator to stop operations for reasons unrelated to a good faith belief that there may be a safety problem. In this respect the provision is similar to other provisions in the standard (and elsewhere in 29 CFR part 1926) in which an employer is required to have a person in a specialized role perform specific tasks involving the application of expertise (e.g., competent and qualified persons performing inspections under § 1926.1412). In each case compliance with the standard is predicated on the good faith application of that expertise.[95]

C-DAC thoroughly discussed the wording of this provision, mindful of the need for both clarity and sufficient flexibility to enable the operator to address myriad circumstances. The Committee's wording strikes an appropriate balance. The word "concern" refers to a good faith belief that safety may be in jeopardy. The word "assured" means that the qualified person has assessed whatever triggered the crane operator's belief that there was a concern as to safety and either: (1) determines that

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1926.1418 requires the employer to authorize its crane operator to halt operations upon a safety concern until a qualified person determines that safety has been assured.

[95] Two organizations that nominated C-DAC members reminded the Agency in their comments that OSHA had committed during the C-DAC negotiations to include a discussion in the preamble regarding this principle of good faith. (ID -0205.1; -213.1.) The Agency believes that the foregoing paragraph satisfies that agreement.

there is not, in fact, a safety hazard, or (2) after corrective action is taken, determines that there is no longer a safety hazard.

OSHA disagrees with the commenter's suggestion to link the authority to a violation of subpart CC. While C-DAC and the Agency have made every effort to address the hazards associated with crane and derrick operation, there may be circumstances that present hazards that have not been anticipated here.

In addition, a particular situation may not be immediately recognized as falling within one of subpart CC's provisions. An operator's uncertainty in that regard could lead him/her to hesitate to exercise the authority even where it needs to be applied. Also, the determination by a qualified person to proceed with operations needs to be based on whether safety is assured, not on the resolution of a debate about whether the operator's concern fits within a provision of this standard.

Another commenter expressed the following concerns: "qualified person" should be better defined; the qualified person would feel undue pressure from the controlling entity or crane employer to find that safety had been assured, and that the qualified person's scope of responsibility once operations resume is unclear. (ID -0218.1.)

As explained in the preamble to the proposed rule, the definition of "qualified person" in § 1926.1401 corresponds to the definition of "qualified" in § 1926.32(m) and reflects the fact that the duties assigned to "qualified persons" here are similar to those assigned under other construction standards. The Committee intentionally used the same definition to make it clear that employers could rely on their current understanding of "qualified person." OSHA sees no reason to deviate from that definition where the

commenter did not explain how it viewed the definition as vague or provide alternative language.

With respect to the issue of undue pressure on the qualified person, C-DAC shared the commenter's concern; the Committee identified pressure placed by some employers on operators to proceed with unsafe lifts as a significant problem in the industry. This led C-DAC, for example, to include the specific prohibition in § 1926.1417(o)(2) against requiring an operator to operate the equipment in excess of its rated capacity (see the discussion of § 1926.1417(o)(2) in 73 FR 59792-59793, Oct. 9, 2008). The commenter did not suggest, and OSHA is not aware of, any additional measures that could be included in the standard to help prevent the application of that type of pressure.

As to the commenter's final point, after a crane operator stops and refuses to proceed with operations due to a concern as to safety, the qualified person would then assess the situation and determine whether or when safety has been assured. At that point, the qualified person's responsibilities under § 1926.1418 would be completed unless and until the crane operator identifies another concern as to safety. The Agency, therefore, is promulgating this provision as proposed.

Sections 1926.1419 through 1926.1422 Signals

Sections 1926.1419 through 1926.1422 address the circumstances under which a signal person must be provided, the type of signals that to be used, criteria for how signals are transmitted, and other criteria associated with the use of signals.

OSHA has decided to replace the term "lift supervisor" with the term "lift director" in §§ 1926.1419(c)(2), 1926.1421(a), and 1926.1421(c). This decision was made to be consistent with the similar change from "A/D supervisor" to "A/D director" in § 1926.1404(a). For an explanation of the change, see the discussion of § 1926.1404(a).

Section 1926.1419 Signals – General requirements

This section sets requirements regarding signals when using equipment covered by this standard. C-DAC determined that addressing these issues is one of the means by which the number of injuries and fatalities caused by "struck-by" incidents, in which the equipment or load strikes an employee, can be reduced.

Paragraph (a)

Paragraphs (a)(1) through (a)(3) of this section address the circumstances that require the use of a signal person: (1) when the point of operation, meaning the load travel path or the area near or at load placement, is not in full view of the operator (§ 1926.1419(a)(1)); (2) when the equipment is traveling and the operator's view in the direction of travel is obstructed (§ 1926.1419(a)(2)); and (3) when, due to site specific safety concerns, either the operator or the person handling the load determines it is necessary (§ 1926.1419(a)(3)). The first two of these circumstances involve an obvious hazard – limited operator visibility. With respect to the third circumstance, C-DAC determined that other situations arise that, from a safety standpoint, necessitate the use of a signal person (see examples in the preamble to the proposed rule at 73 FR 59796, Oct. 9, 2008).

One commenter, representing the interests of the material delivery industry, suggested that § 1926.1419(a) be changed to specify that, if a signal person is needed at the site due to the obstructed view of the operator when delivering building materials, then the construction site customer (not the material delivery employer) would be responsible for providing the signal person. (ID -0184.1.) OSHA concludes that the question of whether the material delivery employer or the construction site customer should bear the cost of providing the signal person when required is an economic issue that is most appropriately left to the parties to resolve.

During the public hearing, a labor representative stated that his organization believes that a signal person is always necessary when working with cranes. (ID -0343.) Two commenters representing the materials delivery industry disagreed (ID -0184.1; -0218.1.)

OSHA has decided to defer to the expertise of the Committee, which found that a signal person should only be required in the three circumstances listed in § 1926.1419(a). Moreover, OSHA notes the requirement in § 1926.1419(a)(3), which provides that a signal person must be provided if the crane operator or person handling the load determines a signal person is necessary due to site specific safety concerns. This provision, in particular, ensures that a signal person will be required when necessary.

One commenter asked for clarification on the meaning of "full view of the operator" in § 1926.1419(a)(1). (ID -292.1.) In particular, the commenter asked whether mirror or camera systems would meet this requirement. Another commenter suggested adding language allowing the use of boom mounted video cameras for blind lifts. (ID -0120.0.)

A live video system that provides a full view to the crane operator – i.e., provides a sufficiently broad, clear and detailed view to enable the operator to see all that is needed to operate the equipment safely – would meet the "full view of the operator" requirement. Mirrors, on the other hand, typically distort images or distances and thus would not normally be sufficient to provide a "full view."

The sufficiency of any system will depend on the particular needs posed by each situation. For this reason, OSHA has decided to rely on C-DAC's clear and succinct phrase, "full view of the operator," rather than to attempt to further define that concept or to list acceptable devices in the regulatory text.

Paragraph (b) Types of signals

As explained in the proposed rule preamble, under paragraph (b) of this section, signals to crane operators would have to be by hand, voice, audible, or "new" signals (see 73 FR 59796-59797, Oct. 9, 2008). As used in this standard, these terms refer to the type of signal, not the means by which the signal is transmitted. For example, signaling by voice refers to oral communication, not whether the oral communication is done with or without amplification or with or without electronic transmission. The manner of transmission of the signal is addressed separately. No comments were received on this paragraph; it is promulgated as proposed.

he criteria for the use of these signal types are set out in §§ 1926.1419(c)-(m) (additional voice signal requirements are in § 1926.1421, *Signals – voice signals – additional requirements*). The Committee's intent was to reduce the potential for miscommunication, which can lead to injuries and fatalities, particularly from "struck-

by" and "crushed-by" incidents. In setting parameters for the use of the various types of existing signal methods, and for signal methods that may be developed in the future, the Committee sought to promote a degree of standardization while still allowing appropriate flexibility. In addition, the provisions are designed to ensure that the selection of signal type and means of sending the signals are appropriate under the circumstances and reliable.

Paragraph (c) Hand signals

Paragraph (c) of this section addresses the use of hand signals. The industry has long recognized the need for consistent, universal hand signals to minimize the potential for miscommunication between signal persons and operators. ANSI B30.5-1968, "Crawler, Locomotive and Truck Cranes," contains illustrations of hand signals that are the same as the current 2004 edition of ASME B30.5 and that are consistent with hand signals for other types of cranes in ASME B30 standards. The same hand signals have been expressed in similar charts published by a variety of other groups. (See, e.g., Construction Safety Association of Ontario, MIOSHA, MSHA.)

Because of the industry's long familiarity with these standard hand signals, C-DAC determined that, when using hand signals, the standardized version of the signals should continue to be required. These signals, which are located in Appendix A, are referred to as the "Standard Method," and this term is defined in § 1926.1401 as "the protocol in Appendix A for hand signals." However, the Committee recognized that there are instances when use of the Standard Method is either infeasible or where there is no Standard Method signal applicable to the work being done.

In such instances, under this paragraph, non-standard signals may be used. To avoid confusion when non-standard signals are used, proposed § 1926.1419(c)(2) requires that the signal person, crane operator, and lift director (where there is one) meet prior to the operation to agree upon the signals that will be used.

At the public hearing, one witness commented that the use of non-standard hand signals should not be allowed because it would unnecessarily confuse contractors and utility workers, and because standard signals are already used in the industry. (ID - 345.17.) OSHA defers to the expertise of the Committee, which found that a non-standard signal may be needed on occasion (see 73 FR 59797, Oct. 9, 2008, in which the Agency described examples of such situations). Additionally, it should be noted that § 1926.1419(c) requires the use of Standard Method hand signals and permits an exception only where the Standard Method signals are infeasible or where there is no Standard Method signal for the particular attachment.

One commenter pointed out that there are currently no hand signals specific to articulating cranes and asked which signals OSHA intended to be used with articulating cranes. (ID -0206.1.) The record contains no information on the extent to which hand signals for articulating cranes may differ from those used for other cranes. If the use of Standard Method hand signals is either infeasible for articulating cranes, or if the use or operation of an attachment is not covered by the Standard Method, then the exception in § 1926.1419(c)(1) and the requirements for non-standard hand signals in § 1926.1419(c)(2) would apply.

OSHA is only making two changes, neither of which is substantive, from § 1926.1419(c) as proposed. The first is a grammatical correction, and the second merely

removes the superfluous direction that "[t]he following requirements apply to the use of non-standard hand signals," which is already clear from the text of § 1926.1419(c)(2).

Paragraph (d) New signals

Paragraph (d) of this section allows signals other than hand, voice, or audible signals to be used if certain criteria are met. As explained in the discussion of § 1926.1419(b) in the preamble to the proposed rule, C-DAC included § 1926.1419(d) to allow for the development of new signals in the future (see 73 FR 59796-59797, Oct. 9, 2008). To ensure that any new signals developed by a particular employer are as effective as hand, voice, or audible signals, §§ 1926.1419(d)(1) and (d)(2) require the employer to demonstrate that the new signals are as effective as existing signals for communicating. Alternatively, an employer may use signals that comply with a national consensus standard.[96] OSHA decided to change the language of paragraph (d)(2) to clarify that an employer's signals must comply with the national consensus standard signals. C-DAC determined it was appropriate to allow reliance on signals in a national consensus standard because their inclusion in such a standard shows a high degree of standardization and widespread acceptance by persons who are affected by the signals, thereby ensuring that the signals can be used safely to control equipment operations and preventing the "on the fly" development of signals cited as dangerous by the commenter. (ID -0110.1.)

[96] The C-DAC draft refers to an "industry consensus standard." OSHA has changed this to "national consensus standard" to conform to the terminology used in the OSH Act. See definition in sec. 3(9) of the Act.

Paragraph (e) Suitability

Under paragraph (e) of this section, the type of signal (hand, voice, audible, or new) and the transmission method used must be suitable for the site conditions. For example, hand signals would not be suitable if site conditions do not allow for the signal person to be within the operator's line of sight. Radio signals would not be suitable if electronic interference on the site prohibits the signals from being readily understood.

One commenter requested that the determination of which type and means of signaling is appropriate for the site conditions be made by the crane operator or other qualified person. (ID -0172.1.)

The Agency concludes that this is a straight-forward determination that does not require the specialized expertise of a qualified person. Also, the crane operator will typically be involved in this determination, since there are several requirements relating to effective communication that, as a practical matter, will typically involve input from the operator (see, for example, §§ 1926.1419(f), 1926.1420(a), and 1926.1421(c)).

Paragraph (f)

Paragraph (f) of this section requires the ability to transmit signals between the operator and signal person to be maintained. If that ability is interrupted, the operator is required to safely stop operations until signal transmission is reestablished and a proper signal is given and understood. No comments were received on this provision; it is included in the final rule without change.

Paragraph (g)

As explained in the preamble to the proposed rule, paragraph (g) of this section requires the operator to stop operations if the operator becomes aware of a safety problem and needs to communicate with the signal person (see 73 FR 59797, Oct. 9, 2008). Operations may only be resumed after the operator and signal person agree that the problem has been resolved.

No comments were received on this provision; it is included in the final rule without change.

Paragraphs (h) and (j)

Paragraph (h) of this section requires that only one person at a time signal the operator. As explained in the preamble to the proposed rule, C-DAC determined this provision was needed to prevent confusion with respect to which signals the operator is supposed to follow (see 73 FR 59797, Oct. 9, 2008). An exception is provided in § 1926.1419(j) to address situations when somebody becomes aware of a safety problem and gives an emergency stop signal. Under § 1926.1417(y), the operator is required to obey such a signal. No comments were received on either of these provisions; they are included in the final rule without substantive change. OSHA has modified paragraph (h) to clarify that it is a requirement.

Paragraph (i) [*Reserved*.]

Paragraph (k)

As explained in the preamble to the proposed rule, paragraph (k) of this section requires that all directions given to the operator by the signal person be given from the operator's direction perspective, meaning that the signal person must provide the signals as if he or she was sitting in the operator's seat and facing the same direction as the operator (see 73 FR 59797, Oct. 9, 2008). In the Committee's experience, the operator will tend to react to a directional signal, such as "forward," by acting on the signal from the operator's perspective. This provision ensures that the signal that is given will be consistent with that natural tendency. No comments were received on this provision; it is included in the final rule without change.

Paragraph (l) [*Reserved*.]

Paragraph (m) Communication with multiple cranes/derricks

Paragraph (m) of this section addresses a situation where one or more signal person(s) is in communication with more than one crane or derrick (for example, during multiple crane lifts). It requires each signal person to use an effective means of identifying which crane or derrick the signal is for. Sections 1926.1419(m)(i) and (ii) set out alternate means of complying with this requirement. Under § 1926.1419(m)(i), for each signal the signal person must, prior to giving the function/direction, identify the crane/derrick for which the signal is intended. Alternatively, under § 1926.1419(m)(ii), the employer could implement a method of identifying the crane/derrick for which the signal is intended that is as effective as the system in § 1926.1419(m)(i). For example, under § 1926.1419(m)(ii), the signal person could simultaneously identify the crane and

provide the signal. Because of the potential for confusion, it is essential that an alternative system under § 1926.1419(m)(ii) be equally effective as § 1926.1419(m)(i) in clearly conveying, on a consistent basis, the crane/derrick to which each signal is directed. No comments were received on this provision; it is included in the final rule without substantive change. The wording of the paragraph has been modified with several minor grammatical changes.

Section 1926.1420 Signals – radio, telephone, or other electronic transmission of signals

C-DAC concluded that certain criteria are needed to ensure the reliability and clarity of electronically transmitted signals; these criteria are listed in §§ 1926.1420(a) through (c). Paragraph (a) of this section requires the testing of the transmission devices prior to the start of operations to make certain that the signals are clear and that the devices are reliable. This helps ensure that the operator receives, and can understand, the signals that are given, and will prevent accidents caused by miscommunication.

One commenter, remarking that a second or two of delay may still pose a significant safety hazard, suggested that § 1926.1420(b) be amended to read, "Signal transmission must be through a dedicated channel without noticeable delay…." (ID - 0172.1.)

OSHA agrees that a noticeable delay in transmission of an electronic signal could pose a significant hazard and has decided to address this concern by adding the requirement that signal transmission be "effective." To be effective, a transmitted signal must produce or be capable of producing the intended result. In other words, a signal must be transmitted and understood by the crane operator in such a way and within such a

time as would allow the operator to respond to the signal and operate the crane in a safe manner.

Paragraph (b) of this section requires that signals be transmitted through a dedicated channel. As defined in § 1926.1401, a "dedicated channel" is "a line of communication assigned by the employer who controls the communication system to only one signal person and crane/derrick or to a coordinated group of cranes/derricks/signal person(s)." Use of a dedicated channel ensures that the operator and signal person are not interrupted by users performing other tasks or confused or distracted by instructions not intended for them.

An exception to § 1926.1419(b) allows more than one signal person and more than one crane/derrick operator to share a dedicated channel in multiple crane/derrick situations for coordinating operations. The Committee determined, and OSHA agrees, that this exception is needed because, in those situations, it may be advantageous to share a single dedicated channel. For example, in some situations several cranes may be operating in an area in which their booms, loads or load lines could come in contact with each other. In such cases it is crucial that the movements of each crane be properly coordinated. By sharing a single channel, each operator can hear what each crane is being asked to do, which can facilitate that coordination.

Several commenters representing the railroad industry raised concerns about the dedicated channel requirement as it relates to the use of cranes on or adjacent to railroad tracks. (ID -0170.1; -0176.1; -0291.1.) These commenters pointed out that the actions of crane operators often have to be coordinated with other moving equipment (e.g. trains)

and that the use of a dedicated channel in these circumstances would actually be more dangerous.

The commenters' points in this regard are persuasive; OSHA has accordingly added § 1926.1420(b)(2). This allows an exception to the use of a dedicated channel when a crane is being operated on or near railroad tracks and the crane operator must coordinate with the movement of other equipment on or near the railroad tracks.

Paragraph (c) of this section requires that the operator's reception be by a hands-free system. In other words, the operator must not have to depress a button, manipulate a switch, or take any action for the incoming signal to be received. C-DAC determined that this provision is needed because the operator must have both hands free to manipulate the equipment's controls. No comments were received on this provision; it is included in the final rule without change.

Section 1926.1421 Signals – voice signals – additional requirements

C-DAC considered whether the rule should include a standardized set of voice signals. Unlike hand signals, which have become standardized to a large extent within the industry, in the Committee members' experience there is significant variation in the phrases used to convey the same instructions. Consequently, C-DAC was concerned that words or phrases that it might have chosen to be "standard" voice signals could be unfamiliar to many employees in the industry or contrary to common usage in some parts of the country. In light of this, the Committee determined that it would be better to use a different approach to address the problem of miscommunication when using voice

signals. This approach, which establishes criteria for whatever voice signals are used, is set out in §§ 1926.1421(a)-(c).

Under paragraph (a) of this section, prior to beginning operations, the personnel involved with signals – the crane operator, signal person and lift director (if there is one) – are required to meet and agree on the voice signals that will be used. Because of the lack of standardization and the variety of languages that are in use in the construction industry, the Committee concluded that it is essential that the persons who give and/or receive voice signals agree in advance on the signals that will be used to avoid miscommunication. OSHA agrees. Once the parties have met and agreed on the voice signals, another meeting is not required to discuss them unless another worker is added or substituted, there is some confusion about the signals, or a signal needs to be changed.

Section 1926.1421(b) requires that each voice signal contain the following three elements, given in the following order: function (such as hoist, boom, etc.), direction; distance and/or speed; function, stop command. For example: hoist up; 10 feet; hoist stop. As discussed above, the Committee considered it impractical to attempt to standardize the voice signals themselves (that is, to require the use of particular words to represent particular functions, directions or other instructions). However, the Committee concluded that the chance of miscommunication could nonetheless be reduced if certain parameters were established for the type of information and order of information that would be given. OSHA agrees.

Section 1926.1421(c) requires the crane operator, signal person, and lift director (if there is one) to be able to effectively communicate in the language used. Voice signals will not serve their intended purpose if they cannot be understood, or can be

misinterpreted. The inability of these workers to understand each other could lead to accidents that occur when, for example, the crane operator moves a load in a different direction than the signal person intends.

One commenter suggested that uniform verbal signals were necessary to limit the likelihood of miscommunications resulting from language barriers. (ID -0379.1.) Three commenters suggested that OSHA establish uniform verbal signals enhanced by diagrams and pictures. (ID -0110.1; -0115.1; -0178.1.) Two of these commenters suggested that OSHA require these verbal signal charts to be conspicuously posted in the vicinity of the hoisting operations. (ID -0110.1; -0115.1.)

As discussed above, C-DAC considered whether the rule should include a standardized set of voice signals and decided that it would not be practical to do so. It did, however, address the potential for miscommunication by developing the requirements in § 1926.1421(a) (requiring a meeting between the operator, signal person and lift director to determine which verbal signals will be used). Having received no evidence to the contrary, OSHA has decided to defer to the expertise of the Committee, and is promulgating this requirement without substantive change. The word "shall" is replaced with "must" in paragraphs (b) and (c) to remove any doubt that the sentences are imperative commands, rather than descriptive.

Section 1926.1422 Signals – hand signal chart

Section 1926.1422 requires that hand signal charts be posted on the equipment or readily available at the site. OSHA is requiring the charts to be posted to serve as a

reference for operators and signal persons of the mandatory hand signals and thereby help avoid miscommunication.

Three commenters suggested that § 1926.1422 be rewritten to require that the hand signal charts be "conspicuously posted in the vicinity of" the hoisting operations, rather than merely making them "readily available at the site" as proposed. (ID -0110.1; -0115.1; -0178.1.)

Upon further reflection, the Agency acknowledges that the original language (that the hand signal chart could be "readily available at the site") did not afford the same amount of protection afforded by "conspicuously posted in the vicinity of the hoisting operations." For example, a hand signal chart stored in a shop trailer on the other side of the site or obscured from sight by other objects might be "readily available at the site," but it would do little to ensure that the chart would be accessed by employees where it is needed. It is the Agency's intent that employees be able to access the chart quickly. OSHA therefore decided to modify the language of § 1926.1422 to require that signal charts be conspicuously posted in the vicinity of hoisting operations, or on the equipment.

Section 1926.1423 Fall Protection

This section contains provisions designed to protect workers on equipment covered by this subpart from fall hazards. (See § 1926.1431, *Hoisting Personnel*, for fall protection provisions that apply when equipment is used to hoist personnel).

Falls have traditionally been the leading cause of deaths among construction workers. BLS data for 2004 and 2005, the latest years for which complete figures are available, shows 445 fatalities from falls in 2004 (ID -0023) and 394 in 2005 (ID -0024).

In 2004, 20 fatalities resulted from falls from nonmoving vehicles and in 2005, such falls caused 18 deaths. A recent study of crane-related fatalities in the U.S. construction industry found that 2% resulted from falls. J.E. Beavers, J.R. Moore, R. Rinehart, and W.R. Schriver, "Crane-Related Fatalities in the Construction Industry," 132 Journal of Construction Engineering and Management 901 (Sept. 2006). (ID -0012.) Falls from cranes, particularly when the operator is entering or leaving the crane, also cause numerous non-fatal injuries to construction workers. (OSHA-S030-2006-0663-0422.)

As discussed in the preamble to the proposed rule, the Committee determined that safety would be enhanced by addressing the problem of fall hazards associated with cranes and derricks comprehensively and that putting all such requirements in subpart CC would make it easier for employers to readily determine the applicable fall protection requirements (see 73 FR 59799, Oct. 9, 2008). Accordingly, under the final rule, subpart M does not apply to equipment covered by subpart CC except where § 1926.1423 incorporates requirements of subpart M by reference.

In this regard, the Agency has amended subpart M at § 1926.500(a)(2)(ii) to make clear that subpart CC specifies the circumstances in which fall protection must be provided to workers on equipment covered by subpart CC. The Agency has also amended § 1926.500(a)(3) to state that the criteria for fall protection systems required under subpart CC are as set forth in § 1926.1423 of subpart CC. In addition, § 1926.500(a)(4) has been amended to specify that the training requirements in § 1926.503 do not apply to the use of equipment covered by subpart CC. These amendments to § 1926.500 are discussed in the explanation of amendments to subpart M.

Definition of “Fall protection equipment”

“Fall protection equipment” is defined in § 1926.1401, and is limited to guardrail systems, safety net systems, personal fall arrest systems, positioning device systems, and fall restraint systems. One commenter stated that this definition should be changed to that found in ANSI/ASSE Z359.0 – 2007, *Definitions and Nomenclature used for Fall Protection and Fall Arrest*, which defines “fall protection” more broadly to include any equipment, device, or system that either prevents a fall or mitigates the effect of a fall. (ID -0178.1.) However, as OSHA explained in the proposed rule, the proposed definition was chosen to use the same terminology found in other OSHA standards to ensure that employers would be familiar with the terminology (see 73 FR 59799, Oct. 9, 2008). Moreover, OSHA notes that sec. 1.3.1 of ANSI/ASSE Z359.0 – 2007 provides that the scope of that standard does not include the construction industry. Accordingly, OSHA is retaining the proposed definition in the final rule.

Definition of “Positioning device system”

A trade association objected to the lack of definitions for “fall arrest” or “positioning systems.” (ID -0178.1.) OSHA notes that proposed § 1926.1401 did contain a definition for “personal fall arrest system,” and that definition is included in the final rule. OSHA agrees that a definition of “positioning device system” is needed and is adding a definition to § 1926.1401 in the final rule that is the same as the definition found in subpart M.

Paragraph (a) Application

Section 1926.1423(a) specifies which provisions in this section apply to all equipment, including tower cranes (§§ 1926.1423(c)(1), (c)(2), (d), (g), (j) and (k)); which provisions apply to all equipment except tower cranes (§§ 1926.1423(b), (c) (3), (e) and (f)); and which provisions apply only to tower cranes (§§ 1926.1423(c)(4) and (h)).

Paragraph (b) Boom walkways

For the reasons explained in the preamble to the proposed rule, § 1926.1423(b) addresses the hazard of falls from lattice booms by establishing when walkways must be incorporated into lattice booms, and the criteria for such walkways (see 73 FR 59799-59800, Oct. 9, 2008). No comments were received on this paragraph; it is included in the final rule without change.

Paragraph (c) Steps, handholds, ladders, grabrails, guardrails and railings

Section 1926.1423(c) in the final rule specifies criteria for the use and maintenance of steps, handholds, ladders, grabrails, guardrails and railings. The Agency notes that proposed paragraph (c) inadvertently omitted "ladders" from the list of devices in the paragraph's heading. Accordingly, OSHA has revised final paragraph (c) to include the word ladders.

Section 1926.502(b) generally provides criteria for guardrail systems, with some exceptions (see discussion of amendments to § 1926.500). C-DAC concluded, however, that specific criteria for steps, handholds, ladders, grabrails, guardrails and railings were

necessary to address the design characteristics of equipment covered by subpart CC and the particular fall hazards associated with the use of such equipment.

OSHA agrees, and is therefore adding § 1926.1423(c)(1), which states that § 1926.502(b) (guardrail systems) must not apply to equipment covered by subpart CC, to the final rule. It makes clear that the guardrail criteria requirements in § 1926.502(b) for those items do not apply to equipment covered by subpart CC. Instead, §§ 1926.1423(c)(2), (3), and (4), discussed below, provide the applicable criteria for such equipment. Because of the addition of paragraph (c)(1), which was not in the proposed rule, paragraphs (c)(2), (3), and (4) have been renumbered from the proposal, where they were paragraphs (c)(1), (2), and (3).

Paragraph (c)(2) of this section requires that the employer maintain in good condition originally-equipped steps, handholds, ladders and guardrails/railings/grabrails.[97] The failure to properly maintain such devices could pose dangers to the workers who use them. For example, a grabrail would not be maintained in good condition if it has become weakened from rust. A weakened guardrail could fail when an employee uses it, which could cause the employee to fall. Likewise, a railing would not be maintained in good condition if all or part of the railing is missing. A manufacturer that integrated a railing into its boom design may have relied on the presence of the railing and provided a walking surface that would otherwise be too narrow to be safe.

Paragraphs (c)(3) and (c)(4) of this section require that equipment manufactured more than one year after the effective date of this standard be equipped to provide safe

[97] OSHA has changed the location of the words "in good condition" in § 1926.1423(b) to make it clear that it applies to maintenance of all of the listed items.

access and egress on equipment covered by this subpart by the provision of devices such as steps, handholds, ladders, and guardrails/railings/grabrails. Tower cranes must be equipped to provide safe access and egress between the ground and the cab, machinery platforms, and tower (mast) (see below discussion of paragraph (c)(4)). All other equipment covered by this subpart must be equipped to provide safe access and egress between the ground and the operator work station(s), including the forward and rear operator positions. As discussed below, §§ 1926.1423(c)(3)(i) and 1926.1423(c)(4)(i) require the steps, handholds, ladders and guardrails/railings/grabrails used to comply with this section to meet updated design criteria.

Prior to this final rule, former § 1926.550(a)(13)(i) in subpart N required that guardrails, handholds, and steps be provided on cranes for easy access to the car and cab and specified that these devices conform to ANSI B30.5. The 1968 version of ANSI B30.5, which was in effect at the time subpart N was issued, specifies that the construction of these devices must conform to the 1946 U.S. Safety Appliance Standard. C-DAC recognized that many pieces of equipment now in use would have been manufactured with handholds and steps but was concerned that the handholds and steps may have been designed to meet outdated criteria.

The Committee determined, and OSHA agrees, that it would be unduly burdensome to require all equipment to be retrofitted with new steps, handholds, and railings simply because the existing design may vary from what is required under the final rule. Accordingly, § 1926.1423(c)(3) only applies to equipment manufactured more than one year after the effective date of this standard. This gives equipment

manufacturers adequate time to incorporate the requirements of § 1926.1423(c)(3)(i) into their new products.[98]

Paragraph (c)(3)(i) requires that steps, handholds, ladders and guardrails/railings/grabrails meet the criteria of SAE J185 (May 2003) or ISO 11660-2:1994(E). As explained above in the discussion of amendments to subpart X, OSHA amended subpart X to clarify that subpart X does not apply to integral components of equipment covered by subpart CC. The specifications in SAE J185 (May 2003) are referenced in other industry consensus standards, such as ASME B30.5-2004, "Mobile and Locomotive Cranes" and ASME B30.3-2004, "Construction Tower Cranes," and crane manufacturers are familiar with those requirements. Section 1926.1423(c)(3)(i) alternatively allows compliance with ISO 11660-2 because those provisions are sufficiently protective and employers also use equipment built by foreign manufacturers who have been following that standard.

OSHA notes that proposed § 1926.1423(c)(2)(i)[99] inadvertently omitted handholds from the listed devices that must meet the criteria of SAE J185 (May 2003) or ISO 11660-2:1994(E). Accordingly, OSHA has added handholds to the final rule in § 1926.1423(c)(3)(i). Additionally, OSHA has replaced the word "requirements" in proposed § 1926.1423(c)(2)(i) with "criteria" in the final § 1926.1423(c)(3)(i). The Agency determines this change clarifies that the listed devices must comply with the design criteria contained in the referenced standards and that, for the purposes of § 1926.1423(c)(3)(i), other provisions in the referenced standards do not apply. To

[98] OSHA had added the word "devices" in the last sentence of paragraph (c)(3) for grammatical clarity.
[99] Proposed § 1926.1423(c)(2)(i) corresponds with § 1926.1423(c)(3)(i) in the final rule.

illustrate, both SAE J185 (May 2003) and ISO 11660-2:1994(E) contain provisions relating to the scope of those standards. However, § 1926.1400 sets forth the scope of equipment covered by subpart CC (see discussion above of § 1926.1400, *Scope*). Consequently, § 1926.1423(c)(3)(i) requires that steps, handholds, ladders, and guardrails/railings/grabrails on equipment covered by subpart CC (other than tower cranes) meet the criteria for such devices in SAE J185 (May 2003) or ISO 11660-2:1994(E), irrespective of the scope provisions in those consensus standards.

Paragraph (c)(3)(ii) of this section requires that walking/stepping surfaces, except for crawler treads, have slip-resistant features/properties (such as diamond plate metal, strategically placed grip tape, expanded metal, or slip-resistant paint). Former § 1926.550(a)(13)(iii) of subpart N required platforms and walkways to have anti-skid surfaces. C-DAC recommended that OSHA retain this requirement as a complement to the use of guardrails, handholds, grabrails, ladders and other engineered safety features that are required by new § 1926.1423. OSHA concludes that compliance with this provision will minimize the number of slips and falls for employees who must travel point to point to access the operator workstations on equipment covered by this section.

Paragraph (c)(4) of this section applies to fall protection on tower cranes. For the same reasons explained above with respect to § 1926.1423(c)(3), § 1926.1423(c)(4) likewise only applies to tower cranes manufactured more than one year after the effective date of this standard. Such equipment must be equipped so as to provide safe access and egress between the ground and the cab, machinery platforms, and tower (mast), by the provision of devices such as steps, handholds, ladders, and guardrails/railings/grabrails. In the preamble to the proposed rule, OSHA stated the Agency's intent to include a

requirement to provide safe access and egress on tower cranes, similar to the requirement in final paragraph (c)(3) to provide safe access and egress on other equipment covered by subpart CC, and requested public comment on the issue (73 FR 59800, Oct. 9, 2008).

Three commenters responded, all stating that the final rule should include the requirement to provide safe access and egress on tower cranes. (ID -0182.1; -0205.1; -0213.1.) Accordingly, OSHA has added paragraph (c)(4) to the final rule.

Paragraph (c)(4)(i) of this section requires steps, handholds, ladders, and guardrails/railings/grabrails on these tower cranes to meet the criteria of ISO 11660-1:2008(E) and ISO 11660-3:2008(E), or SAE J185 (May 2003), except where infeasible. For the same reasoning discussed above with respect to § 1926.1423(c)(3)(i), paragraph (c)(4)(i) allows employers to use equipment designed to the specifications of SAE J185 (May 2003) or, alternatively, ISO 11660-1:2008(E) and ISO 11660-3:2008(E).

The Agency notes that ISO 11660-1:2008(E) provides criteria applicable to cranes in general while ISO 11660-3:2008(E) provides criteria particular to tower cranes. The Agency reads the particular criteria in ISO 11660-3:2008(E) as supplementing the general criteria in ISO 11660-1:2008(E).[100] Therefore, paragraph (c)(4)(i) would only be satisfied under this alternative if the steps, handholds, ladders and guardrails/railings/grabrails on the tower crane meet the criteria in both ISO 11660-1:2008(E) and ISO 11660-3:2008(E).

Paragraph (c)(4)(ii) of this section requires walking/stepping surfaces on tower cranes to have slip-resistant features/properties, such as diamond plate metal, strategically

[100] The Agency notes that the approach for the 2008 editions of ISO 11660-1 and ISO 11660-3 appears to differ from that of the ISO 11660-2:1994(E). The Agency interprets ISO 11660-2:1994(E) as addressing steps, handholds, ladders and guardrails/railings/grabrails independent of ISO 11660-1:2008(E).

placed grip tape, expanded metal, or slip-resistant paint. Similar to paragraph (c)(3)(ii) (see above discussion of paragraph (c)(3)(ii)), paragraph (c)(4)(ii) carries forward the anti-skid protections from former § 1926.550(a)(13)(iii).

Paragraph (d) Personal fall arrest and fall restraint systems

Paragraph (d) of this section addresses personal fall arrest systems and fall restraint systems used to satisfy the requirements under subpart CC to provide fall protection.

Paragraph (d) was not in the proposed rule but has been added to the final rule to make clear that certain appropriate requirements of subpart M apply to subpart CC. Paragraph (d) requires the use of personal fall arrest system components in personal fall arrest and fall restraint systems required by subpart CC. These systems must conform to all of the criteria in § 1926.502 of subpart M, except § 1926.502(d)(15). Section 1926.502(d)(15) provides general criteria for anchorages for personal fall arrest systems, but OSHA is choosing to apply the anchorage criteria in § 1926.1423(g)(3) rather than the criteria in § 1925.502(d)(15). This approach is consistent with the approach to requirements for personal fall arrest and fall restraint systems provided in § 1926.760(d)(2) of subpart R, except for the exclusion of § 1926.502(d)(15).

Paragraph (e) Fall protection requirements for non-assembly/disassembly work

Paragraph (e) of this section addresses fall protection requirements for employees engaged in work other than assembly/disassembly work (“non-A/D” work). For such work, in certain circumstances, employers are required to provide and ensure the use of

fall protection equipment for employees who are on a walking/working surface with an unprotected side or edge more than 6 feet above a lower level.

C-DAC discussed different trigger heights for fall protection requirements for particular types of cranes and derricks. Ultimately, C-DAC concluded that the requirements for fall protection should remain consistent with 29 CFR part 1926 subpart M, which generally requires fall protection at heights at and above 6 feet, as much as possible. (As discussed below, for assembly/disassembly (A/D) work, the Committee recommended fall protection beginning at 15 feet.) C-DAC also determined that operators do not need to be tied off while moving to and from their cabs, and paragraph (e)(1) of this section, discussed below, therefore requires fall protection equipment only when employees are moving point-to-point on booms or while at a work station (with certain exceptions). The Committee determined that the steps, handholds, and railings required under § 1926.1423(c) protect operators moving to and from their workstations and eliminate the need for additional fall protection equipment.

Paragraph (e)(1) Non-assembly/disassembly: moving point to point

Paragraph (e)(1)(i) of this section requires employers to provide and ensure the use of fall protection equipment at 6 feet and above when an employee is moving point to point on non-lattice booms (whether horizontal or not horizontal). Moving point to point is defined in § 1926.1401 and refers to when an employee is going to or coming from a work station.

C-DAC determined that non-lattice booms generally present more hazards to workers who must walk them to reach other work areas, devices, and equipment attached

to it than lattice booms. Non-lattice booms are typically of the extensible type. As a result, as members noted, the walking/working surfaces on these types of booms are often oily (from the hydraulic mechanisms). Also, since the boom sections extend and retract, it is typically infeasible to provide boom walkways and other safety features. Because they tend to be slippery from oil, the Committee concluded that they are especially hazardous to move across even when horizontal. Therefore, where an employee is required to move point to point on a non-lattice boom, the Agency decided to remain consistent with the requirements in 29 CFR part 1926 subpart M to require fall protection at heights at or above 6 feet and the final rule requires fall protection when the fall distance is greater than 6 feet.

Paragraph (e)(1)(ii) applies the same fall protection requirements to point to point movement on lattice booms that are not in a horizontal position. The Committee found that in non-A/D work, an employee may, for example, need to move point-to-point on a lattice boom to inspect a part that is suspected to need repair, or to make a repair (such as replacing a broken or missing cotter pin). In many of these situations, the boom will not be horizontal, since space limitations often make it difficult to lower the boom to do this work.

The Committee determined that it is both necessary and feasible for fall protection to be used in such instances. Typically, the fall protection that would be used would consist of a double-lanyard or similar personal fall arrest system. Since the boom in these instances would be elevated, there would usually be a point on the boom above the level of the employee's feet to which the lanyard could be attached.

In contrast, it is uncommon for an employee to need to move point-to-point on a horizontal lattice boom for non-A/D work. If work does need to be done, such as making an inspection or repair as discussed above, the employee would usually get access to their work station with a ladder. In those instances when the employee must traverse the boom itself, the Committee concluded that it would be inappropriate to require fall protection for the reasons discussed below.

The key difficulty in providing fall protection in such instances stems from the lack of a tie-off point above the level of the employee's feet. The Committee discussed that most lattice booms when horizontal would be less than 15 feet above the next lower level. At heights below 15 feet, a personal fall arrest system tied off at the level of the employee's feet, with a lanyard long enough to afford the employee the range of movement necessary for this work, might not prevent the employee from falling to the next lower level.

In construction work the problem of providing personal fall protection in this height range, when there is no higher tie-off point, is usually solved in one of three ways (apart from the use of ladders, scaffolds, aerial lifts, and similar devices). One way is to use a restraint system, which is anchored at a point that prevents the employee from moving past an edge. The Committee discussed that this type of system could not be used while on a boom because the boom is too narrow. Another method is to set up a personal fall arrest system that would arrest the employee's fall before hitting the next lower level by using stanchions to support an elevated, horizontal life-line. However, such stanchions must be securely fastened and whatever they are fastened to must be able

to withstand considerable forces in an arrested fall. On a crane's lattice boom, the stanchions would have to be attached either to the chords or the lacings.

The chords and lacings are engineered to be as light as possible, and an engineering analysis would be needed in each case to determine if the attachment point was sufficiently strong to withstand those forces. Also, the Agency determines that manufacturers would be unlikely to approve clamp-on type systems because of the likelihood of the clamping forces damaging these critical structural components. Similarly, the Agency determines that manufacturers would not approve the repeated weld/removal/re-weld cycles that would be involved in attaching and removing stanchions because this could adversely affect the boom's structural components.

The third method commonly used in construction work is a temporary guardrail system, but that also would require attaching stanchions to the boom, which would be infeasible for these same reasons.

The Committee concluded that, in light of such factors, it would not be appropriate to require fall protection when an employee moves point-to-point on horizontal lattice booms. However, in the preamble to the proposed rule, the Agency noted that, although it may rarely be necessary for an employee moving point-to-point on a horizontal lattice boom to be 15 feet or more above the next lower level, there is the possibility of such an occurrence, such as where a horizontal boom spans a large gap in the ground surface. At such heights a personal fall arrest system tied off at the level of the employee's feet would allow sufficient room for the arrest system to operate without allowing the employee to strike the next lower level. Therefore, the Agency requested

public comment on whether proposed § 1926.1423(d)(1)(ii)[101] should be expanded to require fall protection when an employee, engaged in non-A/D work, is moving point-to-point on a boom that is horizontal and the fall distance is 15 feet or more.

OSHA received three comments on this issue. (ID -0182.1; -0205.1; -0213.1.) These commenters stated that the final rule should require fall protection when an employee, engaged in non-A/D work, is moving point-to-point on a boom that is horizontal and the fall distance is 15 feet or more. Accordingly, the Agency has added paragraph (e)(1)(iii) to the final rule to require fall protection under these circumstances. No comments were received on proposed paragraphs (d)(1)(i) and (ii), and they are included in the final rule without change as paragraphs (e)(1)(i) and (ii).

Paragraph (e)(2) Non-assembly/disassembly: while at a work station

Paragraph (e)(2) of this section requires employers to provide and ensure the use of fall protection while an employee is at a work station on any part of the equipment (including the boom, of any type), except when the employee is at or near draw-works (when the equipment is running), in the cab, or on the deck (see the discussion of this in the preamble of the proposed rule, where this paragraph was denominated as § 1926.1423(d)(2); 73 FR 59802, Oct. 9, 2008). No comments were received on this paragraph; it is included in the final rule without change other than its redesignation.

Paragraph (f) Assembly/disassembly

[101] Proposed § 1926.1423(d)(1)(ii) corresponds with final § 1926.1423(e)(1)(ii).

Paragraph (f) of this section requires the employer to provide and ensure the use of fall protection equipment during assembly and disassembly (A/D) work for employees who are on a walking/working surface with an unprotected side or edge more than 15 feet above a lower level, except when the employee is at or near draw-works (when the equipment is running), in the cab, or on the deck (see the discussion of this in the preamble of the proposed rule, where this paragraph was denominated as § 1926.1423(e); 73 FR 59802, Oct. 9, 2008). No comments were received on this paragraph; it is included in the final rule without change other than its redesignation.

Paragraph (g) Anchorage criteria

Paragraph (g) of this section requires the use of, and specifies criteria for, anchorage points in personal fall arrest systems, positioning device systems, and fall restraint systems.[102] Paragraph (g)(1) provides that §§ 1926.502(d)(15) and 1926.502(e)(2) of subpart M apply to equipment covered by subpart CC only to the extent delineated in paragraph (g)(2). Sections 1926.502(d)(15) and 1926.502(e)(2) provide, respectively, anchorage criteria for personal fall arrest systems and positioning device systems. As discussed below with respect to paragraph (g)(2), C-DAC determined that the particular circumstances associated with the use of personal fall arrest systems and positioning device systems on equipment covered by subpart CC necessitate specific criteria for the anchorages of such systems. Therefore, OSHA added paragraph (g)(1) to

[102] "Personal fall arrest system" and "Positioning device system" are defined in § 1926.1401. These definitions parallel those in § 1926.500(b) of subpart M. "Fall restraint system" is also defined in § 1926.1401. This definition parallels the one in § 1926.751 of subpart R. As with other definitions applicable to this section, C-DAC endeavored, to the extent possible and appropriate, to use terminology that is familiar to the industry.

this section of the final rule to make clear that the general anchorage criteria in § 1926.502 apply to equipment covered by subpart CC only as delineated in paragraph (g)(2), discussed below (see also discussion above of § 1926.500).

Paragraph (g)(2) of this section, *Anchorages for personal fall arrest and positioning device systems*, contains requirements for anchorage points used in personal fall arrest and positioning device systems (this was denominated paragraph (f) in the proposed rule). Sections 1926.1423(g)(2)(i) and 1926.1423(g)(2)(ii) permit personal fall arrest systems and positioning systems to be anchored to any apparently substantial part of the equipment unless a competent person, from a visual inspection, without an engineering analysis, would conclude that the applicable criteria in § 1926.502 of subpart M of this part would not be met. An apparently substantial part of the equipment is a part that would appear substantial to a reasonable competent person. The subpart M criteria include, for personal fall arrest systems, 5,000 pounds per employee or twice the potential impact load of an employee's fall (in addition to other requirements) (§ 1926.502(d)(15)); for a positioning device, 3,000 pounds or twice the potential impact load of an employee's fall, whichever is greater (in addition to other requirements) (§ 1926.502(e)(2)).

Most of the equipment covered by the standard is designed to lift and support weights much heavier than these. Apparently substantial parts of the equipment are, therefore, typically capable of meeting the subpart M capacities. Consequently, C-DAC determined that the criteria in §§ 1926.1423(g)(2)(i) and 1926.1423(g)(2)(ii) are appropriate and would avoid burdening employers with what it considered to be the unnecessary expense of obtaining engineering analyses for each part that would serve as

an anchor. (See the discussion of these provisions in the preamble of the proposed rule under proposed rule paragraph (f) of this section, 73 FR 59802, Oct. 9, 2008.)

One commenter suggested revising the provision to require a competent person to supervise the selection, use, and inspection of fall arrest and positioning anchorages. (ID -0178.1.) This commenter suggested that this revision was needed to avoid compatibility issues and to emphasize the competent person's planning role. OSHA declines to adopt the commenter's suggestion. As explained above, this provision is included because the suitability of substantial parts of the equipment for anchoring fall arrest and positioning device systems will often be readily apparent, and the employer will only need to seek a competent person's judgment if there is some question as to the anchorage's suitability. The revision suggested by the commenter would contravene this intent.

Paragraph (g)(2)(iii) requires that attachable anchor devices (portable anchor devices that are attached to the equipment) meet the applicable anchorage criteria in § 1926.502(d)(15) for personal fall arrest systems and § 1926.502(e)(2) for positioning device systems. These criteria are the same as those discussed with respect to paragraph (g)(2) for personal fall arrest and positioning device systems.

Paragraph (g)(3), *Anchorages for fall restraint systems*, requires fall restraint systems to be anchored to any part of the equipment that is capable of withstanding twice the maximum load that a worker may impose on it during reasonably anticipated conditions of use. Since fall restraint systems do not arrest a worker's fall (instead they prevent a fall from occurring), the anchorage does not need to be able to support the significantly greater force generated during an arrested fall. OSHA relies on C-DAC's

determination that having the anchorage support twice the maximum anticipated load provides an adequate margin of safety when a fall restraint system is used.

The Agency made several changes to text originally proposed as paragraph (f) of this section, and now designated as final paragraph (g) for the purposes of clarity and consistency. OSHA devoted final paragraphs (g)(2)(i) and (g)(2)(ii) to personal fall arrest systems and positioning device systems, respectively, and added references to §§ 1926.502(d)(15) and 1926.502(e)(2) to specify which of the criteria in § 1926.502 of subpart M are applicable to anchorages used to comply with this section. OSHA concludes these changes improve the clarity of the final rule. In addition, final paragraph (g) uses the terms "personal fall arrest" instead of "fall arrest" and "fall restraint systems" instead of "restraint systems" to use the defined terms from § 1926.1401 and maintain consistency with other construction standards.

Paragraph (h) Tower cranes

Paragraph (h) of this section specifies fall protection requirements specific to tower cranes. Note that the final rule uses the terminology "erecting, climbing, and dismantling" with regard to tower cranes rather than "assembly" and "disassembly;" or the term "erecting/dismantling" used in the proposed rule, because this terminology reflects the industry's use of these terms.

Paragraph (h)(1) Work other than erecting, climbing, and dismantling

Paragraph (h)(1) of this section addresses fall protection requirements for work other than erecting, climbing, and dismantling. The employer is required to provide and

ensure the use of fall protection equipment for employees who are on a walking/working surface with an unprotected side or edge more than 6 feet above a lower level. The exceptions to this requirement would be when the employee is at or near draw-works (when the equipment is running), in the cab, or on the deck. (See the discussion of this provision in the preamble of the proposed rule at 73 FR 59803, Oct. 9, 2008, where it was designated as paragraph (g)(1)). No comments were received on this paragraph; it is included in the final rule without change other than its revised heading and redesignation from paragraph (g)(1) in the proposed rule to (h)(1) in the final rule.

Paragraph (h)(2) Erecting, climbing, and dismantling

Proposed § 1926.1423(g)(2) (redesignated § 1926.1423(h)(2) in the final rule) specified that, for erecting/dismantling work, employers must provide, and ensure the use of, fall protection equipment for employees who are on a walking/working surface with an unprotected side or edge more than 15 feet above a lower level. (See the discussion of that provision in 73 FR 59803, Oct. 9, 2008.) OSHA noted in the proposed rule that C-DAC did not include the exceptions that were included in proposed § 1926.1423(g)(1) for when the employee is at or near draw-works (when the equipment is running), in the cab, or on the deck. The Agency stated that it was unaware of any reason why those exceptions would not be equally applicable for § 1926.1423(g)(2), and asked for public comment on this issue (see 73 FR 59803, Oct. 9, 2008).

OSHA received responses from three commenters, all of whom stated that this exception should be added to the final rule. (ID -0187.1; -0205.1; -0213.1.) Accordingly, OSHA has included the exception in § 1926.1423(h)(2) of the final rule.

Paragraph (i) [*Reserved*.]

Paragraph (j) Anchoring to the load line

Paragraph (j) of this section permits an employer, under prescribed conditions, to anchor a fall arrest system to the hook or other part of a load line of a crane or derrick. Previously, § 1926.502(d)(23) of subpart M prohibited personal fall arrest systems to be attached to "hoists except as specified in other subparts of this part." Former § 1926.550 in subpart N did not contain any provisions specifically addressing this issue. Therefore, since the hook or other part of a load line is connected to a hoist in the crane or for the derrick, attaching a personal fall arrest system in this manner had been prohibited by subpart M.

Prior to this rulemaking, OSHA received inquiries asking whether a crane's hook or load line may be used as an anchorage point for fall protection. Using a crane for such purpose would be particularly useful in many situations, especially where establishing a suitable anchor point would be otherwise very difficult. OSHA asked C-DAC to consider whether there is any reason to prohibit using a crane or derrick for such purpose. C-DAC determined that the hook or load line of a crane could be used safely as an anchor point under the conditions set forth in paragraph (j).[103]

Paragraph (j)(1) allows the hook or load line to be used as an anchorage point when a qualified person has determined that the set-up and rated capacity of the

[103] OSHA modified the language from the proposed rule so that final paragraph (j) of this section refers to a "personal fall arrest system" rather than a "fall arrest system." This modification was made for the purpose of clarity to use the terms defined in § 1926.1401, *Definitions*, and to maintain consistency in the construction standards.

crane/derrick (including the hook, load line and rigging) meets or exceeds the requirements in § 1926.502(d)(15). C-DAC concluded that, as long as the crane or derrick has sufficient capacity to meet those criteria, there is no reason to prohibit its use for this purpose.

C-DAC did conclude, however, that the expertise of a qualified person is required to determine whether specific criteria are met when anchoring to the hook or load line. The criteria in § 1926.502(d)(15) were developed to ensure that fall protection anchorages provide adequate employee protection. Anchorages used for personal fall arrest systems must be capable of supporting at least 5,000 pounds or designed, installed, and used as part of a complete personal fall arrest system which maintains a safety factor of at least two. A number of factors related to the crane's capacity in the particular configuration and set-up involved would need to be considered, including, in some cases, the angle of the fall arrest lanyard to the boom if a fall were to occur. In addition, the qualified person would need to determine whether the set-up is such that it would not cause an equipment failure, such as a broken cable or chain, for the load line to serve as an anchorage for a personal fall arrest system. These determinations necessarily would include consideration of the characteristics of the particular equipment involved and the limitations of its operation. OSHA agrees that a qualified person must determine whether the criteria are met, and has included that requirement in paragraph (j)(1).

Paragraph (j)(2) requires that the equipment operator be at the work site and informed that the equipment is being used to anchor a personal fall arrest system. This would ensure that the operator is available to make any necessary adjustments, such as moving the boom or load lines. Further, in the event of an emergency that results in a

tied-off employee being suspended from the hook or load line, the operator would be available to bring the worker to the ground safely.

OSHA received three comments on the provisions relating to anchoring to the load line, and one member of the public submitted written testimony on the provisions prior to the hearing on the proposed rule. Two of the commenters responded positively to the provisions (ID -0155.1; -0203.1) and one commenter stated the provisions were a necessary improvement that would allow employers to provide fall protection in the narrow circumstances where there are no viable options other than the crane hook (ID -0203.1).

The third commenter was opposed to the provisions and stated that anchoring to the load line should be prohibited. (ID -0178.1.) This commenter stated that cranes are only engineered to lift straight up and straight down and that retracting a hook at any other angle may jam or break the cable or chain, which would result in a dropped load. OSHA concludes paragraph (j) addresses this concern for the reasons discussed below.

Written testimony submitted prior to the hearing expressed the concern that, under § 1926.1417(e), which allows a suspended load to be left unattended by the equipment operator under certain conditions, an employee's personal fall arrest system could be anchored to a load line at the same time a load is unattended. (ID -0333.2.) This party suggested that the rule make clear that fall protection should never be anchored to the load line when the load is unattended.

OSHA disagrees. In fact, the intent of § 1926.1423(j) is to allow an employee's personal fall arrest system to be anchored to the load line only when there is no load suspended from the line. This is implicit in the requirement of paragraph (j)(1) that the

qualified person determine that the set-up and rated capacity (including the hook, load line, and rigging) meets or exceeds the requirements of § 1926.502(d)(15). If it were permissible for there to be a suspended load, the parenthetical would include the word "load," for the weight of any load would certainly affect the ability of the hook or load line to serve as a fall protection anchorage. To make the rule's intent clear, OSHA is adding paragraph (j)(3), which states that no load may be suspended from the load line, as an additional condition that must be met when anchoring a personal fall arrest system to the hook or load line.

Paragraph (k) Training

In the preamble to the proposed rule, the Agency requested comments on its proposed training requirements. One commenter pointed out that a requirement for fall protection training had not been included in the proposed rule and is needed. (ID - 0178.1.) While training is already required under § 1926.21(b)(2),[104] OSHA has determined that including a more specific training requirement regarding fall protection in subpart CC will highlight the requirement and facilitate compliance.

Therefore, in the final rule, paragraph (k) has been added to this section. It requires employers to ensure that each employee who may be exposed to a fall hazard while on, or hoisted by, equipment covered by this subpart is trained on the requirements in subpart CC that address fall protection and the applicable requirements of §§ 1926.500 and 1926.502 in subpart M. This provision supplements other applicable training provisions in § 1926.1430 (see discussion below of § 1926.1430, ***Training***). As noted

[104] That provision states: "The employer shall instruct each employee in the recognition and avoidance of unsafe conditions and the regulations applicable to his work environment to control or eliminate any hazards or other exposure to illness or injury."

above, OSHA has made a conforming amendment to § 1926.500(a)(4) to make clear that the fall protection training requirements in § 1926.503 of subpart M do not apply to fall protection systems used to comply with subpart CC. As a result, the training requirements applicable to § 1926.1423 are found exclusively in § 1926.1423(k).

General comment

OSHA received a comment from a safety association generally objecting to the adequacy of the fall protection required under this section. (ID -0178.1.) The commenter stated that OSHA should reference certain ANSI/ASSE standards addressing fall protection in construction work, including: ANSI/ASSE A10.32 – 2004, *Fall Protection Systems for Construction and Demolition Operations*; ANSI/ASSE A10.18 – 2007, *Safety Requirements for Temporary Roof and Floor Holes, Wall Openings, Stairways, and Other Unprotected Edges*; and ANSI/ASSE A10.28 – 1998 (R 2004), *Safety Requirements for Work Platforms Suspended from Cranes or Derricks*. However, the commenter has not pointed to which particular provisions of these consensus standards it believes are appropriately included in this rule or that it believes would better effectuate the purpose of this section than those developed by C-DAC.

As discussed above, C-DAC determined that fall protection from cranes and derricks presented unique problems and that this section should address those problems while only incorporating limited provisions of OSHA's general fall protection standard in subpart M. Upon reviewing the record, including the comments submitted by the commenter and others on the specific provisions contained in the proposal, OSHA continues to conclude this approach is appropriate. Absent additional information as to

why OSHA should adopt or reference provisions in the standard the commenter has cited, OSHA is unable to assess whether any such provisions would better address fall protection issues than the provisions of this final rule.

Section 1926.1424 Work area control

Section 1926.1424(a) addresses the hazard of employees being struck, pinched or crushed within the swing radius of the equipment's rotating superstructure. Paragraph (a)(1) states that the precautions in paragraph (a)(2) must be taken when there are accessible areas in which the equipment's rotating superstructure (whether permanently or temporarily mounted) poses a reasonably foreseeable risk of either: (i) striking and injuring an employee; or (ii) pinching/crushing an employee against another part of the equipment or another object. Paragraph (a)(1) is adopted as proposed.

Included in § 1926.1401, *Definitions* of this rule is the definition for "upperworks", which C-DAC identified as a synonym for the term "superstructure", used in the regulatory text of paragraph (a)(1) of this section, as well as the term "upperstructure".

However, two commenters noted that the proposed definition for "upperworks" did not take into consideration the fact that many rough-terrain cranes have the engine mounted in the carrier, or lower carriage of the crane, instead of the superstructure. (ID -0292.1; -0131.1.) In response, OSHA modified the definition of "upperworks" to acknowledge that the presence of an engine is not always a defining characteristic of that portion of the crane.

Under paragraph (a)(2), the employer is required to institute two measures to prevent employees from entering these hazard areas. Specifically, under paragraph (a)(2)(i), the employer must train employees assigned to work on or near the equipment in how to recognize these areas.

Paragraph (a)(2)(ii) requires the employer to erect and maintain control lines, warning lines, railings, or similar barriers to mark the boundaries of the hazard areas, but contains an exception when such a precaution is infeasible. If it is neither feasible to erect such barriers on the ground nor on the equipment, the employer is required to mark the danger zone with a combination of warning signs and high visibility markings on the equipment that identify the hazard areas. In addition, the employer must train employees to understand what those markings signify.

OSHA received comments advocating an exemption for cranes used in the railroad industry, especially cranes moving along a track. (ID -0170.1; -0176.1; -0342.) One commenter suggested that the requirement for barriers was impractical for cranes moving along a track, as the barriers would have to be continually reset.

These objections to the requirement for barriers are not persuasive. First, the requirement for barriers is not a new requirement. Former § 1926.550(a)(9) required barricades to prevent employees from being struck or crushed by the crane, including the swing radius of the rear of the rotating superstructure. The railroad employers did not provide any evidence that they were unable to comply with the previous requirement.

Second, the rule already anticipates that for certain equipment a traditional type of barrier might not be practical and instead permits the use of a barrier that attaches directly to, and will move with, the equipment.

Finally, paragraph (a)(2)(ii) of this section permits the employer to identify these hazard areas with warning signs and high visibility markings on the equipment when it is not feasible to erect a barrier on the ground or the equipment.

Therefore, paragraph (a)(2) is being promulgated as proposed.

To prevent struck-by and crushed-by injuries and fatalities, paragraph (a)(3) is designed to help protect employees who must sometimes enter the hazard area to perform work, by ensuring that there is adequate communication and coordination between the operator and the employee in the danger area.

Under paragraph (a)(3)(i), before an employee goes in that area the employee (or someone instructed by the employee) has to ensure that the operator is informed that the employee is going to that location. This is an essential first step in preventing the operator from moving the superstructure and causing injury to that employee. This provision is adopted without change from the proposal.

Paragraph (a)(3)(ii)(A) of this section of the proposed rule stated that the operator was prohibited from rotating the superstructure unless and until he/she gave a warning that the employee in the hazard area understood as a signal that the superstructure was about to be rotated. This was intended to give the employee time to get to a safe area. Alternatively, under proposed paragraph (a)(3)(ii)(B), the operator could rotate the superstructure if he/she was informed, in accordance with a prearranged system of communication, that the employee who was in the hazard area had moved to a safe position.

Several commenters suggested that the compliance option in proposed paragraph (a)(3)(ii)(A) was insufficient to guarantee the safety of the employee in the hazard area.

(See, e.g., ID -0122.0.) A similar issue was discussed in connection with § 1926.1404(e) of the final rule. Section 1926.1404(e) addresses employees in the swing radius area or crush/caught-in-between zone during the assembly/disassembly process. (See discussion of § 1926.1404(e) for additional information.)

For the reasons discussed with regard to the issue raised under § 1926.1404(e), OSHA has removed proposed paragraph (a)(3)(ii)(A) from this section, revised proposed paragraph (a)(3)(ii)(B), and renumbered it paragraph (a)(3)(ii).

Paragraph (a)(3)(ii) requires the operator to get information that the employee has cleared the hazard area before rotating the superstructure. The method of communication must be one that is pre-arranged. Examples of such a system are provided in the discussion of § 1926.1404(e) above.

For a full discussion of C-DAC's rationale for the provisions in paragraph (a), see the preamble to the proposed rule (73 FR 59803-59804, Oct. 9, 2008).

Proposed paragraph (b) of this section addressed situations where multiple pieces of equipment are located in such proximity that their working radii overlap. Such situations pose the danger of employees being pinched/crushed between the equipment and being injured as a result of unintended movement or collapse when pieces of equipment collide. To prevent such accidents, the proposal required the controlling entity to coordinate the operations of these pieces of equipment. In the event that there was no controlling entity, the proposal required the employers operating the equipment to institute a coordination system.

A commenter asked that § 1926.1424(b) be deleted, or alternatively, that an exemption be created for employers in the home building industry. (ID -0232.1.)

However, this commenter did not provide evidence that equipment coordination is any less necessary on a residential job site than it is on other construction job sites. Another representative of the building industry also objected to imposing obligations on a "controlling entity," but did not dispute the necessity of equipment coordination on construction job sites. (ID -0214.1.) C-DAC concluded that the controlling entity, to the extent there is one, is in the best position to take responsibility for the coordination required by paragraph (b). OSHA has not been persuaded otherwise.

Both commenters nominated members which served on the negotiated rulemaking committee. Neither of their respective nominees dissented on these provisions during the negotiated rulemaking meetings and neither organization has explained why its position is different from that of its nominated member. In light of this inconsistency, OSHA has given diminished weight to these comments.

The C-DAC language for proposed paragraph (b) did not address a situation in which only one employer is responsible or the operation of multiple pieces of equipment. OSHA requested comment about revising the C-DAC language to make clear that such an employer would be required to institute a coordination system. No comments were received on this issue. OSHA has therefore revised paragraph (b) to address situations where one employer is operating multiple pieces of equipment, without a controlling entity at the jobsite.

Section 1926.1425 Keeping clear of the load

This section addresses the hazards posed to employees from being struck or crushed by the load. (See the preamble to the proposed rule for a full discussion of C-DAC's rationale for the provisions in this section (73 FR at 59805-59806, Oct. 9, 2008).)

Paragraph (a)

Paragraph (a) of this section requires the employer to use available hoisting routes that minimize employee exposure to hoisted loads to the extent consistent with public safety. No comments were received on this provision; it is promulgated as proposed.

Paragraph (b)

Paragraph (b) of this section specifies that employees cannot be in the fall zone when the equipment operator is not moving a suspended load, with limited exceptions as described in paragraphs (b)(1)-(3).

Fall zone is defined in § 1926.1401 as "the area (including but not limited to the area directly beneath the load) in which it is reasonably foreseeable that partially or completely suspended materials could fall in the event of an accident." The fall zone thus includes both the area directly under the load as well as other areas into which it is reasonably foreseeable that suspended materials could fall. For example, if wind is causing the load to swing, the employer would need to consider the extent to which the load is swinging or may swing in determining the extent of the fall zone. Another example is where a bundle of materials is suspended, and some loose materials at the top of the bundle may slide off sideways. In such a case those materials would foreseeably fall outside the area directly beneath the load.

Paragraph (b)(1) permits employees engaged in hooking, unhooking or guiding a load to be within the fall zone while engaged in these activities. No comments were received on this paragraph; it is promulgated as proposed.

Paragraph (b)(2) permits employees engaged in the initial attachment of the load to a component or structure to be within the fall zone. One example of this activity is: A subassembly of steel members is hoisted for attachment to a structure. When initially attaching the lower portion of that subassembly, an employee is within the fall zone of the load. In this example, the employee engaged in the initial attachment of the subassembly to the structure would be permitted to be within the fall zone; that work cannot be done otherwise. No comments were received on this paragraph; it is promulgated as proposed.

Paragraph (b)(3) allows workers to be present in the fall zone when operating a concrete hopper or concrete bucket. The employee operating the hopper or bucket is necessarily in the fall zone since the hopper or bucket is suspended while the employee operates the releasing mechanism.

One commenter suggested adding a requirement that there be a competent supervisor for these operations and a requirement for employee training for activities covered by paragraph (b)(3). (ID -0120.1.) However, that commenter did not provide an explanation of how this would increase safety for the employee or any support for such additional requirements. Nor did the commenter identify any reason why the activities covered by paragraph (b)(3) would require different or additional supervision or training requirements than the activities covered by paragraphs (b)(1) or (b)(2). C-DAC did not recommend any additional supervision or training requirements for paragraph (b)(3), and

OSHA is not persuaded that there is a safety justification for deviating from C-DAC's determination. Therefore, this paragraph is promulgated as proposed.

A representative of the building industry suggested in its comment that an exception should be added for dedicated spotters and fall monitors. (ID -0232.1.) This marks a change from the position of that organization's nominated representative during the negotiated rulemaking. (See discussion of this organization's comments under paragraph (c) of this section.) C-DAC did not conclude that an exception for spotters and fall monitors was warranted, and the NAHB did not present evidence to persuade OSHA otherwise. OSHA defers to the expertise of the Committee and this paragraph is promulgated as proposed.

Paragraph (c)

Paragraph (c) of this section deals with the work activities addressed in §§ 1926.1425(b)(1) and (b)(2). These requirements were necessary to ensure employee safety, given the additional risks posed while employees are performing those tasks in the fall zone.

Paragraph (c)(1) requires that the load be rigged to prevent unintentional displacement, so that workers in the fall zone are less likely to be struck by shifting materials. No comments were received on this paragraph; it is promulgated as proposed.

Paragraph (c)(2) requires the use of hooks with self-closing latches or their equivalent, to prevent accidental failure of the hooks. However, the use of "J" type hooks is permitted for setting wooden trusses. This exception is designed to enable the truss to be unhooked without the need for an employee to go out on the truss. This avoids the

additional exposure to fall hazards that would otherwise occur from going out on the truss to release a latched hook.

OSHA received a comment from the building industry requesting that the exception permitting the use of J-hooks when lifting trusses be extended to lifting wall panels as well; it asserts that the same additional exposure to fall hazards would be present. (ID -0232.1.)

This commenter nominated a member who served on the negotiated rulemaking committee. The member did not dissent during the negotiated rulemaking to this provision. The commenter has not explained why it has changed its position on this issue or why its current position differs from that of its nominated member. In light of this inconsistency, OSHA has given diminished weight to its comment.[105]

In addition, OSHA notes that there are two important distinctions between setting roof trusses and setting wall panels. First, there is no need for a worker to be exposed to a fall hazard to detach a hook with a self-closing latch from a wall panel. Once the wall panel has been set, a worker can readily reach the hook from a ladder on the interior side of the panel. Second, wall panels typically often weigh more than wooden roof trusses;

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[105] A further basis for according diminished weight to this comment is that this commenter had a direct channel for presenting its interests to the committee – its nominee member – and a presumptive ability to direct its member's negotiating position. When such an organization submits negative comments to the proposed rule opposing both its own member's negotiating position and the committee's consensus, it undermines the negotiating process in a similar manner as when a member contravenes the ground rules. The integrity of the negotiating process is central to effectuating the purpose of the Negotiated Rulemaking Act of 1990.

The Agency also notes that, in future negotiated rulemakings, one of the factors that it plans to consider in assessing nominations submitted by organizations is whether the nominee can demonstrate that he/she has documented authority to bind the organization to agreements and the position the nominee takes in such negotiated rulemaking.

they pose both struck-by and crushed-by risks to workers if the hook becomes prematurely detached from the load. Such unintended detachment is more likely to occur with a J-hook because it lacks a hook gate.

One commenter suggested that the exception for J-hooks should include requirements for training and rigging. (ID -0218.1.) This commenter acknowledged that the use of J-hooks is prevalent in the industry, and indicated that the specialized training and rigging requirements it was proposing were intended to protect the component being lifted. The commenter did not suggest that its proposed requirements would enhance employee safety. Therefore, this paragraph is promulgated as proposed.

Paragraph (c)(3) requires the use of a qualified rigger[106] in the rigging of materials in the situations addressed by paragraph (c). Proper rigging reduces the risk for workers who must perform work in the fall zone. No comments were received on this provision; it is promulgated as proposed.

Paragraph (d) Receiving a load

Paragraph (d) prohibits all employees except those needed to receive a load from being in the fall zone when it is being landed. No comments were received on this provision; it is promulgated as proposed.

Paragraph (e)

Paragraph (e) concerns tilt-up and tilt-down operations. In these operations, one end of a component, such as a precast panel, is either raised, tilting the component up,

[106] Section 1926.1401 defines a "qualified rigger" as a rigger who meets the criteria for a qualified person.

usually from a horizontal position (often on the ground) to a vertical position; or lowered, tilting the component down, usually from a vertical position to a horizontal position on the ground or other surface. Note that the requirements in this paragraph do not apply when receiving a load.

As with any other suspended load, it is dangerous to be directly beneath the load because of the possibility of a failure or error that would cause the load to fall or be accidentally lowered onto an employee. To minimize the risk of such accidents, paragraph (e)(1) of this section provides that no employee must be directly under the load during a tilt-up or tilt-down operation. Section 1926.1401 defines "directly under the load" to mean "a part or all of an employee is directly beneath the load." No comments concerning this provision were received; therefore, it is promulgated as proposed.

While paragraph (e)(1) prohibits employees directly under the load, paragraph (e)(2) of this section provides an allowance for employees to be in the fall zone (but not directly under the load), when those employees are "essential to the operation" during a tilt up or tilt down operation.

In the preamble to the proposed rule, the Agency provided a list of activities it determined to typically be infeasible to do outside the fall zone and therefore an employee would be in the fall zone for these activities. The Agency requested public comment on whether there were additional activities that would be infeasible to do from outside the fall zone, and whether it would be appropriate to add a definition of "essential to the operation" to the standard.

One commenter responded, asserting that the phrase "essential to the operation" does not need to be defined. (ID -0205.1.)

No commenters disagreed with the three scenarios listed in the preamble to the proposed rule describing instances where an employee is "essential to the operation" and must be within the fall zone. However, one commenter suggested adding to the list the activities of making initial connections and securing bracing. (ID -0205.1.)

OSHA believes that those two additional tasks – making initial connections and securing bracing – fall within part of the third scenario listed in the proposed rule preamble (i.e., to ". . . initially attach [the load] to another component or structure").

For clarity, OSHA has decided to modify paragraph (e)(2) by adding the operations listed in the proposed rule and including the recommendation of the commenter.

One comment suggested that there might be some conflict between the NOTE in this section, § 1926.1426, and § 1926.1433(b)(4). The discussion of that comment may be found in the portion of the preamble addressing § 1926.1426 of the final rule.

Section 1926.1426 Free fall and controlled load lowering

This section addresses the hazards that can arise from free fall of the boom (live boom) during lifts. Live booms are those in which the rate of lowering can be controlled only by a brake; a failure of the brake will result in a free fall (i.e., unrestricted lowering) of the boom. In contrast, for equipment that has a boom that is not "live," there is a mechanism or device other than the brake which slows the boom's lowering speed.

The uncontrolled lowering of a boom could result in an accident which could injure or kill workers in proximity to the load or hoisting equipment. This section prohibits use of live booms in most circumstances. An exception is provided in limited

conditions that do not pose hazards for employees with respect to the use of older equipment manufactured before October 31, 1984. See discussion in § 1926.1426(a)(2)(i) below.

Additionally, this section specifies the circumstances under which free fall of the load line is prohibited at § 1926.1426(d).

Paragraph (a) Boom free fall prohibitions

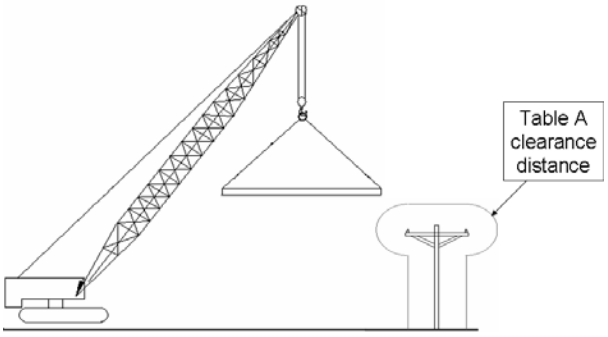
Under paragraph (a)(1) of this section, the use of equipment in which the boom is designed to free fall is prohibited under six specified conditions.

Paragraph (a)(1)(i) prohibits the use of a live boom when an employee is in the fall zone of the boom or load (see the explanation of "fall zone" in the discussion above of § 1926.1425(b)). Section 1926.1425, *Keeping clear of the load*, of this standard recognizes that there are some situations in which certain employees need to be positioned in the fall zone to perform their assigned duties. However, when equipment with a live boom is in use, the likelihood that an employee would sustain a serious injury or be killed by a free fall is very high when an employee is in the fall zone of the boom or load.

Paragraph (a)(1)(ii) prohibits use of a live boom when an employee is being hoisted by equipment. If a hoisted employee was dropped in an uncontrolled fall, the likelihood of a serious injury would be high.

No comments were received for paragraphs (a)(1)(i) or (ii); they are promulgated as proposed.

Paragraph (a)(1)(iii) as set forth in the proposed rule, would have prohibited the use of a live boom where the load or boom is directly over a power line, or over any part of the area extending the Table A of proposed § 1926.1408 clearance distance to each side of the power line. The diagram below illustrates a situation in which a load on a live boom is over the area extending the Table A clearance distance to each side of the power line:



As discussed above in relation to §§ 1926.1407 through 1926.1411, equipment making electrical contact with power lines is one of the primary causes of equipment-related deaths on construction sites and, to prevent such contact, those sections would require equipment to maintain minimum distances from power lines.

In the proposed rule, OSHA determines that there are circumstances where neither the boom nor the load are directly over the power line or Table A clearance distance, but where the power line or the Table A clearance distance is within the fall path of the boom or load. This circumstance is depicted in the following illustrations:

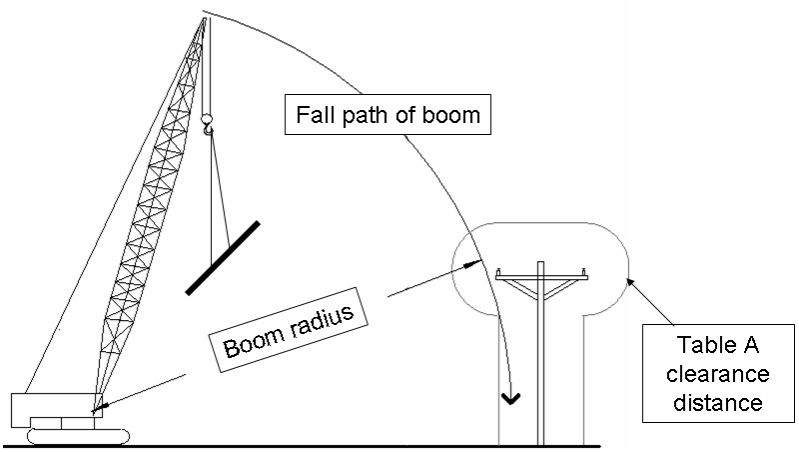


Illustration A

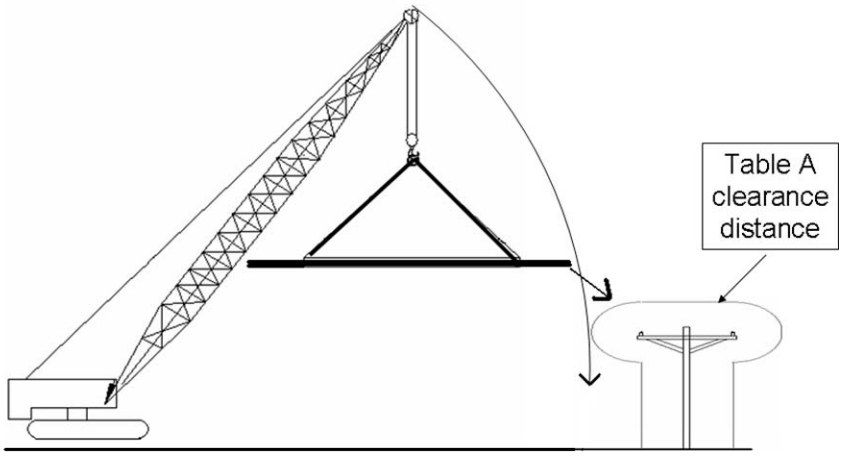


Illustration B

In Illustration A, neither the boom nor the load is above the power line or any part of the Table A zone. However, if the boom were to fall, the boom would cross into the Table A zone. In Illustration B, neither the boom nor load is above the power line or any part of the Table A zone. However, if the boom were to fall, the load would cross into the Table A zone.

OSHA requested comment in the proposed rule as to whether § 1926.1426(a)(1)(iii) should be modified to also prohibit the equipment from being positioned such that the fall path of the boom or load would breach the Table A of § 1926.1408 clearance distance. This requirement was proposed to prevent the boom, hoist line, or load or from contacting an energized power line and carrying the electric current back through the equipment. One commenter, in two comments, agreed with the proposed change. (ID -0052.0; -0092.1.) No commenters disagreed.

Therefore, OSHA has modified § 1926.1426(a)(1)(iii) to prohibit free fall (live boom) where the power line or the Table A clearance distance is within the fall path of the boom or the load.

Paragraph (a)(1)(iv) prohibits use of a live boom where the load is over a shaft. Employees in a shaft receiving a load are at high risk of death or injury from a free falling boom as the shaft severely limits the ability to avoid the falling boom. Because this hazard only exists when there is an employee in the shaft, OSHA has specified in § 1926.1426(a)(1)(iv) of the final rule that the live boom prohibition only applies when at least one employee is in the shaft. This language is different from the language of § 1926.1426(a)(1)(v), regarding cofferdams, because a shaft is typically a smaller work space than a cofferdam, thus, a shaft under a load is necessarily in the fall zone of the boom or the load.

Paragraph (a)(1)(v) prohibits free fall of a boom when the load is over a cofferdam, except where there are no employees in the fall zone of the boom or load. Much like employees who must receive a suspended load in a shaft, employees have limited ability to escape a free falling boom or load in a cofferdam. However,

cofferdams are typically much larger work spaces than shafts, the fall zone of a falling boom or load may only affect one part of the cofferdam. Therefore, this provision only applies when employees are in the fall zone of the boom or load.

OSHA noted an ambiguity in proposed § 1926.1426(a)(1)(v). The exception referred only to "the fall zone"; OSHA determines that – to make this provision consistent with § 1926.1426(a)(1)(i) (prohibiting the use of live booms when an employee is in the fall zone of the boom or the load) – the words "of the boom or load" should be added to the language proposed for § 1926.1426(a)(1)(v).

Paragraph (a)(1)(vi) prohibits use of a live boom for lifting operations in a refinery or tank farm. A free falling boom could strike pipes or a tank in a refinery or tank farm. Such accidental impact could cause a release of toxic materials or conflagration. No comments were received for this provision; it is promulgated as proposed.

Paragraph (a)(2) of this section is the exclusive list of conditions under which the use of cranes with live booms is permitted. C-DAC found that cranes with live booms can be used safely under some circumstances and did not determine that the cost of replacing or retrofitting all such equipment is justified as long as the use of live boom equipment is limited to these conditions. However, none of the conditions outlined in § 1926.1426(a)(1) may be present.

Paragraph (a)(2)(i) allows the use of equipment with a live boom if that equipment was manufactured prior to October 31, 1984, and none of the circumstances listed in § 1926.1426(a)(1) are present. ANSI B30.5 first prohibited live booms in the

1972 version and reiterated the prohibition in the 1982 edition, which was published on October 31, 1983, and became effective on October 31, 1984.

OSHA concludes that manufacturers would have begun to phase out live-boom equipment when ANSI first prohibited its use in 1972 and that few, if any, live boom equipment would have been manufactured after October 31, 1984. Moreover, during this period, hydraulic hoisting equipment, the design of which typically precluded boom free fall even in its early designs, became more prevalent.

In light of these factors, the Agency concludes that most equipment manufactured after October 31, 1984, would not have live booms. Section 1926.1426(a)(2) thus allows the older live boom equipment to be phased out safely by restricting its use to situations in which none of the circumstances listed in § 1926.1426(a)(1) are present. However, OSHA added a new provision to this paragraph that considers live-boom equipment manufactured on or after October 31, 1984, and meeting the requirements of paragraph (b) of this section, not to be subject to the limitations of paragraph (a) of this section. OSHA considers such equipment, when so modified, to be as safe as any equipment modified under the requirements of paragraph (b).

Paragraph (a)(2)(ii) allows use of a live boom if the equipment is a floating crane/derrick or is a land crane/derrick on a vessel/flotation device and none of the circumstances listed in § 1926.1426(a)(1) are present. The Committee found, and OSHA agrees, that equipment used on the water commonly has a live boom because the dynamics of load transfer while on water (from side to side), as well as unexpected wave action can cause rapid changes in list and trim, which sometimes necessitates that the operator have a free fall boom system to compensate for these effects. Non-live systems

are not fast enough for this purpose. At the public hearing, a witness from the maritime industry said that the "unique tasks [associated with operating cranes on the water] have often required and will continue to require a modification of existing cranes and derricks so that they can safely accomplish these specialized applications." (ID -0345.41.)

As a result, the Agency concludes that there is no need to modify this provision; it is promulgated as proposed.

One commenter suggested there is a conflict between the § 1926.1426(a) allowance for the limited use of free falling booms and § 1926.1433(b)(4) incorporation of the ASME standard prohibition on the use of free falling booms. (ID -0053.1.)

Section 5-1.3.1 of ASME B30.5-2004 has a paragraph (b), which contains its own text, as well as two subsidiary paragraphs, enumerated (1) and (2), each of which also contains text. The ASME prohibition against live booms is in the text of paragraph (b) of ASME B30.5-2004 sec. 5-1.3.1. Free fall is not mentioned in subsidiary paragraphs (b)(1) or (b)(2) of ASME B30.5-2004 sec. 5-1.3.1.

Section 1926.1433 incorporates the concepts in only subsidiary paragraphs (b)(1) or (b)(2) of ASME B30.5-2004 sec. 5-1.3.1, it does not incorporate the portions of paragraph (b) of ASME B30.5-2004 sec. 5-1.3.1 that would conflict with §1926.1433. There is, therefore, no conflict between §§ 1926.1426(a) and 1926.1433(b)(4).

Paragraph § 1926.1426 (a)(2) is promulgated as proposed.

Paragraph (b) Preventing boom free fall

Paragraph (b) of this section establishes criteria for the boom hoist on equipment with a boom designed to free fall. Paragraphs (b)(1) through (b)(4) specify the

mechanisms or devices that a boom hoist can utilize as a secondary means to prevent boom free fall when the primary system fails. C-DAC determined that each of these were effective means of preventing boom free fall, and OSHA agrees. The addition of a listed secondary mechanism or device to prevent the fall of the boom changes the characteristics of equipment designed with a live boom, decreasing the risk of injury to employees. Therefore, if equipment has a boom hoist with a secondary mechanism or device listed in paragraphs (b)(1) through (4), it is not considered a live boom for purposes of the limitations of (a) of this section. No comments were received on these provisions; they are promulgated as proposed.

Paragraph (c) Preventing uncontrolled retraction

Paragraph (c) of this section requires hydraulic telescoping booms (which are also referred to as hydraulic extensible booms) to have an integrally mounted holding device to prevent the boom from retracting in the event of hydraulic failure

The C-DAC draft of this provision stated that the purpose of this device was "to prevent boom movement in the event of hydraulic failure." OSHA determines that this language was unintentionally broad in that it refers to any "boom movement." In the proposed rule, OSHA modified the language to state that the purpose of the integrally mounted holding device is "to prevent the boom from retracting" in the event of hydraulic failure and requested public comment on this change.

Two commenters agreed with the modification and no commenters disagreed. (ID -0205.1; -0213.1.) The text of § 1926.1426(c) is therefore promulgated as proposed.

Paragraph (d) Load line free fall

Paragraph (d) of this section lists the circumstances under which free fall of the load line hoist is prohibited and controlled load lowering must be used. "Free fall (of the load line)" is defined in § 1926.1401 to mean "where only the brake is used to regulate the descent of the load line (the drive mechanism is not used to drive the load down faster or retard its lowering)." "Free fall" is contrasted with "controlled load lowering," which § 1926.1401 defines as "lowering a load by means of a mechanical hoist drum device that allows a hoisted load to be lowered with maximum control using the gear train or hydraulic components of the hoist mechanism. Controlled load lowering requires the use of the hoist drive motor, rather than the load hoist brake, to lower the load."

As with free fall of the boom, free fall of the load line hoist presents a struck-by hazard to employees. One difference is that free fall of the load line endangers a smaller area than boom free fall. When a boom free falls, its tip (and any attached load) moves both downward and outward. Because the load will moving in at least two directions simultaneously, the area that will be affected by the fall is larger than the affected area from a load line free fall.

In contrast, if a load line free falls, the load will tend to fall in a relatively straight path downward (as long as the boom is not being moved and the load is not significantly affected by winds). Thus the area affected will typically be smaller. As a result the prohibitions for load line free fall are less than those affiliated with boom free fall. No comments were received on paragraphs (d)(1) or (d)(2); they are promulgated as proposed.

Proposed paragraph (d)(3) stated that the use of load line hoist free fall is prohibited when the load is directly over a power line, or over any part of the area extending the Table A clearance distance to each side of the power line. OSHA requested comment on whether proposed § 1926.1426(d)(3) should be modified to also prohibit the equipment from being positioned where the fall path of the load would breach the Table A clearance distance. One commenter, in two comments agreed with the change and no commenters disagreed. (ID -0052.0; -0092.1.)

Since this modification is consistent with the purpose of the provision, OSHA has included this revised language in the final rule; § 1926.1426(d)(3) to prohibit load line free fall where the power line or the Table A clearance distance is within the fall path of the load.

Proposed paragraph (d)(4) stated that load line free fall is prohibited when the load is over a shaft or cofferdam. OSHA noted that, unlike the prohibition against live booms in § 1926.1426(a)(1)(v), proposed paragraph (d)(4) contained no exception regarding cofferdams in which there are no employees in the fall zone. OSHA requested comment on whether proposed § 1926.1426(d)(4) should include the same exception included in § 1926.1426(a)(1)(v). Two commenters agreed with the modification and no commenters disagreed. (ID -0205; -0213.) Because the fall zone of a free falling load line is typically a smaller area than the fall zone of a free falling boom, the Agency is unaware of any reason to include the exception in § 1926.1426(a)(1)(v) for live booms but omit it for load free fall. Therefore, in the final rule, OSHA has modified the language in proposed § 1926.1426(d) by separately addressing shafts and cofferdams, and adding an exception for the latter.

Section 1926.1427 Operator Qualification and Certification

Introduction

Section 1926.1427 addresses the safety problems that result if equipment operators lack the knowledge and skills necessary to perform their duties safely. In C-DAC's collective experience, operator error plays a role in a significant percentage of fatal and other serious crane accidents because operators are not familiar with the precautions needed to protect against hazards such as power line contact, crane overloading and collapse, and loss of control of the load. C-DAC concluded that a verified testing process is essential for ensuring that crane operators have the requisite knowledge and skills and that requiring crane operators to successfully complete such a process would be an effective and efficient way to reduce crane-related accidents.

In the proposed rule, OSHA noted that C-DAC's finding in this regard was supported by a study conducted over a 34-year period (1969-2002) by the Construction Safety Association of Ontario that showed a substantial decrease in crane and rigging fatalities in Ontario beginning in 1979, when mandatory training and certification requirements for Ontario crane operators went into effect. (ID -0009.) In the ten year period from 1969 through 1978, before Ontario's requirements went into effect, 85 Ontario construction workers suffered crane and rigging fatalities, amounting to 8.5 per year, or 19.8% of all construction fatalities in Ontario. In the 24 year period from 1979 through 2002, there were 51 crane and rigging fatalities, or slightly more than two per year. For this period, crane and rigging fatalities equaled 9.6% of all Ontario construction fatalities. In the 12-year period from 1991 through 2002, the total number of

crane and rigging fatalities was 9, or fewer than one per year. During this period, crane and rigging fatalities amounted to 4.1% of total construction fatalities. This study supports C-DAC's conclusion that third-party certification is an effective means of promoting safe crane operations.[107]

The rulemaking record contains additional support for C-DAC's conclusion. A study of crane accidents in California both before and after that state adopted a mandatory certification requirement shows a significant drop in crane-related fatalities and injuries after the certification requirement went into effect on May 31, 2005. (ID -0205.1.) For the three years prior to that date, California experienced ten fatal accidents, while in the next three years, only two fatal accidents occurred. The number of injury cases declined from 30 to 13 over the same two periods. The California data supports that from Ontario and demonstrates that significant safety benefits can be expected from a requirement for third-party certification.

[107] The Ontario system requires prospective or current crane operators (referred to in Ontario as "hoisting engineers") to either successfully complete an apprenticeship program or demonstrate sufficient previous experience before seeking certification as a hoisting engineer. The apprenticeship program includes in-school training in a number of topics determined by the Ministry of Education, a practical examination administered at Ministry-designated sites, and a written examination administered by the Ministry. Upon passing this examination and proving completion of the requisite work hours, an apprentice receives a certificate of qualification as one of three types of hoisting engineer from the Ministry. (ID -0010.)

Hoisting engineers already qualified elsewhere must also obtain a certification from the Ministry to operate cranes in the province. These candidates must sit for the written examination and complete the practical skills assessment required for qualification of apprentices, but may demonstrate sufficient previous experience instead of completing the number of work/training hours required by the apprenticeship program, to receive a certificate of qualification from the Ministry in one of the three hoisting engineer categories. (ID -0011.)

The rulemaking record also contains substantial evidence regarding the need for continued application of State and local laws. As several commenters explained, State and local licensing requirements are backed by the police power of that government. For example, New York law states that the operation of a crane without a valid license in New York City is a misdemeanor punishable by fines and imprisonment. (NYC Administrative Code §§ 28-405.1; 28-203.1.) Moreover, states have the power to revoke previously issued licenses under appropriate circumstances. (ID -0171.1.) In contrast, OSHA's enforcement of certification or other qualification requirements would be limited in most cases to a citation to an employer. Based on the record as a whole, the Agency concludes that cooperative federal-state enforcement will increase the effectiveness of the new standard. See also discussion of federalism in section V.D of this preamble.

The certification requirements in the final rule are therefore designed to work in conjunction with state and local laws, and to afford employers several options for ensuring operator abilities in areas where there are no state or local operator licensing requirements. For operation of equipment within jurisdictions where a State or locality licenses crane operators, and the government entity's licensing program meets certain criteria, OSHA is requiring operators (with the exception of operators that are employees of and operating equipment for the U.S. military) to be licensed by that government entity. For operation in other areas, employers will have three options for certification or qualification of their operators. Each of these options will be explained and discussed in detail below. They are:

1. Be certified by passing an examination administered by an accredited testing organization.

2. Be qualified through the employer's in-house, but independently audited, testing program.

3. Be qualified by the United States military.

While OSHA is requiring compliance with State and local licensing laws immediately upon the effective date of this standard in recognition of the existing force and effect of those laws, OSHA is not requiring certification or qualification under the three options listed above until four years from the effective date of this standard. Moreover, there are limited exceptions to all of the licensing and certification requirements, as specified in § 1926.1427(a). Even after the four-year phase-in period of the general certification requirements, OSHA will continue to allow non-certified operators to operate the equipment as operators-in-training in accordance with § 1926.1427(f), discussed below.

Of the three options available in the absence of state or local licensing laws, Option (3) of this section is available only to the United States military for qualification of its employees. Further, as discussed below, a number of commenters stated that Option (2) of this section was not viable for many employers. However, Option (1) of this section is available to all employers and will be the one that is most widely used. Therefore, most of the public comments and evidence presented at the hearing addressed Option (1).

At the hearing, a witness for an accredited testing organization testified that the certification process embodied in Option (1) originated in the 1990s when private

industry groups began an effort to improve crane safety. The witness explained that the industry representatives involved with the organization are drawn from such groups as contractors, crane rental firms, labor unions, owners, steel erectors, manufacturers, construction firms, training consultants, and insurance companies. (ID -0343.) The witness also explained that exam management committees meet throughout the year to ensure the continuing fairness and integrity of the testing process. Finally, the witness explained that certification promotes safety by ensuring that the training an individual has received has succeeded in giving that individual the knowledge and skills to operate a crane safely. (ID -0343.)

Many commenters and witnesses at the public hearing expressed support for the proposed rule's approach of requiring third party verification of an operator's qualifications and for the range of options presented. A national safety organization expressed support for the provision to ensure qualification and certification of operators. (ID -0178.1.) A trade association stated that third party oversight was critical to create an effective and legitimate testing process and to ensure that the training portion did not have undue influence on the testing process. (ID -0205.1.)

Similarly, another commenter supported the proposed Q/C requirements, emphasizing the importance of independent certification of an operator's skill and knowledge by an accredited nationally recognized third-party entity or organization. (ID -0169.1.) Similar views were expressed by other commenters. (ID -0158.1; -0160.1; -0173.1; -0192.1; -0196.0; -0211.1; -0212.1; -0220.1; -0225.1; -0228.1; -0241.1.)

A number of witnesses at the public hearing also supported the proposed requirement for third-party verification. A representative from a crane rental company

said that, although they incur additional cost to prove certification, they consider that cost an investment in the safety of their employees. (ID -0344.) A major crane user observed both certified and non-certified operators and found that the certified operators operated far more safely because of the more comprehensive training required to become certified. (ID -0344.)

An insurance company representative and former crane operator stated that his company believes that employers who certify their operators have fewer accidents and that, as a result, his firm offers companies it insures a ten percent discount if they have their operators certified. (ID -0343.) The representative believed that the cost of certification was modest when compared to the cost of accidents. (ID -0343.) A representative from a crane rental company testified that preparing for the certification process allowed his company to improve their operators' knowledge and ability to operate cranes safely. (ID -0343.) A representative from a steel erection company agreed that certification is important to both insurance companies and employers because certification gives employers peace of mind and reduces insurance costs. (ID -0344.)

Some commenters and witnesses opposed the proposed rule's requirement for qualification or certification of operators. A trade association commented that the requirements would not improve safety more than having trained, qualified operators because many of the operators in recent accidents were certified. (ID -0151.1.) The commenter also questioned whether sufficient analysis had been done to show that the proposed requirements would improve the safety of crane operations. This commenter believed that the current requirement (§ 1926.20(b)(4)) for equipment operators to be qualified by training or experience was sufficient. A witness from a similar trade

association expressed a similar view, stating that training, not certification, is the answer to safe crane operations. (ID -0343.)

A representative of the building industry thought the requirements were too restrictive and stated that OSHA failed to show that the limited requirements would substantially reduces the risk of accidents while other alternatives would not. (ID -0232.1.) The commenter asked that its members have the option to self-evaluate their operators after they have gone through a specified training program in lieu of the third-party certification that would be required under proposed Option (1) of this section for cranes of less than 35 ton capacity with a boom length no greater than 120 feet. A witness who appeared on behalf of the commenter criticized the proposal for imposing the same requirements on employers engaged in residential construction as those in commercial construction and said training and certification requirements should be crane and industry specific. (ID -0341.)

Another trade association similarly recommended that its members be given the ability to self-certify their operators. (ID -0218.1.) A small business representative asked OSHA to assess whether it is feasible to allow small employers to "self-certify" that an operator is trained and competent to operate the equipment and perform the tasks being conducted.[108] (ID -0147.1.) A trade association suggested that OSHA consider the feasibility of allowing small employers to "self-certify" that their operators are trained and competent to operate the equipment and perform their assigned tasks. (ID -0187.1.) Another trade association believed that mandatory self-certification was a feasible option

[108] The commenter, however, also acknowledged that there are small businesses that are in favor of third-party certification. (ID -0147.1.)

for operators of what it characterized as "light-duty" cranes used by its members. (ID -0189.1.)

An energy association argued that firms engaged in wind turbine construction should be permitted to self-certify their crane operators. (ID -0329.1.) The commenter stated that construction of wind turbines requires the use of the largest and most complex cranes available, and that some of its members had found that some operators certified by NCCCO were not truly qualified to operate those cranes. It therefore believed that firms in its industry should be able to self-qualify their crane operators, but objected to the need for employers in its industry who use Option (2) of this section to be required to use the services of an auditor. The commenter said it did not believe that there would be properly trained and qualified people available to audit the wind industry. Instead of requiring auditors, the commenter suggested that OSHA add to the find rule additional, detailed criteria that an employer-sponsored program must contain to be acceptable.

OSHA rejects the suggestions of the commenters who argued that employers should have the option of determining that their operators are qualified without any form of third-party verification. Based on the rulemaking record, OSHA is persuaded that the third-party requirements in the proposed rule are an essential element in improving crane safety. The members of C-DAC, who had vast collective experience in all aspects of crane operations, reached a consensus (with two members dissenting)[109] that third-party verification was needed to reduce the number of crane accidents and fatalities in the construction industry. Their consensus was supported by a number of commenters, including some employers who have already had their operators certified through a third-

[109] As explained in the Introduction, under C-DAC ground rules, a "consensus" was reached on an issue if there were no more than two non-federal dissenters.

party process and have found certification to be a useful and cost-effective means of promoting safety.[110] The reliance of the insurance industry on third-party verification as such an indicator of reduced risk that it warrants reduced premiums, is further evidence of its value. Moreover, the fact that safety-conscious members of private industry voluntarily helped to develop a third-party certification process before there was a government mandate to do so is further evidence that certification promotes safety.

As discussed earlier, a number of commenters urged OSHA to require training rather than certification. But training alone is insufficient without a means of verifying that each operator understands the training well enough to operate safely and is sufficiently skilled to implement what he/she has been taught. As Graham Brent, Executive Director of NCCCO put it at the hearing, "[c]ertification . . . is an employer's, as well as the general public's, best assurance that the required training has not only been effective, but that learning has taken place during the training process." (ID -0343.) OSHA's current training standard has not prevented the high number of crane-related fatalities and serious injuries that have been occurring as a result of improper operation.

OSHA acknowledges that many employers have effective training programs and highly competent crane operators. However, the rulemaking record shows that a training requirement alone is insufficient to ensure that crane operators have the requisite level of competence. This was the opinion of the members of C-DAC and is shared by many of the members of the public who commented on the proposed rule and who testified at the public hearing.

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[110] It is also supported by the data from Ontario and California showing that third-party certification can significantly reduce crane-related fatalities and injuries, discussed below.

A representative of the building industry objects to OSHA's reliance on the study by the Construction Safety Association of Ontario, saying that it does not meet statutory and regulatory information quality standards, including the Department of Labor's Information Quality Guidelines.[111] (ID -0232.1.) First, OSHA notes that the Ontario study is only part of the record evidence on which the Agency relies in promulgating this standard. In the preamble to the proposed rule, OSHA stated that the Ontario study "buttressed" C-DAC's experience and conclusions regarding the need for independent testing of operator ability (see 73 FR 59810, Oct. 9, 2008). Second, OSHA's reliance on that study does comply with the Department's guidelines. Appendix II of the guidelines addresses the information quality principles on which OSHA relies in setting health and safety standards. For safety standards, such as this rule, OSHA must use "the best available statistical data from surveys of fatalities, injuries, and illnesses, and the best available peer-reviewed science and supporting studies that describe the nature of the safety risks being addressed." OSHA determines that the Ontario study, though not peer-reviewed, is the "best available statistical data" showing the efficacy of third-party operator certification. The California study is similarly supportive of the C-DAC conclusions.

In other respects as well, OSHA has complied with the Department of Labor's Information Quality Guidelines. The guidelines state that "[t]he goal of a safety risk analysis is to describe the numbers, rates, and causal nature of injuries related to the safety risks being addressed." To meet this goal, OSHA historically has "relied on injury

[111] "Guidelines for Ensuring and Maximizing the Quality, Objectivity, Utility, and Integrity of Information Disseminated by the Department of Labor," (Oct. 1, 2002), available on the Department of Labor's website.

and illness statistics from BLS, combined with incident or accident reports from enforcement activities, incident or accident reports submitted to the record from the private or public sectors, testimony of experts who have experience dealing with the safety risks being addressed, and information and data supplied by organizations that develop consensus safety standards."

In developing the proposed rule, and in issuing this final rule, OSHA has relied on these types of evidence, including studies based on BLS statistics and OSHA enforcement reports, as well as incident reports from specific enforcement cases. (See 73 FR 59719-59723, Oct. 9, 2008.) On the specific question of the need for third-party verification of a crane operator's qualifications, OSHA has relied primarily on the opinions of experts with vast experience in crane operations and the hazards presented by crane use, including the members of C-DAC and construction industry employers who appeared at the public hearing. OSHA is persuaded that third-party verification will significantly reduce the number of crane-related injuries and is confident that the information on which it relies to set this standard is reliable, the best available, and meets the Department's guidelines.

A trade association also questioned OSHA's reliance on the Ontario study, suggesting that Ontario's ability to issue citations to employees is the likely cause of Ontario's decrease in fatal crane accidents. (ID -0151.1.) OSHA notes, however, that the Construction Safety Association of Ontario attributed the decrease to increased operator skill, not employee citations. (ID -0009.) OSHA determines that the Construction Safety Association of Ontario was well-positioned to evaluate why Ontario was able to achieve a dramatic reduction in crane-related fatalities and accepts its opinion on the question.

Moreover, the employee citations permitted under Section 66 of Ontario's Occupational Health and Safety Act did not take effect until 1990. These employee citations appear to function primarily as a deterrent to non-compliance with Ontario's construction safety standards, as opposed to the operator certification requirements that are intended to verify knowledge and skills necessary for safe operation. In that regard, the civil fine provisions are similar to the licensing requirements (separate from certification) that Ontario had required prior to 1979. There is no indication in the record that the fines provided a greater level of deterrence than the government's pre-existing authority to sanction an individual operator through the revocation of an operator's license.

The representative of the building industry claimed that the rate of accidents resulting from crane use in the residential construction industry is too low to justify requiring homebuilders to comply with the qualification/certification requirement in the proposed rule. The commenter conducted a study, using fatality data from the Bureau of Labor Statistics, which, according to the commenter, showed that 13 out of 1385, or slightly less than 1%, of fatalities in the residential construction industry from 2003-2006 were crane-related. (ID -0232.1.) Because this percentage is substantially less than the more than 8% of all construction fatalities that were found to be crane-related in the Beavers study, the commenter suggests the risk of serious injury from the smaller truck mounted telescopic boom cranes used in residential construction is substantially less than the risk of injury from large lattice boom and tower cranes used in commercial/industrial construction. The commenter stated that a copy of its study was attached to its comment and is available on its website. (ID -0232.1.) In fact, a copy was not attached to its comment. OSHA has located a document on the commenter's website entitled

"Residential Construction Fatalities, 2003-2006" that describes the causes of fatalities in residential construction, but has found nothing in that document to support the commenter's claim that only 13 of those fatalities were crane-related.

Nevertheless, even if the commenter could support its claim of 13 crane-related fatalities, its conclusion that cranes present little risk of serious injury in residential construction does not follow. First, OSHA determines that 13 crane-related fatalities in homebuilding in a four year period is significant and well worth trying to reduce. Moreover, the commenter's comparison of percentages is not persuasive. The fact that a smaller percentage of fatalities are crane-related in residential construction than in commercial/industrial construction may simply reflect lower crane usage in residential construction. A witness who appeared on behalf of the commenter at the public hearing, testified that cranes are typically used on a residential construction project between two and six hours to lift objects like roof and floor trusses. (ID -0341.) The witness noted that for commercial construction, a crane might be on the job from six months to two years. (ID -0341.) In light of the brief percentage of time cranes are used in residential construction compared to the percentage of time they are used in commercial construction, it would be expected that the percentage of accidents they cause will similarly be lower even if, while they are on the job, they present the same or even a higher degree of risk.[112]

OSHA also rejects the commenter's suggestion that homebuilders should be permitted to self-certify their crane operators. The commenter states that the vast

[112] Mr. Behlman testified that overhead power lines are "very seldom" found on residential sites. (ID -0341.) However, the document on NAHB's website showing the causes of residential construction fatalities from 2003 to 2006 attributes 76 fatalities to "contact with overhead power lines."

majority of the building association's single-family home builders are very small, with 61% building ten homes or fewer. The witness stated at the hearing that the home building industry has many small operations and a few very large players. (ID -0341.) In OSHA's experience, most small construction firms would not have the expertise to develop or administer the types of tests necessary to reliably assess operator ability (see the discussion of the criteria applied by nationally recognized accrediting entities to accredit certification organizations).

OSHA also does not conclude that such companies typically possess the expertise to establish and implement the sophisticated type of training program that the commenter suggests should be required for employer self-certification. (ID -0232.1.) The same problem exists throughout the construction industry, which includes numerous small firms. Furthermore, as found by C-DAC, independent testing is essential to ensure that operators have in fact attained the knowledge and ability the training is supposed to impart.

A number of commenters suggested that the proposed requirements should be modified in various ways. Some suggested exempting certain equipment from the qualification/certification requirement or requiring a form of qualification/certification that the employer could implement without resort to third-party verification. Others suggested expanding the range of options available to the employer, in particular allowing accredited educational institutions to certify operators. These comments will be discussed below in the sections of the standard that address the issues raised by the commenters.

Paragraph (a)

In the final rule, paragraph (a) of this section specifies that the employer must ensure that the operator of any equipment covered under § 1926.1400, with certain listed exceptions, is either qualified or certified to operate the equipment in accordance with the provisions of this section or is operating the equipment during a training period. Paragraph (a)(1) requires compliance with state and local operator licensing laws. For areas where state or local licensing is not required, paragraph (a)(2) requires employers to use one of the three options listed above to certify or qualify their operators. Paragraph (a)(3) provides exceptions from all of § 1926.1427's certification and qualification requirements for operators of certain equipment, regardless of whether state or local governments have licensing requirements for operators of that equipment.[113]

Paragraph (a)(1) Compliance with State and local licensing requirements

The proposed rule included a fourth option to satisfy the operator certification/qualification requirements of § 1926.1427: qualification through a government entity with a licensing program meeting certain criteria. Several states submitted comments on the proposed rule urging the Agency to preserve state and local operator licensing laws. Some of these concerns are addressed in the discussion of preemption under federalism in section V.D of this preamble. Two of those commenters, each with its own statewide crane operator licensing requirements, specifically requested that OSHA mandate compliance with State requirements for crane operations within the

[113] These state and local licensing requirements would remain in effect. See discussion of preemption of state and local law under federalism in section V.D of this preamble. OSHA is simply choosing not to require compliance with any such licensing requirements for that equipment.

jurisdiction of those states (with the exception of operators who are employees of the U.S. military). (ID -0171.1; -0237.) Three state governments argued persuasively that if government licensing was presented merely as an option, rather than required, many employers would simply by-pass these licensing requirements in favor of less stringent, portable private certification options. (ID -0171.1.) One state government also noted that some states have proven, reliable licensing procedures already in place. Where state and local licensing departments or offices are already well established and staffed, and are already preventing deaths or serious injuries through the use of effective licensing procedure, there is little support in the record for disturbing them.

In light of the commenter's compelling arguments and the policy considerations noted above, the Agency is convinced that the governmental licensing requirements should be mandatory, rather than optional. In response, the Agency is revising paragraphs (a) and (e) of § 1926.1427 to mandate compliance with State and local operator licensing laws that meet a "federal floor" established in paragraphs (e)(2) and (j) of this section.[114]

This mandatory compliance is set forth in the introductory text of § 1926.1427(a)(1) and paragraph (a)(1)(i). OSHA has added § 1926.1427(a)(1)(ii) to clarify that employees of the U.S. military who have been certified or qualified to operate equipment pursuant to § 1926.1427(d) would not also be required to obtain an operator's license from a State or local government for construction work on behalf of the military

[114] This "federal floor" refers to the minimum requirements for license tests in § 1926.1427(e)(2), and the minimum knowledge and skills that must be tested as set forth in § 1926.1427(j)(1) and (j)(2). Employers would not be required by OSHA to comply with State or local government entity licensing requirements that do not meet this "federal floor," but States and local governments could still seek to enforce their own laws.

employer. By requiring compliance with state and local laws, the Agency is also complying with Executive Order 13132, which urges agencies to preserve the full force and effect to state and local laws. (See 64 FR 43225, Aug. 10, 1999.)

This decision is a logical outgrowth of the proposal. The proposal identified a significant safety risk from improper operation of equipment and proposed certification requirements as a means of addressing that risk. Governmental licensing of crane operators has existed alongside OSHA's prior crane rules at former § 1926.550 for many years, and C-DAC made them a significant component of the proposal without any indication that the new standard would exempt employers from compliance with those laws. The government licensing provision was the subject of a number of comments, and was discussed during the hearing in the context of comments requesting OSHA to make the government licensing mandatory.

The preamble to the proposed rule noted C-DAC's opinion that some States have "effective, reliable, licensing procedures" (73 FR 59814, Oct. 9, 2008). The preamble to the proposed rule also specifically cited the Department of Transportation's requirement that commercial drivers also carry state drivers licenses issued in accordance with federal standards (73 FR 59810). The DOT licensing was provided as an example of how state licensing, when required as part of a general federal compliance scheme, has been "used in the past to prevent fatal and other serious accidents that result when operators lack the knowledge and skills needed to operate safely." *Id.* The only other example of successful third-party certification provided as a basis for the certification requirement was another government licensing requirement: Ontario's licensing requirements for crane operators. *Id.* The combination of OSHA's exclusive reliance on these examples

and the government licensing provision in proposed § 1926.1427(e) provided clear notice that the government licensing provision might develop along the lines of the examples. While several commenters submitted comments supporting mandatory compliance with government licenses, thereby indicating that at least these parties viewed the mandatory compliance as a possible outcome of the rulemaking, none of the commenters objected to the government licensing provision or questioned the validity of their tests. The Agency's choice to make compliance with paragraph (e) mandatory, rather than optional, flows logically from the proposal, the comments, and the discussion at hearing. See *National Mining Ass'n v. Mine Safety and Health Admin.*, 512 F.3d 696, 699 (DC Cir. 2008) (noting that the logical outgrowth test takes into account the comments, statements and proposals made during the notice-and-comment period).

The Agency's decision to mandate compliance with state and local laws is not new. OSHA already relies on state licensing requirements in its respirator standard when it provided for "a licensed health care professional" to perform a medical evaluation of an employee's ability to use a respiratory (see § 1910.134(e)). This portion of the standard was challenged and upheld in *American Iron Steel and Steel Institute v. OSHA*, 182 F.3d 1261, 1278 (11th Cir. 1999). OSHA's choice to mandate compliance with state or local law is also consistent with the approach of other agencies. (See, e.g., Department of Transportation regulations requiring state licensing of commercial drivers, discussed in the preamble to the proposed rule at 73 FR 59810, Oct. 9, 2008.)

Paragraph (a)(2) Options for certification or qualification where license not required by a government entity

As noted above, where a state or local license is not required, employers have three choices for certification of operators. Those choices are set out in paragraphs (b) through (d) of this section and discussed in detail below. It is important to note that these options will not satisfy the requirements of § 1926.1427 for operation of equipment within a state or local government's jurisdiction when that government entity has it's own licensing requirements that satisfy the criteria in paragraphs (e) and (j) of this section.

Paragraph (a)(3) Exceptions

The exceptions in the proposed rule were for types of equipment that are specifically excluded from the qualification/certification requirement under sections of this standard that pertain to that equipment, including derricks (see § 1926.1436), sideboom cranes (see § 1926.1440), and equipment with a rated hoisting/lifting capacity of 2,000 pounds or less (see § 1926.1441).

A labor representative pointed out that the exception in § 1926.1441 applies to equipment with a "maximum manufacturer-rated" hoisting/lifting capacity of 2,000 pounds or less, and it asked that this same language be used in § 1926.1427(a) to avoid suggesting that the exception might apply to larger equipment when it is configured to have a rated capacity of 2,000 pounds or less. (ID -0341.) OSHA agrees that the suggested change better reflects the intent of the provision and has modified the language of § 1926.1427(a) in the final rule by replacing the word "rated" with "maximum rated." OSHA notes that this change does not change the substantive requirements of the rule in any manner.

A number of commenters asked that additional types of equipment or activities be exempted from § 1926.1427's qualification/certification requirement.

A utility company recommended that cranes of 10,000 pound capacity or less be excluded on the basis that most uses of these cranes are highly repetitive and predictable. (ID -0144.1.) A trade association suggested exempting cranes rated at less than 10 or 15 tons from the requirement. (ID -0191.1.) It said that these types of cranes are often used to deliver products to a jobsite or to place small rooftop HVAC units on low rise buildings, and that they are used for simple lifts of relatively light loads. This commenter also requested that OSHA add a less restrictive certification level for cranes rated less than 30 tons, which it said are less complicated to assemble and set up and are used during "low risk" lifts.

Another trade association suggested that the threshold for requiring qualification/certification should exclude the 5,000 to 10,000 pound capacity cranes that its members typically use. (ID -0189.1.) It said that this equipment is relatively simple to operate, that the signs its members install rarely exceed 2,000 pounds, and that the equipment is used intermittently on the job and only for brief periods of time.

A third trade association believes that the size and scope of the lifts its members make do not justify the qualification/certification requirements in the proposed rule and suggested alternative requirements for its members when they operate cranes of less than 35 ton capacity with a boom length no greater than 120 feet. (ID -0218.1.) They ask that their members have the option to self-evaluate their operators after they have gone through a specified training program instead of the third-party certification that would be required under proposed Option (1). A representative of the building industry made a

similar recommendation for cranes of less than 35 ton capacity with a boom length no greater than 120 feet. (ID -0232.1.) A small business representative suggested that OSHA consider exempting some small cranes (based on vehicle weight or boom length) or routine lifts. (ID -0147.1.)

A witness for a labor representative testified in opposition to excluding equipment rated over 2,000 pounds by the manufacturer. He stated that some low-capacity cranes have long booms and are used to lift loads to great heights, particularly when there is not sufficient space for a larger crane. (ID -0341.) According to the witness, safety concerns presented by low capacity cranes with a long boom are as serious as the concerns presented by high capacity cranes. (ID -0341.) He added that the danger of power line contact was present regardless of the capacity of the crane.

A representative from a crane rental company also testified against exempting low-capacity cranes from the qualification/certification requirement. His company had a fleet of cranes ranging from 4 to 600 ton capacity, and in his experience the majority of accidents that his customers experienced when they rented cranes but provided their own operators occurred with cranes rated 35 tons or less. (ID -0344.) He was aware of accidents on residential construction sites that resulted from operating on unsuitable ground, not setting the outriggers properly, and lifting too heavy a load for the crane's configuration, deficiencies that he attributed to operators who did not appreciate the hazards involved. (ID -0344.)

OSHA has carefully considered the comments asking for additional types of equipment to be exempted from the qualification/certification requirements of §

1926.1427. For the following reasons, OSHA declines to add such exemptions to the final rule.

The members of C-DAC, who had vast collective experience in all aspects of crane operations, reached a consensus that third-party verification was needed to reduce the number of crane accidents and fatalities in the construction industry. They further determined that such a requirement should apply to virtually all hoisting equipment, with only the limited exceptions listed in the proposed rule. In proposing to exempt equipment with a rated capacity of 2,000 pounds or less, the Committee considered whether to establish a higher threshold for the requirement but concluded that the operators of higher-capacity cranes, including those in the 5,000-35,000 pound range that the commenters ask to be exempted, needed to be well-qualified to reduce the number of accidents involving such cranes. Ultimately, C-DAC included the 2,000 pound cutoff to parallel ANSI B30.5 in this regard (see 73 FR 59841, Oct. 9, 2008).

The rulemaking record shows that many of the same hazards presented by larger cranes are present for cranes in this capacity range, including operating in proximity to power lines, the potential for collapse if the crane is overloaded, and the need for adequate ground conditions to ensure the crane's stability during operation. As a labor representative testified, these smaller cranes may be used in tight spaces where larger cranes cannot be used. An operator's loss of control of the load in a tight space would present a serious safety hazard, and the potential for operating in tight spaces highlights the need for operators of even relatively low-capacity cranes to be highly skilled.

OSHA also rejects the suggestions by some commenters that exemptions should be created for cranes that are typically used for repetitive, predictable, intermittent, or light use.

The principal difficulty with this suggestion is that the underlying causes of crane-related fatalities and injuries are not necessarily diminished in such situations. For example, the presence of power lines presents an electrocution hazard in all situations, irrespective of how the equipment is used. Proper ground conditions, which can change during crane use, are also as necessary for those types of uses as others, and all cranes can be overloaded if operated improperly. The knowledge and skill needed for attaining operator qualification/certification under this section is a prerequisite for being able to successfully address these and other hazards.

Furthermore, while an employer may initially plan to use a crane in a repetitive or otherwise predictable manner, or to handle light loads, unforeseen circumstances can arise that can alter those plans. Wind, which can arise unexpectedly during a lift, can dramatically decrease the capacity of a crane and increase the difficulty in properly handling the load; a previously "repetitive" lift can change unexpectedly when rain causes the ground supporting the crane to become muddy and less able to support the crane; a rigging problem may arise during one of "repetitive" lifts, which could cause unexpected load control problems during the lift; and hoisting a "light" load at a low boom angle can pose similar overturning hazards to hoisting a heavy load at a high boom angle. Nor are there fewer crane-related hazards when a worker operates a crane only intermittently. For example, that operator on one of those occasions may have to run the crane near power lines, in the blind, with uneven winds, or at a low boom angle; in such

cases (as in many others) he/she needs to be as fully capable as an operator who runs the crane regularly.

Paragraph (a)(4)

The Agency is adding this paragraph to the final rule to clarify that operator certification or qualification as required under this section must be provided at no cost to employees who are already employed by the employer on [INSERT DATE 90 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER]. This clarification is consistent with the Agency's revision of the training requirements throughout subpart CC to expressly state that employers must provide all training at no cost to employees. The clarification is consistent with the Agency's treatment of costs for operator qualification and certification in the preliminary economic analysis provided in the preamble of the proposed rule. (See, e.g., 73 FR 59895, Oct. 9, 2008 (operator certification training treated as cost to employer).)

Based on the testimony of several witnesses at the hearing, OSHA concludes that imposing the operator qualification and certification costs on the employer will not be overly burdensome to the employer. At the hearing, a representative from a crane rental company said that, although his company incurs additional cost to provide certification, his company considers that cost an investment in the safety of their employees. (ID -0344.) An insurance company representative and former crane operator stated that the cost of certification was modest when compared to the cost of accidents. (ID -0343.) This witness also stated that his company believes that employers who certify their operators have fewer accidents and that, as a result, his firm offers companies it insures a

ten percent discount if they have their operators certified. (ID -0343.) A representative from a steel erection company agreed that certification is important to both insurance companies and employers because certification gives employers peace of mind and reduces insurance costs. (ID -0344.)

In light of the need for clarification and witness support at the hearing, OSHA is adding new paragraph (a)(4) to this section of the final rule.

Paragraph (b) Option (1): Certification by an accredited crane operator testing organization

As noted above, the proposed rule provided four options for a crane operator to be qualified or certified. Option (1) of this section, in which the employee becomes certified to operate equipment of a certain type and capacity by passing an examination administered by an accredited testing organization, is the most broadly available option, and OSHA expects it to be the one that most employers use outside of jurisdictions with state or local licensing requirements.

Under Option (1), a crane operator becomes certified by a testing organization that has itself been accredited by a "nationally recognized accrediting agency." Section 1926.1401 defines "nationally recognized accrediting agency" as "an organization that, due to its independence and expertise, is widely recognized as competent to accredit testing organizations." The use of a nationally recognized accrediting agency to provide an independent, authoritative assurance of a testing organization's competence is a well-established practice. For example, for a number of years, the National Commission for Certifying Agencies (NCCA), the accreditation body of the National Organization for

Competency Assurance (NOCA), has accredited testing organizations in a wide variety of fields, including those that provide crane operator certification. (ID -0021.) Also, in 2003, the American National Standards Institute began accrediting personnel certification entities. (ID -0022.)

Under § 1926.1427(b)(1)(i), for a testing organization to become accredited, the accrediting agency must determine that the testing organization's written testing materials, practical examinations, test administration, grading, facilities/equipment and personnel meet industry recognized criteria. The accrediting agency must determine that the written testing materials and practical examinations are well designed and sufficiently comprehensive that an individual who achieves a passing grade has demonstrated the skills and knowledge needed to operate the equipment safely. The accrediting agency must also determine that the testing organization's administration and grading ensure the integrity of the test so that the individual's grade truly represents the knowledge and skill level of that individual.

A safety association believed that the criteria for accrediting agencies in proposed § 1926.1427(b)(1)(i) were not sufficiently rigorous and suggested replacing that paragraph with a paragraph that required the nationally recognized accrediting agency to use certification criteria equal to or greater than that of the National Commission of Certifying Agencies (NCCA), the Council of Engineering and Scientific Specialty Boards (CESB), or ANSI/ISO/IEC 17024, *General Requirements for Bodies Operating Certification Systems of Persons*. (ID -0178.1.) This commenter expressed concern that, without this more specific level of rigor, entities with little experience in professional

certification will be able to establish accrediting bodies for certifications that do not adequately demonstrate professional crane operator competence.

An operator certification organization stated that NCCA and ANSI are nationally recognized accrediting agencies and that others should only be designated as such by OSHA after a comprehensive review of its accrediting protocols. (ID -0382.1.) It suggested changing the definition of "nationally recognized accrediting agency" in § 1926.1401 to specify that the only accrediting agencies are ANSI, NCCA, and any other organization designated by OSHA as competent to accredit testing organizations.

These commenters are concerned that an organization that applies insufficiently stringent accrediting criteria might claim to be a "nationally recognized accrediting agency" and accredit testing organizations that are less competent than those accredited by NCCA and ANSI.

OSHA determines that the commenters are correct in suggesting that some additional specificity is needed in the definition to ensure that only entities using sufficiently stringent accrediting criteria are included. In the preamble to the proposed rule, OSHA identified two organizations that it determined were examples of a "nationally recognized accrediting agency" – the National Commission for Certifying Agencies (NCCA) and the American National Standards Institute (ANSI) (see 73 FR 59811, Oct. 9, 2008). No commenters have suggested that these are inappropriate examples of this term. Therefore, to provide greater specificity, OSHA has modified the language used in the proposed rule's definition to include references to NCCA and ANSI as examples of organizations that meet the final rule definition in § 1926.1401.

Section 1926.1427(b)(1)(ii)(A) specifies that the written and practical tests administered by the testing organization must, at a minimum, assess the knowledge and skills listed in §§ 1926.1427(j)(1) and (2). Those subjects are discussed below under § 1926.1427(j).

Paragraph (b)(1)(ii)(B) provides that the testing organization must provide different levels of certification based on equipment capacity and type. This requirement is designed to ensure that the a certified operator has the knowledge and skill needed to safely operate equipment of the type and capacity the employee will actually be operating while avoiding the need for employees to know how to operate more complex equipment.

In the proposed rule, OSHA gave examples of what this provision means in practice. It stated, as one example, an employee who only operates a hydraulic truck crane would not need to also have the additional knowledge and skills necessary to operate a lattice boom crawler crane. As another, it said that an employee who operates only a 22 ton capacity hydraulic truck crane would not need to also have the additional knowledge and skills necessary to operate a 300 ton hydraulic truck crane. The Agency further stated that certification on a more complex type of equipment would typically qualify an operator to operate lower-capacity equipment of the same type, e.g., certification on a 300 ton hydraulic crane would qualify an operator to operate a 22 ton hydraulic crane.

None of the commenters opposed allowing operators certified to operate at a given capacity from also operating lower-capacity equipment of the same type. Two commenters recommended that "type," for purposes of paragraph (b)(1)(ii)(B), be defined for mobile cranes as they are defined in ASME B30.5. (ID -0205.1; -0213.1.)

These commenters also stated that "qualifications (and certification) should be driven by the knowledge and skill required to operate a piece of equipment. When a body of knowledge or a particular skill set for a particular 'type' of crane changes, then so should the appropriate category of certification/qualification."

The Agency concludes that a descriptive definition of "type" that addresses the point raised by these commenters would better accomplish the purpose of the term than tying it to specific examples of existing technology. Therefore, OSHA has added a definition of the word "type" to § 1926.1401 of the final rule.

Examples of many of the various types of cranes currently in use are described in the ANSI B30 series (see, for example, ASME B30.5-2004 for mobile cranes and ASME B30.3-2004 for construction tower cranes). For example, in this context, truck-mounted telescoping boom cranes, truck-mounted non-telescoping boom cranes, and crawler cranes are three different "types," since the specific bodies of knowledge and skills needed for the safe operation of each category is different (although they are not completely distinct – the knowledge and skill sets overlap to some degree).

Commenters and witnesses from the railroad industry believed that certification based on "equipment capacity and type" did not address unique conditions in their industry because current certification examinations did not cover the types of cranes they use or the circumstances under which they use them. A railroad company stated that certification tests used by the two accredited testing organizations require knowledge of skills that do not apply in the railroad industry. (ID -0176.1.) A railroad association stated that railroads use cranes in fundamentally different ways than construction companies and that neither [currently] accredited testing organization has tests that

address the use of cranes on railroads. (ID -0170.1.) A representative from another railroad company testified that some of the types of cranes his railroad uses are fundamentally different from the typical cranes used in the construction industry. Among the cranes that he said are unique to the railroad industry are locomotive cranes and rubber-tired cranes that can either run on the ground or travel on rails. (ID -0342.) The representative stated that certification tests on typical construction cranes were not suited to the types of cranes used in his industry and asked that the rule offer the latitude for the industry to train operators in a way that makes sense for railroads. (ID -0342.)

The comments and testimony by the railroad industry representatives suggest the need for some flexibility in the certification requirement to deal with specialized types of cranes or newly developed equipment for which certification examinations might not be available. Another aspect of this problem was raised by an energy association, which said that the cranes used in erecting wind turbines are the largest and most complex available, and that certification for such equipment is not currently available. (ID -0329.1.)

C-DAC addressed one example of a type of equipment – dedicated pile drivers – for which certification examinations were not available. Section 1926.1439(e) of the proposed rule accommodated this problem by providing that dedicated pile driver operators can be certified either for operation of dedicated pile drivers or for equipment that is most similar to dedicated pile drivers. OSHA concludes a similar approach is appropriate for any equipment for which a certification is not available. Accordingly, OSHA is adding § 1926.1427(b)(2) to the final rule, which allows an operator to be certified to operate a crane if he or she is certified to operate a higher-capacity version of

that type of crane or, if no accredited certification entities offer certification for that particular crane, if he or she is certified to operate the type of crane most similar to the equipment in question.

In light of this change, OSHA is deleting § 1926.1439(e) from the final rule as it is no longer necessary. Paragraph (b)(2) will also facilitate employers' compliance with the requirements of § 1926.1427 by making it clear that the operator's certificate must indicate the particular type and capacity of crane for which the operator was certified.

As discussed in the proposed rule, during the SBREFA process, several small entity representatives suggested that basing certification on the type of crane might result in some capable operators being denied certification. They described situations in which an operator is knowledgeable and skillful with respect to one particular model of crane but might be unable to obtain certification based on equipment capacity and type. In response to this concern, OSHA sought public comment on whether there should be a mechanism for an operator to become certified on a particular model of crane.

Some commenters supported such a mechanism. (ID -0145.1; -0151.1; -0194.1; -0214.1.) Several commenters who opposed the suggestion stated that such certification would likely not be available from testing organizations, that employers who use Option (2) would find it costly and impractical to develop tests for each model of crane, and that testing based on crane model was not appropriate because the skill set and knowledge required for safe operation are not model-dependent. (ID -0175.2; -0205.1; -0213.1.) Witnesses at the hearing also opposed model-specific certification. (ID -0341; -0343.)

OSHA has concluded that expansion of the options to include certification on a specific model of crane is not necessary. The body of knowledge and skills required to

be qualified/certified on a particular model of crane is not less than that needed to be qualified/certified for that model's type and capacity.

It may well be that an operator seeking certification is confident about operating the particular model of crane he/she has been operating but is concerned about being tested on another model of the same type of crane. To the extent this is a concern, OSHA notes that at least one accredited testing organization allows the practical test to be administered at the employer's worksite using the employer's own equipment. (ID - 0343.) With this type of practical test available, operators who feel confident that they can become certified on a particular model can be tested on that model, and such certification will allow them to operate any model of the same type (as long as they also pass the written test). Therefore, certification on a specific model would be more restrictive than is necessary, and OSHA sees no benefit from providing for such a certification. OSHA has therefore retained the requirement that certification is based on the "type" of crane.

The SBREFA Panel also received comments from some SERs suggesting that the standard should accommodate crane operators who were fully capable of operating particular equipment in a limited set of circumstances but who would be unable to pass certification tests that required knowledge and abilities beyond those circumstances. The Panel recommended that OSHA consider and solicit public comment on expanding the levels of operator qualification/certification to allow such operators to be certified for a specific, limited type of circumstance defined by a set of parameters that, taken together, would describe an operation characterized by simplicity and relatively low risk. In response to the Panel's recommendation, OSHA requested public comment on whether

such parameters could be identified in a way that would result in a clear, easily understood provision that could be effectively enforced.

A number of commenters were in favor of a provision that would allow certification in a limited set of circumstances. A labor organization supported certification limited to the use of rail-bound equipment used to install continuously welded rail and stick rail. (ID -0145.1.) This commenter said that such operations involved dragging, manipulating, and positioning rather than hoisting. Other commenters also supported such a limited certification provision but did not provide specific information about how to define those operations or what aspects of the operations made them less risky than other crane operations. (ID -0151.1; -0176.1; -0191.1; -0214.1.) Other commenters opposed this type of "restricted" certification. (ID -0175.2; -0205.1; -0213.1.) They said that the degree of risk in a given situation was difficult to assess and could change due to unforeseen circumstances arising on the job.

OSHA agrees with the commenters who opposed allowing a limited form of certification based on perceived risk levels. As explained earlier in the discussion of this section, the Agency found the argument that certification should not be required to operate cranes that are typically used for repetitive, predictable, intermittent, or light use to be unpersuasive. OSHA did so because such uses are likely to involve many if not all of the same hazards present in other situations.

Similar concerns apply to the concept of "low risk" operations. First, even if such operations could be effectively identified, the possibility of unforeseen events occurring during such a lift requires that the operator have sufficient ability to handle such complications.

Second, as noted above, apart from the suggestion regarding certain railroad operations, no commenter offered a means of setting the parameters for defining this concept. OSHA has therefore rejected the concept of a limited, "low risk" qualification/certification.

A labor organization recommended that OSHA require that applicants for certification testing provide documentation that they have at least 1000 hours of crane related on-the-job experience or training. (ID -0341.) Such experience was necessary, in this commenter's view, because neither the written nor practical exams tested an operator's ability to handle unusual worksite conditions, such as adverse weather or working on crowded jobsites, and did not test an operator's judgment.

As explained above, OSHA has included the qualification/certification requirement to serve as a mechanism to help ensure that operators have attained the level of knowledge and skill necessary to safely operate the equipment. The record amply demonstrates the sufficiency of the accreditation process that must be passed for a testing organization to become accredited. That process is designed to ensure that accredited testing organizations use a sufficiently reliable process for certifying operators. The record also shows that such a mechanism is an effective one for determining operator competence (the record includes the support of the commenter and its C-DAC nominee for that mechanism).[115]

[115] OSHA also notes that the this commenter is, in this regard, taking a position that is inconsistent with the one taken by its C-DAC nominee, who had agreed to the C-DAC version of § 1926.1427, which had no experience/training prerequisite. Nor has this commenter explained why it has changed its position from that of its C-DAC nominee. Due to this inconsistency in position, OSHA accords reduced weight to this commenter's suggested change.

There is insufficient information in the record to include an additional requirement for 1000 hours of "crane related experience or training." The commenter does not specify what should be included in "crane related experience," or why 1000 hours would be the appropriate amount of such experience for this purpose. The commenter also does not specify if meeting the 1000 hour prerequisite by "training" should mean hands-on (criteria for such training is delineated in § 1926.1427(f)) or classroom type training. OSHA notes that the other commenters supporting this section have not recommended adding an experience or training prerequisite. The Agency has therefore declined to accept this suggested change.[116]

Section 1926.1427(b)(1)(iii) requires that the testing organization have procedures for operators to re-apply and be re-tested in the event an applicant fails a test. This would help ensure that if the employee initially failed to pass the test, the employee would be able to retake the test and still have the opportunity to obtain the certification. Section 1926.1427(b)(1)(iii) also requires that the testing organization have procedures for operators to re-apply and be re-tested in the event an operator is decertified.

Section 1926.1427(b)(1)(iv) specifies that the testing organization must have procedures for re-certifying operators designed to ensure that the operator continues to meet the requirements of § 1926.1427(j). Under § 1926.1427(b)(4), a certification is valid for five years, after which the operator must again pass a certification examination.

[116] OSHA also notes that the commenter is, in this regard, taking a position that is inconsistent with the one taken by its C-DAC nominee, who had agreed to the C-DAC version of § 1926.1427, which had no experience/training prerequisite. Nor has the commenter explained why it has changed its position from that of its C-DAC nominee. Due to this inconsistency in position, OSHA accords reduced weight to the -commenter's suggested change.

Section 1926.1427(b)(1)(iv) is included so that recertification procedures appropriate for those who have already been certified will be available.

Under § 1926.1427(b)(1)(v), the testing organization's accreditation must be renewed by the accrediting organization at least every three years to ensure continuing quality of testing materials and administration.

No comments were received on §§ 1926.1427(b)(1)(iii)-(v); those provisions are promulgated as proposed.

Under § 1926.1427(b)(3) (previously designated § 1926.1427(b)(2) in the proposed rule), a certification is "portable," which means that a certificate issued under Option (1) would meet the requirements of § 1926.1427(a)(2) (when state or local jurisdiction does not require operator licensing) until the certificate expires. In the final rule, OSHA is specifying that meaning directly in § 1926.1427(b)(3) rather than in a separate definition in § 1926.1427(m), as proposed. C-DAC determined that certification under this option should be portable because the testing organization is fully independent of all employers who may employ a crane operator and there is no reason to limit the certification to a particular employer. OSHA agrees.

Section 1926.1427(b)(4) (previously designated § 1926.1427(b)(3) in the proposed rule) provides that a certification under this paragraph is valid for exactly five years. The exact five year period is intended to strike the appropriate balance between ensuring that certified operators are re-evaluated regularly, while reducing the burden of recertification on operators.

No comments were received on the text that is now in paragraphs (b)(3) and (b)(4). As noted, the definition of "portable" has been moved from proposed (m)(1) to final (b)(3).

Paragraph (c) Option (2): Qualification by an audited employer program.

Paragraph (c) of this section sets out Option (2), in which the employer determines, through its own audited testing program, that its employee is qualified to operate the equipment. This option is designed to enable employers to meet the § 1926.1427 requirements through their own in-house testing programs. As discussed above, however, C-DAC determined that independent, third-party involvement was needed to ensure the reliability and integrity of any testing program. Therefore, to ensure that testing under Option (2) of this section is accurate and reliable, § 1926.1427(c)(1) requires that the tests must be developed by either an accredited crane operator testing organization (as described under Option (1)), or approved by an auditor who is certified by an accredited crane operator testing organization. In addition, the administration of the tests must be audited.

If the employer chooses to use tests approved by an auditor, the auditor must, under § 1926.1427(c)(1)(ii)(A), be certified as a test evaluator by an accredited testing organization. To ensure that the auditor's evaluation is independent and impartial, § 1926.1427(c)(1)(ii)(B) prohibits the auditor from being employed by the employer seeking evaluation of its qualification program. Also, § 1926.1427(c)(1)(ii)(C) requires the auditor to determine that the program meets nationally recognized test development criteria and adequately assesses the criteria in § 1926.1427(j).

The requirements for test administration that apply under Option (2) of this section are set forth in § 1926.1427(c)(2). These requirements apply to both tests that have been developed by an accredited crane operator testing organization or to those that have been approved by an auditor. Section 1926.1427(c)(2)(i) requires that the auditor find that the procedures for administering the test meet nationally recognized test administration standards. This provision is designed to ensure that the test results accurately reflect the operator's performance on the test.

Under § 1926.1427(c)(2)(ii), the auditor must be certified to evaluate the administration of the written and practical tests by an accredited crane operator testing organization. Section 1926.1427(c)(2)(iii) prohibits the auditor from being employed by the employer seeking the auditor's approval of its test administration procedures.

Proposed § 1926.1427(c)(2)(iv) required that the audit be conducted in accordance with nationally recognized auditing standards. OSHA noted that the proposed rule, as drafted by C-DAC, required only that the administration of the tests, and not the audit of the tests themselves under paragraph (c)(1)(ii), would have to be conducted in accordance with nationally recognized auditing standards. OSHA determines that this was a drafting error and that the Committee intended that the entire audit be conducted in accordance with nationally recognized auditing standards. Therefore, the Agency solicited public comment on whether a new § 1926.1427(c)(1)(ii)(D), reading as follows, should be added to § 1926.1427(c)(1)(ii):

> (D) The audit shall be conducted in accordance with nationally recognized auditing standards.

Several commenters stated that the regulatory text should remain unchanged because, the commenters believed, the nationally recognized accrediting agencies that accredit testing

organizations do not review the examinations for content but only for examination design, administration, and maintenance. (ID -0175.1; -0205.1; -0211.1; -0213.1.)

The Agency concludes that the commenters have misunderstood OSHA's intent in this regard. Under Option (1) of this section, § 1926.1427(b)(1), the accrediting agency must evaluate the "written testing materials" as well as the "practical examinations, test administration, grading, facilities/equipment and personnel" to make sure they all meet "industry recognized criteria." The accrediting agency therefore must evaluate the tests as well as their administration to confirm that they meet industry recognized criteria.

Just as the accrediting agency under Option (1) of this section assesses written testing materials and the practical test for compliance with industry recognized criteria, under Option (2) of this section, as drafted by C-DAC and as written in the proposed rule, the auditor must determine "that the written and practical tests meet nationally recognized test development criteria and are valid and reliable in assessing the operator applicants . . . ." (see § 1926.1427(c)(1)(ii)(C)). No comments were received objecting to those requirements.

OSHA determines that C-DAC's intent in designing Option (2) was, in essence, to have the auditor serve a role similar to that of the accreditor in Option (1). The accreditor in Option (1) assesses the tests as well as their administration to determine if they meet "industry recognized criteria." As drafted by C-DAC, the auditor does the same thing, both with respect to assessing the tests and their administration.

The problem identified by OSHA in the proposed rule relates to auditing procedure, not testing criteria. For example, the records that the auditor would generate

and maintain, the procedures he/she would use for obtaining documents that need to be examined to conduct the audit, the thoroughness of the audit, and similar procedural matters regarding the conduct of the audit need to accord with nationally recognized auditing standards. Section 1926.1427(c)(1)(ii)(C) shows that C-DAC concluded that it was important that the audit meet nationally recognized auditing standards to help ensure the integrity of the audit of the administration of the tests. OSHA determines that it is equally important that the audit of the tests themselves meet those same procedural criteria. Therefore, the Agency has added new § 1926.1427(c)(1)(ii)(D).

Paragraph (c)(3) requires that the program be audited within three months of its inception and every three years thereafter. The Agency has added "at least" to the final rule to clarify that the auditor has the flexibility to perform audits more regularly if it so chooses.

Paragraph (c)(4) of this section requires the employer's program to have testing procedures for re-qualification designed to ensure that the operator continues to meet the technical knowledge and skills requirement in § 1926.1427(j). The re-qualification procedures must be audited in accordance with §§ 1926.1427(c)(1) and (c)(2).

In the event an auditor discovers a deficiency in an employer's operator qualification program, the employer must meet the requirements set forth in paragraph (c)(5) of this section. Under paragraph (c)(5)(i), no additional operators may be qualified until the auditor determines that the deficiency has been corrected. Under paragraph (c)(5)(ii), the program must be re-audited within 180 days of the confirmation that the deficiency was corrected. Paragraph (c)(5)(iii) requires the auditor to file a report of any such deficiency with the appropriate OSHA Regional Office within 15 days of

discovery. In addition, paragraph (c)(5)(iv) requires that records of the audits must be maintained by the auditor for three years and must be made available by the auditor at the request of the Secretary of Labor or a designated representative. The auditor's maintenance of the records, and the reporting requirement, are intended to preserve the independent verification function of the auditor.

Paragraph (c)(6)(i) specifies that a qualification under Option (2) is not portable. As defined in § 1926.1427(m)(2), "not portable" means that only the employer issuing the qualification may rely upon it. OSHA has added that statement of meaning directly in paragraph (c)(6)(i) in the final rule and has removed paragraph (m). C-DAC determined that portability should be limited to certification under Option (1) because the degree of consistency in adhering to the requirements of this section is likely to be highest among accredited crane operator testing organizations because they are fully independent and their business interest depends on their continued accreditation. Under paragraph (c)(6)(ii), a qualification under Option (2) is valid for exactly five years.

A trade association stated that qualification under Option (2) of this section (as well as Options (3) and (4)) should, like certification under Option (1), also be portable. (ID -0214.1.) The commenter stated that there was no rational reason to adopt a rule where portability is restricted to Option (1) certifications. However, OSHA concludes that C-DAC's decision to accord full portability only to a certification under Option (1) is sound. A certification issued under Option (1) is based on tests that are completely independent of any particular employer. Moreover, the commenter's nominee to C-DAC did not dissent on this issue and the commenter has not explained the reason for changing

its position. OSHA gives reduced weight to comments by a nominating organization that are inconsistent with the position its nominee took on C-DAC.

A utility company suggested that electric utilities be able to use Option (2) without an independent auditor by allowing for an internal audit of the employee training program based on annual employee inspections, as allowed in § 1910.269(a)(2). (ID -0342.) Granting this request would permit electric utilities to self-certify their operators. OSHA has rejected this option above and does so here for the same reasons given earlier.

Some commenters stated that Option (2) was impractical because there are currently no individuals who are accredited to carry out the duties of the auditor under the option (ID -0151.1; -0329.1.) OSHA notes, however, that employers have four years from the effective date of this standard to comply with § 1926.1427, and the agency anticipates that, if the demand exists for the services of accredited auditors, they will become available during that time frame.

An operator certification company recommended eliminating Option (2) because, in the commenter's view, it lacks sufficient safeguards to ensure the integrity of the qualification process. (ID -0330.1.) The commenter views this Option as a form of self-certification that is generally inconsistent with the rule's principle of third-party verification. It suggests that this Option presents an inherent conflict of interest based on the incentive that employers have to pass their employee-operators and that the conflict is not cured by an auditor's oversight of the program. OSHA disagrees. Under this option, the auditor must be independent of the employer and certified by an accredited testing organization. In OSHA's view, these requirements provide adequate assurance that a testing program approved by the auditor is of high quality and reliability.

Paragraph (d) Option (3): Qualification by the U.S. military

Proposed § 1926.1427(d) provided that an operator who is an employee of the United States military would be deemed qualified if he/she had a current qualification issued by the U. S. military. The criteria for qualification under Option (3) would be left to the military to determine, including the length of time such a qualification would be valid. Qualification under this option would not be portable unless it meets the requirements of Option (1) of this section.

Unlike Options (1) and (2), Option (3) is available, in accordance with the requirements of paragraph (d), whether or not the equipment is operated within the jurisdiction of a state or local government that has its own operating licensing requirement. The Agency notes that in its comments requesting mandatory compliance with state licensing requirements, New York State noted that it did not intend to supplant Option (3). (ID -0171.1.) There is nothing in the record to indicate that employees of the U.S. military who are authorized by the U.S. military to operate equipment covered by this subpart are currently required to comply with State or local licensing requirements.

In the proposed rule, OSHA noted that OSHA standards did not apply to uniformed military personnel and to civilian employees of the military who are engaged in uniquely military equipment, systems, and operations. Accordingly, Option (3) would apply only to civilian employees of the Defense Department and Armed Forces who are engaged in work that is not uniquely military. It does not apply to employees of private contractors who are working under contract to the military. In the proposed rule, OSHA

noted that the C-DAC document did not clearly exclude such employees even though that was C-DAC's intent.

To make this point clear, OSHA is adding the following clarification to § 1926.1427(d)(1): An "employee of the U.S. military" is a federal employee of the Department of Defense or Armed Forces and does not include employees of private contractors. This clarification was originally proposed in § 1926.1427(m), which is removed from the final rule. Two commenters supported the clarification proposed by OSHA. (ID -0205.1; -0211.1.) Another said the provision should be clarified but did not express an opinion on whether OSHA's proposed clarification should be adopted. (ID -0122.) In the absence of any reasons presented in opposition to the proposed clarification, OSHA is retaining the clarification.

Paragraph (d)(2) specifies that qualification under Option (3) is not portable. Because this option is designed specifically to accommodate civilian employees of the U.S. military, and therefore is not based on the same criteria and independent third-party verification. However, if a U.S. military entity meets the requirements of Option (1), OSHA would consider the operator certification provided by that entity to be portable.

Paragraph (e) Option (4): Licensing by a government entity

Paragraph (e) of this section of the final rule addresses government licensing departments/offices that issue operating licenses for equipment covered by this standard. Paragraph (e)(1) makes it clear that OSHA is only requiring compliance with State or local operating licensing requirements when those licensing programs meet the requirements specified in paragraphs (e)(2). These requirements are commonly referred

to as a "federal floor," meaning that they are the minimum criteria necessary to trigger employer compliance with those licensing requirement under this standard. OSHA is including this "federal floor" because it determines, as did C-DAC, that some, but potentially not all, state/local governments will have effective, reliable licensing procedures. If OSHA determines that a State or local licensing department/office, or its testing, does not satisfy the minimum requirements set out in paragraphs (e) and (j), then employers would not be required by OSHA to comply with the licensing requirements of that government entity. In such cases, the employer would satisfy the requirements of this section by ensuring that their operators are certified or qualified in accordance with the options provided in paragraphs (b) through (d).

The requirement for the government licensing department/office to meet the criteria in § 1926.1427(e)(2) ensures that operators who qualify under Option (4) have the requisite knowledge and skills to operate safely. Paragraph (e)(2)(i) requires that the criteria used by the licensing department/office address the knowledge and skill requirements listed in § 1926.1427(j). Section 1926.1427(e)(2)(ii) requires that the government entity follow the same test content, test administration and related criteria as required under Option (1). Section 1926.427(e)(2)(iii) requires that the office with authority over the licensing department/office assess the tests and procedures used by the licensing office/department and determine that the requirements of §§ 1926.1427(e)(2)(ii) and 1926.1427(e)(2)(iii) have been met. Also, the government licensing office must have re-certification procedures in place as discussed in §§ 1926.1427(b)(1)(iv) and 1926.427(c)(4).

Under § 1926.1427(e)(3)(i), a qualification under Option (4) is valid only within the geographic jurisdiction of the licensing entity. However, if the qualifications of Option (1) in § 1926.1427(b) are met, OSHA would consider the operator certification provided by that entity to be portable. Under paragraph (e)(3)(ii), the qualification is valid for the time period specified by the licensing entity, but for no longer than five years.

Several commenters expressed the concern that OSHA's new standard would preempt existing state or local laws, particularly those relating to licensing of crane operators. Others encouraged the Agency to expressly preempt those laws. The preemption issue is discussed in full at the end of this preamble within section V.D addressing federalism.

Other recommended options

Commenters recommended that OSHA offer employers two additional options for qualifying or certifying operators. One is to allow employers to self-certify operators based on their own evaluation of the operator's ability. For the reasons discussed in the introduction to this section, OSHA rejects that suggestion.

A number of commenters recommended that OSHA expand the range of options by allowing an accredited educational institution to certify operators. (ID -0105.1; -0147.1; -0151.1; -0187.1; -0193.1.) At the public hearing, a witness for a trade association further recommended an option whereby operators could be trained and qualified through an employer program developed by an accredited educational institution. (ID -0343.)

Some commenters believed that additional options were needed because they believed that Option (1) was the only viable option for many employers and that an insufficient number of accredited testing organizations existed to meet the demand that an OSHA rule would create. (ID -0165.1; -0187.1; -0193.1.)

OSHA notes that an educational institution, like any other testing organization, may become an accredited testing organization under Option (1) by becoming accredited by a nationally recognized accrediting agency based on the criteria listed under that option and complying with the "firewall" requirements of § 1926.1427(g). However, OSHA determines the comments favoring this concept were addressing OSHA's request for comment on whether to allow an educational institution to certify operators based solely on its accreditation by an organization recognized by the Department of Education (DoE) without the need to be accredited under Option (1) (see 73 FR 59812, Oct. 9, 2008).

OSHA concludes that accreditation of an educational institution under DoE criteria is insufficient to ensure that a certification issued by the institution would reliably demonstrate that the crane operator has the knowledge and skills needed for safe operation. The fundamental reason is that the accreditation process for educational institutions does not include an assessment of an institution's ability to assess personnel competency.

A representative from a consensus standard organization addressed this issue at the public hearing. The representative had experience both in accrediting educational institutions and personnel certification organizations. (ID -0344.) He testified that the accreditation of an educational institution under the DoE system is designed to assess the

quality of the education an institution offers but does not determine whether the individuals who have attended that institution possess the specific skills or competencies required for particular jobs. Unlike an educational institution, which focuses on the number of graduates, attrition rates, and the percentage pass rate on any national certification or state licensure examinations, a personnel certification program is designed to address competency for job performance. Among the concerns cited by the representative were that the accreditation for an educational program does not assess competency, and that the tests administered by an educational program are not held to the same psychometric standards as those administered by an accredited personnel certification program. The commenter said higher education accreditation is concerned with the quality of education. Personnel certification accreditation, on the other hand, evaluates the quality of assessments to measure the acquisition and ongoing maintenance of valid job competencies (ID -0344.) In addition, personnel certification is time-limited and certifying entities retain the ability to withdraw certification if the individual subsequently demonstrates a lack of competency. (ID -0344.) Institutions of higher education cannot revoke or repossess diplomas.

The representative explained that a key difference between educational accreditation and personnel accreditation is surveillance of the test administration process by the accrediting body to ensure that an individual's score is not tainted by prior knowledge of the examination or by lack of security during the test itself. Using the ANSI accreditation process as an example, he explained that a certification entity seeking accreditation will undergo annual surveillance - onsite during the first and third years, which can encompass multiple sites if the certification entity's structure merits such

review. ANSI examines the controls over test items and the development of test items, to ensure that these items are not released to the public. ANSI also looks to ensure that the organizational structure of the certifying entity is reflective of the population it is intended to serve, and that the administration is fair and equitable among all the applicants. These criteria are not required elements of accreditation for higher education institutions, according to both the representative and Department of Education materials (see 34 CFR 602).

There is another reason why certification by an educational institution would, in most cases, not be suitable for crane operators: the need for personnel testing to be independent of the training that precedes the testing. As discussed below, § 1926.1427(g) of this rule is designed to ensure that training is separate from testing to prevent an organization that offers both services from defeating the validity of the test by "teaching to the test." OSHA acknowledges that it might be possible for an educational institution to provide the necessary "firewalls" between its training and testing, and obtain the separate accreditation required under this section, such that it could comply with § 1926.1427(g). However, educational institutions typically both teach and test, and may do so within their educational accreditation without any requirement that the testing process be insulated from the teaching process.

The purpose of a personnel certification test is different from a test offered by an educational institution, which is to determine whether the individual has mastered the material that was taught. As a labor representative stated at the hearing, personnel certification tests examine a random sampling of information that individuals must know to perform the function being tested. (ID -0341.) The labor representative pointed out

that if the individual is tested only on the material he or she has been taught, the individual learns only the information needed to pass the test and the test is not a reliable measure of the person's depth of knowledge on the subject. Therefore, allowing educational institutions to certify crane operators based solely on their DoE accreditation would be inconsistent with the principle that testing for certification purposes should be independent of any training that the individual has received and would severely compromise the reliability of the certification process.

In sum, the DoE accreditation system for educational institutions is not designed to assess the capabilities that are needed for developing or administering personnel competency tests.[117]

Moreover, concerns about inadequate availability of certifying entities are unfounded. At the time of the proposed rule, two testing organizations, NCCCO and the Southern California Crane & Hoisting Association, had been accredited (see 73 FR 59812, Oct. 9, 2008). By the time of the hearing, four additional testing organizations had been accredited: the Operating Engineers Certification Program, Union Pacific Railroad, National Center for Construction Education and Research, and Crane Institute Certification. (ID -0343.) Although some of these are not available to all employers or crane operators, it does not appear that there will be a lack of availability of testing services under Option (1), particularly with the four-year phase-in period for § 1926.1427.

[117] At least one other federal agency has also taken this view of certification. The Department of Defense requires the certification of certain personnel performing Information Assurance functions within that organization. Appendix 2 to DoD 8570.01-M, the directive addressing such certifications, requires that the certifications must be accredited, and maintain accreditation, under ISO 17024. (ID -0346.1.)

In addition, the record shows that testing organizations arrange for testing to be available at convenient locations. For example, NCCCO offers the written test anywhere in the country where it receives adequate notice and an appropriate testing room is available. (ID -0343.) NCCCO also sends examiners to an employer's worksite to administer the practical tests. (ID -0343.) OSHA therefore concludes that the current four options afford crane operators and their employers sufficient opportunity to obtain qualification/certification and that additional options are not needed to make such services readily available.

Two building trade associations recommended that OSHA add an option that combines aspects of Option (2) of this section with tests developed by an accredited educational institution. (ID -0218.1; -0232.1.) Under their recommendation, the educational institution would develop written and practical tests, and the tests would be approved by an auditor who is certified by an accredited educational institution as qualified to evaluate such tests. The actual operator certification would be issued by the accredited educational institution.

OSHA determines that this recommended program is, in practical effect, not significantly different than the general recommendation for OSHA to allow certification by an accredited educational institution. First, it is likely that educational institutions would be administering tests to individuals who have taken their training courses without "firewall" separation between those functions, thereby giving rise to the problem addressed above that testing would not be independent of training and would therefore be of reduced reliability. Second, although the commenters would not permit the auditor to be employed by the employer, there is no prohibition against the auditor being employed

by the accredited educational institution who certifies him/her. In OSHA's view, this creates the potential for a conflict of interest because the auditor would not be independent of the institution whose tests he or she is reviewing. OSHA finds that the recommendation by the commenters does not contain sufficient safeguards to ensure that the tests provide an indicator of operator competence that is comparable to the other options permitted under this rule.

One commenter asked OSHA to prohibit different organizations from administering the written and practical testing. (ID -0199.1.) The commenter stated that it is necessary for one organization to maintain oversight of the entire test process. The commenter did not provide any support for this assertion, nor has OSHA identified any other evidence in the record to support it. OSHA does not find the request persuasive and is instead relying on the accreditation requirements to ensure that the certifying entity administers all testing appropriately.

Paragraph (f) Pre-qualification/certification training period

Section 1926.1427(f) establishes a process by which operators who are not certified or qualified can get experience operating the equipment to help prepare for obtaining a certification/ qualification. Section 1926.1427(f) allows employees who are not yet qualified or certified to operate cranes provided that they qualify as "operators-in-training" in accordance with §§ 1926.1427(f)(1) through (5), which require appropriate monitoring of such operators-in-training to ensure worksite safety and places limitations on the tasks they can perform. OSHA revised proposed § 1926.1427(f) to clarify that employees who do meet the requirements of an "operator-in-training," and who are not

otherwise certified or qualified under this section, are prohibited from operating equipment (except for maintenance, as provided in § 1926.1429 of this subpart). OSHA has removed the text that was in proposed paragraph (f)(2) as redundant,[118] and has renumbered paragraph (f) of this section.

The proposed rule used the phrase "trainee/apprentice" to describe an operator-in training, the word "supervisor" to describe the individual responsible for monitoring the operator-in-training, and the word "supervise" to describe that individual's oversight of the operator-in-training. Several commenters suggested that the terms "trainee," "apprentice," and "supervisor" could be construed to have labor/management consequences under the National Labor Relations Act (NLRA). (ID -0182.1; -0199.1; -0341.0.) OSHA did not intend for these terms to be construed as they are used under the NLRA, and, to avoid any possible confusion on the subject, has changed "supervisor" to "trainer," "trainee/apprentice" to "operator-in-training," and "supervise" to "monitor" in the final rule.

Paragraph (f)(1) requires that the operator-in-training be provided with sufficient training prior to operating the equipment to enable him/her to operate it safely under the limitations listed in this section and any additional limitations established by the

[118] Proposed paragraph (f)(1) of this section had provided that "[a]n employee who is not qualified or certified under this section is permitted to operate equipment" by satisfying the requirements of proposed paragraph (f)." Proposed paragraph (f)(2), and an alternative also included in the proposed rule, had granted the same permission to any employee who had not passed the written exam or practical tests required under § 1926.1427. While OSHA still intends that employees who have passed either the written exam or practical test be eligible to serve as an "operator-in-training," it is not including this text in the regulation because these employees are already addressed by the language that was in proposed paragraph (f)(1) ("an employee who is not qualified or certified under this section") and is included in the final rule as the introductory text for paragraph (f).

employer. This ensures that, before beginning to operate the equipment at the site, the operator-in-training would have attained sufficient knowledge and skills to operate the equipment safely within the limitations and with the monitoring required by the remainder of § 1926.1427

Paragraph (f)(2) restricts the operator-in-training operation of the equipment to those tasks currently within his/her ability. As the operator-in-training gains experience and demonstrates increased skill, this provision allows him/her to perform progressively more complex tasks.

Paragraph (f)(3) sets forth the requirements that an employee would have to meet to be permitted to monitor the operator-in-training's operation of the crane. During the training period, the operator-in-training must be closely monitored to ensure that he/she is operating in accordance with the training he/she has received and is adhering to the limitation in paragraph (f)(2) that he/she only performs tasks currently within his/her ability.

Under paragraph (f)(3)(i) the operator-in-training's trainer has to be an employee or agent of the operator-in-training's employer. This ensures that the trainer has the authority to direct the actions of the operator-in-training.

Paragraph (f)(3)(ii) requires that the operator-in-training's trainer must be either a qualified/certified operator (in accordance with § 1926.1427), or to have passed the written portion of a qualification/certification test under one of the Options in § 1926.1427. In addition, the trainer must be familiar with the proper use of the equipment's controls. This provision is designed to ensure that the trainer has sufficient

knowledge about the equipment to enable him/her to effectively oversee the safe operation of the crane.

Paragraph (f)(3)(iii) requires that the trainer perform no tasks that would detract from his/her ability to monitor the operator-in-training. This provision ensures that the trainer is able to devote sufficient attention what the operator-in-training is doing so that he/she can intervene to prevent the operator-in-training from doing anything unsafe.

Under paragraph (f)(3)(iv), for equipment other than tower cranes, the trainer and the operator-in-training must be in direct line of sight of each other and are required to communicate either verbally or by hand signals. This provision ensures that the trainer monitor can rapidly and effectively give instructions to the operator-in-training, especially for purposes of correcting anything that the operator-in-training may be doing incorrectly.

With respect to tower cranes, the height of the operator's station will often make it infeasible to maintain direct line of sight between the trainer and the operator-in-training. For the same reason, use of hand signals is also often not feasible. Therefore, the provision instead requires that they be in direct communication with each other. For example, direct communication could be achieved by radio or other instant electronic voice communication system.

Section 1926.1427(f)(4) permits the operator-in-training to continue operating the crane in the absence of the trainer for short breaks under criteria designed to result in safe operation. This provision recognizes that monitoring 100 percent of the time is neither practical nor is it necessary for safe operation if appropriate limitations are imposed. Those limitations are listed in paragraphs (f)(4)(i)–(iii):

Under paragraph (f)(4)(i), the break would be restricted to no more than 15 minutes, with no more than one break per hour.

Under paragraph (f)(4)(ii), immediately prior to the break, the trainer must inform the operator-in-training of the specific tasks that the operator-in-training is authorized to perform and the limitations that he/she must adhere to during the break.

Under paragraph (f)(4)(iii), the specific tasks that the operator-in-training would perform during the break must be within the operator-in-training's ability.

Proposed paragraph (f)(2)(v)[119] stated that a ". . . trainee/apprentice shall not operate the equipment in any of the following circumstances." This paragraph was followed by paragraphs (f)(2)(v)(A)-(E). Of these, paragraphs (f)(2)(v)(A)–(D) contained absolute prohibitions while paragraph (f)(2)(v)(E) contained a conditional prohibition. To avoid inconsistency between paragraph (f)(2)(v) and the paragraphs that followed, the paragraph, which is now at § 1926.1427(f)(5) has been modified to make clear that there is an exception at (f)(5)(v).

Paragraph (f)(5) recognizes that certain tasks are too complex or present such heightened risks that it would be unreasonably dangerous if a less than fully qualified operator were to operate the equipment. For the circumstances listed in §§ 1926.1427(f)(5)(i)-(v), the operator-in-training is prohibited from operating the equipment in all cases. With respect to operations involving multiple-lift rigging, the Committee determined that the difficulty and/or risk involved is not at the same level as the operations listed in §§ 1926.1427(f)(5)(i)–(iv). Consequently, while § 1926.1427(f)(5) contains a general prohibition against an operator-in-training operating

[119] This requirement is now located at § 1926.1427(f)(5).

the equipment during multiple-lift rigging operations, an exception would apply where the trainer determined that the operator-in-training's skills are sufficient for this high-skill work.

A utility company objected to the requirement in proposed § 1926.1427(f)(2)(v)(A) that operators-in-training who are performing subpart V work (construction and improvement of power lines) maintain at least a 20-foot distance from energized power lines, asking that operators-in-training only be required to maintain the same clearance from power lines (those listed in Table V-1 of subpart V) as certified operators. (ID -0144.1.) This commenter claimed that the prohibition would limit the ability of electric utility owners and operators to provide operators-in-training with hands on training.

Based on the record as a whole, OSHA is convinced that the risk of injury from contact with an energized power line is so great that it warrants extra precautions, particularly with respect to operators who are still learning how to operate their equipment. OSHA notes that the other electric utilities and representatives who submitted comments and appeared at the hearing did not voice a similar concern, nor did the industry's representatives on C-DAC. OSHA also notes that the exclusion of digger derricks from the scope of this subpart for pole work should largely alleviate this commenter's concern. Accordingly, OSHA is retaining paragraph (f)(5)(i) in the final rule.

Paragraph (g)

Paragraph (g) of this section provides that "a testing entity is permitted to provide training as well as testing services as long as the criteria of the applicable accrediting agency (in the option selected) for an organization providing both services are met." This paragraph serves two purposes. First, it makes clear that an entity providing qualification/certification testing may also provide training to the individuals it tests, as well as others. Second, it establishes a condition such entities must satisfy: the testing agency must meet the criteria of its accrediting agency for an organization providing both services.

For example, an industry consensus standard, the International Organization for Standardization ("ISO") 17024, requires that a certifying entity only offer training if it can demonstrate that the training is independent of both evaluation and certification. This is intended to prevent the entity's training arm from "teaching to the test," which would detract from the test's ability to determine the individual's true knowledge of the subject matter needed for safe operation. It is also necessary to protect the integrity of the testing. Therefore, with respect to those accrediting agencies that apply the ISO standard, a testing entity may also conduct training as long as an adequate "firewall" exists between the two functions.

Paragraph (h)

Paragraph (h) of this section addresses C-DAC's concern that some competent crane operators may be hindered in obtaining qualification or certification under this section because they have difficulty with taking written tests even though they possess sufficient literacy for reading and understanding safety-related material such as the

crane's operating manual and load chart. To avoid disqualifying individuals solely because they have this type of difficulty, paragraph (h) permits written tests under this section to be administered verbally, with answers given verbally, where the operator candidate (1) passes a written demonstration of literacy relevant to the work; and (2) demonstrates the ability to use the type of written manufacturer procedures applicable to the class/type of equipment for which the candidate is seeking certification. These would typically include, for example, the load chart and operator's manual for the crane the candidate would be operating. Thus, paragraph (h) only permits tests to be administered verbally where the individual demonstrates the literacy needed to read and understand written material needed for safe operation.

As explained in the proposed rule, neither of the demonstrations in paragraphs (h)(1) or (h)(2) would have to be made in English (see 73 FR 59816, Oct. 9, 2008). As an example, under these provisions, an employer could obtain a Spanish-language version of the load charts and operator's manual, and arrange to have the literacy test administered in Spanish. An operator able to meet the requirements of § 1926.1427(h) using these Spanish language materials would have demonstrated adequate literacy under the rule.

A trade association supported the provision allowing examinations to be administered verbally. (ID -0151.1.) A testing organization opposed the provision, believing it adds an unnecessary and potentially harmful step in the qualification process. (ID -0343.) The testing organization was concerned that the rule does not identify standards or protocols by which the written demonstration of literacy relevant to the work and the ability to use written manufacturer procedures are to be made.

OSHA recognizes the testing organization's concern but concludes that the rule must allow sufficient flexibility in the testing process to enable individuals who have sufficient literacy skills and are demonstrably competent to operate a crane, but are deficient in written test-taking ability, to obtain qualification/certification under this rule. Accordingly, OSHA is retaining the provision allowing tests to be administered verbally if the specified demonstrations of literacy are made.

OSHA requested comment on several issues arising under paragraph (h), including (1) whether, if an operator complies with paragraph (h) by demonstrating proficiency in a language other than English, the qualification/certification should be limited to the use of equipment that is equipped with materials in the operator's language; (2) whether the rule needs to incorporate safeguards to ensure that a translation of manufacturer-supplied materials conveys the same information as the original; (3) whether employers should be permitted to use manuals that have been re-written in simplified language to accommodate individuals whose literacy level does not permit them to understand the manufacturer-supplied materials.

One trade association commented that, in many regions of the United States, employers rely on non-English speakers to operate cranes and stated that OSHA should require testing organizations to offer crane operator certification in languages other than English. (ID -0231.1.) OSHA's longstanding position is that workers must be trained and provided with information in a language that they can understand. That is particularly important for crane operators, who will be in control of large pieces of equipment, with the potential to inflict major damage and injury.

It was C-DAC's intent in the proposed rule, and it is OSHA's intent in this final rule, that non-English speaking operators will have the ability to become certified using languages other than English. Paragraph (h)(2) of the rule, therefore, authorizes testing organizations to administer tests in any language that the operator candidate understands. Paragraph (h)(2) is intended to ensure that crane operators are certified in a language that they comprehend, and that the cranes they operate are equipped with the requisite materials in that language. OSHA intends to work with certifying organizations to ensure that examinations in appropriate languages are available within the four-year phase-in period under this section.

OSHA expects employers who perform their own testing under paragraph (c) to test candidates in the languages understood by their workers. OSHA concludes that accredited testing organizations providing certifications under paragraph (b) should likewise provide testing in major languages understood by the relevant worker population of the regions in which they do business. Doing so will maximize an organization's share of the testing market. Moreover, OSHA expects that employers who rely on testing organizations will demand testing in the languages understood by their workforces.

Paragraph (i) [*Reserved*.]

Paragraph (j) Certification criteria

Paragraph (j) of this section sets out the qualification and certification criteria applicable to Options (1), (2), and (4) of this section. These criteria address the knowledge and skills that are fundamental to safe crane operation. As stated in the

introductory language in § 1926.1427(j), these would constitute "minimum" criteria; the accredited testing organizations, employers, or local or state licensing offices would not be precluded from adding additional requirements to their certification or qualification programs.

Paragraph (j)(1) describes the criteria that must be covered by the written examination portion of a qualification/certification program. As stated above in the discussion of examination administration, the written portion of the examination may be administered orally, so long as the candidate has demonstrated sufficient literacy relevant to the work (e.g., load charts and equipment manual).

Paragraph (j)(1)(i) states that the individual seeking qualification or certification must know "the information necessary for safe operation of the specific type of equipment the individual will operate . . ." Paragraph (j)(1)(i) goes on to list specific types of information the individual must know.

Paragraph (j)(1)(i)(A) requires that the written examination address the candidate's knowledge of the equipment controls and operational/performance characteristics of the specific type of equipment. Operational/performance characteristics would include, for example, the deflection characteristics of the boom, including how deflection affects the positioning of the load and the extent to which deflection varies with boom angle and length as well as load weight. Also, equipment with lattice/cable supported booms has different deflection characteristics than equipment with non-lattice booms (that is, hydraulic ram extensible booms).

Paragraph (j)(1)(i)(B) requires the candidate to know the use of, and be able to calculate (manually or with the use of a calculator), load/capacity information on a

variety of configurations of the equipment. Such information is typically contained in load charts and manuals. This provision ensures that the operator is able to accurately determine, independently, the capacity of the equipment in each situation that he/she might encounter and thereby avoid overloading the equipment.

Paragraph (j)(1)(i)(C) requires the candidate to know procedures for preventing and responding to power line contact. As discussed above in relation to §§ 1926.1407-1926.1411, electrical contact with power lines is one of the principal causes of crane-related fatalities and injuries, and those sections contain detailed requirements for preventing such contact and for reducing the likelihood of death or injury should such contact occur. [120] Knowing how to prevent and respond to power line contact is therefore critical knowledge for any crane operator.

Paragraph (j)(1)(i)(D) addresses the need for crane operators to have technical knowledge similar to the subject matter listed in Appendix C applicable to the specific type of equipment the individual will operate. These criteria were selected by C-DAC because, in the experience of the committee's members, they are critical knowledge and skill areas for equipment operators. OSHA defers to C-DAC's experience on this issue and notes that the Agency did not receive any comments suggesting that a particular item be removed from this list. While testing based on the specific list provided in Appendix C is not the means of satisfying the requirements of § 1926.1427(j)(1)(i)(D), alternative criteria must be "similar to" that of Appendix C. The appendix also serves as a "safe

[120] As provided in § 1926.1408(g)(1)(i)(A) on power line safety, operators must be aware of the danger of electrocution if they simultaneously touch energized equipment and the ground. They must also, pursuant to § 1926.1408(g)(1)(i)(B), be trained to understand that when the equipment makes electrical contact with a power line, the operator's safety requires him or her to remain inside the cab except where there is an imminent danger of fire, explosion, or other emergency that necessitates their leaving the cab.

harbor," meaning that testing on all of the criteria provided in Appendix C would satisfy the requirements of § 1926.1427(j)(1)(i)(D).

In addition to the technical knowledge that is required under § 1926.1427(j)(1)(i)(D), technical knowledge applicable to three specific subjects is required under § 1926.1427(j)(1)(i)(E). Paragraph (j)(1)(i)(E)(1) requires that an operator have technical knowledge about the suitability of the supporting ground and surface to handle expected loads. Paragraph (j)(1)(i)(E)(2) requires operators to possess technical knowledge applicable to site hazards, such as hazards posed by excavations or vehicular traffic. Paragraph (j)(1)(i)(E)(3) requires operators to have technical knowledge about site access so that the operator can evaluate whether conditions at the point of access to the site enable the equipment to travel safely onto or off of the site. For example, where equipment must descend or ascend a dirt ramp, the operator needs to be able to assess the effect of the ramp's steepness and to detect signs of instability.

Paragraph (j)(1)(i)(F) requires operators to demonstrate a thorough knowledge of this subpart, including incorporated materials. Operators play a key role in the application of these requirements, and it is therefore essential that they understand them. Paragraph (j)(1)(ii) provides that the individual is able to read and locate relevant information in the equipment manual and other materials containing information referred to in paragraph (j)(1)(i) of this section. As discussed above in relation to paragraph (h), the written materials to which this paragraph refers must be in a language that the individual can read and in which the individual is tested.

Paragraph (j)(2) requires that the qualification/certification examination include a determination through a practical test that the individual has the skills necessary for the

safe operation of the equipment. It also states criteria for such a test. Paragraph (j)(2)(i) requires that an individual demonstrate the ability to recognize, from visual and auditory observation, the items listed in proposed § 1926.1412(d), which sets criteria for shift inspections. Paragraph (j)(2)(ii) requires the operator to demonstrate operational and maneuvering skills. Paragraph (j)(2)(iii) requires that the operator demonstrate the ability to apply load chart information. Paragraph (j)(2)(iv) requires that an operator be able to apply safe shut-down and securing procedures.

One commenter suggested incorporating standard verbal operation signals into the certification criteria. (ID -0110.1.) A different commenter asked OSHA to require knowledge of the "dynamics of boom flex" in its criteria for certification. (ID -0125.) To the extent that knowledge of such signals and the dynamics of boom flex are required for the safe operation of the type of equipment the individual will operate, they would be covered under § 1926.1427(j)(1)(i). The examples of the types of information that would be required for certification are not all inclusive. OSHA defers to C-DAC's experience with respect to the determination of which examples should be highlighted in paragraph (j).

No other comments were received on § 1926.1427(j); it is promulgated as proposed, except that OSHA has corrected "audible observations" to read "auditory observations (observations through the use of the ear).

Paragraph (k) Phase-in

As discussed above, a number of commenters believe that Option (1) of this section (certification by an accredited testing organization) is the only viable option for

many employers and expressed concern about the availability of sufficient accredited testing organizations to meet the demand that this rule would create. Therefore, in the final rule, OSHA has provided a four-year phase-in period for compliance with paragraph (a)(2), which requires employers to have their operators certified or qualified under Option (1) (independent certifying organization), Option (2) (audited employer certification), or Option (3) (U.S. military employees). Paragraph (k)(1) of this section of the final rule sets out different effective dates for the different provisions of § 1926.1427: all provisions except paragraphs (a)(2) and (f) of this section are enforceable as of the effective date of new subpart CC, whereas the certification required under paragraph (a)(2) will not required until the end of the phase-in period, which is four years after the effective date of subpart CC.

The phase-in period does not apply to compliance with licensing requirements of government entities. Those government entities already require compliance with their own licensing requirements, and OSHA sees no rationale for delaying compliance with existing law. Employers would be required to comply with State or local government entity licensing requirements only to the extent that State or local government entity licenses comply with the "federal floor" established in paragraphs (e)(2) and (j) of this section. The options available under § 1926.1427(a)(2) would remain available, and the four-year phase-in period would apply.

As already discussed, C-DAC determined that the market would respond to a qualification/certification requirement, and the increase in the number of accredited testing organizations since C-DAC completed its consensus document validates that view (OSHA notes that several more testing organizations have become accredited since the

proposed rule was issued). There is no evidence in the record that the available testing organizations will be unable to meet the demand even if almost all employers choose that option. The four year period will provide time for additional testing organizations to become accredited for purposes of Option (1).

A labor organization suggested that the four-year phase-in period be reduced to two years. (ID -0409.1.) The commenter stated that C-DAC agreed to the four-year period when it issued its report in 2004 to allow sufficient time for additional certification services to become available. It noted that several additional testing organizations had become accredited since 2004 to meet the demand for certification under various state laws and suggested that the number of accredited testing organizations was now sufficient to meet the demand under this rule within two years. Another commenter also suggested that the phase-in period could be reduced to two or three years if sufficient certifying organizations are available when the final rule is issued. (ID -0104.1.)

OSHA concludes that the rulemaking record supports the proposed four-year phase-in period. While the availability of certification services has increased since C-DAC issued its report, four years is a reasonable amount of time to ensure that the supply of certification services will be sufficient to meet demand. It will also provide time for those operators who need additional training to pass qualification/certification tests to complete that training, and for accredited testing organizations to develop tests in languages other than English to accommodate crane operators for whom English is not their first language.

The four year period will also provide time for the market to also respond to demand for certification programs for certified auditors as described under Option (2) of

this section (and for employers who so choose to develop audited programs for use under Option (2)). Some state and local government entities now offer licenses and, if those licensing organizations do not already meet the criteria under Option (4) of this section, the four-year phase-in period gives them time to do so if they so choose. C-DAC's determination that four years is a reasonable phase-in period was not based solely on the availability of testing services under Option (1) of this section, and OSHA continues to agree that period is appropriate.

Under paragraph (k)(1), during this four year period, §§ 1926.1427(k)(1)(i) and (ii) address the qualifications and training an operator must have before becoming qualified or certified under one of the four options. Section 1926.1427(k)(1)(i) requires that operators be competent for the purposes of operating the equipment safely. This means that the operator must have the requisite knowledge and skill to identify, anticipate, and avoid actions which could result in hazardous conditions related to the equipment and job site.

Paragraph (k)(1)(ii) requires that employers ensure that operators who do not already have sufficient knowledge or skill to operate the equipment safely undergo training prior to engaging in operations. In addition, the employer is required to ensure that the operator is evaluated to confirm that he/she understands the information provided in the training.

The interim measures in paragraph (k)(1) are not significantly different from requirements that were effective under subpart N of this part at former § 1926.550, § 1926.20(b)(4) ("the employer shall permit only those employees qualified by training or experience to operate equipment and machinery"), and § 1926.21(b)(2)("the employer

shall instruct each employee in the recognition and avoidance of unsafe conditions . . .”). However, they are included in this final rule to ensure that there will not be a gap with respect to operator qualifications between the termination of the requirements under subpart N of this part at former §1926.550 and the effective date of §§ 1926.1427(a) through (j) and (m).

Paragraph (l) [*Reserved*.]

Definitions

The proposed rule contained definitions of “portable” and “not portable” in proposed § 1926.1427(m). In addition, OSHA stated that it was considering adding a definition of “employee of the U.S. military” to paragraph (m). As noted above, OSHA has moved the definitions of “portable” and “not portable” to the provisions where those terms are used, and has added a definition of “employee of the U.S. military” to paragraph (d). As a result, proposed paragraph (m) is not needed and is removed.

Physical Qualifications And Substance Abuse Testing

Physical qualifications

C-DAC considered whether to include in this standard provisions that would require equipment operators to meet particular physical qualifications. After considering various possible approaches, including those in industry consensus standards, the Committee decided that it would be very difficult, and likely unnecessary, to identify minimum physical requirements that would be appropriate.

First, the physical demands of equipment covered by this rule vary significantly depending on the type and, in some cases, age of the equipment. For example, some equipment is operated largely by electronic controls. In contrast, older "friction cranes" have pedal controls that can require significant strength and stamina to operate. Some equipment is air conditioned whereas other equipment is not. Tower cranes can require very long climbs to the operator station; small mobile hydraulic cranes typically have an operator's station that is much more easily accessible. A requirement regarding physical qualifications would have to account for these types of differences.

Second, establishing physical qualifications that would appropriately account for the effect of medical conditions would be a complex undertaking. The Committee ultimately determined that, in light of its members' experience that accidents caused by problems associated with the operator's physical/medical condition are rare, the issue of physical qualifications did not need to be addressed by this standard.

Several commenters suggested that OSHA should require operators to undergo and pass medical examinations. (ID -0104.1; -0143.1; -0151.1; -0152.1; -0187.1.) A trade association suggested that medical testing of vision, hearing, and potential for seizures, epilepsy, emotional instability, high blood pressure, and other physical impairments should be part of requirements for safe crane operation. (ID -0187.1.) A safety consultant stated that establishing physical qualifications that would appropriately account for the effects of medical conditions would not be a complex undertaking. (ID -0152.1.) This commenter suggested that a doctor who performs an operator's physical and medical examination could determine if an operator was medically qualified to operate a crane.

OSHA is not persuaded by these comments. First, OSHA concludes that it would not be reasonable to rely on the unguided discretion of examining physicians to determine whether an operator is medically qualified to operate a crane. Doing so would likely lead to a wide variation in the medical conditions that different physicians believe are either necessary or unnecessary for crane operation. Moreover, individual physicians are unlikely to be aware of the variety of conditions that may influence an individual's ability to operate a crane safely, such as the variation in strength needed to operate the controls on different types of cranes. Although physicians are able to determine if an individual has a particular medical condition, they are not well situated to determine if that condition should preclude the individual from operating a crane.

OSHA also finds the comment by the trade association to be unpersuasive. First, this commenter nominated a C-DAC member, who did not dissent on this issue. The commenter did not explain why it is deviating from the position its nominee took on C-DAC, and for that reason OSHA gives reduced weight to its comment. Moreover, OSHA notes that some of the criteria suggested by the commenter, particularly the phrase "other physical impairments," are of questionable value in determining the physical qualifications of crane operators. Indeed, OSHA determines that the commenter's inclusion of such a catchall phrase highlights the difficulty of trying to list the medical conditions that should preclude a person from operating a crane.

In short, OSHA has not been given any persuasive reason to deviate from the considered judgment of C-DAC that this standard should not address the issue of physical qualifications of equipment operators.

Substance abuse testing

As explained in the proposed rule, C-DAC considered whether to include mandatory substance abuse testing for equipment operators and others, such as signal persons, whose jobs affect safety. It decided against doing so because of the procedural limitations such a requirement would impose on employers who have voluntarily instituted substance abuse programs; a government mandate for substance abuse testing would have to meet constitutional safeguards.[121] For example, under a government-mandated testing program, an employer likely would not be permitted to "stand down" an operator based on an unconfirmed test result but would need to wait until a positive result is verified by a medical review officer. The Committee did not want to restrict an employer's ability to suspend an operator who tested positive pending confirmation of the result.

In short, the Committee balanced the potential benefits from a requirement for substance abuse testing that would have more restrictive procedures against the fact that many employers already have their own programs in place that, in C-DAC's view, may be more protective than what could be enacted as an OSHA requirement. C-DAC concluded that it would be better not to include a substance abuse requirement.

Several commenters recommended that OSHA include substance abuse testing in the final rule. (ID -0104.1; -0105.1; -0151.1; -0152.1; -0187.1.) These commenters did not, however, address C-DAC's conclusion that an OSHA mandate for such testing could have the adverse consequence of limiting employers' ability to enforce their own

[121] See *Skinner v. Railway Labor Executives' Ass'n*, 489 U.S. 602 (1989); *International Brotherhood of Teamsters v. Department of Transportation*, 932 F.2d 1292 (9th Cir. 1991).

substance abuse testing programs and could thereby detract from worksite safety. OSHA therefore defers to C-DAC's judgment and declines to include a substance abuse testing requirement in the final rule.

Section 1926.1428 Signal person qualifications

As discussed under § 1926.1419, *Signals – general requirements*, the safety of equipment operations depends in many situations on signals given to the operator. It is critical that the operator understand the signals given, and the signal person must therefore be able to give clear, accurate and appropriate signals that unambiguously convey the needed information. The Committee, which included a number of members with significant experience with signal persons, was concerned that some signal persons are not able to recognize the hazards involved with certain crane operations, do not, in some cases, understand what it is that the crane needs to do to accomplish the task, and do not know how to give the appropriate signals. This poses hazards, such as struck-by and crushed-by hazards, due to either miscommunication or the communication of instructions that are inappropriate.

An example of the type of accident that can be caused by miscommunication from not knowing the appropriate signals is as follows: The signal person intends to indicate to the operator to hoist up, since the load needs to be raised straight up. However, the signal person uses the standard signal for booming up in the mistaken belief that this signal is for hoisting up. A struck-by or crushed-by incident could result because, when booming up, the load will move laterally as well as vertically.

A failure to understand what it is that the crane needs to do to accomplish a task can also lead to struck-by or crushed-by incidents. For example, as a crane booms down, boom deflection tends to increase, which has the effect of lowering the load more than if there were no boom deflection. If the signal person is unfamiliar with this boom characteristic, he or she may fail to signal in time for the load to stop at the correct point or may cause the load to descend too quickly.

The Committee concluded that to prevent such accidents it is necessary to establish qualification criteria that would have to be met for an individual to serve as a signal person (that criteria is set out in proposed § 1926.1428(c), discussed below). The employer would have the option of using one of two methods for ensuring that these criteria were met. Under Option (1) of this section (§ 1926.1428(a)(1)), the signal person would have documentation from an independent "qualified evaluator (third party)," as defined in § 1926.1401, showing that the evaluator had determined that the signal person meets the requirements of § 1926.1428(c).

This qualification would be portable, that is, any employer could rely on such documentation to show that a signal person meets the criteria. C-DAC determined that such portability would be appropriate because of the independence and expertise of the third-party evaluator.

Under Option (2) of this section (§ 1926.1428(a)(2)), an employer's own qualified evaluator (not a third party) would determine that a signal person meets the qualification requirements. Since such a determination would not be done by an independent entity, other employers would not have a basis to assume that the assessment had been done correctly. Therefore, a qualification under this option would not be portable; other

employers would not be permitted to rely upon it to show that the signal person meets these requirements.

One commenter argued for the deletion of Option (2) of this section (the employer option) altogether to ensure that an independent evaluator trains signalpersons according to the established best practices of the industry. (ID -0156.1.) The commenter did not explain why employer evaluations were less effective. To the contrary, the Agency notes that C-DAC experience indicated that employer evaluations of signal persons were effective. The employer evaluation may in some cases be even more effective and efficient than independent evaluations, such as for the evaluation of employer specific signals. Sections 1926.1428(a)(1) and (2) (Options (1) and (2)) are promulgated as proposed.

The term "qualified evaluator" used in proposed § 1926.1428(a)(2) was defined in proposed § 1926.1401 as "a person employed by the signal person's employer who has demonstrated that he/she is competent in accurately assessing whether individuals meet the Qualification Requirements in this subpart for a signal person." In reviewing the C-DAC document, the Agency realized that the Committee had not provided a definition for the term "third party qualified evaluator," which was used in proposed § 1926.1428(a)(1). OSHA therefore added to the proposed rule a definition for this term.

The Agency requested public comment about whether this definition is appropriate, and two commenters indicated support for the definition. (ID -0187.1; -0205.1.) One commenter requested that, in the phrase, "due to its independence and expertise," the Agency add "history in providing training" as an additional criterion and

include labor-management joint apprenticeship training programs as an example of an entity that meets this definition. (ID -0191.1; -0194.1.)

The role of the third-party qualified evaluator in § 1926.1428(a)(2) is to assess the individual's competence. The expertise needed for training is not the same as the expertise needed for evaluating competence (see the explanation of the distinction between training expertise and competence evaluation in the discussion of § 1926.1427). Therefore, it would be inappropriate to require training expertise as a prerequisite for being considered a third-party qualified evaluator.[122] Similarly, while labor-management joint apprenticeship training programs that train and assess signal persons would typically meet the definition for a third-party qualified evaluator, OSHA concludes that including them as an example in the definition could incorrectly imply that training expertise (as opposed to assessment expertise) is a prerequisite.

Several other commenters expressed general support for the definition of a third-party qualified evaluator but requested clarifications. Two of these commenters proposed changing the definition to specify that an "individual" could also qualify as a third-party qualified evaluator. (ID -0205.1; -0222.1.) This is unnecessary because the word "entity" already encompasses an individual. The other commenters recommended that OSHA further clarify the definition by requiring an evaluating entity to "demonstrate" its competence through an independent body's audit, certification, or accreditation. (ID -0169.1; -0211.1.) OSHA agrees with C-DAC that competence can be demonstrated in a variety of ways and is not establishing an accreditation requirement as for evaluators of

[122] A third party evaluator that did not have signal person training expertise would nonetheless have to have substantive expertise in signaling and the other subjects referred to in § 1926.1428, as well as expertise in assessment, to meet the "expertise" criterion in the definition.

crane operators. The assessment of a signal person's qualifications is inherently less complex than the assessment of a crane operator's qualifications because the range of signals and their applications are more finite than the wide assortment of scenarios and skills for which a crane operator must be tested. As such, the need for independent assessment of the evaluator is diminished. Therefore, the Agency has not made the suggested changes; the definition is promulgated as proposed except that the defined term is "qualified evaluator (not a third party)" in the final rule.

Another commenter at the hearing, citing the availability of experienced, trained signal persons in his organization, requested a "grandfather" clause for signal persons so that previous training and proof of hands-on practical experience would qualify signal persons under this rule, citing the availability of experienced, trained signal persons in that organization. (ID -0345.17.) OSHA does not agree that a "grandfather" clause is necessary or appropriate. The experienced, trained workers to which the commenter refers should be able to pass the required assessment with little additional training.[123]

OSHA concurs with the C-DAC Committee's determination that it is important for employers to make the documentation of signal person qualifications readily available to employees and others who need to rely on those qualifications, such as crane operators who rely on signal persons provided by a different employer, or OSHA for compliance purposes. In proposed § 1926.1428(a)(3), OSHA included C-DAC's language requiring that the documentation be "available," rather than "available at the site," but noted that C-DAC intended that the documentation be available at the site by, for example, the

[123] In many cases the only additional training that likely will be needed for those experienced and trained workers will be to become familiar with the relevant requirements of §§ 1926.1419-1926.1422, and § 1926.1428 (knowledge of that information is required under § 1926.1428(c)(4)).

documentation being physically present at the site or through use of an on-site computer. OSHA asked for public comment on changing the term "available" to "available at the site."

Two commenters objected to the proposed change, indicating that it is not necessary to have the documentation on site so long as it can be readily produced. (ID -0205.1; -0222.1.) The commenters did not, however, provide further explanation or cite any examples of how the documentation would be "readily produced" quickly through means other than via computer. Moreover, the commenter's suggestion that documents be "readily produced" is vague and could encompass documents that might be "produced" offsite quickly but not transmitted in a timely manner to the work site. OSHA has decided to modify the language used in the proposed rule and require in the final rule that the documentation be available at the site, and is also adding language to make it clear that the employer is responsible for making that documentation available at the worksite.

In the proposed rule preamble, the Agency noted that the C-DAC draft of Option (2) of this section did not explicitly state that documentation of the signal person's qualification by this method is required. However, proposed § 1926.1428(a)(3) stated that "the documentation for whichever Option is used shall be available . . . ." It was not clear to the Agency if C-DAC intended to require documentation under Option (2) of this section as it did for Option (1), or if it only intended that any documentation the employer chose to create under Option (2) would have to be made available.

One reason to require documentation under Option (2) of this section is the Committee's concern that, at present, the operator's employer has no ready means of

determining if the signal person (who is typically a different employer's employee) has the necessary knowledge and skill for signaling until after hoisting operations have begun. In other words, a problem with the signal person's ability may not become evident to an operator until a hazardous situation has already arisen. Requiring documentation enables this determination to be made before hoisting operations begin.

Requiring documentation under Option (2) of this section addresses C-DAC's concern. Therefore, in the proposed rule, OSHA expanded the first sentence of the C-DAC version of § 1926.1428(a)(2) to clarify that documentation is required under Option (2). The only comment received on OSHA's inclusion of an explicit requirement for documentation under Option (2) was from SC&RA, which supported its inclusion. (ID - 0205.1.) Therefore, in the final rule, documentation is required under Option (2).

The Agency concludes that the rationale for including an explicit requirement for documentation under Option (2) of this section – the need for other affected employers at the site, such as the operator's employer, to have a ready means of determining if the signal person has the necessary knowledge and skill before beginning hoisting operations – also necessitates that the documentation be available at the site. OSHA is concerned that if it is not available at the site (either in paper form or electronically), it is less likely that the documentation will serve its intended purpose. Therefore, in the final rule, the documentation required under both Option (1) and Option (2) of this section must be available at the site.

OSHA is also adding a requirement in paragraph (a)(3) of this section of the final rule that the documentation must specify each type of signaling for which the signalperson has been tested and meets the requirements of § 1926.1428(c). This

requirement parallels the requirement in § 1926.1427(b)(2) in which operator certification documents must specify the type and capacity of the equipment for which an operator is certified. This new provision fills a potential communication gap that would have existed in the implementation of the rule as proposed. As explained above, one of the main reasons that OSHA is requiring the documentation to be available at the site is so that the operator, or any person on the job site, who is unfamiliar with a signal person may review that documentation to ensure that the signal person is sufficiently qualified to provide the signals required for that job. Because many of the qualifications that must be tested under paragraph (c) of this section are conditional (e.g., if hand signals are to be used, the signal person must understand the Standard Method hand signals), and the proposed rule did not specify any content for the documentation, the documentation provided by a third-party qualified evaluator under Option (1) of this section might simply have generally noted the satisfactory completion of testing in accordance with § 1926.1428(c). In that case, under the proposed rule, an operator preparing for a job requiring the use of hand signals would not have been able to use that documentation as intended to determine whether the signalperson knew and understood the Standard Method for hand signals. Under the final rule, the operator will be able to make that determination quickly because the documentation must specify whether the signalperson was examined on hand signals. This requirement is not intended to require significant detail, such as specifying that the signalperson knows the hand signals for “hoist” or “stop.” Rather, it is intended to identify satisfactory completion of testing on different categories of signals, such as hand signals, radio signals, or flag signals.

Paragraph (b) of this section addresses circumstances in which a signal person who had been qualified under § 1926.1428(a) subsequently acts in a manner that indicates that he or she may not meet the qualification requirements. Such an indication would result, for example, where the use of Standard Method signals have been agreed to but the signal person does not give a Standard Method signal. Another example would be where the signal person gives inappropriate signals (such as indicating to the operator to boom up when the action that is needed is to hoist up).

In such circumstances the employer is prohibited from allowing the individual to continue working as a signal person until he or she is re-trained and has been requalified in accordance with § 1926.1428(a). No comments were received on this provision; it is promulgated as proposed.

Paragraph (c) of this section sets forth the qualification requirements for signal persons. Paragraph (c)(1) requires that the signal person know and understand whatever signal method will be used for that particular job site.

In addition, if hand signals are used, the signal person must know and understand the Standard Method for hand signals. Hand signals are widely used in this industry. As discussed above with respect to § 1926.1419(c), C-DAC determined that accidents due to miscommunication could be reduced if there were more widespread use of standardized hand signals. C-DAC concluded that this provision will promote greater use of standardized hand signals through the use of the Standard Method.[124] No comments were received on this provision; it is promulgated as proposed.

[124] As discussed above with respect to § 1926.1419(c), there are circumstances when it would be permissible to use hand signals other than the Standard Method signals. Also, under § 1926.1419, signals other than hand signals can be used.

Paragraph (c)(2) of this section will help prevent miscommunication between the signal person and the crane operator by requiring the signal person to be competent in the application of whatever signals are used. No comments were received on this provision; it is promulgated as proposed.

Paragraph (c)(3) of this section requires the signal person to have a basic understanding of crane operation and limitations, including crane dynamics involved in swinging and stopping loads and boom deflection from hoisting loads. As explained in the proposed rule preamble, it is critical that the signal person understand how the crane and load will move in response to the various signals he or she gives so that the signal person will give the most appropriate signals and reduce the occurrence of struck-by, crushed-by and other hazards (see 73 FR 59823, Oct. 9, 2008). No comments were received on this provision; it is promulgated as proposed.

Paragraph (c)(4) of this section specifies that signal persons must know and understand the relevant requirements in §§ 1926.1419-1926.1422, which address the types of signals that may be used and the circumstances surrounding their use, and the requirements of § 1926.1428. C-DAC included the phrase "relevant requirements" to make clear that a signal person's qualification could be limited with regards to the use of a particular type of signal and associated information.

For example: A crane operation is going to use Standard Method hand signals. The signal person knows and understands all aspects of § 1926.1419 that are relevant when using hand signals, as well as § 1926.1422, *Signals – hand signal chart*. In addition, the signal person meets the requirements in § 1926.1428(c)(1) and (2) with respect to the use of Standard Method hand signals. The signal person also has the

knowledge necessary to meet the provision in § 1926.1428(c)(3), and demonstrates through a verbal or written test, and through a practical test, that he/she has this knowledge and capabilities. However, the signal person is unfamiliar with the contents of § 1926.1420, *Signals – radio, telephone or other electronic transmission of signals*, or of § 1926.1421, *Signals – voice signals – additional requirements*.

In this example, it would be appropriate for the signal person to be qualified under either Option (1) or Option (2) of this section (see 1926.1428(a)) so long as that qualification was limited to signaling with Standard Method hand signals. Since the signal person would be qualified only for Standard Method signaling, there would be no need for that person to have the knowledge or capabilities associated with other types of signaling. In such a situation employers, though, would be precluded from using such a person if other types of signals were to be used. No comments were received on this provision; it is promulgated as proposed.

Paragraph (c)(5) of this section would require that the signal person pass knowledge and practical tests to demonstrate that he or she meets the qualification requirements. The knowledge test may be either oral or written. C-DAC noted that signal persons normally need not read or write to perform their jobs effectively. No comments were received on this provision. Therefore, OSHA agrees with C-DAC that administering the knowledge test orally, without a separate demonstration of literacy, should be permitted. The provision is promulgated as proposed, with one minor grammatical correction.

Section 1926.1429 Qualifications of Maintenance and Repair Workers

This section addresses the qualifications that the workers who maintain and repair cranes/derricks must possess. Subpart N of this part at former § 1926.550 contained no provisions concerning the qualifications of maintenance and repair workers.

The Committee had two basic concerns regarding maintenance and repair work. First, it was aware of accidents that had occurred when the equipment that was being maintained or repaired was operated improperly. For example, a maintenance worker who booms down a mobile hydraulic crane to one side without following the manufacturer's instructions for deploying outriggers may overturn the equipment. C-DAC concluded that placing restrictions on equipment operations during such work would help prevent such accidents.

Second, the Committee sought to avoid hazards that can result from maintenance and repair work that is done improperly by ensuring that maintenance and repair workers are sufficiently qualified to perform their work. For example, if a load-bearing component is removed for maintenance or repair and re-installed incorrectly, unintended movement of the load or even a collapse could occur during operations.

Paragraph (a)

The Committee was aware that maintenance and repair workers sometimes need to operate equipment to perform maintenance, inspect the equipment, or verify the performance of the equipment. This work typically involves operating the equipment to get access to components, diagnose problems and check repairs.

C-DAC did not determine it necessary for maintenance, inspection and repair personnel to meet the requirements in proposed § 1926.1427, *Operator qualification and*

certification, when operating equipment for such purposes. The operations involved for these purposes are almost always done without a load on the hook. The only instance when there is a load on the hook is if the equipment is load tested. However, even when load testing, the operation is very limited, since the load is not moved about as it would be during normal crane operations.

While such limited operation does not, in C-DAC's view, necessitate the maintenance, inspection or repair personnel to meet the proposed § 1926.1427 requirements, a failure to operate the equipment properly even in these limited circumstances can result in accidents from, for example, unintended movement or tip-over. OSHA agrees, and is therefore permitting maintenance and repair workers to operate equipment during their work only under specific restrictions designed to ensure safety.

Specifically, under paragraph (a)(1) of this section, maintenance and repair workers are permitted to operate the equipment only to the extent necessary to perform maintenance, inspect the equipment, or verify its performance. Under this provision, maintenance and repair workers are not permitted to operate the equipment during regular operations.

Paragraph (a)(2) of this section requires the maintenance and repair worker who operates equipment to either (i) do so under the direct supervision of an operator who meets the requirements of § 1926.1427, *Operator qualification and certification*, or (ii) be familiar with the operation, limitations, characteristics and hazards associated with the type of equipment involved.

Paragraph (b)

In light of the safety hazards that could result from maintenance and repairs that are performed improperly, C-DAC determined that it was necessary for maintenance and repair workers to meet the "qualified person" criteria. OSHA agrees. Paragraph (b) of this section therefore provides that maintenance and repair personnel must meet the definition of a qualified person with respect to the equipment and maintenance/repair tasks they perform. As defined in § 1926.1401, a "qualified person" is "a person who, by possession of a recognized degree, certificate, or professional standing, or who by extensive knowledge, training, and experience, successfully demonstrated the ability to solve/resolve problems relating to the subject matter, the work, or the project."

Two commenters requested that maintenance and repair workers be certified by a third party. (ID -0061; -0156.1.) As noted in the preamble to the proposed rule and again here, C-DAC considered the requirements for maintenance and repair workers and found that the term "qualified person" would adequately address these concerns. OSHA agrees, and is promulgating paragraph (b) without substantive change. OSHA is substituting the word "must" for "shall" in the last sentence of that paragraph to avoid any implication that a maintenance and repair worker is, by definition, a qualified person.

Section 1926.1430 Training

With a few exceptions, the requirements in this final rule for this section are the same as those in the proposed rule (see 73 FR 59939, Oct. 9, 2008). This section both references training criteria required by other sections of subpart CC and sets forth

additional training criteria and requirements. Additionally, § 1926.1430(h) requires employers to evaluate employees' understanding of the training.

The Agency determined that both training and testing of certain employees are critical to the safety of crane/derrick use in construction.[125] The requirements of this section and subpart with respect to training do not replace those established by § 1926.21, *Safety training and education*, which requires the employer to (1) "establish and supervise programs for the education and training of employers and employees in the recognition, avoidance and prevention of unsafe conditions in employments covered by the [OSH] Act," and (2) "instruct each employee in the recognition and avoidance of unsafe conditions and the regulations applicable to his work environment to control or eliminate any hazards or other exposure to illness or injury." Instead, they supplement and clarify the general training requirements for particular conditions and activities. These specific provisions ensure that employees have the necessary knowledge and skill to work safely with and around cranes. Greater specificity highlights the particular tasks (and the hazards associated with them) for which certain types of training are necessary.

The Agency is also clarifying in § 1926.1430 that employers have a duty to train each employee covered by subpart CC, and to provide that training at no cost to the employee. In the introductory text to proposed § 1926.1430, the Agency specified that the employer "shall provide" all applicable training, which was included to indicate that the employer would bear the cost of training. This is consistent with the Agency's

[125] With respect to operator testing, as discussed in connection with § 1926.1427, *Operator qualification and certification*, this standard places special emphasis on ensuring that equipment operators have acquired the knowledge and skills necessary to operate their equipment safely. This standard also includes specific assessment requirements for signal persons (see § 1926.1428(a)).

treatment of training costs in the preliminary economic analysis provided in the preamble for the proposed rule. (See, e.g., 73 FR 59895, Oct. 9, 2008 (operator certification training treated as cost to employer).) In the final rule, OSHA is rewording each of the training requirements to further clarify the employer's responsibilities with respect to all training requirements under subpart CC, and is adding new § 1926.1430(g)(3) to expressly state that employers must provide all training at no cost to the employee.

Several commenters recommended that additional training be required. (ID -0126.1; -0156.1; -0182.1; -0209.1.) One suggested that maintenance and repair personnel be certified by either the manufacturer or an independent third party that they are trained in the maintenance and repair of the crane. (ID -0156.1.) However, under § 1926.1429(b), maintenance and repair employees are required to be qualified persons. Those employees must be trained on the requirements of subpart CC as required by § 1926.1430(d) and must have the education or experience to be considered a qualified person as defined in § 1926.1401. This commenter has not presented evidence showing that manufacturer or third party certification would significantly improve the qualifications of maintenance and repair personnel who meet the test of "qualified person."

Another commenter felt additional hazard awareness training should be required for employees. (ID -0182.1.) OSHA determines that the training requirements of this and other sections of subpart CC, along with § 1926.21, provide for adequate training of all employees and allow employers flexibility to provide training as needed for each employee at various worksites.

Proposed § 1926.1430(a), *Overhead powerlines*, stated that employees listed in § 1926.1408(g) must be trained accordance with the requirements of that paragraph. As discussed in § 1926.1410, OSHA has added § 1926.1410(m), which requires that operators and crew assigned to work with equipment that comes closer to power lines than the minimum clearance distance permitted under §§ 1926.1408 and 1926.1409, must also be trained in accordance with § 1926.1408(g). To accommodate this change, § 1926.1430(a) also includes a reference to § 1926.1410(m).

Under paragraph (b) of this section, *Signal persons*, employees assigned to work as signal persons and need training to meet the requirements of § 1926.1428(c) must be trained in the areas addressed in that paragraph. As discussed in § 1926.1428(c), each employee who serves as a signal person must pass a verbal or written test, and a practical test demonstrating the required knowledge and skills. One commenter believes the training requirement outlined in this paragraph could be interpreted to mean that only training is required and the qualification requirements of § 1926.1428 are not applicable. (ID -0292.1.) This is incorrect. This paragraph requires an employer to ensure the employee assigned as a signal person receives training, or re-training if needed, to be a signal person according to § 1926.1428. This is not a replacement for the qualification requirements of § 1926.1428. This provision is promulgated as proposed except for the clarification of the employer's duty to train each employee.

Proposed paragraph (c) of this section was entitled *Operators*, and set forth training requirements for operators of equipment covered by this subpart. Proposed § 1926.1430(c)(1) stated that "operators who are not qualified or certified under § 1926.1427 shall be trained in the areas addressed in § 1926.1427(j). . . ."

Several commenters believed that the language of proposed § 1926.1430(c)(1) indicated that operators who have not been qualified or certified under § 1926.1427 may nonetheless operate cranes. (ID -0156.1; -0182.1; -0208.1; -0292.1.) One commenter noted it could be interpreted to mean that certification was not required, only training. (ID -0182.1.)

Such interpretations are contrary to the Agency's intent. OSHA used the word "operator" in the proposed § 1926.1427(c) to refer to any employee, with the exception of maintenance and repair workers, who operates equipment, whether or not that employee has completed all necessary training. It has the same meaning when used in final § 1926.1427(c).

Proposed paragraph (c)(1) was intended to apply to operator trainees who must be qualified or certified under § 1926.1427 to operate equipment, but are not yet qualified or certified. Also in this category are employees who need training to become re-qualified or re-certified, or who failed to pass a qualification or certification test and need additional training. Such employees are only permitted to operate cranes under the conditions specified in § 1926.1427(f), and the proposed rule required them to be trained in the operator certification/qualification criteria provided in § 1926.1427(j).

Because the certification and qualification requirements of § 1926.1427 will not be phased in until four years after the effective date of the standard, see § 1926.1427(k), OSHA specified in the preamble to proposed paragraph (c)(1) that operator training during this phase-in period would likewise be required to address the criteria in § 1926.1427(j) (see 73 FR 59826, Oct. 9, 2008).

To clarify its intent in the final rule OSHA has split proposed paragraph (c)(1) of this section into three separate paragraphs, (c)(1) through (3), and renumbered proposed (c)(2) as (c)(4). Revised paragraph (c)(1) is intended to apply after the four-year phase in period to employees who must be certified, or qualified, under § 1926.1427 and are training to do so for the first time, and to employees who are training for re-certification/re-qualification. These employees, who will only be permitted to operate the equipment as "operators in training" and subject to several conditions, must be trained in the areas addressed in § 1926.1427(j) (criteria for operator certification testing).

Paragraph (c)(1) also requires employers to provide the necessary additional training if the operator-in-training does not pass a qualification or certification test. C-DAC determined, and OSHA agrees, that it is important for an employer to provide the training necessary for its operators to be qualified or certified as required by this subpart.

C-DAC selected the criteria in § 1926.1427(j) as the minimum knowledge and skill requirements necessary for safe operation of equipment. OSHA is therefore requiring training in the same areas to ensure consistency with the certification/qualification process and to develop the trainee's knowledge and skills in the areas that the record reflects are critical to the safe operation of equipment.

New paragraph (c)(2) addresses training during the 4-year phase-in period in the same way for the same people as in paragraph (c)(1): each must be trained in the areas addressed in § 1926.1427(j). Although the certification/qualification requirements do not apply until four years after the effective date of this standard, OSHA concludes that it makes sense for two reasons to train employees in the same areas that they will need to master to pass the certification/qualification examinations: (1) it will facilitate their

preparation for the examination, and (2) these areas have been identified in the record as the minimum knowledge and skill sets that all operators should possess.

Paragraph (c)(3) applies to operators of equipment covered by this subpart but are expressly excepted from the certification and qualification requirements of § 1926.1427. This includes those operators for whom the qualification or certification requirements of § 1926.1427 do not apply based on the type of equipment being operated. Section 1926.1427(a) provides: "Exceptions: Operator qualification or certification under this section is not required for operators of derricks (see § 1926.1436), sideboom cranes (see § 1926.1440), and equipment with a maximum manufacturer-rated hoisting/lifting capacity of 2,000 pounds or less (see § 1926.1441)." For the same reasons that the Agency has concluded that the operator certification/qualification criteria in § 1926.1427 are not appropriate for these operators, the Agency concludes that training on the same § 1926.1427(j) criteria would also not be necessary. Instead, these operators, must be trained in the safe operation of the type of equipment they will be operating.

Proposed paragraph (c)(2) has been renumbered in the final rule as paragraph (c)(4). Final rule paragraph (c)(4) applies to all persons operating equipment under subpart CC, regardless of whether that person must be certified or qualified under § 1926.1427, and regardless of whether it is during or after the four-year phase-in period, and requires operators to be trained in two practices that C-DAC deemed worthy of specific emphasis for the safe operation of any equipment. Paragraph (c)(4)(i) requires training in the testing of the boom hoist brake on friction equipment prior to moving a boom off a support to determine whether the brake requires adjustment or repair. The purpose of this procedure is to ensure that the brake is sufficient before the boom is at too

great an angle or height. Using this procedure, if the brake is deficient, the boom will fall only a short distance. This provides an additional safety measure related to the hazards resulting from an uncontrolled boom. Moving the boom when the brake is not working properly can result in uncontrolled lowering of the boom, which can endanger workers in the proximity of the hoisting equipment. Paragraph (c)(4)(i) also requires similar training for testing the brake on all other equipment with a boom. Again, this procedure provides an additional safety measure related to the hazards resulting from an uncontrolled boom. For clarity, the Agency has added a reference to §§ 1926.1417(f) and (j) for additional requirements related to tag-out procedures and communication for any necessary repairs. See discussion the these requirements above at §§ 1926.1417(f) and (j).

Paragraph (c)(4)(ii) requires the operator to be trained in the manufacturer's emergency procedures, when available, for stopping unintended equipment movement. This provides another level of protection to minimize employee injury resulting from unintended equipment movement. OSHA recognizes that manufacturer's emergency procedures for halting unintended equipment movement may not always be available and therefore this training is required only when the procedures are available.

One commenter requested that more specialized training, such as model-specific training, should be required for newly hired operators or operators assigned to new or different models of equipment. (ID -0199.1.) OSHA determines that the rule addresses this commenter's concern. An operator qualified or certified under § 1926.1427 has shown that he/she is qualified to operate any type of equipment covered by the qualification/certification. Others must be trained in the type of equipment they are operating under paragraph (c) of this section.

Paragraph (d) of this section, *Competent persons and qualified persons*, requires competent persons and qualified persons to be trained regarding the requirements of this subpart applicable to their respective roles.

A person assigned by an employer to be a "competent person" or "qualified person" under this rule must already have had a certain level of training (or, in the case of a competent person, either training or experience) to meet the criteria applicable to such a designation. This paragraph does not address such training – it does not require the employer to provide the training needed for an employee to meet the criteria to become a competent or qualified person. The sole purpose of this paragraph is to require the employer to ensure that both competent persons and qualified persons are trained on the requirements of this subpart applicable to the person's role and responsibility. For example, under § 1926.1430(d), a "competent person" assigned to conduct shift inspections required in § 1926.1412(d) must be trained in the required elements of a shift inspection. This training is necessary to ensure that the competent person or qualified person is aware of his/her role under this subpart regarding finding/correcting hazardous conditions.

Another example is maintenance and repair personnel, who may operate equipment under limited conditions necessary to perform the maintenance or repair (see § 1926.1429(a)). Such an employee must be "qualified person," § 1926.1429(b), and must be trained in accordance with § 1926.1430(d) to operate the equipment as necessary to perform the maintenance or repair. The Agency notes, however, that maintenance and repair workers are not considered "operators" for the purposes of paragraph (c) of this

section and are therefore not required to be trained in all of the areas addressed in § 1926.1427(j), or as required under § 1926.1427(c)(3).

No comments were received on this paragraph; it is promulgated without change from the proposed rule except for the clarification of the employer's duty to train each employee.

Paragraph (e) of this section, *Crush/pinch points*, provides that employees who work with equipment covered by this subpart must be instructed to stay clear of holes, crush/pinch points and the hazards that are addressed in § 1926.1424, *Work area control*. See the discussion above of hazards and requirements addressed by § 1926.1424. No comments were received on this provision, and it is promulgated as proposed except for the clarification of the employer's duty to train each employee.

Paragraph (f) of this section, *Tag-out*, states that operators and other employees authorized to start or energize equipment or operate equipment controls (such as maintenance and repair workers) must be trained according to the tag-out and start-up procedures in § 1926.1417(f) and (g). See the discussion above of these procedures in § 1926.1417.

On review of this paragraph, OSHA determines that a reference to the start-up procedures was inadvertently omitted in the text of the proposed rule since these employees are "authorized to start/energize equipment." OSHA has corrected this omission in the final rule by adding a reference to start-up procedures in § 1926.1417(g) in the regulatory text.

Paragraph (g) of this section requires employers to ensure that employees understand the required training and provide refresher training when necessary.

Specifically, § 1926.1430(g)(1) requires the employee to be evaluated to verify that he/she understands the information provided in training required by this subpart. The Agency determined that, to ensure that the training is effective, some means of assessment for understanding is needed.

One commenter believed this requirement was unclear and did not understand how an employer would determine if training was effective. (ID -0232.1.) This commenter also indicated that it could be interpreted that a test would always be required to determine whether training had been effective.

The Agency purposely does not use the term "test" in this paragraph. "Test" may be interpreted to mean a standardized written or a structured oral exam, which may not be appropriate for all situations. OSHA determines the method of evaluating an employee's training for effectiveness will vary by the subject matter of the training and the employee, and the Agency has therefore drafted this paragraph to provide sufficient flexibility for the employer to determine the most appropriate method of evaluation. Any number of methods could be used to determine if an employee has understood the training provided. For example, during assembly/disassembly a certain method of blocking may be needed. The supervisor trains and instructs the employee on the proper method. The supervisor can then evaluate the employee's comprehension of training in a number of ways. One way could be simply to ask the employee to orally describe how he/she would do this task, or to have the employee physically emulate the blocking method. Another would be to provide blocking to the employee and ask the employee to arrange the blocking in the proper manner. Either method can give the supervisor the necessary information to

determine if the employee understood the proper method or if additional training is required.

Another commenter recommended the incorporation by reference of ANSI/ASSE Z490.1-2001 for how to test trainees. (ID -0178.1.) Much of sec. 6.2 of that standard reflects the same concepts referred to above and may be useful to employers. However, a "Note" to sec. E6.2.2 suggests that self-evaluations may be adequate. OSHA does not conclude that a self-evaluation is appropriate to meet the requirements of § 1926.1430(g)(1). While other aspects of the ANSI/ASSE standard may be useful as a guide to employers, it is not drafted in a way that is suitable for enforcement of this provision. For these reasons, OSHA declines to incorporate it by reference as a requirement.

Paragraph (g)(2) of this section requires the employer to provide refresher training for an employee when, based on evaluation or employee conduct, it is indicated that retraining is needed.

One commenter recommended a requirement for a minimum number of continuing education courses each year for employees. (ID -0209.1.) Another commenter recommended that refresher training be done every 3 years or earlier when based on evaluation of employee conduct. (ID -0182.1.)

The Agency finds these comments to be unpersuasive. As proposed, the employer is required to retrain an employee based on the individual's conduct. OSHA determines this promotes a more effective retraining requirement than one based on time or type of coursework.

Therefore, paragraphs (g)(1) and (2) of this section are promulgated as set forth in the proposed rule. As noted above, the Agency is adding new paragraph (g)(3) to clarify that employers are responsible to provide the training required under subpart CC at no cost to employees.

The following chart summarizes the location of the training requirements in the final rule:

SECTION	**TRAINING REQUIREMENT**
§§ 1926.1408(g) & 1926.1410(m)	Power line safety
§ 1926.1424(a)(2)	Swing radius hazards
§ 1926.1437(c)(2)(ii)	Swing radius hazards (floating cranes & land cranes on barges)
§ 1926.1430(e)	Crush/pinch points (Work Area Control)
§ 1926.1430(f)	Tag-out
§ 1926.1430(f)	Start-up
§ 1926.1430(d)	Competent and Qualified Persons
§ 1926.1430(g)(2)	Refresher training (general)
§ 1926.1430(b)	Signal person training (equipment with greater than 2,000 pound maximum rated capacity)
§ 1926.1428(b)	Signal person re-training
§ 1926.1427(f)	Operator-in-training
§§ 1926.1427(k), 1926.1430(c)(2) and 1926.1430(c)(4)	Operator training during transitional period.
§ 1926.1430 (c)(3)	Operator training for equipment where qualification or certification is not required by this subpart
§ 1926.1430(c)(1)	Operator training for qualification or certification
§ 1926.1430(c)(4)(i)	Operator training – boom hoist brake test
§ 1926.1430(c)(4)(ii)	Operator training – emergency procedures (halting unintended movement)
§ 1926.1441(e)	Operator training (2,000 pound maximum rated capacity)
§ 1926.1441(f)	Signal person training (2,000

	pound maximum rated capacity)
§ 1926.1423(k)	Fall protection training

Section 1926.1431 Hoisting Personnel

This section of the final rule sets forth additional requirements when equipment is used to hoist employees. Because equipment covered by this subpart is designed to move materials, not personnel, additional requirements are necessary for employee safety. This section replaces the requirements of subpart N, former § 1926.550(g). Those requirements have been effective in reducing accidents and as a result most of the requirements have been continued in this rule. However, while continuing most of the hoisting personnel requirements that were in subpart N, subpart CC clarifies requirements where needed and has added requirements for certain activities, such as hoisting personnel in a drill shaft, as discussed below. With a few exceptions, the requirements in this final rule are the same as those found in the proposed rule (see 73 FR 59714, 59939-59943, Oct. 9, 2008). The following discussion will primarily focus on the differences between the proposed rule and this final rule.

OSHA stresses the provisions in this section are additional requirements that must be met when equipment is used to hoist personnel. During such use, all other applicable requirements of this subpart must be met.

Paragraph (a)

This paragraph states that equipment may be used to hoist personnel only when all other means of reaching the work area presents a greater hazard or is not possible because of the project's structural design or worksite conditions. It reflects OSHA's

longstanding recognition that using cranes and derricks to lift personnel is inherently hazardous and should only be done when it is either the least hazardous means or when, in light of the configuration of the worksite, it is the only means of performing required work.

This paragraph does not apply to work covered by 29 CFR part 1926 subpart R, Steel Erection. Subpart R, at § 1926.753(c)(4), allows the use of equipment to hoist personnel in a platform that complies with subpart CC without the need for a showing that other means of reaching the work area would create a greater hazard or is impossible. OSHA's reasons for including this exception in subpart R are discussed in detail in the preamble to the steel erection standard (66 FR 5196, 5209, Jan. 18, 2001).

One commenter asserted that employers engaged in work covered by 29 CFR part 1926 subpart V, Power Transmission and Distribution, should be allowed to use equipment (with a boom attached platform) to hoist personnel without showing that other means of reaching the work area creates a greater hazard or is not possible. (ID -0144.1.) This commenter bases this assertion on the premise that many manufacturers offer a platform specifically designed to attach to the tip of the boom which may include platform mounted controls. The commenter believes that when using this type of platform, the equipment "essentially transforms the crane into a large aerial lift."

The Agency finds this comparison unpersuasive. As stated above, equipment covered by this section is primarily designed for hoisting materials, not people. C-DAC concluded that it was important to differentiate between equipment primarily designed for moving personnel, such as an aerial lift, as compared to equipment that is primarily designed to lift materials. In the judgment of the Committee, a personnel platform

attached to equipment covered by this section presented a greater hazard than a machine that is designed for moving personnel. Therefore, the proposed rule would have required an employer to show that another means of reaching the work area presents a greater hazard or is not possible. OSHA agrees, and is retaining the same substantive requirement in the final rule.

Upon review of this provision, the Agency realized the use of the word "worksite" in the phrase, "conventional means of reaching the worksite" could be misleading. The Agency has changed the phrase to "conventional means of reaching the work area." The term worksite could be interpreted to mean the entire construction worksite. This requirement is about an employee working in a particular area or place on a larger worksite. OSHA finds the use of the phrase "work area" to provide greater clarity. Therefore, the provision is promulgated as proposed incorporating this terminology change.

Paragraph (b) Use of personnel platform

Paragraph (b)(1) of this section generally requires the use of a personnel platform when hoisting employees and requires that criteria specified in § 1926.1431(e) be met for such platforms. Paragraph (b)(2), Exceptions, sets forth the construction activities in which hoisting personnel without using a personnel platform is allowed. These activities are: hoisting employees into and out of drill shafts 8 feet and smaller in diameter, pile-driving operations, marine worksites, storage tanks (steel or concrete), shaft operations and chimney operations. OSHA considers the use of a personnel platform in these situations to be generally infeasible or more hazardous than other means. This section

contains specific requirements for hoisting personnel during these operations at §§ 1926.1431(o), (p), (r), and (s), including alternatives to the use of a personnel platform. Each of the exceptions is discussed below under the particular paragraph related to that operation.

No comments were received on § 1926.1431(b); it is promulgated as proposed except that "must" replaces "shall to ensure that the sentence is imperative, not merely descriptive.

Paragraph (c) Equipment set-up

This paragraph sets forth the basic criteria for equipment set-up for personnel hoisting.

Paragraph (c)(1) of this section requires the equipment to be on level, firm and stable footing. A qualified person must determine if the footing is "sufficiently firm and stable." Stable footing is essential to minimize the hazard of the equipment tipping while hoisting personnel. C-DAC determined that the danger of the equipment potentially tipping when hoisting personnel justifies the need for a qualified person to examine and approve the equipment's stability. OSHA agrees.

Paragraph (c)(2) specifies that each outrigger must be both extended and locked. The amount of extension must be the same for all outriggers and also be in accordance with the manufacturer's specifications. Proper placement and deployment of outriggers, C-DAC concluded, is essential to prevent the hazard of equipment tipping while hoisting personnel.

Equal extension of outriggers eliminates the hazard of the operator forgetting that one or more outriggers has a shorter extension and swinging into that area with a load that exceeds the crane's capacity. The essential factor is to have each outrigger extended equally within the manufacturer's specifications and procedures, whether it is a full or partial extension. No comments were received on § 1926.1431(c); it is promulgated as proposed.

Paragraph (d) Equipment criteria

This paragraph sets forth requirements for the equipment used to hoist personnel.

Paragraph (d)(1) of this section, *Capacity: use of suspended personnel platform*, limits the total load to 50 percent of the equipment's rated capacity and specifies that the total load includes the hook, load line, and rigging. The 50 percent capacity limit does not apply during equipment proof testing.

The 50 percent limit reflects C-DAC's conclusion that using this equipment to hoist personnel requires a greater number of safety precautions than when lifting materials. The limit provides for an extra margin of safety to prevent overloading the equipment, which could cause tip-over or structural collapse.

One commenter asserted that a specific boom limit of not less than 65 degrees should be added to the requirements of this paragraph. (ID -0178.1.) The commenter did not provide any rationale for this recommendation. Therefore, OSHA defers to C-DAC's expertise in this area and is promulgating this provision as proposed.

Paragraph (d)(2), *Capacity: use of boom-attached personnel platforms*, establishes the load limit at 50 percent of rated capacity for platforms that are attached to

the boom. It also provides an exception to the 50 percent capacity limit during equipment proof testing. The same reasons for the 50 percent limit in § 1926.1431(d)(1) apply here.

In the proposed rule, OSHA requested public comment on whether additional requirements (i.e., requirements other than those specified in the proposed rule for a suspended personnel platform) should apply when using boom-attached personnel platforms. No comments were received stating that this type of platform could present an additional hazard to employees. One commenter stated that this type of platform is safer than a suspended personnel platform. (ID -0144.1.) Since no comments or information were received demonstrating that precautions beyond those already proposed are needed for boom attached personnel platforms, OSHA has not added any further requirements for this type of platform in the final rule. Therefore, this paragraph is promulgated as proposed.

Paragraph (d)(3), *Capacity: hoisting personnel without a personnel platform*, establishes the load limit at 50 percent of rated capacity. In calculating the load, the weight of the personnel, including the hook, load line, rigging and any other equipment that imposes a load must be included. No comments were received on this provision; it is promulgated as proposed.

Paragraph (d)(4) requires engaging all the equipment's locking or braking devices when the platform has reached its stationary work position. The purpose is to minimize sudden and unintended movement or tipping of the platform when employees have reached the work area. No comments were received on this provision; it is promulgated as proposed.

The provisions of paragraph (d)(5), *Devices*, require certain safety devices for equipment addressed by this section (see 73 FR 59829-59830, Oct. 9, 2008). OSHA received one comment on § 1926.1431(d)(5)(i), which stated that a boom angle indicator would not provide useful information on an articulating crane because such cranes have up to three boom sections at various angles and numerous combinations of boom angles will achieve the same lifting capacities. (ID -0206.1.) OSHA agrees that essential design of the articulating crane precludes the use of a boom angle indicator. However, to provide some protection against falling and tipover hazards, OSHA has determined that an alternative device must be used on articulating cranes when they are used to hoist personnel. As discussed under § 1926.1400, *Scope*, the record indicates that many articulating cranes are equipped with automatic overload-prevention devices. Such a device provides protection comparable to that provided by a boom angle indicator, which helps the operator prevent the crane from becoming overloaded by providing the boom angle information needed to apply the crane's load chart. Because overload protection is particularly vital when equipment is used to hoist personnel, OSHA is addressing the comment about articulating cranes by adding § 1926.1431(d)(5)(ii), which specifies that articulating cranes must be equipped with a properly functioning automatic overload protection device.

No comments were received on the remaining provisions of paragraph (d)(5); they are promulgated as proposed, except that §§ 1926.1431(d)(5)(ii)-(vi) have been renumbered as §§ 1926.1431(d)(5)(iii)-(vii) because of the addition of new § 1926.1431(d)(5)(ii). Additionally, with respect to paragraph (d)(5)(vii), the following has been added: "(See § 1926.1417 for tag-out and related requirements.)" This sentence

has been added to ensure the reader is aware of the applicable tag-out and related requirements of § 1926.1417, *Operation*.

Paragraph (d)(6) prohibits the use of a personnel platform directly attached to a luffing jib. In the experience of C-DAC members, a complete prohibition of use of a boom-attached personnel platform to a luffing jib was necessary in light of the range of motion of a luffing jib and the fact that boom-attached personnel platforms are not designed for attachment to a luffing jib. Thus, only a suspended type personnel platform may be used on a luffing jib. OSHA defers to the expertise of the Committee. No comments were received on these provisions; they are promulgated as proposed.

Paragraph (e) Personnel platform criteria

This paragraph establishes the minimum criteria for a personnel platform. Paragraph (e)(1) of this section requires that both the platform and its attachment/suspension system be designed by a qualified person who understands structural design and be designed for the particular function of personnel hoisting. The purpose of this paragraph is to clearly stipulate that the platform must be designed for employee safety. This addresses the hazards of structural failure of the platform, failure of the attachment/suspension system, and precludes the use of designs that would be inappropriate for hoisting people.

Paragraph (e)(2) requires the system used to connect the personnel platform to the equipment to be within 10 degrees of level. This addresses the hazard of platform tipping by maintaining the platform close to level.

Paragraph (e)(3) requires the platform designer to consider the movement of employees on the platform and design the suspension system to minimize platform tipping from such movement. The purpose is to design the platform in such a way as to limit the likelihood of platform tipping while employees are working from the platform.

Paragraph (e)(4) requires the platform to support its own weight plus a minimum of five times the maximum intended load without failure. C-DAC selected this minimum limit because it would provide an adequate margin of safety for employee protection from structural failure of the platform. The guardrail system and personal fall arrest system anchorages are not subject to this requirement but instead are subject to § 1926.1431(e)(6).

Paragraph (e)(5) requires that welding of any part of the platform or its component parts be performed by a welder who is certified and familiar with the weld grades, types and material specified in the particular platform's design. This requirement is designed to prevent structural failure of the platform due to improper welding.

Paragraph (e)(6) details the requirements of the platform for guardrails, fall arrest anchorage points and enclosure of the platform between the toeboard and mid-rail. Proper guardrails and fall arrest anchorage points are critical fall protection devices, and the required platform enclosure is needed to protect employees below from falling objects. In addition, points to which personal fall arrest systems are attached must meet the anchorage requirements in 29 CFR part 1926 subpart M.

Paragraph (e)(7) requires the placement of a grab rail within the entire perimeter of the personnel platform except for access gates/doors where a grab rail can be impractical. The grab rail provides a place for the employee to hold onto while in the

platform instead of using a guardrail as a hand hold. Using a guardrail as a hand hold exposes the employee's hand to being smashed by external objects.

No comments were received on paragraphs (e)(1) through (e)(7); they are promulgated as proposed.

Paragraphs (e)(8)(i) and (ii), *Access gates/doors*, specifies that access gates/doors must be designed to not swing outward and must also have a mechanism that will keep the gate/door from being opened unintentionally.

One commenter, a platform manufacturer, stated that generally their platforms have doors that do not swing outward. (ID -0238.1.) However, for certain custom platforms, such as a one-person platform, the size and design of the platform makes it unsafe for a person to enter the platform and close the gate behind the occupant when it is an inward swinging gate. The commenter indicated that for this type of platform, the gates are designed to swing outward to provide safe access for the individual. To protect against accidental opening of the gate, a positive latching system is included with an outward swinging gate.

The Agency agrees that certain types of personnel platforms could be of a size or configuration that would necessitate an outward swinging access gate or door to allow for safe entry and egress of an occupant. Therefore, OSHA has revised this paragraph to include an exception for this type of platform. When it is infeasible to have an inward swinging gate due to the size or design of the platform, the gate can swing outward. However, the additional feature of a positive latching or similar system that prevents accidental opening must be included. This conforms with the intent of this requirement

to prevent an occupant from falling from the platform due to an access gate or door opening unexpectedly.

Paragraph (e)(9) requires adequate headroom to allow employees to stand upright in the personnel platform. This provides adequate space for the employee to work from the platform while keeping his/her entire body within the platform, and contributes to greater stability during platform movement. No comments were received on this provision; it is promulgated as proposed.

Paragraph (e)(10) requires an overhead protective cover attached to the platform when an employee is exposed to falling objects. It mandates the overhead cover of the platform to be of such material and design to provide visibility for both the operator and the employees on the platform, while maintaining adequate protection from falling objects. The reference to a wire mesh with ½ inch openings is an example of a type of material and design that could be used for the platform cover. The nature of the worksite conditions and likely type of falling objects determines the type of material and design needed to protect the platform occupants. Full overhead protection (i.e., no visibility through the protective cover) is allowed when conditions are such that a full protective cover is necessary to protect employees from falling objects.

Paragraph (e)(10) explicitly states that the protection provided by the cover is supplemental to the protection provided by hard hats – the use of hard hats does not obviate the requirement for the platform cover.

One commenter noted that having overhead protection for employees in the power line industry interferes with the ability to work overhead, which is a routine occurrence. (ID -0144.) Additionally, at the public hearing, a representative from a labor

union noted that typically an overhead cover would not be used on a personnel platform when they are working near power lines, as it is desirable to minimize the amount of conductive material. (ID -0344.) The Agency acknowledges that it is common for those in the power line industry to work overhead. However, the use of a personnel platform attached to a crane is not the only means of reaching this work location. As noted in § 1926.1431(a), the use of a personnel platform attached to a crane is only permitted where the employer demonstrates that conventional means of reaching the worksite, such as an aerial lift, would be either more hazardous or impossible. OSHA notes that aerial lifts are commonly used in utility work, and it therefore determined that crane-suspended personnel platforms will be used rarely in such work. OSHA also notes that paragraph (e)(10) mandates overhead protection only when an employee is exposed to falling objects, and that should not be a common occurrence in utility work. Therefore, the Agency does not determine that this provision needs to make special accommodation for work near power lines. Paragraph (e)(10) is promulgated as proposed.

Paragraph (e)(11) requires that all edges of the platform be smooth enough to prevent injury. The purpose is to protect the employee from injuries such as lacerations and puncture wounds.

Paragraph (e)(12) requires conspicuous posting of a plate or other permanent written notice on the personnel platform listing the weight of the platform itself and the platform's rated capacity. The purpose of the provision is to make employees aware of the platform's limits to prevent overloading, which could result in structural failure of the platform or equipment, and to facilitate compliance with § 1926.1431(f)(1), which prohibits loading the platform in excess of its rated capacity.

No comments were received on paragraphs (e)(11) or (e)(12); they are promulgated as proposed.

Paragraph (f) Personnel platform loading

Paragraph (f)(1) of this section prohibits loading the platform in excess of its rated capacity.

Paragraph (f)(2)(i) requires the platform to be used exclusively for personnel hoisting and not for hoisting materials. However, it does allow the necessary materials and tools for the work activity to be hoisted along with the employees. Using a personnel platform to hoist materials can lead to damage of the platform due to materials shifting or excessive loading. This can subject the platform to structural stresses that may not be visible and contribute to platform structural failure.

Paragraph (f)(2)(ii) provides an exception to paragraph (f)(2)(i) to allow materials and tools on the personnel platform during the trial lift as long as the materials/tools are properly secured and distributed as specified in § 1926.1431(f)(3).

Paragraphs (f)(3)(i) and (ii) require that any materials and tools that are on the platform during the hoist be secured, and evenly distributed within the platform itself while the platform is suspended. These precautions are designed to prevent platform tipping and injury to employees due to movement of materials or tools during the hoist. OSHA concludes that the combination of paragraphs (f)(2)(ii) and (f)(3) strikes the appropriate balance by accommodating the practical requirements of the job while reducing the potential for overloading.

No comments were received on paragraphs (f)(1) through (f)(3); they are promulgated as proposed.

Paragraph (f)(4) limits the number of employees on a personnel platform to the lesser of either the number needed to perform the work or the maximum number for which the platform was designed. The purpose is to expose the fewest possible number of employees to the hazards presented when hoisting personnel and to minimize the load on the platform to the extent possible.

One commenter stated that boom attached personnel platforms should be limited to a maximum of 4 employees. (ID -0178.1.) Because no reason was provided to support this requirement, OSHA has not changed the requirement that the maximum number of employees on a platform is limited to the lesser of the number the platform was designed to hold or the number required to perform the work. Therefore, paragraph (f)(4) is promulgated as proposed.

Paragraph (g) Attachment and rigging

Paragraph (g)(1) of this section establishes the requirements for the device used to connect the personnel platform to the hoist line.

The nature and type of connector used is critical to the overall safety of the suspended personnel platform. Under this paragraph, a hook used to connect the hoist line and personnel platform must be the type that can be closed/locked and must be closed/locked when attached to the platform. When a shackle is used in lieu of a hook, it must be of the alloy anchor type with either: a bolt, nut and retaining pin in place; or: the screw type with the screw pin secured against accidental removal. Any detachable device

other than a shackle or hook that is used must be closable and lockable to the same extent a hook or shackle would be when in compliance with this section. When used to connect the personnel platform, such a device must be closed and locked to ensure that the platform is secured to the hoist line.

Paragraph (g)(2) requires that each bridle leg in a rope bridle be connected to the master link/shackle in a manner that allows the platform's load to be equally distributed among each bridle leg. The purpose of this type of attachment is to avoid platform tipping.

Paragraph (g)(3) requires that all hardware used for rigging must be able to support five times the maximum intended load applied to or transmitted to that component. Additionally, slings using rotation resistant rope must have a safety factor of ten. These measurements continue the requirements that were in former § 1926.550(g)(4)(iv)(C).

Paragraph (g)(4) requires the eyes in wire rope slings to be fabricated with thimbles. The purpose of this requirement is to prevent excessive wear to the eyes and possible failure of the platform's rigging.

No comments were received on paragraphs (g)(1) through (g)(4); they are promulgated as proposed with minor grammatical clarifications.

Paragraph (g)(5) requires that bridles and rigging used to suspend the personnel platform be used exclusively for hoisting personnel operations. Rigging components must be dedicated for the sole use of personnel hoisting to help ensure that they are not damaged. Materials hoisting can lead to damage of the rigging components due to material shifting or excessive loading. This can make the rigging components susceptible

to structural stress that may not be visible, yet contribute to failure. To clarify that the bridles and rigging used for hoisting personnel may only be used if they have not ever been used for other operations prior to being designated for the purpose of hoisting personnel, OSHA has modified the regulatory text from the proposed rule to state that the bridles and rigging "must not have been used for any purpose other than hoisting personnel."

Paragraph (h) Trial lift and inspection

Paragraph (h)(1) of this section requires a trial lift without occupants and with the platform loaded to at least the anticipated liftweight. The purpose of the trial lift is to confirm that: the lift set-up works properly; the lift route is free of obstacles; the work location is accessible; no work location will place the crane or derrick in such a configuration where the intended load would exceed 50 percent of the equipment's rated capacity; the soil or other supporting surface is stable; and that the lift route is suitable for the intended lift. The path of the trial lift must begin at the point the employees enter the platform and end at the ultimate location the platform is being hoisted to and positioned (end point). When there are multiple destination locations from a single set-up point, the trial lift must be conducted in one of two ways.

First, individual lifts may be conducted in which the platform is moved to one of the end points from the starting point, returned to the starting point, moved to a second end point, again returned to the starting point, and the process repeated until each end point has been reached. Alternatively, a single lift may be conducted from the starting

point to all of the end points in sequence, without returning to the starting point until after the last end point has been reached.

OSHA determined that the phrase "a single trial lift for all locations" in the text of the proposed rule for § 1926.1431(h)(1), based on C-DAC consensus language, was not sufficiently clear to describe the intended meaning of this requirement (see 73 FR 59714, 59940-59941, Oct. 9, 2008). In addition, OSHA was concerned that allowing the trial lift to be conducted in either of these two ways, irrespective of how the personnel will actually be hoisted, may result in the trial lift failing to reveal problems that would be encountered in the actual personnel lift.

To address these concerns, OSHA suggested language in the preamble to the proposed rule to clarify that the employer must use a lift path and sequence of stops in the trial lift that will match the lift path and sequence of stops when actually hoisting personnel. As noted above, the purpose is to detect any problems that could arise before personnel are hoisted. OSHA asked for public comment on these issues and the suggested language (73 FR 59714, 59833, Oct. 9, 2008).

Two commenters stated that the language in the proposed rule was sufficient and should not be changed (ID -0205.1; -0213.1); another commenter stated that the text suggested by OSHA in the preamble to the proposed rule should be used in the final rule (ID -0104.1). The Agency concludes this suggested text provides a better description of what needs to be done to ensure safety – i.e., that the trial lift method needs to match the actual hoist method. Therefore, the provision in the final rule includes this suggested language.

Paragraph (h)(2) requires the trial lift to take place immediately prior to each shift when hoisting personnel, and each time the equipment is moved and set up in a new location or a previously used location. This is to ensure that the conditions for the trial lift will be nearly identical to those of the actual personnel lift. Additionally, a trial lift must be done each time the lift route is changed, unless a competent person determines the new lift route does not present new factors affecting safety.

Paragraph (h)(3) requires a competent person to ensure that all required safety devices and operational aids required by this section are activated and properly functioning, that nothing interferes with the equipment or personnel platform during the trial lift, that the lift load does not exceed 50 percent of the equipment's rated capacity, and that the load radius used is accurately determined. These requirements ensure that necessary safety measures are in place and validated by a competent person for the trial lift. It is important for this to be the responsibility of a competent person because such a person not only has the knowledge necessary to make the determinations, but also has the authority to take any necessary corrective action.

Paragraph (h)(4) establishes the duties of the competent person immediately after the trial lift. It requires the competent person to conduct a visual inspection of the personnel platform and equipment to determine if there is any problem or defect resulting from the trial lift or if it produced any adverse effect. In addition, the competent person must ensure that the test weight used during the trial lift has been removed prior to personnel loading.

The purpose of these requirements is to ensure that any defects in the equipment, base support, or ground and personnel platform, revealed by the trial lift are seen by a

competent person prior to hoisting personnel. (Note that, under § 1926.1431(h)(6), any condition found during the trial lift that fails to meet a requirement of this standard or otherwise constitutes a safety hazard must be corrected before hoisting personnel.) Paragraph (h)(4) continues the requirements from former § 1926.550(g)(5)(iv) while adding the requirement that the competent person ensure that the test weight is removed. This is needed because overloading the personnel platform can occur if the test weights are not removed and left on the platform when hoisting personnel.

No comments were received on §§ 1926.1431(h)(2) through (h)(4); they are promulgated as proposed.

Under paragraph (h)(5)(i), immediately prior to each personnel lift, the competent person must inspect the platform while it is lifted a few inches to ensure that the platform is secure and properly balanced.

The purpose of this procedure is to ensure that, with the occupants and materials/tools to be hoisted on the platform immediately before the hoist is to take place, the platform is secure and properly balanced. The purpose of having the occupants and materials/tools on board during this check is twofold. First, it ensures that the check takes place just before the personnel lift, which minimizes the chance that damage or other problems affecting the platform's security will occur after the check. In addition, it would be difficult to ensure that the platform will be properly balanced when in actual use without having the employees and materials/tools on board.

In the proposed rule, the text did not state that personnel and materials were to be on board during the trial lift (see 73 FR 59941, Oct. 9, 2008). In the preamble to the proposed rule, the Agency asked for comment on adding the phrase "with the personnel

and materials/tools on board" to clarify the intent of this requirement (see 73 FR 59833, Oct. 9, 2008).

Three comments were received in response to the Agency's request for comment on this issue. (ID -0104.1; -0205.1; -0213.1.) All three commenters agreed with the Agency's suggested revision. Therefore, the final rule reflects this change in § 1926.1431(h)(5)(i).

Paragraph (h)(5)(ii) requires a competent person to determine that hoist ropes are free of defects, that multiple part lines are not twisted around each other, and that the primary attachment is centered over the platform. If the load rope is slack, the competent person must inspect the hoisting system to ensure the rope lines are properly seated on drums and in sheaves. Paragraphs (i) and (ii) continue the requirements from former § 1926.550(g)(5)(iii), with the additional clarification that hoist ropes must be free of deficiencies (that is, not just free of "kinks," as was required in former § 1926.550(g)(5)(iii)(A)). The purpose of these requirements is to mandate an additional final review by a competent person to evaluate the personnel platform, the balance of the load, and the lifting devices to ensure that necessary safety requirements are met.

No comments were received on § 1926.1431(h)(5) (ii); it is promulgated as proposed.

Paragraph (h)(6) establishes that any condition that fails to meet the requirements of this standard or otherwise creates a safety hazard must be corrected before personnel are hoisted. This includes conditions found during the trial lift or in any inspection or subsequent review of the equipment, platform or rigging. No comments were received for this provision. However, the following reference has been added to this provision for

clarification: "(See § 1926.1417 for tag-out and related requirements.)." This sentence has been added to ensure the employer is aware of the applicable tag-out and related requirements of § 1926.1417, *Operation*.

Paragraph (i) [*Reserved*.]

Paragraph (j) Proof Testing

This paragraph delineates the requirements of and method for proof testing the personnel platform and rigging. It requires the proof test to be done at each jobsite prior to hoisting personnel and after any repair or modification of the platform. The proof test must be at 125 percent of the platform's rated capacity with an evenly distributed test load. The platform must be lowered by controlled load lowering, braked, and held in a suspended position for at least five minutes. After this proof test, the competent person must inspect the platform and rigging to determine if it has passed the proof test. If not, all deficiencies that pose a safety hazard must be corrected and another proof test performed. The competent person must determine that the platform and rigging have successfully passed the proof test before any personnel hoisting begins.

The purpose of this paragraph is to determine if the structural integrity of the personnel platform is intact or if it has been affected by any condition, damage, repair or modification which could result in structural failure or other safety hazards from the platform or rigging. This ensures the load lowering and braking mechanisms are functioning properly before personnel are lifted. In addition, § 1926.1431(j)(3) clarifies

that only deficiencies that present a safety hazard need be corrected; minor deficiencies bearing no relation to safety do not need to be corrected.

In addition, the Agency is adding a reference to the requirements of § 1926.1417, *Operation*, to ensure the reader is aware of the applicable tagout and startup requirements of § 1926.1417, *Operation*. Paragraph (j)(3) of this section is otherwise promulgated as proposed.

One commenter stated that proof testing should not be required for boom attached personnel platforms, since there is no rigging and a simple visual inspection of the mounting hardware would be sufficient. (ID -0144.1.)

OSHA disagrees with this comment. The purpose of this proof test is to ensure the sufficiency and integrity of the system that will be hoisted by the crane/derrick. In the case of a suspended platform, that system consists of the platform and the rigging that attaches it to the crane/derrick. In the case of a boom-attached platform, that system consists of the platform with its boom-mounting hardware (in such cases OSHA considers the boom-mounting hardware part of the platform itself). Therefore, even when rigging is not used, the proof test still needs to be performed to help ensure the adequacy of the platform, including its attachment system.

Therefore, §§ 1926.1431(j)(1), (2) and (4) are promulgated as proposed.

Paragraph (k) Work practices

Paragraph (k)(1) of this section requires hoisting the personnel platform in a slow, controlled, cautious manner, with no sudden movements of the equipment or platform.

This precaution minimizes the likelihood of platform tipping, loss of footing, and loss of control of the platform by the operator during hoisting.

Paragraph (k)(2)(i) requires that all occupants of the personnel platform keep all parts of the body inside the platform while it is being raised, lowered or moved horizontally. This does not apply when a platform occupant must position the platform. Additionally, this does not apply when a platform occupant is performing the duties of a signal person. The purpose of this requirement is to prevent an employee from having a body part struck by or caught in between the personnel platform and another object.

Paragraph (k)(2)(ii) prohibits platform occupants from standing on, sitting on, or working from any surface other than the floor of the personnel platform during hoisting or when working from the platform. It prohibits working from a railing or toeboard or the use of any means or device to raise the employee's working height. The purpose is to ensure that the occupants benefit from the protections of the guardrail system and do not destabilize the platform.

Paragraph (k)(2)(iii) prohibits platform occupants from pulling the platform out of plumb in relation to the hoisting equipment. The purpose is to prevent tipping of the platform with employees on board, which could exacerbate the fall hazard.

Paragraph (k)(3) requires a personnel platform that is not landed to be secured to the structure, before employees enter or exit the platform, to prevent dangerous movement of the platform at these times, which could exacerbate the fall hazard or cause an employee's body part to be struck by or caught in between the personnel platform and the structure. Paragraph (k)(3) allows an exception when a greater hazard is created by securing the platform to the structure.

Paragraph (k)(4) requires the operator to receive confirmation that the platform is no longer tied to the structure and is freely suspended before the operator moves the platform. This requirement prevents structural damage to the platform and/or rigging and prevents the fall hazard that could result from pulling the platform out of plumb if there were an attempt to move it while it is still attached.

Paragraph (k)(5) requires the use of tag lines when necessary to control the personnel platform. The purpose is to provide an additional way to control platform stability to decrease the risk of injury from loss of footing or from the platform striking an object.

Under paragraph (k)(6), where the platform is not equipped with any controls, the equipment operator is required to remain at the equipment controls at all times while the personnel platform is occupied. Because there are no controls in the personnel platform, the equipment operator must be available to make any necessary adjustments to protect the employees from injury from any condition arising after the platform is placed at the working location. Paragraph (k)(6) requires the operator to stay at the equipment controls, and on site and in view of the equipment, at all times the platform is occupied, whether or not the crane engine is running. Equipment controls, as discussed here and in § 1926.1431(k)(7), include remote controls that are used to control the boom and swing functions of the equipment. This subpart does not prohibit the use of remote controls for equipment by an operator. See discussion of the use of remote controls at the preamble for § 1926.1417(e)(1). The Agency has added the "on site and in view of the equipment" requirement in the final rule to address the situation where the operator uses a remote control to operate the equipment. The same requirement was included in proposed §

1926.1431(k)(7) to address the same issue, and is included in final § 1926.1431(k)(7), as discussed below.

No comments were received on paragraphs (k)(1) through (k)(6); they are promulgated as proposed with the exception of the addition noted for (k)(6).

Paragraph (k)(7), *Platforms with controls*, applies when a personnel platform has controls. Controls on certain personnel platforms enable a platform occupant to move both the platform and the boom. Other platform designs enable an occupant to control only the platform/basket itself, for example, to level the basket as it is boomed up or down.

Paragraph (k)(7)(i) requires the platform occupant using the platform's controls to be a qualified person with respect to their use, including the safe limitations of the equipment and hazards associated with its operation. Such knowledge and skill is essential for the safety of the platform occupants and employees in the surrounding area.

Proposed paragraph (k)(7)(ii) required the equipment operator to be at the equipment controls, in the personnel platform, or on site and in view of the equipment. In the proposed rule, the Agency requested public comment on whether this paragraph should be reworded to clarify the circumstances for selecting a location for the equipment operator (73 FR 59835, Oct. 9, 2008). Two commenters stated that, regardless of which option is chosen, the operator must be in a position that allows him to control the boom and swing functions of the equipment. (ID -0205.1; -0213.1.) However, these commenters also stated that the proposed regulatory text did not need to be revised. (ID -0205.1; -0213.1.)

Upon reviewing the paragraph as proposed and considering these comments, OSHA finds that the language used in proposed 1926.1431(k)(7)(ii) needs to be changed to clearly specify that an operator has to be able to control the boom and swing functions, wherever the operator is located. If the platform does not have controls for the boom and swing functions of the equipment, then it is essential that the operator be at the set of equipment controls which include these functions, because they are crucial for the safety of personnel being hoisted. These equipment controls may be on the platform, in the cab, or on a remote control. The operator must be able to take immediate action when necessary (such as, for example, when there is unexpected platform or equipment movement, a sudden change in wind conditions, or an injury to a platform occupant). In the final rule, OSHA has modified § 1926.1431(k)(7)(ii) accordingly.

Paragraph (k)(7)(iii) requires the platform's operating manual to be on the platform or on the equipment while the platform is occupied. The purpose is to have ready access to manufacturer's operating information when employees are on the platform. No comments were received on this provision; it is promulgated as proposed.

Paragraph (k)(8)(i), *Environmental conditions – Wind*, requires a qualified person to determine if it is unsafe to hoist personnel when the wind speed (gust or sustained) exceeds 20 mph. C-DAC selected this triggering wind speed based in part on ASME B30.23-2005, which prohibits personnel hoisting operations when wind speed exceeds 20 mph. High winds increase the likelihood of platform tipping, sudden unexpected movement of the platform, or structural failure of the equipment. While OSHA is declining to set a specific wind speed threshold at which all hoisting operations must cease, it agrees that 20 mph is an appropriate point at which a safety determination be

required. If the qualified person determines that hoisting personnel is unsafe, hoisting operations must not begin or, if already in progress, must be terminated.

One commenter questioned where and how the wind speed must be determined. (ID -0120.) With respect to where the measurement must be taken, the language of this provision refers to wind speed "at the personnel platform." This means that a safety determination is required at any time at which the wind to which the platform is exposed exceeds 20 mph, whether the platform is on the ground or suspended.

The provision does not specify any particular type of device or protocol for taking the measurement. The Agency does not determine that such specificity is needed; any generally accepted method that accurately measures wind speed would suffice. Therefore, this paragraph is promulgated as proposed.

Paragraph (k)(8)(ii), *Environmental conditions – Other weather and environmental conditions*, requires a qualified person to determine if it is not safe to hoist personnel when there are indications of dangerous weather or any other impending/existing dangerous environmental condition. Upon determination that it is unsafe, personnel hoisting operations must not be started or must be terminated if already in progress.

Paragraph (k)(9) requires employees being hoisted to remain in direct communication with either the signal person (where used) or equipment operator at all times. In some instances the platform occupants are in a better position to see potential problems developing than the operator, or to recognize there is some other safety-related need for the operator to take action. In addition, there are instances when the operator becomes aware of a developing problem and needs to communicate that information to

the employees being hoisted. This provision ensures that such information can be communicated quickly between the hoisted employees and operator.

No comments were received on paragraphs (k)(8)(ii) or (k)(9); they are promulgated as proposed.

Paragraphs (k)(10)(i) and (ii), *Fall protection*, require employees on the personnel platform to be provided with and use a personal fall arrest system attached to a structural member within the personnel platform. The fall arrest system (including the attachment point) must comply with § 1926.502, *Fall protection systems criteria and practices*. When hoisting personnel over water, a personal fall arrest system would not be required since, in the event that an error or failure occurred resulting in the employees being in the water, being tied-off exacerbates the drowning hazard. However, the requirements of § 1926.106, *Working over or near water*, do apply. Upon review of the rule, the Agency determined that it would provide greater clarity if the note referring to the requirements of § 1926.106 was included in paragraph (k)(10)(ii), instead of at the end of this paragraph. The regulatory text of the final rule reflects this change.

The purpose of this requirement is to protect employees from a fall hazard while in the personnel platform in the event of sudden movement, tipping, or other circumstance in which a fall would not be prevented by the platform's guardrail system.

Paragraph (k)(11)(i), *Other load lines*, mandates that while hoisting personnel no other lifts may be made with any of the equipment's other load lines. This provision serves several purposes. First, it prevents platform tipping due to entanglement with other load lines or loads. Second, it reduces the chance that the equipment could be overloaded. Third, when hoisting personnel, it is essential that the operator's full

attention be devoted to the hoisted personnel; use of another load line necessarily diverts his/her attention. An exception applies for pile driving operations, as the pile driver is always suspended on a load line and at times personnel have to be hoisted on another line to conduct work during the pile driving operation.

In the preamble to the proposed rule, OSHA explained that the C-DAC consensus language for this provision would have applied the requirement only when personnel were suspended on a personnel platform. However, the standard permits personnel to be hoisted without a personnel platform under certain circumstances. Since the requirement also needs to apply in those circumstances, OSHA expanded the language so that, in proposed paragraph (k)(11)(i), it also applied in those circumstances (see 73 FR 59836, Oct. 9, 2008). No comments were received on this issue; the provision is promulgated as proposed.

Paragraph (k)(11)(ii), *Other load lines*, allows the use of a winch line while hoisting personnel when all of the following factors are present: the personnel platform is a factory-produced boom-mounted personnel platform incorporating a winch as original equipment, the load on the winch line does not exceed 500 pounds, and the load on the winch line itself does not exceed the rated capacity of the winch and platform. C-DAC selected these factors based on the experience of its members, and determined that when all of these factors are present, there is little chance that the use of the winch line will compromise employee safety. OSHA agrees.

Paragraph (k)(12)(i), *Traveling – equipment other than derricks*, prohibits any traveling by equipment with hoisted employees except in two circumstances. The first is where the equipment is traveling on fixed rails. The second is where the employer

demonstrates that there is no less hazardous way to perform the work than by traveling. However, this second exception does not apply to rubber-tired equipment, for which traveling is always prohibited. Traveling with hoisted employees is also always prohibited for derricks, as set forth under § 1926.1431(k)(13). (See the discussion of these provisions in the preamble to the proposed rule, 73 FR at 59836-59837, Oct. 9, 2008.)

No comments were received on paragraphs (k)(10), (k)(11)(ii) or (k)(12)(i); they are promulgated as proposed. However, the note that appeared at the end of (k)(10) has been added to (k)(10)(i) as described above.

Paragraph (k)(12)(ii) (A)-(E) , *Traveling – equipment other than derricks*, establishes certain criteria that must be met when traveling with employees in the situations permitted under paragraph (k)(12)(i).

One commenter stated the requirement to limit travel to the boom length was unclear. (ID -0053.1.) This commenter believed it could be interpreted to limit the length of the boom itself and not the distance the equipment can travel. The Agency concludes the requirement as written in the proposed rule, "Travel shall be limited to boom length," is clear. However, in the interest of providing additional clarity, the Agency is adding the word "equipment" to the text of the final rule so that it will read, "Equipment travel must be limited to boom length." The addition of this word makes it clear the focus of the requirement is the distance of travel for the equipment.

Paragraph (k)(13), *Traveling – derricks*, prohibits a derrick from traveling while it is hoisting personnel. In C-DAC's experience, hoisting employees on a traveling derrick

is dangerous because derricks are not sufficiently stable when traveling. No comment was received on this provision; it is promulgated as proposed.

Paragraph (l) [*Reserved*.]

Paragraph (m) Pre-lift meeting

This paragraph requires a meeting prior to the trial lift at each new work location to review the requirements of this section and the procedures to be followed when hoisting personnel. The pre-lift meeting would be attended by the equipment operator, signal person (when one is used for the lift), employees to be hoisted, and the person responsible for the task to be performed.

Also, this paragraph requires this meeting to be repeated when an employee is newly assigned to the operation. The purpose of this requirement is to make all employees involved in the personnel hoisting operation aware of the requirements of this section and the plan for the personnel lift. This provides an opportunity for all employees involved to have a common and complete understanding of the hoisting operation and to give uniform information and instructions immediately prior to the lift. This addresses hazards which result from misunderstanding of the requirements, particular lift conditions or procedures. no comments were received on this provision; it is promulgated as proposed.

Paragraph (n) Hoisting personnel near power lines

This paragraph prohibits hoisting personnel within 20 feet of a power line 350 kV and below or within 50 feet of a power line over 350 kV, except for work that is covered by 29 CFR part 1926, subpart V, Power Transmission and Distribution.

The purpose of this requirement is to establish a safe clearance distance from power lines to protect employees from an electrocution hazard that could result if the personnel, a personnel platform, or equipment makes electrical contact with a power line. The clearance distances are similar to those in §§1926.1407 and 1926.1408 for equipment operating near power lines. However, under §§ 1926.1407 and 1926.1408, clearances less than 20 and 50 feet are permitted for certain voltage ranges. However, C-DAC determined that when personnel are hoisted near a power line it is necessary to require the minimum distances of 20 feet for lines 350 kV or less and 50 feet for lines over 350kV. Note that all other requirements in subpart CC regarding power line safety must also be met, including §§ 1926.1406-1409. No comments were received on this provision; it is promulgated as proposed.

Paragraph (o) Hoisting personnel in drill shafts

This paragraph provides requirements when hoisting personnel in drill shafts that are 8 feet and smaller in diameter. Drill shafts of this size may be either too small to use a personnel platform, or use of a personnel platform might not allow the room needed to perform the necessary work. Therefore, due to the limitations of a drill shaft of this size, use of a personnel platform would typically be infeasible and a boatswain's chair may be the only practical means of hoisting personnel and performing the necessary work.

One commenter stated that personnel should not be hoisted into a drill shaft unless the employer determined that use of a video camera was both impractical and infeasible. (ID -0120.0.) However, this commenter did not provide any explanation or supporting documentation of how this would improve safety beyond what the proposed rule required. As discussed at paragraph (a) of this section, equipment may be used to hoist personnel only when all other means of reaching the work area presents a greater hazard or is not possible because of the project's structural design or worksite conditions.

Because no information was provided to justify an additional restriction on an employer, OSHA is promulgating this provision as proposed.

Section 1926.1431(o)(1) allows the employer to use either a personnel platform or a boatswain's chair for hoisting personnel.[126] When an employer elects to use a boatswain's chair instead of a personnel platform, particular supplementary requirements in paragraph (o)(3) must be met. Those requirements address the heightened danger that the employee may fall from the chair or contact the wall of the drill shaft.

Paragraph (o)(2) requires the employer to follow requirements (a) through (n) of § 1926.1431 when using a personnel platform to hoist employees.

Section 1926.1431(o)(3) sets out additional requirements that must be met when the employer elects to use a boatswain's chair instead of a personnel platform for hoisting personnel.

[126] Note that, under § 1926.1431(a), an employer may only use equipment to hoist personnel when other means of reaching the work area would present a greater hazard or would not be possible because of the project's structural design or worksite conditions. Therefore, before using either means to hoist personnel in drill shafts, the employer would need to determine and demonstrate that hoisting personnel instead of using other means of access to the work area is the least hazardous, or the only, means to gain access to the work area.

Paragraph (o)(3)(i) identifies which of the provisions in § 1926.1431 (a)-(n) apply when using a boatswain's chair. For the applicable provisions, the phrase "boatswain's chair" is substituted for either "personnel platform" or "platform."

The § 1926.1431 paragraphs not listed in § 1926.1431(o)(3)(i) do not apply when a boatswain's chair is used. This is because those requirements are either specifically applicable to personnel platform design and use, or are otherwise not relevant when hoisting personnel in a drill shaft.

Paragraph (o)(3)(ii) requires a signal person to be stationed at the opening of the shaft during personnel hoisting. The purpose is to ensure that a signal person is used and stationed at the best position to watch the employee being hoisted, since the hoisted employee is out of the view of the operator.

Paragraph (o)(3)(iii) requires the employee to be hoisted in a slow, controlled descent and ascent. This is to limit swinging or sudden movement of the boatswain's chair to prevent a fall from the chair or impact with the walls of the drill shaft.

Paragraph (o)(3)(iv) requires the employee in the boatswain's chair to use personal fall arrest equipment, including a full body harness, that is attached independent of the crane/derrick. The purpose of requiring a tie off point independent of the equipment is to protect the employee from a sudden drop or fall due to equipment failure or other problem associated with the operation of the crane/derrick, and to protect the employee from falls when accessing and egressing the boatswain's chair.

Paragraph (o)(3)(v) requires fall protection equipment to comply with § 1926.502, *Fall protection systems criteria and practices*.

Paragraph (o)(3)(vi) requires the boatswain's chair (excluding the personal fall arrest anchorages) to be capable of supporting, without failure, its own weight plus a minimum of five times the maximum intended load. This is similar to the requirement for personnel platforms at § 1926.1431(e)(4). The strength requirement applicable to personal fall arrest anchorages is in § 1926.502(d)(15).

Paragraph (o)(3)(vii) mandates that only one person can be hoisted at a time when using a boatswain's chair. No comments were received on paragraphs (o)(1) – (o)(3); they are promulgated as proposed.

Paragraph (p) Hoisting personnel for pile driving operations

This paragraph provides requirements for hoisting personnel in pile driving operations. Section 1926.1431(p)(1) requires the employer to use either a personnel platform or boatswain's chair when hoisting personnel in pile driving operations. As with drill shafts, use of a personnel platform will often be infeasible in this type of operation, and § 1926.1431(p)(1) gives the employer the option of choosing which method to use. No comments were received on this provision; it is promulgated as proposed.

Section 1926.1431(p)(2) delineates the alternatives to using an anti two-blocking device during pile driving operations, since the heavy vibrations of the pile driver typically damage this device. (See § 1926.1431(d)(45)(v), *Anti two-block*). The language C-DAC developed for this provision did not distinguish between lattice boom cranes and telescopic boom cranes. Its language would have required, for either type of equipment, that the cable used to hoist personnel be clearly marked so that they

equipment operator would have sufficient time to stop hoisting to prevent two-blocking, or to use a spotter to warn the operator in time to prevent two-blocking. However, in reviewing the C-DAC language, OSHA realized that marking the cable is not a sufficient means of preventing two-blocking in telescopic boom cranes when extending the boom because extending the boom while the load hoist remains stationary can cause two-blocking. Instead, a spotter is always needed to warn against two-blocking for telescopic boom cranes.

Consequently, for the proposed rule, OSHA modified the language used by C-DAC and addressed lattice boom cranes and telescopic boom cranes separately. Proposed § 1926.1431(p)(2) requires employers, when using lattice boom cranes, to clearly mark the cable used to hoist personnel at the point on the cable that allows the equipment operator to stop hoisting in time to prevent two-blocking, or to use a spotter to warn the operator in time to prevent two-blocking. When using lattice boom cranes, in addition to marking the cable as above, a spotter must also be used. (See the discussion of the proposed provision at 73 FR 59838, Oct. 9, 2008.)

In the preamble to the proposed rule, OSHA asked for public comment on this change to the C-DAC language, but no comments were received on this issue. Therefore, the provision is promulgated as proposed.

Section 1926.1431(p)(3) requires the employer to follow §§ 1926.1431(b) through (n) when using a personnel platform to hoist employees. Section 1926.1431(a) does not apply because the employer is not required to demonstrate that the other means of access listed in § 1926.1431(a) are infeasible before being permitted to hoist personnel during pile driving operations. Demonstrating infeasibility prior to using a personnel platform is

not required because in most instances another means of access is not feasible for this operation. No comments were received on this provision; it is promulgated as proposed.

Section 1926.1431(p)(4) establishes the requirements for use of a boatswain's chair instead of a personnel platform for hoisting personnel.

Section 1926.1431(p)(4)(i) identifies which of the provisions in §§ 1926.1431(a)-(o) apply when using a boatswain's chair in a pile driving operation. For the applicable provisions, the phrase "boatswain's chair" is substituted for either "personnel platform" or "platform."

The § 1926.1431 paragraphs not listed in § 1926.1431(p)(4)(i) do not apply when a boatswain's chair is used. This is because those requirements are either specifically applicable to personnel platform design and use, or are otherwise not relevant when hoisting personnel in a pile driving operation.

Section 1926.1431(p)(4)(ii) requires the employee to be hoisted in a slow, controlled descent and ascent. This is to limit swinging or sudden movement of the boatswain's chair to prevent a fall from the chair or impact with equipment or other structures.

Section 1926.1431(p)(4)(iii) specifies that the employee in the boatswain's chair use personal fall arrest equipment, including a full body harness. The fall arrest system must be attached to either the lower load block or the overhaul ball. The purpose of having the fall protection equipment and tie off point independent of the boatswain's chair and rigging used to hoist the employee is twofold: it protects the employee from a sudden drop or fall due to failure of that equipment and protects the employee when accessing and egressing the boatswain's chair.

Section 1926.1431(p)(4)(iv) requires fall protection equipment to comply with § 1926.502, *Fall protection systems criteria and practices*. This ensures that the fall protection equipment is sufficient to safely arrest the employee's fall.

No comments were received on paragraphs (p)(4)(i) – (p)(4)(iv); they are promulgated as proposed.

The C-DAC consensus document did not include provisions to require a minimum strength for the boatswain's chair and to require that only one person be hoisted at a time, when using a boatswain's chair in pile driving operations. As explained in the preamble to the proposed rule, the Agency determined these were unintended omissions by the Committee. OSHA stated that it planned on including such provisions in the final rule, and asked for comment. No comments were received on this issue. Therefore, the final rule includes § 1926.1431(p)(4)(v), which requires the boatswain's chair to be capable of supporting its own weight and at least five times the maximum intended load, and § 1926.1431(p)(4)(vi), which states that only one person may be hoisted at a time.

Paragraph (q) [*Reserved*.]

Paragraph (r) Hoisting personnel for marine transfer

This paragraph addresses the particular hazards related to hoisting personnel for transfer to or from a marine construction worksite. This paragraph applies when hoisting employees solely for such transfer.

Section 1926.1431(r)(1) requires the employer to use either a traditional personnel platform or a marine-hoisted personnel transfer device. This paragraph allows an employer to use a marine-hoisted personnel transfer device instead of a personnel platform for several reasons. Transferring personnel to or from a marine construction site poses special problems due to the effects of waves and gusting wind. These effects, which can be unpredictable, can result in a situation where the equipment operator will not be able to adequately control the equipment. In such a situation, the device used to transfer the employees may suddenly wind up in the water. Another situation is when employees may need to jump into the water to avoid a collision with the ship or an object on the construction site. A third situation is when the operator is unable to control the equipment while the employees are attempting to board or disembark. The longer it takes to get on or off, the greater this risk becomes. In all of these scenarios the employees need to be able to enter and exit the device being used to transfer them quickly and easily.

A personnel platform, which is designed, in part, to keep the employees inside, would, in most marine situations, compound the hazard faced by the employees, since they can be difficult to enter and exit quickly. In contrast, a marine-hoisted personnel transfer device is designed specifically to facilitate the employees' rapid entry and exit. The employer has the option of using such a device so that it may be used when the conditions are such that the risk of being prevented from entering or exiting quickly is greater than the risk of unintentionally falling.

In the proposed rule, OSHA requested public comment on whether paragraph (r)(1) should require the employer to first establish that use of a marine-hoisted

personnel-transfer device was not less safe than a personnel platform. No comments were received on this issue.

Paragraph (r)(2) requires the employer to follow the requirements of paragraphs (a) through (n) of § 1926.1431 when using a personnel platform to hoist employees. As discussed previously, these provisions are designed to ensure that hoisting personnel is the safest means of the employees gaining access to the work and that the personnel platform's design and use are adequate from a safety standpoint.

Paragraph (r)(3) establishes the requirements when the employer elects to use a marine-hoisted personnel-transfer device instead of a personnel platform for hoisting personnel.

Paragraph (r)(3)(i) identifies which of the provisions in §§ 1926.1431 (a) through (q) apply when using a marine-hoisted personnel-transfer device. For the applicable provisions, the phrase "marine-hoisted personnel-transfer device" is substituted for either "personnel platform" or "platform."

The § 1926.1431 paragraphs not listed in § 1926.1431 (r)(3)(i) do not apply when a marine-hoisted personnel-transfer device is used. This is because those requirements are either specifically applicable to personnel platform design and use, or are otherwise not relevant when hoisting personnel at a marine worksite.

Paragraph (r)(3)(ii) requires the marine-hoisted personnel-transfer device to be used exclusively for transferring employees. One purpose of this provision is to prevent the device from being used as a work platform. The device's design, which specifically facilitates easy and rapid entry and exit, is ill suited to providing a safe work platform. In particular, it is not designed to prevent a fall when an employee is using his or her hands

for working rather than holding on to the device. Also, it is ill suited as a material transfer device because it is not designed to prevent materials from falling from it, and could be damaged by such use.

Paragraph(r)(3)(iii) limits the number of employees on the marine-hoisted personnel-transfer device to the maximum number the device is designed to hold. This prevents overloading, which can result in structural failure of the device. It also prevents overcrowding, which can cause an unintended fall or preclude a worker from entering or exiting as rapidly as when used properly.

Paragraph (r)(3)(iv) requires each employee being transferred on a marine-hoisted personnel-transfer device to wear a U.S. Coast Guard personal flotation device that is approved for industrial use. The purpose is to protect the employee from drowning if the device enters the water, or if the employee falls or needs to jump into the water.

No comments were received on paragraphs (r)(1) – (r)(3); they are promulgated as proposed.

Paragraph (s) Hoisting personnel for storage-tank (steel or concrete), shaft and chimney operations

This paragraph establishes requirements when hoisting personnel in storage-tanks (steel or concrete), shaft operations and chimney operations. Use of a personnel platform, while usually feasible, is infeasible in some circumstances involving these operations due to the nature of the work activity. Consequently, boatswain's chairs are allowed instead of a personnel platform in such instances, but only when the employer can demonstrate that use of a personnel platform is infeasible. For these reasons, §

1926.1431(s)(1) allows the employer to use a boatswain's chair only when the employer has determined that use of a personnel platform is infeasible.

Section 1926.1431(s)(2) requires the employer to follow the requirements of paragraphs (a) through (n) of § 1926.1431 when using a personnel platform to hoist employees. Under § 1926.1431(a), an employer may only use equipment to hoist personnel when other means of reaching the work area presents a greater hazard or is not possible because of the project's structural design or worksite conditions. Therefore, before using a personnel platform to hoist personnel in storage tanks (steel or concrete), shaft operations and chimney operations, the employer must determine that hoisting personnel instead of using other means of access to the work area is the least hazardous, or the only, means to gain access to the work area.

Section 1926.1431(s)(3) establishes the requirements when the employer uses a boatswain's chair instead of a personnel platform for hoisting personnel.

Section 1926.1431(s)(3)(i) identifies which of the provisions in §§ 1926.1431(a) through (r) apply when using a boatswain's chair. For the applicable provisions, the phrase "boatswain's chair" is substituted for either "personnel platform" or "platform."

The § 1926.1431 paragraphs not listed in § 1926.1431(s)(3)(i) do not apply when a boatswain's chair is used. This is because those requirements are either specifically applicable to personnel platform design and use, or are otherwise not relevant when hoisting personnel on a boatswain's chair in storage tanks (steel or concrete), shaft operations and chimney operations.

Section 1926.1431(s)(3)(ii) requires the employee to be hoisted in a slow, controlled descent and ascent. This is to limit swinging or sudden movement of the

boatswain's chair to prevent a fall from the chair or impact with the walls or other areas or structures involved in these operations.

No comments were received on paragraphs (s)(1) through (s)(3)(ii); they are promulgated as proposed.

Section 1926.1431(s)(3)(iii) requires the employee in the boatswain's chair to use personal fall arrest equipment, including a full body harness, that is attached independent of the crane/derrick. Having the tie off point independent of the equipment protects the employee from a sudden drop or fall due to equipment failure or other problems associated with the operation of the crane/derrick, and to protect the employee from falls when accessing and egressing the boatswain's chair.

One commenter noted that in certain construction projects there is no structure in place for independent attachment of personal fall arrest equipment. (ID -0130.l; -0343.1.) This commenter further requested that for activities related to construction of storage tanks, concrete shafts and chimneys, the requirement be changed to allow attachment to the lower load block or overhaul ball. The Agency found the information provided persuasive and has revised the regulatory language for the final rule. The Agency is limiting the change to those situations in which there is no adequate structure available for independent attachment. While there may be no available tie-off point during new construction, construction activities sometimes take place in storage tanks, concrete shafts and chimneys after the structure is in place. Therefore, the requirement has been changed to add a sentence specifying that when there is no adequate structure for attachment of personal fall arrest equipment as required in § 1926.502(d)(15), the

personal fall arrest equipment should be attached to the lower load block or to the overhaul ball.

Section 1926.1431(s)(3)(iv) requires fall protection equipment to comply with § 1926.502, *Fall protection systems criteria and practices*. This ensures that the fall equipment is sufficient to safely arrest the employee's fall.

Section 1926.1431(s)(3)(v) requires the boatswain's chair to be capable of supporting, without failure, its own weight plus a minimum of five times the maximum intended load. This is consistent with the requirement for personnel platforms at § 1926.1431(e)(4).

Section 1926.1431(s)(3)(vi) mandates that only one person be hoisted at a time when using a boatswain's chair. No comments were received on paragraphs (s)(3)(iv) through (s)(3)(vi); they are promulgated as proposed.

Section 1926.1432 Multiple-crane/derrick lifts

Final § 1926.1432 lists additional requirements for operations involving multiple cranes and derricks. As discussed in the proposed rule preamble, this section addresses hazards arising from operations that use more than one crane/derrick to lift a load (see 73 FR 59840-59841, Oct. 9, 2008). After reviewing comments on the proposed rule, the Agency is promulgating §§ 1926.1432(a) and 1926.1432(b)(1) as proposed. Section 1926.1432(b)(2) is nearly identical to the proposed text, but includes the following changes: the use of the terms "directed" and "lift director" instead of "supervised" and "supervisor," respectively, and language to clarify that the lift director must review the multiple crane/derrick lift plan with all workers "in a meeting."

Several commenters expressed the view that OSHA should add specific requirements and procedures for the protection of employees engaged in "critical lifts," which were not addressed separately in the proposed rules. (ID -0182.1; -0207.1.) One of these commenters requested that OSHA add "critical lifts" to the title of § 1926.1432, and define "critical lift" to include any lift that exceeds 75 percent of the rated capacity of the crane or derrick, requires the use of more than one crane or derrick, involves hoisting personnel, or is otherwise determined by a qualified person to involve an exceptional level of risk. (ID -0182.1.) OSHA disagrees with these commenters for the reasons discussed below.

C-DAC specifically considered whether to use the term "critical lift" for triggering additional requirements, such as planning and oversight. (OSHA-S030-2006-0663-0485.) There are a variety of differing views as to what ought to be considered a critical lift in this regard. For example, the Army Corps of Engineers, in its 2008 U.S. Army Corps of Engineers Safety and Health Requirements Manual, defines "critical lift" as "a non-routine crane lift requiring detailed planning and additional or unusual safety precautions." This manual describes critical lifts, in part, as lifts: 1) in which the load weighs 75% of the rated capacity of the crane; in which the load is out of the operator's view; involving more than one crane; involving non-routine or technically difficult rigging arrangement; hoisting personnel with a crane or derrick; or that the crane operator believes should be considered critical. EM 385-1-1, pg. 293. The National Aeronautics and Space Administration's definition is different:

> Critical lifts are lifts where failure/loss of control could result in loss of life, loss of or damage to flight hardware, or a lift involving special high dollar items, such as spacecraft, one-of-a-kind articles, or major facility components, whose loss would have serious programmatic or institutional

> impact. Critical lifts also include the lifting of personnel with a crane, lifts where personnel are required to work under a suspended load, and operations with special personnel and equipment safety concerns beyond normal lifting hazards.

NASA Standard for Lifting Devices and Equipment, NASA STD-8719.9, pg. 5.[127]

C-DAC identified and addressed the particular situations that necessitate special planning and procedures rather than using a more generalized "critical lift" approach based on a percent of rated capacity. For example, the Committee developed specific requirements for hoisting personnel, operating equipment when power lines are present, and in §§ 1926.1417(o)(3)(ii) and 1926.1417(s), for hoisting loads that exceed 75 percent of rated capacity or are 90 percent or more of rated capacity. This enabled the Committee to separately address the specific hazards associated with each type of operation. The advantage of this approach is that the standard's requirements could be specifically tailored to each type of situation, promoting both effectiveness and clarity. Therefore, OSHA defers to the expertise of C-DAC and declines to adopt the commenters' suggestions.

Paragraph (a) Plan development

Section 1926.1432(a) requires an employer to develop a plan before beginning a crane/derrick operation in which more than one crane/derrick will be supporting the load, the operation must be planned. The planning must meet the criteria set forth in §§

[127] In OSHA's steel erection standard, 29 CFR 1926 subpart R, critical lift is defined as "a lift that (1) exceeds 75 percent of the rated capacity of the crane or derrick, or (2) requires the use of more than one crane or derrick" (See § 1926.751). However, the steel erection standard does not require planning or other additional precautions whenever there is a critical lift. A critical lift plan is only required in subpart R when the employer elects to do a site-specific erection plan as an alternative to the requirements of §§ 1926.753(c)(5), 1926.757(a)(4), or 1926.757(e)(4).

1926.1432(a)(1) through (3). The purpose of the requirement for a plan is to help ensure that the hazards involved with a multiple lift are identified and eliminated. The Committee determined that a plan-based requirement would be the most appropriate and effective means of reducing the risks associated with these operations.

Section 1926.1432(a) does not, however, require the multiple crane/derrick lift plan to be documented. One commenter suggested that the final rule require the plan to be in writing to ensure that the plan would be well designed and could be clearly communicated to all affected personnel. (ID -0182.1.) C-DAC carefully considered where to recommend including documentation requirements throughout the standard, and did not recommend including one for this provision. The commenter did not provide any explanation of how a documentation requirement would enhance the review of the plan or the communication of the plan to the parties involved, and OSHA has decided to defer to the expertise of the Committee and declines to include a documentation requirement for § 1926.1432.

Paragraph (a)(3)

Section 1926.1432(a)(3) requires engineering expertise to be provided by the employer whenever the qualified person determines that it is necessary. One commenter believed that all multiple-crane/derrick lifts should be planned by a licensed professional engineer due to the technical complexity of such lifts. (ID -0156.1.) As discussed in the preamble to the proposed rule, in the view of the Committee, some, but not all, multiple-crane/derrick lifts need to be planned with engineering expertise so that the lift can be performed safely (73 FR 59841, Oct. 9, 2008). Similarly, the Committee determined that

it is not practical to set criteria in the rule for identifying which lifts need such expertise. OSHA defers to the expertise of the Committee on this issue and has decided not to adopt the commenter's suggestion.

Paragraph (b) Plan implementation

Under this paragraph, the employer is required to take specific steps designed to ensure that the decisions and precautions built into the plan are effectively implemented.

Section 1926.1432(b)(1) requires direction of plan implementation by competent and qualified persons, or by one person who meets the definitions of both. OSHA has decided to replace the word "supervised" in this paragraph with the word "directed." (For a detailed explanation of competent and qualified persons and the reason for replacing "supervised," refer to the preamble discussion of § 1926.1404(a), *Supervision – competent-qualified person*).

One commenter suggested that the final rule require a "lift director" for each multiple-crane/derrick lift and that the "lift director must be present for each critical lift." (ID -0178.1.) OSHA agrees and, to also be consistent with the identification of the A/D director in § 1926.1404(a), has denoted the person directing the multiple-crane/derrick lift as the "lift director."

Paragraph (b)(2)

OSHA has decided to replace the term "supervisor" in § 1926.1432(b)(2) with the term "lift director." This decision was made to be consistent with the similar change from "A/D supervisor" to "A/D director" in § 1926.1404(a) and the change from "lift

supervisor" to "lift director" in §§ 1926.1419(c)(2), 1926.1421(a), and 1926.1421(c). (For a detailed explanation of this change, refer to the preamble discussion of § 1926.1404(a), *Supervision – competent-qualified person*).

Section 1926.1432(b)(2) mandates that the director review the plan with all employees who will be involved with the operation before lift operations begin. The Committee determined that it is important for employees to know how the plan will work, including their responsibilities and the responsibilities of others, to help ensure that the diverse aspects of the operation will be coordinated (see the more complete discussion of this provision in the proposed rule preamble at 73 FR 59841, Oct. 9, 2008).

One commenter suggested adding an additional provision to proposed § 1926.1432(b) to enable the person directing the lift, or the operator, to halt operations if at any time the lift director determined the lift could not be safely executed pursuant to the lift plan. (ID -0182.1; -0357.1.) If such a halt to operations occurred, the suggested provision would require the lift director to modify the lift plan and review any such modifications with all workers involved with the operation. (ID -0182.1.)

Adding such a provision is unnecessary because § 1926.1432 and other provisions in subpart CC already incorporate the commenter's suggestions. As discussed above, § 1926.1432(b) requires the lift director to be a competent person. As defined in § 1926.1401, a competent person "is a person who is capable of identifying . . . hazards . . . and who has authorization to take prompt corrective measures to eliminate them." This ensures that the lift director has the authority to both halt operations and modify the plan if he or she determined the lift could not be executed safely according to the lift plan. Also, under § 1926.1418, the equipment operator has the authority to stop operations

whenever there is a concern as to safety. Thus, both the lift director and equipment operator have the authority to halt a multiple-crane/derrick lift if either determines the lift cannot be executed safely pursuant to the lift plan.

Furthermore, if the lift director modified the plan, a review of the modified plan with the workers is required under § 1926.1432(b)(2) because it is a different plan from the one that had been used initially.

OSHA also received a comment suggesting that the plan-review requirement in proposed § 1926.1432(b)(2) did not make clear the intention that the review take place in a meeting so that the plan could be reviewed collectively with the workers as a group. (ID -0182.1.) Because a collective review is more likely to be effective than separate, individual reviews, OSHA agrees with the commenter's clarification and has inserted the phrase "in a meeting" into final §1926.1432(b)(2).

Other than this additional language, the replacement of "supervised" with "directed," and the inclusion of the term "lift director," the Agency is promulgating this provision as proposed.

Section 1926.1433 Design, construction and testing

Previously, subpart N included design, construction, and testing requirements for specific types of equipment that either incorporate pre-1970 consensus standards or that require equipment to conform to manufacturer's specifications. The former category includes: crawler, locomotive, and truck cranes (ANSI B30.5-1968, incorporated by former § 1926.550(b)(2)); overhead and gantry cranes (ANSI B30.2.0-1967, incorporated by former § 1926.550(d)(4)); and derricks (ANSI B30.6-1969, incorporated by former §

1926.550(e)). The latter includes hammerhead tower cranes (former § 1926.550(c)(5)) and floating cranes and derricks (former § 1926.550(f)(2)(iii)). Except for crawler, locomotive, and truck cranes, design, construction and/or testing requirements for each of these categories of equipment is addressed in a section of this standard that is dedicated to that type of equipment. This section contains certain requirements applicable only to crawler, locomotive, and truck cranes and, in addition, contains requirements that apply to all of the equipment covered by this subpart.

Paragraph (a)

Paragraph (a) of this section requires that crawler, truck and locomotive cranes manufactured prior to the effective date of this standard meet the applicable requirements for design, construction, and testing prescribed in ANSI B30.5-1968, safety code for "Crawler, Locomotive, and Truck Cranes," PCSA[128] Std. No. 2 (1968), the requirements in paragraph (b), or the applicable DIN (Deutsches Institut für Normung e.V., or German Institute for Standardization) standards that were in effect at the time of manufacture.

This provision allows employers to continue to use equipment that complies with former § 1926.550(b)(2) of subpart N and also gives them the flexibility to use equipment that was built to conform to applicable DIN standards.

One commenter objected to the inclusion of DIN standards, stating that those standards are less stringent than the ANSI standard. (ID -0178.1.) The commenter did not elaborate on this objection, and OSHA does not find merit in it. Many cranes currently in use in the United States were manufactured in Europe to DIN standards, and

[128] "PCSA" is the acronym for the Power Crane Shovel Association.

OSHA has no reason to conclude that these cranes are any less safe than those manufactured domestically. Accordingly, paragraph (a) is promulgated without substantive change. OSHA has clarified the paragraph by splitting the options for compliance into separate paragraphs (1) through (4), but has not changed any of the requirements.

Paragraph (b)

Paragraph (b) of this section uses the phrase "mobile and locomotive cranes" to reflect the current terminology used in ASME B30.5-2004. It specifies that such cranes must meet certain provisions of ASME B30.5-2004.

As drafted by C-DAC, paragraph (b) required that mobile (including crawler and truck) and locomotive cranes manufactured on or after the effective date of this standard meet certain provisions of ASME B30.5–2000 with addenda ASME B30.5a-2002, "Safety Code for Mobile and Locomotive Cranes." Here, as elsewhere in the proposal, OSHA updated the provision to refer to the 2004 version of ASME B30.5, which was published after C-DAC completed its draft and was the most current ASME standard available at the time OSHA prepared the proposed rule for publication. For the proposed rule, OSHA compared the 2004 and earlier version and, as discussed below, requested public comment on whether certain changes in the 2004 version should be adopted. Two commenters objected to the revisions to incorporate the 2004 standards. (ID -0205.1; -0213.1.) Neither of these commenters provided specific reasoning or analysis for their positions beyond saying that the 2004 standard was not available at the time the consensus document was created. OSHA concludes that in the absence of any reason for

not referring to the updated ASME standard, the most recent version of the standard available prior to the publication of the proposed rule should be used in this provision. Therefore, this provision is promulgated as proposed.

The incorporation by reference of the listed provisions of ASME B30.5-2004 in paragraph (b) of this section does not mean that other provisions found in ASME B30.5-2004 do not apply to equipment under this subpart. Some other provisions of ASME B30.5-2004 are not incorporated into this section because they deal with issues addressed elsewhere in this standard. For example, two-block protection, which is required by sec. 5-1.9.9.1 of the ASME standard, is addressed in § 1926.1416 of this proposed standard. In addition, the issues addressed in paragraph (e) below are addressed in ASME B30.5-2004 but, instead of making those provisions applicable solely to mobile and locomotive cranes, C-DAC drafted corresponding provisions that would be applied to all of the equipment subject to this proposed standard.

The sections of ASME B30.5 referenced in §§ 1926.1433(b)(1) and (b)(13) contain requirements for equipment with outriggers partially extended that are not found in the earlier version of the ASME standard. In the discussion of § 1926.1433(b) of the proposed rule, OSHA noted that § 1926.1404(q)(1) permits partial deployment of outriggers when manufacturer procedures permit, and expressed its conclusion that incorporating the provisions on partially deployed outriggers in the 2004 version of ASME B30.5 would be consistent with § 1926.1404(q)(1). OSHA requested public comment on this issue. In response, one commenter recommended requiring a system or device that would sense the positions of the outriggers and interact with the crane's onboard computer system (LMI, RCL, etc.) to automatically reduce the crane's capacity

based on the outrigger positions. (ID -0131.1.) Although this might well be a desirable addition, OSHA cannot find evidence in this rulemaking record to indicate that such a system/device is currently available and feasible. The Agency therefore declines to add such a requirement.

Paragraph (c)

Proposed paragraph (c) of this section, *Prototype testing*, required that mobile (including crawler and truck) and locomotive cranes manufactured on or after the effective date of this standard meet the prototype testing requirements in § 1926.1433(c)(1), *Test Option A* or § 1926.1433(c)(2), *Test Option B* of this section. Test Option A continues the prototype testing methodology that was previously required under subpart N for crawler, locomotive, and truck cranes through the incorporation of ANSI B30.5-1968. Test Option B permits, as an alternative, the use of computer modeling technology for prototype evaluation. C-DAC agreed to allow computer modeling testing under the European CEN standard only on the condition that the requirements of proposed § 1926.1433(c)(2), discussed below, are met to ensure the reliability of the computer modeling. OSHA is incorporating this option into the final rule with the same condition. OSHA has updated the reference to the CEN standard to BS EN 13000:2004. This change was made because for purposes of incorporation by reference OSHA must point to a specific document and OSHA has selected the English language version of EN 13000. In addition, for clarity, a note to paragraph (c) states that prototype testing of crawler, locomotive and truck cranes manufactured prior to the effective date of the

standard must conform to paragraph (a). No comments were received on the provisions of paragraph (c) that apply to mobile cranes.

OSHA noted in the proposal that neither proposed § 1926.1433(c) nor any other proposed provisions would apply prototype testing requirements to tower cranes. It appeared to the Agency that this was an oversight on the part of C-DAC. OSHA requested public comment on whether there should be prototype testing requirements for tower cranes, and, if so, what requirements should apply. All four commenters on this issue recommended inclusion of computer modeling and/or verification for tower crane prototypes in accordance with BS EN 14439:2006. (ID -0156.1; -0180.1; -0205.1; -0213.1.) OSHA agrees with these comments and has added these requirements to the final version of § 1926.1433(c).

Another commenter suggested that the standard require equipment manufacturers to obtain independent verification that the prototype testing was performed. (ID -0156.1.) C-DAC addressed the prototype issues directly and did not recommend this approach. Based on the evidence in the record, the Agency is not convinced that placing this burden on the manufacturer is warranted.

Paragraph (d)

Paragraph (d) of this section mandates that all equipment covered by this subpart meet the requirements listed in §§ 1926.1433(d)(1) through (d)(13) of this section. The issues listed in paragraph (d) are addressed by ASME B30.5-2004. However, as explained in the proposed rule, C-DAC determined that these requirements were also appropriate for other equipment, and the proposed rule applied them to all equipment (see

73 FR 59843-59845, Oct. 9, 2008). The Agency did not receive any comments opposing this approach. Therefore, instead of applying these requirements solely to mobile and locomotive cranes, paragraph (d) applies them to all equipment covered by this subpart.

Section 1926.1433(d)(1), *Load capacity/ratings and related information*, requires the employer to ensure that the information available in the cab (see § 1926.1417(c)) regarding load capacity/ratings and related information include the data listed in §§ 1926.1433(d)(1)(i) through (d)(1)(xvi). These equipment specifications need to be made available for the operator to reference in the cab so that the operator has immediate access to information needed to ensure safe operation.

Section 1926.1433(d)(2) requires that load hooks (including latched and unlatched types), ball assemblies and load blocks be of sufficient weight to overhaul the line from the highest hook position for boom, or boom and jib lengths, and the number of parts of the line in use. This requirement is necessary to prevent any incidents that could occur when ball assemblies, load blocks, and load hooks are of insufficient weight to keep the load line from being unintentionally pulled up the boom due to the weight of the load line itself.

Section 1926.1433(d)(3) requires that hook and ball assemblies and load blocks be marked with their rated capacity and weight. Marking this equipment with their rated capacities and weights is needed to help ensure that they are not overloaded and is necessary to help enable employers to comply with proposed § 1926.1433(d)(2).

Section 1926.1433(d)(4), *Latching hooks*, requires that hooks meet the requirements in §§ 1926.1433(d)(4)(i) – (ii) of this section.[129] Section 1926.1433(d)(4)(i) requires that hooks be equipped with latches, except where the requirements of § 1926.1433(d)(4)(ii) are met. It also requires that latches close the throat openings of hooks and that they be designed to retain slings or other lifting devices/accessories in the hooks when the rigging apparatus is slack. This requirement is included to ensure that the rigging will not be unintentionally dislodged from the hook when the rigging apparatus is slack.

Section 1926.1433(d)(4)(ii) prohibits hooks without latches, or with latches removed or disabled, from being used unless two criteria are met. First, to ensure that the hazards are weighed appropriately, a qualified person must determine that it is safer to hoist and place the load without latches (or with the latches removed/tied-back). Second, routes for the loads must be pre-planned to ensure that no employee is required to work in the fall zone except for employees necessary for the hooking or unhooking of the load. The reason for generally requiring hooks to be equipped with latches is to prevent the load from accidentally disengaging from the hook. C-DAC determined that the use of hooks with latches is an industry recognized practice, but also recognized that there are some circumstances where the use of a hook with a latch presents a greater hazard. The exceptions in § 1926.1433(d)(4)(ii) are included to address the latter circumstances. For example, if an employee would have to climb up or out onto an unsecured, elevated member to unhook the load after its placement, the employee would be exposed to a fall

[129] Pursuant to a commenter's suggestion on the structure of this section as proposed (ID -0172.1), this section was reorganized in the final rule for clarity but was not changed substantively.

hazard. The criteria in § 1926.1433(d)(4)(ii) for permitting a hook to be used without a latch are designed to ensure that the operation can still be conducted safely.

Section 1926.1433(d)(5), *Posted warnings*, states that posted warnings required by this subpart, as well as those originally supplied with the equipment by the manufacturer,[130] must be maintained in legible condition. Compliance with this requirement will increase the likelihood that employees will recognize the hazard identified on the posted warning and avoid or protect themselves from that hazard.

Section 1926.1433(d)(6) requires that an accessible fire extinguisher be on the equipment to eliminate small fires quickly. This provision continues a similar requirement that was in the former § 1926.550(a)(14)(i).

Section 1926.1433(d)(7), *Cabs*, states that equipment with cabs must meet the requirements listed in § 1926.1433(d)(7)(i) through (v) of this section. These provisions ensure that the crane operator is provided with a safe work station that has adequate ventilation, safe means of access and egress, good visibility, protection against window breakage, and sufficient roof strength. Most of these requirements continue the protections provided under OSHA's prior rules for crawler, locomotive, and truck cranes, which incorporated by reference various sections of ANSI B30.5-1968.

Section 1926.1433(d)(7)(i) requires that cabs be designed with a form of adjustable ventilation and method for clearing the windshield for maintaining visibility

[130] Two commenters stated that posted warnings originally supplied with the equipment by the manufacturer should not be included in this provision and were not agreed to by C-DAC; they believed that C-DAC required only original posted warnings related to electrical hazards. (ID -0205.1; -0222.1.) These commenters are mistaken; the proposed language is unchanged from the C-DAC consensus document. In any event, OSHA believes that maintenance of manufacturers' original posted warnings is critical to safe operation of equipment and is promulgating this provision as proposed.

and air circulation. Examples of means for adjustable ventilation include an air conditioner or window that can be opened (for ventilation and air circulation); examples of means for maintaining visibility include heater (for preventing windshield icing), defroster, fan, and windshield wiper. This provision ensures adequate air circulation, both for the operator's health and for good visibility.

Under § 1926.1433(d)(7)(ii), cab doors (whether swinging or sliding) must be designed to prevent inadvertent opening or closing while traveling or operating the machine. Swinging doors adjacent to the operator must open outward. Sliding operator doors must open rearward. Standardization of the direction for opening doors helps ensure that an operator will be able to exit the cab quickly in an emergency.

Section 1926.1433(d)(7)(iii), *Windows*, requires that cab windows meet the requirements listed in §§ 1926.1433(d)(7)(iii)(A) through (C).

Section 1926.1433(d)(7)(iii)(A) requires that the cab have windows in front and on both sides of the operator. Forward vertical visibility must be sufficient to give the operator a view of the boom point at all times.

Section 1926.1433(d)(7)(iii)(B) allows windows to have sections designed to be opened or readily removed. Windows with sections designed to be opened must be designed so that they can be secured to prevent inadvertent closure. Compliance with this provision ensures that the operator can adequately ventilate the cab should conditions within the cab affect the safe operation of the crane.

Section 1926.1433(d)(7)(iii)(C) specifies that windows be constructed of safety glass, or material with similar optical and safety properties, that introduces no visible distortion or otherwise obscures visibility. In the final rule, OSHA has deleted the phrase

"that interferes with the safe operation of the crane" from the end of this paragraph as proposed to eliminate an ambiguity that might arise in interpreting this provision.

Section 1926.1433(d)(7)(iv) requires that a clear passageway be provided from the operator's station to an exit door on the operator's side. This provision will enable the operator to enter and exit the equipment safely and will enable the operator to escape from the cab quickly in the event of an emergency.

Section 1926.1433(d)(7)(v) states that areas of the cab roof that serve as a workstation for rigging, maintenance or other crane-related tasks must be capable of supporting 250 pounds without permanent distortion.

Section 1926.1433(d)(8) requires that belts, gears, shafts, pulleys, sprockets, spindles, drums, fly wheels, chains, and other parts or components that reciprocate, rotate or otherwise move be guarded where contact by employees (except for maintenance and repair workers) is possible in the performance of normal duties. The exception permits maintenance and repair workers to remove the guards when their work requires access to the parts being guarded.

Section 1926.1433(d)(9) requires that all exhaust pipes, turbochargers, and charge air coolers be insulated or guarded where contact by employees is possible in the performance of normal duties. As with § 1926.1433(d)(8), an exception is provided when maintenance and repair workers need to remove the guards to perform their work. This provision is included to protect workers against injuries that can occur if they contact components that are hot enough to cause burns.

Section 1926.1433(d)(10) requires that hydraulic and pneumatic lines be protected from damage to the extent feasible. For example, where hydraulic or pneumatic lines are

subject to chafing from vibration or movement of the equipment, they must be secured, protected with anti-chafing gear, or otherwise protected from chafing damage. Denting, crushing, puncturing, or nicking a hydraulic or pneumatic line could adversely affect the structural integrity of the line and compromise the safe operation of the affected systems and the crane as a whole.

Section 1926.1433(d)(11) requires that equipment be designed so that exhaust fumes are not discharged in the cab and are discharged in a direction away from the operator. This provision ensures that exhaust gases that are likely to adversely affect or incapacitate the operator will not accumulate in the cab because of the design of the equipment. For the same reason, OSHA is amending the final rule to clarify that the exhaust fumes must also be discharged away from any air intake source for the cab.

Section 1926.1433(d)(12), *Friction mechanisms*, states that where friction mechanisms (such as brakes and clutches) are used to control the boom hoist or load line hoist, they must be: of a size and thermal capacity sufficient to control all rated loads with the minimum recommended reeving; and adjustable to permit compensation for lining wear to maintain proper operation. The words "all rated" have been added back into paragraph (d)(12)(i) of this section in response to several comments who correctly pointed out that the phrase was included in the C-DAC consensus document. (ID -0180.1; -0205.1; -0213.1.) This phrase was inadvertently deleted from the proposal and is needed to clarify the requirement.

Section 1926.1433(d)(13), *Hydraulic load hoists*, specifies that hydraulic drums have an integrally mounted holding device or internal static brake to prevent load hoist

movement in the event of hydraulic failure. This requirement will protect employees against unintended movement of the load hoist caused by a hydraulic failure.

As noted above, §§ 1926.1433(d)(7)(iii)(C) and 1926.1433(d)(11) were amended to clarify those provisions, and § 1926.1433(d)(12)(i) was amended to address comments received. All other provisions of paragraph (d) are promulgated as proposed with minor grammatical corrections and changes in numbering.

Paragraph (e)

Section 1926.1433(e) permits employers to rely on documentation from manufacturers to show that they are in compliance with §§ 1926.1433(a) – (c) and 1926.1433(d)(7) – (d)(13) where the equipment has not been modified[131] since it was manufactured, except in accordance with § 1926.1434, *Equipment modifications*. Sections 1926.1433(d)(1)–(d)(6) are excluded from this provision because the employer can easily verify compliance with them without recourse to documentation provided by the manufacturer. An employer's failure to have such documentation in its possession would not, in itself, constitute a violation of these provisions. Rather, § 1926.1433(e) is intended to make clear that crane users need not independently determine whether their equipment meets certain provisions of this section but may rely on manufacturer documentation for that purpose. No comments were received on this paragraph, and it is promulgated as proposed.

[131] For clarification, the phrase in the final standard: "where the equipment has not been modified" replaces the phrase in the proposed standard: "where the equipment has not changed."

Section 1926.1434 Equipment modifications

This section addresses the procedures an employer must follow when equipment is modified in a way that affects its capacity or safe operation. Its purpose is to safeguard against unsafe modifications and to ensure that the equipment's instructions and specifications are updated to reflect the modifications so that the equipment may be used safely.

This section uses the term "modification/addition" to refer to "modification or addition" to clarify that an addition to the equipment is a type of modification and needs to be subject to the same approval procedures as other types of modifications. For example, the addition of a generator to the back of the cab of a crane needs to be subject to the approval procedures because it will alter the crane's backward stability.

Paragraph (a)

Paragraph (a) of this section prohibits modifications or additions to equipment which affect the capacity or safe operation of the equipment except where any of five options set out in §§ 1926.1434(a)(1), (2), (3), (4), and (5) are met. Options outlined in (a)(4) and (a)(5) were not in the proposed rule; see discussion below.

Option (1) – Manufacturer review and approval

Under paragraph (a)(1)(i), the employer must get the manufacturer of the equipment to approve the modifications/additions in writing. Paragraph (a)(1)(ii) requires that load charts, procedures, instruction manuals, and instruction plates/tags/decals be modified in accordance with the modification/addition. Under (a)(1)(iii), the original safety factor of the equipment must not be reduced. Meeting the

requirements of this paragraph ensures that the original safety factor is not reduced and that all affiliated materials related to safe operation of the equipment (instructions, charts) are updated to reflect the changes made. Paragraph (a)(1) is promulgated as proposed.

Option (2) – Manufacturer refusal to review request

Under paragraph (a)(2), the employer must provide a detailed description of the proposed modification to the manufacturer and ask it to approve the modification/addition. If the manufacturer declines to review the technical merits of the proposal or fails, within 30 days, to acknowledge the request or initiate the review, the employer may proceed with the modification/addition if it complies with the other requirements in paragraph (a)(2). In these conditions, the employer may utilize a registered professional engineer who is a qualified person with respect to the equipment to approve the modification/addition in lieu of the manufacturer. See § 1926.1401 for the definition of qualified person. C-DAC found it important to clarify that this individual needs to be a qualified person "with respect to the equipment involved," since specialized knowledge beyond that of a general registered professional engineer is needed to make the required assessments regarding the particular equipment that is being modified.

The Committee recommended this option because it determined that the refusal of a manufacturer to review a request, or a manufacturer's failure to act on the request within a reasonable time, would not preclude an employer from making a modification if adequate precautions are followed. The Committee concluded that 30 days would give the manufacturer a reasonable amount of time to decide whether to simply decline to review the request or to proceed with evaluating it. Also, the Committee concluded that a

failure to respond at all in this period would fairly reflect an intention not to act on the request in a timely manner.

Under paragraph (a)(2)(i)(A) OSHA requires that the approval by the registered professional engineer specify the equipment configurations to which it applies. Cranes typically can be configured in a variety of ways. Modifications may have different effects depending on the configuration. C-DAC determined that it was essential for purposes of ensuring safe operation that the approval specify the configurations to which it applies. An example of an approval satisfying this would be the following: "This is an approval to add an additional boom section of the above-described design for a brand K lattice boom crane, model 1. This approval applies only when the crane is configured without a jib."

Paragraph (a)(2)(i)(B) requires that the registered professional engineer modify load charts, procedures, instruction manuals, and instruction plates/tags/decals as necessary to accord with the modification/addition. Under paragraph (a)(2)(ii), the original safety factor of the equipment must not be reduced.

One local jurisdiction commented that local governments should have the option of reviewing and approving cranes that are not modified in conjunction with the manufacturer. (ID -0156.1.) The commenter did not explain how such a requirement would work in practice or how it would enhance employee safety. OSHA defers to C-DAC's judgment that having a registered professional engineer (who is a qualified person with respect to the equipment involved) approve the modification in accordance with the requirements of paragraph (a)(2) will provide adequate protection. See, e.g., *Building & Constr. Trades Dep't, AFL-CIO v. Brock*, 838 F.2d 1258, 1271 (D.C. Cir. 1988) ("[A]

party challenging an OSHA standard must bear the burden of demonstrating that the variations it advocates will . . . provide more than a de minimis benefit . . . .”). Paragraph (a)(2) is adopted without change from the proposal.

Option (3) – Unavailable manufacturer

Paragraph (a)(3) addresses a scenario in which the manufacturer of equipment is unavailable to review proposed modifications/additions because, for example, it has gone out of business (and has not been taken over by a successor company). In this situation, if the employer wishes to modify its equipment in a way that affects its capacity or safe operation, it can get approval from a registered professional engineer in accordance with the requirements of (a)(2)(i) and (ii) above. This paragraph is adopted as proposed.

Option (4) – Manufacturer does not complete the review within 120 days of the request

Paragraph (a)(4) has been added to this section of the final rule based on a particular scenario raised by a commenter where a manufacturer agrees to review a proposed modification/addition, but fails to complete that review within 120 days of the date on which it was provided with a detailed description of the proposed modification/addition. (ID -0187.1.) OSHA agrees with the commenter that in that scenario the employer should have the option of seeking approval from a registered professional engineer in accordance with the requirements of (a)(2)(i) and (ii) above. OSHA concludes that 120 days will generally be sufficient for manufacturers to complete reviews; for proposed modifications/additions that are particularly extensive or complex, OSHA assumes that the length of time needed to review the proposal will be longer and will be addressed as a contractual matter between the parties.

Option (5) – Multiple manufacturers of equipment designed for use on marine work sites

Paragraph (a)(5) has been added to this final rule in response to a comment regarding equipment used on marine work sites. (ID -0187.1.) According to this commenter, in the marine construction industry, contractors routinely hire shipyards to build specialized barges or modify existing barges used as floating platforms for hoisting equipment. Custom-made hoisting equipment for such operations is frequently assembled using component parts manufactured by multiple manufacturers and then installed on the floating platform. In such cases, it is impossible to identify a single "manufacturer" from which to seek approval for a modification/addition; therefore OSHA concludes that it was reasonable to provide employers in these instances with the ability to seek approval for a proposed modification/addition from a registered professional engineer in accordance with paragraphs (a)(2)(i) and (ii) above. The term marine worksite is defined in § 1926.1401 as "a construction worksite located in, on, or above the water."

Paragraph (b)

Paragraph (b) of this section prohibits modifications or additions which affect the capacity or safe operation of the equipment where the manufacturer, after a review of the technical safety merits of the proposed modification/addition, rejects the proposal and explains the reasons for the rejection in a written response.

OSHA concludes, as did C-DAC, that it was important to expressly state the need for the manufacturer to explain why it rejected the employer's proposed modification.

Such an explanation both demonstrates that the manufacturer reviewed the technical safety merits of the request and gives the employer the opportunity to modify the proposal to address the manufacturer's objections. If the manufacturer does not provide the reasons for its rejection in writing, the employer may consider this a refusal to review a request under paragraph (a)(2) above.

No comments were received for this paragraph; it is promulgated as proposed.

Paragraph (c)

Paragraph (c) of this section states that the provisions in §§ 1926.1434(a) and (b) do not apply to modifications made or approved by the U.S. military. During C-DAC negotiations, a representative of the U.S. Navy indicated to C-DAC that such an exception is needed in the event of military exigencies. OSHA defers to the Committee's expertise on this issue. No comments were received for this paragraph; it is promulgated as proposed.

Section 1926.1435 Tower Cranes

Definition of tower crane

OSHA's proposed definition reflected three changes from the Committee draft. First, a characteristic of tower cranes that was missing from the C-DAC definition was that the working boom is in an elevated position above the ground. Second, the working boom on some tower cranes, even of the non-luffing type, may not be at a 90 degree angle to the tower, and so the term "fixed horizontally" may not always be appropriate for a non-luffing jib. Third, tower cranes do not always rotate about the tower center to

swing loads. There are "top slewing" tower cranes – those in which the working boom rotates on the top of a fixed tower, and "bottom slewing" tower cranes – those in which the tower itself (with the working boom fixed to it) rotates on its base, and for the latter, the boom does not rotate about the tower center. OSHA requested public comment on the changes it made to the Committee draft definition.

One commenter agreed with the proposed definition of "tower crane," saying that OSHA's changes removed any ambiguity in the definition. (ID -0187.1.) Three commenters suggested adding the words "or near vertical" to the first sentence of the definition so that it would say, "a type of lifting structure which utilizes a vertical, or near vertical, mast or tower…." (ID -0180.1; -0205.1; -0 213.1.) These commenters were evidently concerned that a tower crane could, under § 1926.1435(b)(5), *Plumb tolerance*, permissibly deviate from being perfectly vertical by a slight amount. As explained below in the discussion of § 1926.1435(b)(5), the crane's tower must be plumb to the manufacturer's tolerance or, where the manufacturer does not specify the plumb tolerance, plumbed to a tolerance of at least 1:500.

OSHA concludes that adding the words "or near vertical" to the definition of tower crane is not necessary. Although a tower crane may deviate from being perfectly vertical by the amount of the manufacturer's tolerance or, where the manufacturer does not specify a tolerance, at least 1:500, the tower crane would still be "vertical" within the ordinary meaning of that word. Adding the words "or near vertical" could create additional ambiguity and is not necessary to avoid misleading tower crane users into thinking that their equipment does not fall within OSHA's definition if the tower deviates from perfect vertical by the amount permitted by the rule.

Two commenters suggested adding the following sentence at the end of the definition:

> Mobile cranes that are configured with luffing jib and/or tower attachments are not considered tower cranes under this section.

(ID -0205.1; -0213.1.)

The provisions in this section for tower cranes are not appropriate for application to a mobile crane configured with a luffing jib. This conclusion is equally applicable to mobile cranes used with tower attachments. Such attachments typically consist of devices that fix the mobile crane's main boom at a near-vertical position and use of a luffing jib. OSHA therefore agrees that a mobile crane configured in either manner should not be treated as a tower crane, since the supplemental provision for tower cranes in this section are not designed for such applications.[132] Therefore, the Agency has added the language suggested by the commenters to the definition.

Paragraph (a)

Section 1926.1435(a) states that § 1926.1435 contains supplemental requirements for tower cranes and that all other sections of this standard apply to tower cranes unless specified otherwise. This paragraph makes clear that all provisions of this subpart apply to tower cranes unless a specific provision states that they are inapplicable. As discussed below, two sections of this standard that do not apply to tower cranes are §§ 1926.1415 (safety devices) and 1926.1416 (operational aids). Instead, this section lists the safety devices and operational aids that are required for tower cranes. In addition, this section

[132] Note, however, that some tower cranes are mobile, i.e., truck-mounted (such as truck-mounted self-erecting tower cranes). These are considered tower cranes under this standard.

contains additional requirements for erecting, climbing, dismantling, and inspections that are specific to tower cranes. No comments were received on this paragraph, and it is promulgated as proposed.

Paragraph (b) Erecting, climbing and dismantling

Section 1926.1435(b)(1) requires the employer to comply with the assembly and disassembly requirements set out in §§ 1926.1403-1926.1406, except as otherwise specified in this section. Section 1926.1435(b)(1) notes that the industry generally refers to the assembly and disassembly of tower cranes as erecting, climbing and dismantling. Therefore, when the term "assembly" is used in §§ 1926.1403 through § 1926.1405, it is replaced with "erecting and climbing" when referring to tower cranes. Similarly, where the term "disassembly" is used, it is replaced with "dismantling" when referring to tower cranes.

Section 1926.1435(b)(2), *Dangerous areas (self-erecting tower cranes)*, addresses the hazards associated with crew members located in certain areas. Employees must not be in or under the tower, jib, or rotating portion of the crane during erecting, climbing and dismantling operations until the crane is secured in a locked position and the competent person indicates it is safe to enter these areas. The only exception to this is where the manufacturer's instructions direct otherwise and the employer limits access to necessary employees only.

These areas are hazardous because, in the event of unintended movement of components, there is a heightened chance than an employee could be struck or crushed. The exception accounts for those situations in which, due to the design of the equipment,

it is infeasible for all employees to be out of these areas during erecting, climbing and dismantling operations. No commenters addressed § 1926.1435(b)(2). It is promulgated without change.

Proposed paragraph (b)(3), *Foundations and structural supports*, provided: "Tower crane foundations and structural supports shall be designed by the manufacturer or a registered professional engineer."

When a tower crane is mounted to portions of a structure, it is vital for safe operation that the structure be able to withstand the forces imposed by both the crane and the loads the crane will handle throughout the job. Accordingly, when portions of a structure are used to support a tower crane, the manufacturer or registered professional engineer who designs the crane's structural supports must ensure not only that the structure is adequate to support the crane when it is mounted but that it will continue to support the crane under all anticipated conditions of use.

In the proposal, OSHA noted that it interpreted "structural supports" in this provision to include both the portions of the structure used for support and the means of attaching the tower to the structure, and requested public comment on whether proposed § 1926.1435(b)(3) stated this intent with sufficient clarity.

Five commenters recommended that OSHA clarify that "structural supports" means both the portions of the structure used for support and the means of attachment. (ID -0120.0; -0156.1; -0180.1; -0205.1; - 0213.1.) OSHA has modified paragraph (b)(3) of this section of the final rule accordingly.

Section 1926.1435(b)(4), *Addressing specific hazards*, requires the employer to comply with §§ 1926.1404(h)(1) through (9), which pertain to erecting, climbing and

dismantling. In particular, § 1926.1404(h) requires that the A/D Director address certain hazards, which are discussed above in the discussion of § 1926.1404. Section 1926.1435(b)(4) lists additional hazards, specific to tower cranes, that the A/D Director also must address. These additional hazards are those associated with (i) the foundations and structural supports for tower cranes, (ii) the loss of backward stability, and (iii) wind speed.

Proposed § 1926.1435(b)(4)(i) required the A/D Director to "verify" that the foundation and structural supports are installed in accordance with their design. This paragraph is designed to ensure that the design of these components by the manufacturer or registered professional engineer is followed when they are installed.

Three commenters stated that the A/D Director is not qualified to perform this function and that the registered professional engineer who designed the support should verify that the foundation and structural supports are properly installed. (ID -0180.1; -0205.1; -0213.1.)

OSHA determines that the commenters are assuming that, by the use of the term "verify," the proposed provision meant that the A/D Director would have to independently assess the foundation and supports to determine if they were installed in accordance with their design. OSHA is not, however, requiring the A/D Director to make such an independent assessment. For example, the intent of the provision is met when the A/D Director determines from the engineer of record that the installation was done correctly. To make this clear, OSHA has, in the final rule, changed the word "verify" to "determine."

Paragraph (b)(4)(ii) requires that the A/D Director address the backward stability of the crane before self erecting tower cranes or cranes on traveling or stationary undercarriages are swung. OSHA has removed the words "must be considered" that were in the proposed paragraph to avoid ambiguity. Paragraph (b)(4) requires the A/D Director to "address" certain issues, including the stability issue in paragraph (b)(4)(ii), and the words "must be considered" could be read as limiting or modifying that duty. This provision is similar to the assembly/disassembly requirement in § 1926.1404(h)(11) except that it applies only to self erecting tower cranes and cranes that are on traveling or static (stationary) undercarriages. It applies to these types of tower cranes to highlight the fact that, because they do not have a base that is fixed to the ground, the backwards stability safety issue needs to be addressed. No comments were received on this provision, and it is promulgated with only the one revision.

Proposed § 1926.1435(b)(4)(iii) provided that erecting, climbing, and dismantling not take place when the wind speed recommended by the manufacturer is exceeded. Where the manufacturer does not recommend a maximum wind speed, a qualified person is required to establish the maximum wind speed that must not be exceeded. This provision was included because the horizontal force caused by wind during erecting and dismantling can have a substantial effect on the stability of a tower crane.

One commenter suggested that climbing should not be allowed if the wind speed perpendicular to the jib is in excess of 20 miles per hour. (ID -0137.1.) This commenter stated that most manufacturers will allow climbing in winds up to 40 miles per hour but are not specific on winds that are perpendicular to the jib. OSHA concludes that any manufacturer who specifies wind speed will assume that the wind might be blowing in

any direction, including perpendicular to the jib, and take that into account in the recommendation. OSHA further concludes that manufacturers (and qualified persons) are well qualified to determine the maximum wind speed and finds no basis in the record to set a maximum wind speed during erection of 20 miles per hour. Accordingly, OSHA is promulgating § 1926.1435(b)(4)(iii) as proposed.

Paragraph (b)(5) of this section, *Plumb tolerance*, requires that the crane's tower be plumb to the manufacturer's tolerance and verified by a qualified person. Where the manufacturer does not specify the plumb tolerance, this provision requires that the tower be plumb to a tolerance of at least 1:500. The tower needs to be plumb within the manufacturer's tolerance to ensure the crane's stability and prevent it from collapsing. The Committee noted that a tolerance of at least 1:500 is generally what manufacturers specify and that for any type of vertical structure this generally is the accepted plumb tolerance in the engineering and construction industries. No comments were received on this provision; it is promulgated as proposed.

Paragraph (b)(6), *Multiple tower crane jobsites*, requires construction jobsites with more than one fixed jib (hammerhead) tower crane installed to be located so that no crane can contact the structure of another crane. However, the jibs of multiple hammerhead tower cranes are permitted to pass over/under one another. This provision is designed to ensure that multiple tower cranes on a construction site do not collide with each other. No comments were received on this paragraph. OSHA has replaced the word "may" with "can" in the final rule to clarify that it must be physically impossible for the structure of one crane to contact the structure of another. The text is otherwise unchanged in the final rule.

Paragraph (b)(7), *Climbing procedures*, contains special requirements that have to be followed during the climbing process. Climbing is defined in § 1926.1401. Paragraph (b)(7) requires that prior to, and during, all climbing procedures the employer (i) comply with all manufacturer prohibitions; (ii) have a registered professional engineer verify that the host structure is strong enough to sustain the forces imposed through the braces, brace anchorages and supporting floors; and (iii) ensure that no part of the climbing procedure takes place when wind exceeds the speed recommended by the manufacturer or, where the manufacture does not specify the wind speed, the speed determined by a qualified person. No comments were received on this paragraph; it is unchanged in the final rule. The Agency notes that several commenters did object generally to the mandatory compliance with manufacturer requirements. These arguments are addressed in the discussion of § 1926.1417.

Paragraph (b)(7)(ii) requires the employer to have a registered professional engineer verify that the host structure is strong enough to sustain the forces imposed through the braces, brace anchorages and supporting floors. Examples of typical host structures include a building, parking garage, bridge or pier. If the host structure is not strong enough, the host structure could collapse and cause the tower crane to collapse as well. No comments were received on this paragraph; it is unchanged in the final rule.

Proposed paragraph (b)(7)(iii) required the employer to ensure that no part of the climbing procedure takes place when wind exceeds the speed recommended by the manufacturer or by a qualified person if the manufacturer does not specify this information. The Agency noted that § 1926.1435(b)(4)(iii) requires wind speed to be addressed during erecting, climbing and dismantling in the same manner as §

1926.1435(b)(7)(iii) and requested public comment on whether § 1926.1435(b)(7)(iii) should be omitted as redundant. Three commenters agreed that § 1926.1435(b)(7)(iii) was redundant and should be deleted. (ID -0180.1; -0205.1; -0213.1.) OSHA agrees and has deleted § 1926.1435(b)(7)(iii) from the final rule.

One commenter suggested that all rigging used during the climbing process should follow the rules provided in § 1926.1431 (Hoisting personnel), and in particular the requirement that the lift not exceed 50% of the equipment's rated capacity. (ID -0137.1.) This commenter said that such a requirement is appropriate because climbing frames are often hoisted or lowered by the crane while workers are on them. OSHA is aware of no reason why workers need to be on a climbing frame while it is being hoisted and it notes that such a practice would violate a number of provisions of § 1926.1431. As discussed in § 1926.1431, cranes are designed to hoist material, not personnel, and may only be used to hoist personnel when stringent requirements to ensure safety are followed, including the requirement that the lift not exceed 50% of the equipment's rated capacity. OSHA is not requiring that all rigging used in climbing a tower crane meet this requirement because it does not determine that workers should be, or commonly are, hoisted while on the climbing frame.

The same commenter stated that the swing should be disabled during climbing and that a pre-test of the hydraulic system should be performed when the upper structure is initially raised. This commenter did not offer any rationale in support of these suggestions, and OSHA does not conclude they are needed to ensure the safety of the climbing process.

Section 1926.1435(b)(8), *Counterweight/ballast*, addresses the hazard of instability that can result from improper installation or removal of counterweight/ballast, which can cause a collapse. Sections 1926.1435(b)(8)(i) and (ii) require that tower cranes not be erected, dismantled or operated without the amount and position of counterweight or ballast in place as specified by the manufacturer or a registered professional engineer familiar with the equipment and that the maximum amount of counterweight or ballast not be exceeded. No comments addressed this paragraph, and it is promulgated as proposed.

Paragraph (c) Signs

Section 1926.1435(c) requires employers to comply with the manufacturer's specifications regarding the size and location of signs. This requirement addresses the hazards that can result from attaching signs (such as signs with the company's name) to tower cranes. The force of the wind bearing against a large sign can significantly increase the horizontal force the wind exerts on the crane. According to the Committee, most manufacturers specify the maximum size and permissible location of signs so that the stability of the tower crane is not compromised. Where the manufacturer does not specify this information or where such information is unavailable, this provision requires a registered professional engineer who is familiar with the specific type of tower crane involved to give written approval of the size and location of any signs. The provision applies irrespective of whether the sign was installed during or after erecting/climbing. No comments were received on this provision, and it is promulgated as proposed.

Paragraphs (d) Safety devices and (e) Operational aids

These paragraphs set out the safety devices and operational aids that are required on tower cranes. Sections 1926.1415 and 1926.1416, which require safety devices and operational aids on other types of cranes, are not applicable to tower cranes. Instead, §§ 1926.1435(d) and (e) apply. Although some of the safety devices and operational aids for tower cranes are the same as those that §§ 1926.1415 and 1926.1416 require for other equipment, others are unique to tower cranes. C-DAC determined it would promote clarity to list all the devices and aids for tower cranes in this section.

Safety devices must be in proper working order. Where a safety device is not in proper working order, the crane must be taken out of service until it is again functioning properly. The Committee determined that the protection offered by safety devices is critical to safe operation and that there is no alternative way to achieve the same level of safety that the safety devices provide. By contrast, if an operational aid is malfunctioning, operations may continue where the employer implements specified temporary alternative measures. Where the tower crane manufacturer specifies more protective alternative measures than those specified in this section, the employer is required to follow those more protective alternative measures.

Safety Devices: Paragraph (d)(2) requires the safety devices on tower cranes discussed below.

Boom stops on luffing boom type tower cranes (§ 1926.1435(d)(2)(i)) and jib stops on luffing boom type tower cranes if equipped with a jib attachment (§ 1926.1435(d)(2)(ii)) are required. These are comparable to the boom and jib stops required for other cranes under § 1926.1415 (discussed above) and are intended to

prevent the boom and jib from being raised to too high an angle and toppling over backwards.

Paragraph (d)(2)(iii) requires travel end rail stops at both ends of the travel rail. These are comparable to the rail stops required for equipment on rails under § 1926.1415 and are designed to keep the crane from overshooting the boundaries on the rail within which it is supposed to operate, which could cause the crane to collapse.

Paragraph (d)(2)(iv) requires travel rail clamps on all travel bogies. A "travel bogie (tower cranes)" is defined in § 1926.1401 as "an assembly of two or more axles arranged to permit vertical wheel displacement and equalize the loading on the wheels." When tower cranes travel on rails, they are mounted on travel bogies. The rail clamps that are required by this paragraph enable the bogies to be clamped to the rail to prevent the crane from lifting off the rail.

Paragraph (d)(2)(v) requires integrally mounted check valves on all load supporting hydraulic cylinders. A check valve permits fluid to flow in one direction only. When installed on load supporting hydraulic cylinders, such as the cylinders used to climb the crane, they protect against the loss of load support in the event of a hydraulic pressure failure by preventing the reverse flow of the hydraulic fluid supporting the cylinder.

Paragraph (d)(2)(vi) requires a hydraulic system pressure limiting device. A pressure limiting device, such as a relief valve, would prevent the pressure in a hydraulic system from exceeding its design limit, which can cause the system to fail.

Paragraph (d)(2)(vii) requires the following brakes, which must automatically set in the event of pressure loss or power failure: a hoist brake on all hoists; a swing brake; a

trolley brake; and a rail travel brake. These types of brakes are needed to enable the motion of the crane and load to be controlled safely. Under this paragraph, they must set automatically to avoid uncontrolled movement of the crane or load in the event of pressure loss or power failure that prevents their operation.

Paragraph (d)(2)(viii) requires a "deadman" control or forced neutral return control (hand) levers. These devices ensure that the crane does not move unless the movement is being controlled by the operator. In the case of a deadman control, the motion being controlled, such as hoisting or trolleying, ceases when the operator releases the control. Forced neutral return control levers automatically return to the neutral position when they are released.

Paragraph (d)(2)(ix) requires an emergency stop switch at the operator's station. This safety device is needed to enable the operator to immediately stop all crane functions in the event of an emergency.

Paragraph (d)(2)(x) requires trolley end stops as safety devices because trolley travel limiting devices, which are required by § 1926.1435(e)(5)(i), will not work without trolley end stops.

Paragraph (d)(3) requires that all of the safety devices listed in § 1926.1435(d)(2) be in proper working order for the crane to be operated. Where a device stops working properly during operations, the operator would have to safely stop operations, and operations are prohibited from resuming until the device is once again in proper working order. In the final rule, OSHA is adding text and a cross-reference to § 1926.1417 to make it clear that the equipment must be taken out of service, and tagged as such, when a safety device is not operational.

Three commenters stated that several of the proposed safety devices – the hydraulic system pressure limiting device required by § 1926.1435(d)(2)(vi), the brakes required by § 1926.1435(d)(2)(vii), and the deadman control required by § 1926.1435(d)(2)(viii), should be listed as design features rather than safety devices because they cannot be checked every shift, as safety devices must under § 1926.1412(d)(1)(xiv). (ID -0180.1; -0205.1; -0213.1.) OSHA declines to adopt this suggestion because it agrees with C-DAC's determination that these devices must be working properly for the crane to operate safely, and they therefore need to be listed as safety devices under the standard. Moreover, the commenters who said these devices cannot be checked every shift did not explain why they believed this was so, and C-DAC's inclusion of them as safety devices shows that C-DAC determined that checking these devices for proper operation, as § 1926.1412(d)(1)(xiv) requires, is feasible.[133]

Operational aids: Like § 1926.1416 for other equipment, § 1926.1435(e) divides operational aids for tower cranes into Category I aids and Category II aids, with the two categories differing in the amount of time that temporary alternative measures can be used until the aids are repaired. For Category I aids that period is seven days, and for Category II it is 30 days. Also like § 1926.1416, if a required part is ordered within seven days of the occurrence of the deficiency and not received in time to complete the repair in seven and thirty days, respectively, the employer would have seven days from receiving the part to complete the repair. The rationale for these time periods is discussed

[133] The three commenters included one C-DAC member and two organizations that nominated members who served on C-DAC. As discussed above, OSHA gives reduces weight to comments offered by C-DAC members and organizations that nominated C-DAC members when those comments oppose the position those members took in C-DAC deliberations.

under § 1926.1416. For purposes of clarification, the Agency has added a reference to § 1926.1435(e)(3) noting that the requirements of § 1926.1417(j) are applicable. See further discussion at § 1926.1417(j).

Section 1926.1435(e)(4) specifies that operational aids must work properly during operations and, if an aid stops working, the operator is required to safely stop operations until the aid is working properly again or until the temporary alternative measures specified in this section are implemented. Where a replacement part for an operational aid is not available, the substitution of a device that performs the same function would not be considered a modification subject to § 1926.1434, i.e., it would not need to be approved by the manufacturer or a registered professional engineer. (See the discussion above regarding § 1926.1416 for an explanation of the Committee's rationale for this approach to operational aids.)

Three of the operational aids discussed below are required on tower cranes manufactured more than one year after the effective date of the standard. The remainder are required on all cranes. It was C-DAC's understanding that the three aids not required on existing cranes represent technology only recently available to the industry, while the aids that are required on all cranes have routinely been used in the industry for some time.

Paragraph (e)(5) requires the Category I operational aids discussed below and specifies the alternative measures that would have to be followed if they are not working properly. If these operational aids are not working properly, they must be repaired no later than 7 days after the deficiency occurs. However, if the employer documents that it

has ordered the necessary parts within 7 days of the occurrence of the deficiency, the repair must be completed within 7 days of receipt of the parts.

OSHA noted in the proposed rule preamble that the term "days" could mean either business days or calendar days. For the reasons outlined in the discussion of § 1926.1416 above, in the final rule OSHA has changed "days" to "calendar days" to reflect the Committee's intent.

Paragraph (e)(5)(i) requires trolley travel limiting devices. These devices are required at both ends of the jib to prevent the trolley from running into the end stops. If the trolley were to run into an end stop, injuries or fatalities could result in a variety of ways. For example, the sudden stopping of the trolley at the outward end stop could cause the load to swing significantly past the crane's maximum working radius, causing a collapse. Another example is where the load swing from the sudden stopping of the trolley could cause the load to fall and strike employees.

If this operational aid were not working properly, the employer would have to use one of two temporary alternative measures: (A) mark the trolley rope so it can be seen by the operator at a point that will give the operator sufficient time to stop the trolley prior to the end stops, or (B) use a spotter who is in direct communication with the operator when operations are conducted within 10 feet of either end of the travel rail end stops; the spotter must inform the operator of the distance of the travel bogies from the end stops or buffers.

Proposed § 1926.1435(e)(5)(i)(B) did not explicitly require the spotter to be in direct communication with the operator. The Agency proposed adding this language as necessary to make the provision work effectively and as the Committee intended and

requested public comment on whether to add specific language to that effect. Five commenters supported the addition of an explicit requirement that the spotter be in direct communication with the operator; no commenters opposed the change. (ID -0069.1; -0156.1; -0180.1; -0205.1; - 0213.1.) OSHA has amended § 1926.1435(e)(5)(i)(B) accordingly.

A similar change has been made to §§ 1926.1435(e)(5)(ii), (e)(5)(iii), (e)(5)(iv), and (e)(5)(vii) discussed below, which also provide for the use of a spotter as a temporary alternative measure when certain operational aids are not functioning.

In addition, one commenter suggested there should be visual acuity requirements for spotters. (ID -0069.1.) For the reasons discussed earlier under § 1926.1408 (b)(4)(ii), OSHA is not specifying such a requirement in this rule.

Paragraph (e)(5)(ii) requires a boom hoist limiting device. As defined in § 1926.1401, the word "boom" used in reference to tower cranes refers to a luffing boom. Therefore, under this paragraph, a boom hoist limiting device would only be required on cranes with luffing booms. A boom hoist limiting device automatically prevents the boom hoist from pulling the boom past the minimum allowable radius (maximum boom angle), which can result in boom failure (see the discussion above of boom hoist limiting device with respect to § 1926.1416(d)(1)). The temporary alternative measures for this operational aid are similar to the ones for the trolley travel limiting device and the boom hoist limiting device in § 1926.1416(d)(1): the employer has the option of clearly marking the cable at a point that would give the operator sufficient time to stop the boom hoist within the minimum and maximum boom radius or use a spotter who is in direct communication with the operator to inform the operator when this point is reached.

Paragraph (e)(5)(iii) requires an anti two-blocking device. This is comparable to the requirement for anti two-blocking devices for other cranes required by § 1926.1416. This operational aid is required on tower cranes to prevent damage from contact between the load block, overhaul ball, or similar component, and the boom tip (or fixed upper block or similar component). Where the operational aid is not working properly, the employer has the option of clearly marking the cable at a point that would give the operator sufficient time to stop the hoist to prevent two-blocking, or use a spotter who is in direct communication with the operator to inform the operator when this point is reached. (See the discussion of the need for this type of device, and rationale for including it as an operational aid, above with respect to § 1926.1416(d)(3)).

Paragraph (e)(5)(iv) requires a hoist drum lower limiting device. This paragraph requires that tower cranes manufactured more than one year after the effective date of this standard be equipped with a device that prevents the last two wraps of hoist cable from being spooled off the drum. Such a device prevents the entire rope from being spooled off the drum, which can cause the rope to separate (and the load to fall) from the drum due to the shock from the load suddenly stopping.

Paragraph (e)(5)(v) requires a load moment limiting device. "Load moment (or rated capacity) limiter" is defined in § 1926.1401. This type of device detects and prevents a potential overload condition which could cause the load to fall, the crane to collapse or other failure of the crane.

Where the load moment limiting device is not in proper working condition, two types of measures are required. The first type of measure is designed to ensure that the operator determines the radius. If the crane is equipped with a radius indicating device, it

is required to be used. If the crane is not so equipped, the radius is required to be measured (such as with a tape measure) to ensure that the load is within the rated capacity of the crane.

The second type of measure is designed to ensure that the operator accurately determines the weight of the load. The load weight is required to be determined from a source recognized by the industry (such as the load's manufacturer), or by a calculation method recognized by the industry (such as calculating a steel beam from measured dimensions and a known per foot weight). This information must be provided to the operator prior to the lift. The proposed rule had provided for calculations based on a "reliable" source or calculation method, or "by other equally reliable means." To avoid potentially subjective interpretations of "reliable," OSHA is instead requiring that the measurements be from a source typically relied on in the industry.

Paragraph (e)(5)(vi) requires a hoist line pull limiting device so that the load applied to the hoist drum will not exceed the hoist's capacity. If the hoist is equipped with a multiple speed hoist transmission, the device would have to limit the hoist's lifting capacity in each individual gear ratio. If the hoist line pull were to exceed the hoist's capacity, the hoist could fail and unspool the line, causing the load to drop suddenly.

The temporary alternative measure for this operational aid is that the operator ensure that the weight of the load does not exceed the capacity of the hoist, taking into account each individual gear ratio if the crane is equipped with a multiple speed hoist transmission. For example, this could be done by the operator checking the hoist capacity in the equipment manual and verifying that the load will not exceed that capacity.

Paragraph (e)(5)(vii) requires a rail travel limiting device in each direction to prevent the travel bogies from running into the end stops or buffers. As noted above, rail stops that keep the crane from overshooting the section of rail within which it is supposed to operate is one of the safety devices required for tower cranes that travel on rails. A rail travel limiting device is a device that limits the crane's travel to keep a travel bogie from running into a rail stop. C-DAC determined that rail stops should not be the exclusive means of ensuring that the crane stays within its intended limits because the travel bogie could jump the tracks if it were to strike the rail stops at a high enough speed. The temporary alternative to a rail travel limiting device that is not in proper working order is to use a spotter who is in direct communication with the operator when operations are conducted within 10 feet of either end of the travel rail end stops; the spotter must inform the operator of the distance of the travel bogies from the end stops or buffers.

Proposed paragraph (e)(5)(viii) required the boom hoist drum to be equipped with a device that would positively lock the boom hoist drum. One example of such a device is a ratchet and pawl mechanism. The purpose of the device is to prevent the boom hoist (and therefore the load as well) from inadvertently lowering. The temporary alternative measure that was proposed was to require the device to be set manually if an electric, hydraulic, or automatic device is not working.

In the proposed rule, OSHA noted that the temporary alternative proposed in paragraph (e)(5)(viii) addressed the situation where the mechanism to automatically set the locking device was malfunctioning but did not address the situation where the locking device itself was not working properly. The Agency requested public comment on whether this provision should include a temporary measure that would be required if the

positive locking device is not working properly (regardless of whether it is attempted to be set automatically or manually) and, if so, what temporary measure is available in such a situation.

Several commenters responded that boom hoist drum should have either a positive locking device, an integrally mounted holding device, a secondary braking device, or an internal static brake to prevent boom hoist movement in the event of hydraulic or main brake failure. (ID -0180.1; -0205.1; -0213.1.) According to these commenters, any of these devices would prevent the boom hoist drum from spinning freely and allowing the boom to free fall in the event the main boom hoist brake (required by § 1926.1435(d)(vii)(A)) fails.

OSHA concludes that any of the devices mentioned by these commenters, if working properly, would comply with this provision. However, the commenters did not address the question posed in the proposal as to whether there is a temporary measure that should be required if the device is not working properly. If the drum was, for example, equipped with a ratchet and pawl locking device, the record does not show that it would be practical to install another type of device in the event the ratchet and pawl device is not working properly.

Upon further reviewing proposed paragraph (e)(5)(viii), OSHA determines it was C-DAC's intent to require a positive locking mechanism that could be set from a control at the operator's station and to require, as a temporary alternative measure if the control is not working, that the device be set manually. Moreover, OSHA concludes that such an alternative would provide an adequate temporary alternative. Such a device would be analogous to the parking brake of a car, which can normally be actuated from the driver's

seat but, in the event that control fails, the car can be kept from moving by chocking the wheels. To express this intent more clearly, OSHA is modifying paragraph (e)(5)(viii) accordingly.

Paragraph (e)(6) requires the category II operational aids discussed below and specifies the alternative measures that would have to be followed if they are not working properly. If these operational aids are not working properly, they must be repaired no later than 30 days after the deficiency occurs. However, if the employer documents that it has ordered the necessary parts within 7 days of the occurrence of the deficiency, and the part is not received in time to complete the repair in 30 days, the repair must be completed within 7 days of receipt of the parts. As noted above, the word "days" in the proposed rule has been changed to "calendar days" in the final rule.

Paragraph (e)(6)(i) requires a boom angle or hook radius indicator as specified in §§ 1926.1435(e)(6)(i)(A) and (B). Under these provisions, luffing boom tower cranes are required to have a boom angle indicator readable from the operator's station. Hammerhead tower cranes manufactured more than one year after the effective date of this standard are required to have a hook radius indicator readable from the operator's station. These devices are needed because the information they provide is necessary for the operator to determine the crane's capacity under its load chart. As with the similar devices required under § 1926.1416, the temporary alternative is to measure the boom angle or hook radius with a measuring device (§ 1926.1435(e)(6)(i)(C)).

Section 1926.1435(e)(6)(ii) requires tower cranes to have a trolley travel deceleration device that would automatically reduce the trolley speed before the trolley reaches the end limit in both directions. Section 1926.1435(e)(6)(iii) requires tower

cranes to have a boom hoist deceleration device, which would automatically reduce the boom speed before a luffing boom reaches the minimum or maximum radius limit. Section 1926.1435(e)(6)(iv) requires tower cranes to have a load hoist deceleration device, which would automatically limit the load speed before the load hoist reaches the upper limit. In the proposed rule, the temporary alternative measure for each of these operational aids was for the operator to reduce the speed when approaching the limits.

In specifying temporary alternative measures generally for operational aids, C-DAC sought to identify some measure in each instance that would assist the operator in performing the necessary task (in this case, slowing the action of a crane component before it reaches a limiting point). However, in the case of these deceleration devices, the Committee was unable to identify or develop that type of alternative measure. The temporary alternatives listed in the proposed rule instruct the operator to do manually what the operational aids are supposed to do automatically but do not assist the operator in carrying out this function. Because the temporary alternatives specified in the proposed rule did not meet the usual criteria for temporary alternative measures, the Agency requested public comment on whether there are any alternative measures that could be used to assist the operators if these deceleration devices malfunction.

Four commenters stated there are no temporary alternative measures for these devices. (ID -0172.1; -0180.1; -0205.1; -0213.1.) No commenters suggested that there are available measures.

As neither C-DAC nor public commenters have been able to identify appropriate temporary alternative measures, OSHA has considered whether to continue to characterize these devices as operational aids or to treat them as safety devices and

prohibit operation of the equipment unless they are working properly. OSHA has also considered whether to retain them as Category II operational aids, which must be repaired within 30 days, or to change them to Category I operational aids, which must be repaired within 7 days. OSHA has decided to retain them as Category II operational aids but to modify the temporary alternative from that in the proposed rule to ensure that the operator is able to operate the crane safely even if a deceleration device is not working.

As noted above, the proposed rule specified as a "temporary alternative measure" that the operator reduce speed when approaching a limit (such as a trolley's end limit) if a deceleration device is not working properly. In fact, reducing the speed near a limit is a work practice that crane operators generally follow even if the deceleration devices are working properly because serious damage, such as the load falling, can result if a deceleration device should fail suddenly while the component is moving too fast at the end of its travel. The deceleration devices serve as backup devices that slow down the components in the event the operator fails to do so properly, but operator control is the primary means of slowing the trolley, boom hoist, and load hoist before they reach the end of their travel.

As noted above, OSHA is retaining C-DAC's characterization of these deceleration devices as Category II operational aids. C-DAC determined that the crane could be operated safely if the deceleration devices were malfunctioning as long as the operator follows the normal practice of manually slowing the trolley, boom hoist, and load hoist when they are near the end of their travel. No commenter or witness suggested that a different characterization was proper.

To address operations when the deceleration device is malfunctioning, OSHA is requiring the employer to make sure that the operator is aware of the malfunctioning deceleration device and of the need to take extra care when the component is near the end of its travel, instead of requiring the temporary alternative measures listed in the proposed rule. OSHA is therefore specifying, in the final rule, that as a temporary alternative measure for each deceleration device, the employer must post a notice in the cab of the crane notifying the operator that the device in question is malfunctioning and instructing the operator to reduce speed when approaching a limit corresponding to the malfunctioning device. OSHA concludes that an operator who knows that the deceleration device is not working properly will take the extra care needed to ensure that the component is moving at a safe speed. OSHA modified paragraphs (e)(6)(ii) – (iv) in the final rule accordingly.

Paragraph (e)(6)(v) requires tower cranes to have a device that displays the wind speed, mounted above the upper rotating structure. On self erecting tower cranes, which typically rotate at the tower base and do not have an "upper rotating superstructure," it would have to be mounted at or above the jib level to be in a position to give a useful reading. The temporary alternative measure is for the wind speed to be obtained from a properly functioning device on another tower crane on the same site or to be estimated by a qualified person.

One commenter suggested that paragraph (e)(6)(v) be modified to make it clear that the qualified person performing the estimate of the wind speed must be located at the same height as the operator of the crane. (ID -0199.1.) OSHA does not determine such a change is needed. First, the operator's station is not always at the level of the jib; in some

cranes the operator cab is well below the jib, and in others the operator may even be at ground level. Second, a qualified person is expected to use his or her judgment and expertise to perform numerous functions throughout this rule, and OSHA concludes that the qualified person at the site is best able to determine how best to estimate the wind speed if called upon to do so under this paragraph.

Section 1926.1435(e)(6)(vi) requires tower cranes manufactured more than one year after the effective date of this standard to have a device that displays the magnitude of the load on the hook. This could be either a separate device or one that is part of the load moment limiting device (discussed above) that displays magnitude of the load on the hook. By informing the operator of the weight of the load, this device helps the operator ensure that the crane is operated within its rated capacity. The temporary alternative is for the weight of the load to be determined from a source recognized by the industry (such as the load's manufacturer), by a calculation method recognized by the industry (such as calculating the weight a steel beam from measured dimensions and a known per foot weight), or by other equally reliable means. This information must be provided to the operator prior to the lift. The proposed rule had provided that the weight of the load and calculations be based on a "reliable source." To avoid the potentially subjective interpretations of "reliable," OSHA is instead requiring in the final rule that these be from a source typically relied on in the industry.

One commenter believed that most of the operational aids listed in this section are so vital to safe operation that the crane should not be operated if they are not functioning properly. (ID -0172.1.) In effect, this commenter would convert these devices from

operational aids to safety devices. This commenter also believed the time period for other operational aids to be repaired should be shortened.

It was C-DAC's considered judgment that safety would not be compromised if the employer follows the temporary alternative measures specified for the various operational aids and that the time periods for getting malfunctioning devices repaired was reasonable. This commenter has offered no basis for OSHA to override C-DAC's judgment on these issues.

Paragraph (f) Inspections

Proposed paragraph (f)(1) of this section did not state that § 1926.1413 (Wire rope – inspection) applies to tower cranes. OSHA notes that the wire rope inspections required under § 1926.1413 must also be conducted for tower cranes and determines it is useful to reference all tower crane inspection requirements in § 1926.1435(f). Therefore, OSHA modified § 1926.1435(f)(1) of the final rule to specify that 1926.1413 applies to tower cranes.

Under paragraph (f)(1), the post-erection, shift, monthly, and annual inspections required under §§ 1926.1412 and 1926.1413 must be conducted for tower cranes.

Proposed paragraphs (f)(2) and (f)(3) specified additional requirements for the post-erection and monthly inspections for tower cranes beyond those required under § 1926.1412. OSHA received no comments objecting to those requirements but did receive comments suggesting that a pre-erection inspection should be required and recommending that additional items be included in the monthly inspection. OSHA will first address the pre-erection inspection issue.

Two commenters and witnesses at the hearing urged OSHA to add a requirement for a pre-erection inspection of the crane's component parts. (ID -0182.1; -0199.1.) One of the commenters reasoned that a thorough inspection of a tower crane's component parts is more difficult once the crane is erected because the inspector would have to be jacked or hoisted into place and access to the parts would be more restricted. (ID -0199.1.) A witness testified that shift inspections are not adequate to detect damage from previous use, dismantling, handling, or shipping, and such damage could remain undetected until the next comprehensive inspection unless a pre-erection inspection is conducted. (ID -0341.)

Several witnesses who use tower cranes also testified in favor of pre-erection inspections and said that they routinely conduct such inspections. (ID -0344.) For example, a representative from a steel erection contractor and crane vendor was asked by a public participant if there is a benefit to require a pre-erection inspection of all component parts by a qualified person. In response, he testified that a pre-erection inspection is done routinely anyway because his company is required to inspect the crane components before erection to make sure the components were not damaged during shipping. (ID -0344.)

In addition, one commenter noted that ASME B30.3 (2003), Construction Tower Cranes, includes a provision on pre-erection inspections, which suggests that such inspections are routinely conducted in the industry. (ID -0405.1.) The ASME B30.3 provision reads:

> 3-1.1.2(g). Before crane components are erected, they shall be visually inspected for damage from shipping and handling. Dented, bent, torn, gouged, or otherwise damaged structural members shall not be erected

> until repaired in accordance with the manufacturer's or a qualified person's instructions, or replaced.

Although the record contains substantial support for pre-erection inspections, it also reflects different views regarding the appropriate scope of such an inspection. One commenter recommended an inspection of "the tower crane's component parts." (ID -0182.1.) As noted above, the ASME B30.3 standard similarly refers to "crane components." Another commenter listed the turntable, jib, and boom as items to be inspected. (ID -0199.1.) One witness at the hearing stated that the pre-erection inspection should include the tower, turntable, jib, counterjib, machinery, masts, boom, and pendants. (ID -0341.) However, the organization represented by that witness submitted a considerably longer list of items it believed should be inspected. (ID -0333.) Another witness favored pre-erection inspections of "major components" but could not offer a more specific definition than "components that, if they failed, would have a catastrophic result." (ID -0344.)

In light of the record, OSHA concludes that pre-erection inspections should be required for tower cranes, with such inspections focused on discovering defects that would be difficult to detect during the shift inspections that will be conducted regularly after the crane is put in service. By focusing the inspection on such components, the pre-erection inspection will address the concern expressed by commenters that some defects will be difficult to detect during shift inspections after the crane is erected.

OSHA is requiring the pre-erection inspection to be conducted by a "qualified person." The final rule requires that certain other inspections be conducted by a qualified person, including the post-erection inspection required by § 1926.1412(c) and the annual/comprehensive inspection required by § 1926.1412(f). As discussed below, under

the pre-erection inspection required by this final rule, the individual conducting the inspection must make decisions similar to those that must be made during the annual/comprehensive inspection, i.e., deciding whether a deficiency would be an immediate safety hazard or whether it requires scrutiny during the monthly inspections. Since the pre-erection inspection requires the same degree of expertise as the annual/comprehensive inspections, paragraph (f)(2) is similarly requiring the pre-erection inspection to be conducted by a qualified person.

Paragraph (f)(2)(i) requires the qualified person to pay particular attention to components that will be difficult to inspect thoroughly during shift inspections. As noted above, inspection of such components was a special concern of commenters who believed that pre-erection inspections should be required.

The shift, monthly, and annual inspections required under § 1926.1412 leave it up to the individual conducting the inspection to determine if a deficiency revealed by an inspection constitutes a safety hazard that requires either immediate correction or further scrutiny. In particular, §§ 1926.1412(f)(4)-(6) on annual inspections require the qualified person who conducts the inspection to determine whether a deficiency is a safety hazard that requires immediate correction or whether it is not yet a safety hazard but is of sufficient concern to be monitored in the monthly inspections.

OSHA determines that a similar approach is appropriate here because a deficiency revealed in a pre-erection inspection may be sufficiently serious that a component should not be used at all, or it may not presently be a safety hazard but may be a matter of concern to the inspector so as to require periodic scrutiny. Accordingly, paragraph (f)(2)(ii) requires the qualified person who conducts the inspection to determine, before a

component is erected, whether the component would create a safety hazard if used on the crane. If so, the component cannot be used unless it is repaired and upon re-inspection is found not to constitute a safety hazard.

Paragraph (f)(2)(iii) specifies that, if the qualified person determines that, though not presently a safety hazard, the component needs to be monitored, the employer must ensure that the component is checked in the monthly inspections. To ensure that any individual who conducts a monthly inspection knows that the component must be monitored during that inspection, paragraph (f)(2)(iii) requires that any such determination be documented and the documentation made available to any person who conducts a monthly inspection.

Proposed paragraph (f)(2) specified two additional post-erection inspection requirements in addition to those required under § 1926.1412(c). It required a load test using certified weights, or scaled weights using a certified scale with a current certificate of calibration, after each erection. It also specified that the load test be conducted in accordance with the manufacturer's instructions, or if no instructions are available, in accordance with written load test procedures developed by a registered professional engineer. No adverse comment was received on these provisions, and proposed paragraph (f)(2) is promulgated as proposed but renumbered as paragraph (f)(3).

Proposed paragraph (f)(3) required that additional items be included in the monthly inspections of tower cranes. These include tower (mast) bolts and other structural bolts (for loose or dislodged condition) from the base of the tower up or, if the crane is tied to or braced by the structure, those above the upper-most brace support (§ 1926.1435(f)(3)(i)). The monthly inspection must also include the upper-most tie-in,

braces, floor supports, and floor wedges where the tower crane is supported by the structure (§ 1926.1435(f)(3)(i)), for loose or dislodged components.

One commenter's suggestion addressed the suitability of the bolts used to erect the tower and to support the turntable. (ID -0172.1.) Although OSHA agrees with the commenter that these bolts serve an important safety function, the commenter did not provide any supporting information that would enable OSHA to evaluate whether the detailed requirements proposed by the commenter are needed to improve tower crane safety. However, OSHA does determine that the bolts should be included as components to be inspected and is adding paragraph (f)(5) requiring them to be inspected for proper condition and torque as part of the annual inspection.[134]

A commenter suggested that the upper rotation structure should undergo a special, thorough inspection before climbing. (ID -0137.1.) This commenter did not state why it believed such an inspection was needed. Accordingly, OSHA has no basis in the record to conclude that the additional inspection requested by this commenter would improve the safety of the climbing operation.

Proposal for Tower Crane Tracking System

A witness at the hearing suggested that OSHA adopt a tracking system whereby any major part of a tower crane that suffered a structural failure would be able to be identified even if that part was moved to another jurisdiction. (ID -0342.) The witness explained that the proposed system would require the serial number of parts that failed to be reported to the manufacturer so that localities such as New York City could contact

[134] Accordingly, OSHA is promulgating proposed paragraph (f)(3) but renumbering it as paragraph (f)(4).

the manufacturer to determine whether a particular crane was safe to operate within that jurisdiction.[135]

OSHA is not promulgating requirements to implement the system proposed by this witness. Such a scheme is complex, and appears to require the development of new tracking systems and required reporting to manufacturers that might be beyond the scope of OSHA's authority. It also goes far beyond any provisions of the proposed standard, and its adoption would require OSHA to reopen the rulemaking record to allow other interested persons to comment on it. OSHA does not conclude that such a reopening is justified on the basis of the witness's testimony. The Agency notes, however, that it is not preempting a locality's authority to establish such a scheme within its jurisdiction. (See discussion of preemption under federalism in section V.D of this preamble.)

Section 1926.1436 Derricks

This section contains requirements for derricks that supplement the other requirements of this standard. Subpart N, at former § 1926.550(e), required derricks to comply with applicable provisions for design, construction, installation, inspection, testing, maintenance, and operation in ANSI B30.6-1969, safety code for "Derricks," as well as the general provisions of subpart N that applied to all equipment.

C-DAC's experience, and its review of injury and fatality statistics, did not indicate a need to deviate significantly from the requirements of subpart N. For the most part, the most recent version of the ANSI standard, ASME B30.6-2003, does not differ substantively from the 1969 version, so the requirements of this new section differ

[135] This commenter also called for prototype testing of tower cranes. (ID -0156.1.) As explained in § 1926.1433, OSHA has added such a requirement to § 1926.1433(c).

substantively in only limited respects from previous subpart N. Where substantive differences exist, they are discussed in the context of that requirement.

Paragraph (a)

Section 1926.1436 contains supplemental requirements for derricks, whether temporarily or permanently mounted; all sections of this subpart apply to derricks unless specified otherwise. Section 1926.1436(a) defines a derrick as powered equipment consisting of a mast or equivalent member that is held at or near the end by guys or braces, with or without a boom, and its hoisting mechanism. The mast/equivalent member and/or the load is moved by the hoisting mechanism (typically base-mounted) and operating ropes. Derricks include: A-frame, basket, breast, Chicago boom, gin pole (except gin poles used for erection of communication towers), guy, shearleg, stiffleg, and variations of such equipment.

Paragraph (a) excludes the gin poles when used for the erection of communication towers. This mirrors the exclusion of such equipment from the scope of the standard under § 1926.1400(c)(12). See discussion of this exclusion in § 1926.1400(c)(12). No comments were received; therefore this provision is promulgated as proposed.

Paragraph (b) Operation – procedures

Paragraph (b)(1) of this section states that § 1926.1417 (Operation) of this standard applies to derricks except for § 1926.1417(c) (Accessibility of procedures). C-DAC concluded and OSHA agreed that it was appropriate to keep the operation requirements for derricks consistent with those of cranes as much as possible because

they both present many of the same hazards and operational issues. However, § 1926.1417(c) requires the operating procedures, including load charts, to be located in "the cab" of the equipment and derricks often do not have a cab. Therefore, it was not appropriate to require that § 1926.1417(c) apply to derricks. The discussion of § 1926.1436(b)(3) sets forth the requirements for the accessibility of the load chart for derricks.

Paragraph (b)(2) of this section, *Load chart contents*, lists the information that must be included on load charts. Subpart N incorporated similar load chart requirements via sec. 6-1.1.2 in ANSI B30.6-1969, which remains the same in the 2003 version of the consensus standard.

Paragraph (b)(2)(i) requires the load chart contain the rated capacity at corresponding ranges of boom angle or operating radii. This information is necessary to prevent overloading of the derrick.

Paragraph (b)(2)(ii) requires the load chart to list the specific lengths of components to which the rated capacities apply. This information is necessary because the derrick's load capacity varies with different component lengths.

Paragraph (b)(2)(iii) requires the load chart to list required parts for hoist reeving. By listing the reeving parts considered during the tabulation of available load charts, the derrick operator can determine if available load charts are applicable to the configuration of the derrick at the work site. As with paragraphs (b)(2)(i) and (ii), meeting the requirement of paragraph (b)(2)(iii) will help prevent accidents that could occur as a result of errors in determining the equipment's rated capacity.

Paragraph (b)(2)(iv) requires the size and construction of rope to be included on the load chart or in the operating manual. This requirement prevents hoisting accidents that might occur if a rope fails because it was the wrong size or construction for the load being lifted.

Paragraph (b)(3) of this section, *Load chart location*, sets forth the requirement for the location of load charts. Section 1926.1436(b)(3)(i), *Permanent installations*, requires permanently installed derricks with fixed lengths of boom, guy, and mast, to have a load chart posted where it is visible to personnel responsible for the operation of the equipment. Section 1926.1436(b)(3)(ii), *Non-permanent installations*, requires derricks that are not permanently installed to have the load chart readily available at the job site to personnel responsible for the operation of the equipment. These requirements ensure the critical information contained on these charts is readily available on the worksite enabling the calculation of the parameters for a safe lift. No comments were received for § 1926.1436(b); it is promulgated as proposed.

Paragraph (c) Construction

Paragraph (c) of this section contains supplemental engineering and fabrication requirements that address hazards specific to derricks. Paragraph (c)(1), *General requirements*, lists general construction requirements that apply to the use of all types of derricks. These requirements are similar to sec. 6-1.2.1 of ANSI B30.6-1969 and ASME B30.6-2003 and would help the employer prevent accidents caused by inadequate structural design and fabrication.

Paragraph (c)(1)(i) states that derricks must be constructed to meet all stresses imposed on members and components when installed and operated in accordance with the manufacturer's/ builder's procedures and within its rated capacity. "Builder" is defined in § 1926.1401 as "the builder/constructor of equipment." This definition distinguishes a "builder" of equipment (a derrick that is erected at the worksite by an employer) from a manufacturer, who sells products that may be used at any worksite. Section 1926.1436(c)(1)(i) uses the word "builder" in addition to "manufacturer" because it will often be the builder's procedures, rather than the manufacturer's, that must be followed to ensure that derricks are constructed properly. In the proposed rule, the definition of builder included the word employer. Upon review of the definition proposed, OSHA determines that the word employer did not enhance the definition and could possibly lead to confusion. Therefore, OSHA has modified the definition in the final rule.

Paragraph (c)(1)(ii) specifies that the welding of load sustaining members must conform to recommended practices in ANSI/AWS D14.3-94 or AWS D1.1/D1.1M:2002. This is similar to sec. 6-1.2.1(b) of ASME B30.6-2003 which relies on newer welding standards than ANSI B30.6-1969. Paragraph (c)(1)(ii) will prevent structural failures when the derrick is used within its rated capacity.

One commenter wanted the referenced consensus standards to be included as an appendix for ease of compliance. (ID -0214.1.) Including all the consensus standards relevant to this final rule would make the regulatory text or an appendix cumbersome. Moreover, OSHA determines that employers using this equipment are likely to have ready access to the pertinent standards referenced in paragraph (c)(1)(ii). For these

reasons, OSHA is not adding the full text of referenced consensus standards to the regulatory text or an appendix. This paragraph is promulgated as proposed.

Paragraph (c)(2) of this section, *Guy derricks*, lists the additional requirements applicable to the construction of guy derricks. (See the preamble to the proposed rule for a short description of guy derricks, 73 FR 59853, Oct. 9, 2008.)

Paragraph (c)(2)(i) specifies the minimum number of guys to be six, with equal spacing, except where a qualified person or derrick manufacturer approves variations from these requirements and revises the rated capacity to compensate for such variations. This requirement is comparable to sec. 6-1.2.2 of ANSI B30.6-1969 and ASME B30.6-2003. This paragraph is adopted as proposed.

Paragraph (c)(2)(ii) states that guy derricks must not be used unless the employer has the following guy information from a manufacturer or from a qualified person when not available from the manufacturer: (A) the number of guys; (B) the spacing around the mast; and (C) the size, grade, and construction of rope to be used for each guy. Paragraph (c)(2)(iii) requires that for guy derricks manufactured after December 18, 1970, in addition to the information required by § 1926.1436(c)(2)(ii), the employer must have the following guy information from a manufacturer or from a qualified person when not available from the manufacturer: (A) the amount of initial sag or tension; and (B) the amount of tension in guy line rope at anchor.

These provisions are substantially different from requirements in the relevant ANSI/ASME standards. The corresponding ANSI/ASME provisions are sec. 6-1.2.2 of ANSI B30.6-1969 and ASME B30.6-2003. The ANSI/ASME standards require the derrick manufacturer to furnish complete information recommending the guy

specifications listed in §§ 1926.1436(c)(2)(ii) and (c)(2)(iii).[136] The OSHA standard, by contrast, imposes an obligation on derrick users to possess the necessary information. No comments were received on this deviation from the consensus standard and OSHA has deferred to C-DAC's judgment that it is better to place this responsibility on the derrick user rather than the manufacturer.

Paragraphs (c)(2)(ii) and (c)(2)(iii) have been revised from the proposal. As proposed, these paragraphs simply required the employer to have the listed pieces of information before using the guy derrick. OSHA requested comments on whether the standard should require guy specifications to be developed by a qualified person if they are not available from the manufacturer. Several comments were received supporting the proposed revision. (ID 0180.1; -0205.1; -0213.1.) No comments were received that opposed this proposed revision. In the final rule the regulatory text in both paragraphs has been updated to clarify that the required information must come from the manufacturer or from a qualified person when that information is not available from a manufacturer.

Paragraph (c)(2)(iv) states that the mast base must permit the mast to rotate freely with allowance for slight tilting of the mast caused by guy slack. No comments were received for this provision; it is promulgated as proposed.

Paragraph (c)(2)(v) requires that the mast cap must: (A) permit the mast to rotate freely; (B) withstand tilting and cramping caused by the guy loads; (C) be secured to the mast to prevent disengagement during erection; and (D) be provided with means for

[136] The 1969 version of the ANSI standard does not include the pieces of information described in § 1926.1436(c)(2)(iii), but later versions of the B30.6 standard, including the 2003 version, list those items.

attaching guy ropes. Paragraphs (c)(2)(iv) and (v) track similar provisions in secs. 6-1.2.2(c) and (d) of ANSI B30.6-1969 and ASME B30.6-2003. No comments were received on (c)(2)(v); it is promulgated as proposed

Additional installation requirements for guy derricks that are specific to the anchoring of its guys are addressed in § 1926.1436(d).

In the proposed rule, §§ 1926.1436(c) and 1926.1436(d) both contained requirements related to guy derricks. OSHA asked for public comment as to whether having specifications for guy derricks in both paragraphs (c) and (d) of this section could lead to confusion or impede compliance with its provisions. Several commenters believed that the two sets of proposed requirements for guy derricks should be combined. (ID -0180.1; -0205.1; -0213.1.) However, the commenters did not offer an explanation for how this would prevent confusion or enhance compliance. Upon consideration, OSHA disagrees with the commenters and therefore, requirements for guy derricks will be found in both paragraphs (c) and (d) of this section, just as in the proposed rule.

Paragraph (c)(3), *Stiffleg derricks*, provides additional requirements specific to stiffleg derricks to help ensure their safe use. These requirements which have not been changed from the proposal are similar to those in secs. 6-1.2.2(c) and (d) of ANSI B30.6-1969 and ASME B30.6-2003.

Paragraph (c)(3)(i) requires the mast to be supported in the vertical position by at least two stifflegs; one end of each must be connected to the top of the mast and the other end securely anchored.

Paragraph (c)(3)(ii) specifies that stifflegs must be capable of withstanding the loads imposed at any point of operation within the rated load chart range.

Paragraph (c)(3)(iii) specifies that the mast base must: (A) permit the mast to rotate freely (when necessary); and (B) permit deflection of the mast without binding.

Paragraph (c)(3)(iv) states that the mast must be prevented from lifting out of its socket when the mast is in tension.

Paragraph (c)(3)(v) requires the stiffleg connecting member at the top of the mast to: (A) permit the mast to rotate freely (when necessary); (B) withstand the loads imposed by the action of the stifflegs; and (C) be secured so as to oppose separating forces.

OSHA requested public comment on whether the provisions in paragraphs (c)(3) and (d)(3), which both contained requirements for stiffleg derricks, needed to be changed or modified to avoid potential confusion. As discussed above, with respect to the requirements for guy derricks in both paragraphs (c) and (d), OSHA has decided to adhere to the proposal; requirements for stiffleg derricks will be found in both paragraphs (c) and (d) of this section.

Paragraph (c)(4) of this section, *Gin pole derricks*, contains additional requirements specific to gin pole derricks to help ensure their safe use. Similar requirements are found in sec. 6-1.2.4 of ASME B30.6-2003. No comments were received for paragraph (c)(4); it is promulgated as proposed.

Under paragraph (c)(4)(i), guy lines must be sized and spaced so as to make the gin pole stable in both boomed and vertical positions. If the size and/or spacing of guy lines does not result in the gin pole being stable in both boomed and vertical positions, the employer must ensure that the derrick is not used in an unstable position.

Paragraph (c)(4)(ii) requires that the base of the gin pole permit movement of the pole (when necessary).

Under paragraph (c)(4)(iii), the gin pole must be anchored at the base against horizontal forces (when such forces are present).

Paragraph (c)(5) of this section, *Chicago boom derricks*, states that the fittings for stepping the boom and for attaching the topping lift must be arranged to: (i) permit the derrick to swing at all permitted operating radii and mounting heights between fittings; (ii) accommodate attachment to the upright member of the host structure; (iii) withstand the forces applied when configured and operated in accordance with the manufacturer's/builder's procedures and within its rated capacity; and (iv) prevent the boom or topping lift from lifting out under tensile forces. Similar requirements, which will help ensure that such derricks are used safely, are found in sec. 6-1.2.5 of ASME B30.6-2003. No comments were received for paragraph (c)(5); it is promulgated as proposed.

Paragraph (d) Anchoring and guying

Paragraph (d) of this section lists requirements for anchoring and guying derricks to the surfaces that support them.

Paragraph (d)(1) requires the use of load anchoring data developed by the manufacturer or a qualified person. Subpart N, via sec. 6-1.4.3 of ANSI B30.6-1969, required load anchoring data for non-permanent installations, which include most derricks used for construction work, to be determined by the user. The 2003 version of ASME B30.6 requires the data to be determined by a qualified person. C-DAC

concluded that, to better ensure safety, a qualified person (as defined in § 1926.1401) is needed to develop such data. The final rule affords the employer the additional flexibility of relying on data provided by the derrick manufacturer rather than relying exclusively on a qualified person to develop such data.[137] No comments were received for this provision; it is promulgated as proposed.

Paragraph (d)(2) of this section, *Guy derricks*, lists additional requirements, for anchoring and guying, that are specific to the use of guy derricks. These provisions are similar to sec. 6-1.4.1 of ANSI B30.6-1969 and ASME B30.6-2003. Under paragraph (d)(2)(i) the mast based must be anchored. Paragraph (d)(2)(ii) provides that the guys must be secured to the ground or another firm anchorage. And under paragraph (d)(2)(iii) the anchorage and guying must be designed to withstand maximum horizontal and vertical forces encountered when operating within rated capacity with the particular guy slope and spacing specified for the application. No comments were received for paragraph (d)(2); it is promulgated as proposed.

Paragraph (d)(3) of this section, *Stiffleg derricks*, lists anchoring and guying requirements that are specific to the use of stiffleg derricks. This paragraph is similar to sec. 6-1.4.2 in ANSI B30.6-1969 and ASME B30.6-2003.

Under paragraph (d)(3)(i) the mast base and stifflegs must be anchored. Additionally, (d)(3)(ii) provides that the mast base and stifflegs must be designed to withstand maximum horizontal and vertical forces encountered when operating within

[137] C-DAC believed that derrick users should be able to rely on data developed by the manufacturer or a qualified person for any type of installation and therefore did not distinguish between fixed and temporary installations for this purpose.

rated capacity with the particular stiffleg spacing and slope specified for the application. Paragraph (d)(3) had no comments and is promulgated as proposed.

Paragraph (e) Swingers and hoists

Paragraph (e) of this section lists requirements for swinger mechanisms and hoists that are used as part of a derrick. Paragraph (e)(1) requires that the boom, swinger mechanisms, and hoists be suitable for the derrick work intended and be anchored to prevent displacement from the imposed loads. This provision is similar to sec. 6-1.5.1 of ANSI B30.6-1969 and sec. 6-1.5 of ASME B30.6-2003. No comments were received for paragraph (e)(1); it is promulgated as proposed.

Paragraph (e)(2) of this section, ***Hoists***, specifies the minimum requirements for hoists used for derricks. This paragraph of the proposed rule was originally titled and related to base-mounted drum hoists. However, a tank building institute whose members use derricks routinely commented that confusion will result in their industry from the use of the term "Base-Mounted Drum Hoists," in this context. (ID -0130.1.) Hoists used are not limited to the base-mounted type. The commenter requested that the regulatory text of § 1926.1436(e)(2) be revised to replace the words "base mounted drum hoists" with the word "hoist" to eliminate ambiguity.

OSHA determines that it is appropriate to revise § 1926.1436(e)(2) to replace the reference to "base-mounted drum hoist" with the term "hoist." This revision recognizes that there may be designs of hoists, other than base-mounted drum, that are used with derricks.

Additionally, the commenter suggested that § 1926.553 be revised in conjunction with this final rule. (ID -0130.1.) See discussion in the preamble explanation of the amendment to subpart M.

Paragraphs (e)(2)(i)(A) through (D) require base-mounted drum hoists to meet requirements in specified sections of ASME B30.7-2001. Paragraph (e)(2)(i) does not apply to other types of hoists. No comments were received on these provisions and the provisions are adopted as proposed.

Paragraph (e)(2)(ii), *Load tests for new hoists*, outlines the requirements for load testing new hoists used with a derrick. The employer must ensure that new hoists are load tested to a minimum of 110% of rated capacity, but not more than 125% of rated capacity, unless otherwise recommended by the manufacturer. This requirement is met where the manufacturer has conducted this testing. ASME B30.7-2001, in sec. 7-2.2.2(a), requires similar testing but requires the test to be conducted by the manufacturer. OSHA recognizes that the manufacturer will usually be the party who conducts the test and allows the manufacturer to do so, but paragraph (e)(2)(ii) permits the test to be conducted by any party as long as it is performed correctly. This paragraph received no comments and it is adopted as proposed.

Paragraph (e)(2)(iii), *Repaired or modified hoists*, outlines the requirements for use of a hoist that has been repaired or modified. If a hoist has had repairs, modifications or additions that affect its capacity or safe operation it must be evaluated by a qualified person to determine if a load test is necessary If a load test is necessary, load testing must be conducted in accordance with paragraphs (e)(2)(ii) and (iv). This requirement

parallels sec. 7-2.2.2(b)(1) of ASME B30.7-2001. OSHA received no comments on this provision and it is adopted as proposed.

Paragraph (e)(2)(iv), *Load test procedure*, outlines how tests required by paragraphs (e)(2)(ii) or (iii) must be conducted. Under paragraph (e)(2)(iv)(A) the test load must be hoisted a vertical distance to assure the load is supported by the hoist and held by the hoist brakes. Paragraph (e)(2)(iv)(B) requires the test load to be lowered, stopped and held with the brake(s). These provisions are comparable to sec. 7-2.2.2(b)(2) of ASME B30.7-2001.

Paragraph (e)(2)(iv)(C) states that the hoist must not be used unless a competent person determines that the test has been passed. ASME B30.7-2001 does not specify who must determine if a hoist passes its load test. C-DAC concluded, however, that to ensure the load test is properly assessed, this determination needs to be made by a competent person. The requirement that a competent person determine whether the hoist has passed a load test is consistent with the requirement, discussed below under § 1926.1436(g), that a competent person determine whether a derrick has passed a load test.

A commenter recommended that § 1926.1436(e)(2)(iv) be revised to add a paragraph requiring derrick users to simulate test/trial lifts in similar working cycle durations for actual field work cycles. (ID -0120.1.) The commenter provided no explanation for this suggestion nor any information on how the practice would improve safety beyond the requirements proposed. OSHA defers to C-DAC's judgment that the load test procedures specified in paragraph (e)(2)(iv) of this section will provide the necessary level of safety to employees.

For these reasons, OSHA did not modify the proposed text of § 1926.1436(e)(2)(iv) to add a paragraph (D). No other comments were received on paragraph (e)(2)(iv); it is promulgated as proposed.

Paragraph (f) Operational aids

Paragraph (f) of this section specifies the types of operational aids that must be used on derricks during construction activities.

Paragraph (f)(1) is adopted as proposed and states that § 1926.1416 (Operational aids) applies, except for §§ 1926.1416(d)(1), (e)(1) and (e)(4). Under § 1926.1436(f)(1), two operational aids – an anti two-block device and a hoist drum rotation indicator (if the drum is not visible from the operator's station) – are required on a derrick manufactured more than one year after the effective date of this subpart. See discussion of § 1926.1416 for information about the safety functions served by these operational aids.

Proposed paragraph (f)(2) of this section, *Boom angle aid*, provided that the employer had to ensure that either: (i) the boom hoist cable is marked with caution and stop marks, corresponding to maximum and minimum allowable boom angles, that are within view of the operator or a spotter who is in direct communication with the operator, or (ii) an electronic or other device that signals the operator in time to prevent the boom from moving past its maximum and minimum angles, or automatically prevents such movement, is used.

C-DAC intended these precautions to be taken in lieu of requiring boom angle indicators and that they are unnecessary if the derrick has such a device. Therefore, OSHA requested public comment on whether proposed § 1926.1436(f)(2) should be

modified by adding the words, “If the derrick is not equipped with a functioning boom angle indicator.”

Several commenters supported OSHA’s recommended revision of § 1926.1436(f)(2) but noted that the language should be more explicit in stating that a boom angle indicator is not required. (ID -0180.1; -0213.1; -0205.1.) They also asked OSHA to clarify that the options provided in paragraphs (e)(2)(i) and (ii) of this section are not required when boom angle indicators are used. To address these concerns, OSHA has modified the language of § 1926.1436(f)(2) to clarify that while a boom angle indicator is not required, if the derrick has a boom angle indicator, the employer need not use the options provided in paragraphs (e)(2)(i) and (ii) unless the boom angle indicator is not functioning.

Paragraph (f)(3) of this section, *Load weight/capacity devices*, requires that derricks manufactured more than [INSERT DATE 1 YEAR AND 90 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER] with a maximum rated capacity over 6,000 pounds have at least one of the following: load weighing device, load moment indicator, rated capacity indicator, or rated capacity limiter. This paragraph adopts, for derricks, a requirement comparable to that required for cranes under § 1926.1416(e)(4). Because this paragraph imposes a requirement not previously applied to derricks by an industry standard, OSHA concludes, as did C-DAC, that it is appropriate to allow one year after this standard becomes effective for new derricks to be equipped with such devices.

Paragraph (f)(3) sets temporary alternative measures that must be used when the load weight/capacity device is not working properly. In that case the weight of the load

must be determined from a source recognized by the industry (e.g., the load's manufacturer), or by a calculation method recognized by the industry (e.g., calculating a steel beam from measured dimensions and a known per foot weight). This information must be provided to the operator before the lift. These temporary alternatives are the same as those required by § 1926.1416(e)(5) for equipment generally and under § 1926.1435(e)(6)(vi) for tower cranes specifically. For purposes of clarification, the Agency has added a reference to § 1926.1436(f)(3)(i) noting that the requirements of § 1926.1417(j) are applicable. (See further discussion at § 1926.1417(j).)

Under §§ 1926.1416(e) and 1926.1435(e)(6), a load weight/capacity device is a category II operational aid and, as such, it must be repaired within 30 days if it is not working properly.

OSHA requested comment on whether to apply that same 30-day requirement, along with the exception for a situation in which a part is ordered within 7 days of the malfunction but is not received in time to complete the repair within 30 days.

Several commenters supported a revision of paragraph (f)(3) of this section to include the recommended time limits. (ID -0205.1; -0213.1; -0343.) OSHA concludes it is reasonable to make this revision for consistency with alternatives that are available to crane users during the repair of similar operational aids. Section 1926.1436(f)(3) has been revised to reflect this modification.

Paragraph (g) Post-assembly approval and testing – new or reinstalled derricks

Paragraph (g) of this section lists the minimum testing and approval requirements that an employer must meet to assure that its derrick will be structurally and functionally

able to perform within the manufacturer's specifications and recommendations. C-DAC determined that by meeting these minimum requirements, the employer would provide its workers with a safe derrick that will not endanger the workers during hoisting operations.

Paragraph (g)(1), *Anchorages*, lists minimum requirements for an anchor used to support a derrick. Section 1926.1436(g)(1)(i) requires that the anchorages, including the structure to which the derrick is attached (if applicable), be approved by a qualified person.

A commenter recommended that § 1926.1436(g)(1)(i) be revised to require design inspection by a registered professional engineer instead of a qualified person as proposed. (ID -0120.1.) However, the commenter submitted no explanation for the recommendation nor any information as to why the use of a registered professional engineer would result in a higher level of safety than the use of a qualified person. Since no information supporting this position was presented, OSHA finds no reason to modify the provision based on this comment; it is promulgated as proposed.

Paragraph (g)(1)(ii) requires the qualified person to determine whether any special testing of the anchorage is needed when rock or hairpin anchorages are used. If so, it must be tested accordingly.

The provisions of paragraph (g)(1) are similar to what was required by subpart N through its incorporation of sec. 6-2.2.1b in ANSI B30.6-1969 and also what is currently in sec. 6-2.2.1(b) in its newest revision, ASME B30.6-2003.[138] These requirements will help the employer ensure that the derrick does not collapse due to insufficient anchoring

[138] The OSHA standard differs from ASME B30.6-2003 in the following respect: The ASME section states that rock or hairpin anchorages "may require" special testing. C-DAC believed that it is necessary to explicitly require that a qualified person determine whether such testing is needed.

and injure or kill workers who must use or be in the vicinity of the derrick. Paragraph (g)(1) is adopted without change from the proposal.

OSHA received no comments on paragraph (g)(2), *Functional test*, and it is adopted as proposed. The provision requires that, prior to initial use, new or reinstalled derricks must be tested by a competent person with no hook load to verify proper operation as outlined in paragraphs (g)(2)(i) through (v). The test must include (i) lifting and lowering the hook(s) through the full range of hook travel; (ii) raising and lowering the boom through the full range of boom travel; (iii) swinging in each direction through the full range of swing; (iv) actuating the anti two-block and boom hoist limit devices (if provided); and (v) actuating locking, limiting and indicating devices (if provided). These provisions are similar to sec. 6-2.2.1 of ASME B30.6-2003.

OSHA received no comments on paragraph (g)(3), *Load test*, and it is adopted as proposed. The provision requires that, prior to initial use, new or reinstalled derricks must be load tested by a competent person. Subpart N required operational tests prior to initial use of all new and altered derricks through the incorporation of sec. 6-2.2.1 of ANSI B30.6-1969, but a load test was not explicitly required. C-DAC recommended that OSHA adopt the revised guidance provided in sec. 6-2.2.2 of ASME B30.6-2003, which includes a requirement to load test all new and reinstalled derricks prior to initial use and specifies the elements such a test should include. OSHA determines, as did C-DAC, that compliance with the load test requirements listed in paragraph (g)(3) will help the employer identify defects in the derrick prior to its actual use. The requirements for the load test are outlined in paragraphs (g)(3)(i) through (g)(3)(iii).

Under paragraph (g)(3)(i) test loads must be at least 100% and no more than 110% of the rated capacity, unless otherwise recommended by the manufacturer or qualified person, but in no event must the test load be less than the maximum anticipated load. Under paragraph (g)(3)(ii) the test must consist of (A) hoisting the test load a few inches and holding to verify that the load is supported by the derrick and held by the hoist brake(s); (B) swinging the derrick, if applicable, the full range of its swing, at the maximum allowable working radius for the test load; (C) booming the derrick up and down within the allowable working radius for the test load; and (D) lowering, stopping and holding the load with the brake(s). Paragraph (g)(3)(iii) provides that the derrick must not be used unless the competent person determines that the test has been passed.

Paragraph (g)(4), *Documentation*, requires that tests conducted under this paragraph must be documented. The document must contain the date, test results, and the name of the tester. The document must be retained until the derrick is re-tested or dismantled, whichever occurs first. Because a load test meeting the criteria listed in the standard is so important to the safe use of the derrick, C-DAC determined that documentation of the test was needed to show that the test had been conducted properly. Section 6-2.2.2(a)(1) of ASME B30.6-2003 similarly requires that a written report of the load test be prepared and maintained. OSHA received no comments on this paragraph. OSHA is adding language to clarify that all inspection documentation must be available to inspectors in accordance with § 1926.1412(k).

Paragraph (h) Load testing repaired or modified derricks

Paragraph (h) of this section requires that derricks that have had repairs, modifications, or additions affecting the derrick's capacity or safe operation be evaluated by a qualified person to determine if a load test is necessary. If so, load testing must be conducted and documented in accordance with § 1926.1436(g). Subpart N, through incorporation of sec. 6-2.3.3 of ANSI B30.6-1969, required all replaced and repaired parts to have at least the original safety factor. However, there was no explicit requirement to load test the derricks after parts were repaired or replaced. ASME B30.6-2003 does address load testing of repaired, altered or modified derricks in sec. 6-2.2.2(b), specifying that the need for such a test be determined by a qualified person. Paragraph (h) is consistent with the ASME requirement. Such testing will help the employer identify safety defects in a repaired or modified derrick prior to its actual use. No comments were received for (h); it is promulgated as proposed.

Paragraph (i) [*Reserved*.]

Paragraph (j) Power failure procedures

Paragraph (j) of this section requires the derrick operator to safely stop operation if the power fails during operations and lists additional steps that must be taken. Section 1926.1436(j)(1) requires setting all brakes or locking devices. Section 1926.1436(j)(2) requires moving all clutch and other power controls to the off position. These steps will prevent inadvertent movement of the load during the power outage or upon restoration of power. These precautions are found in sec. 6-3.2.3(h) of ANSI B30.6-1969 and are

reiterated in ASME B30.6-2003. No comments were received for (j); it is promulgated as proposed.

Paragraph (k) Use of winch heads

Paragraph (k) of this section specifies minimum requirements for the safe use of a winch during hoisting operations. Paragraph (k)(1) requires that ropes not be handled on a winch head without the knowledge of the operator. Section 1926.1436(k)(2) requires the operator to be within reach of the power unit control while a winch head is being used. These requirements are in sec. 6-3.3.5 of ANSI B30.6-1969 and are continued in sec. 6-3.3.6 of ASME B30.6-2003. No comments were received for (k); it is promulgated as proposed.

Paragraph (l) [*Reserved*.]

Paragraph (m) Securing the boom

Paragraph (m) of this section lists minimum requirements for ensuring the stability of a derrick's boom when at rest to prevent injuries and deaths that could occur if it inadvertently shifted or fell.

Paragraph (m)(1) requires that when the boom is being held in a fixed position, dogs, pawls, or other positive holding mechanisms on the boom hoist be engaged. Section 1926.1436(m)(2) requires that when taken out of service for 30 days or more, the boom be secured by one of the following methods: (i) by laying down the boom; (ii) by securing the boom to a stationary member, as nearly under the head as possible, by

attachment of a sling to the load block; (iii) for guy derricks, by lifting the boom to a vertical position and securing it to the mast; or (iv) for stiffleg derricks, by securing the boom against the stiffleg.

The comparable ASME B30.6-2003 provision (sec. 6-3.3.7) would require the boom to be secured when the derrick is "not in use." C-DAC concluded the intent of the ANSI provision was to require the boom to be secured when the derrick was not in service but concluded that the ASME wording could be misconstrued to mean that the boom had to be secured whenever the derrick was not in the process of lifting a load. To avoid misunderstanding and establish an objective requirement for when the boom had to be secured, C-DAC proposed that the boom be secured whenever the derrick is taken out of service for 30 days or more. No comments were received for paragraph (m); it is promulgated as proposed.

Paragraph (n)

"Jumping the derrick" is the practice of moving structural components of the derrick to different locations, such as to the upper floors as a building is constructed, and is essential to some construction activities. Section 1926.1436(n) requires that the process of jumping the derrick be supervised by the A/D (assembly/disassembly) director. As defined in § 1926.1401, the A/D director must either be a person who meets the criteria for both a competent person and a qualified person, or a competent person who is assisted by one or more qualified persons.

As discussed above, paragraph (g) of this section requires a derrick to be load tested to confirm that the derrick and its support can withstand rated loads. C-DAC

discussed whether load testing should be required when a derrick is jumped, but ultimately concluded that a jumped derrick need not be load tested and determined that the A/D director could be relied upon to see that the jumped derrick is properly erected and anchored and complies with the applicable requirements of this standard. OSHA is satisfied with C-DAC's rationale and agrees that giving the A/D director the responsibility for supervising the jumping of a derrick will ensure that the jumped derrick is safe to use.

Several labor representatives objected to the use of the word "supervisor" in the term "A/D supervisor" used in proposed § 1926.1404(a). (ID -0182.1; -0199.1; -0172.1.) As explained in the discussion of assembly/disassembly, OSHA has decided to replace the term A/D supervisor with "A/D director" in § 1926.1404(a). Accordingly, OSHA has revised this paragraph to replace the term A/D supervisor with the term A/D director.

A commenter recommended that § 1926.1436(n) be revised to add a requirement to include a "site-specific jumping plan approved by a registered professional engineer." (ID -0120.1.) However, the commenter provided no explanation for this recommendation, nor did the commenter provide any information to establish how this would be an improvement over the rule's requirement to have the jumping process directed by an A/D director. Since no information supporting this revision was presented, OSHA finds no persuasive reason to modify the provision based on this comment; it is promulgated as proposed.

Paragraph (o)

Paragraph (o) of this section requires that derrick operations be supervised by a competent person. No comments were received for this provision; it is promulgated as proposed. Subpart N incorporated sec. 6.3.1.1 of ANSI B30.6-1969, which requires derrick operations to be directed by a designated individual. ASME B30.6-2003 contains a similar requirement, and both consensus standards specify the requirements and practices of that designated individual. OSHA concludes, as did C-DAC, that the definition of competent person meets the objectives of the ANSI/ASME designated individual requirements to competently perform the specific duties involved in supervising derrick operations. The experience and knowledge possessed by the competent person and his/her ability to recognize and correct potential hazardous conditions will help ensure the safety of derrick operations.

Paragraph (p) Inspections

Under paragraph (p) of this section, the inspection requirements of § 1926.1412 apply to derricks. In addition to the items that must be inspected under § 1926.1412, this paragraph requires certain additional items to be inspected. These additional items, when combined with the items that must be inspected under § 1926.1412, are consistent with ANSI B30.6-1969 and ASME B30.6-2003.

Paragraph (p)(1), *Daily*, requires the inspection of guys for proper tension. Guy wires are critical elements of the support system for derricks.

Paragraph (p)(2), *Annual*, contains two requirements. Paragraph (p)(2)(i) requires inspection of the gudgeon pin for cracks, wear, and distortion. Paragraph (p)(2)(ii) requires inspection of the foundation supports for continued ability to sustain the imposed

loads. Since a derrick is more likely to remain stationary and supported by the same foundation throughout the duration of its use than the majority of the equipment covered by this standard, C-DAC determined it was necessary to require the foundation to be inspected annually in addition to the items specified in § 1926.1412. No comments were received for this paragraph; it is promulgated as proposed.

Paragraph (q) Operator Qualification and Training

Paragraph (q) of this section, *Qualification and Training*, requires that derrick operators be trained in the safe operation of the specific type of equipment that operator will be using. Section 1926.1427 does not apply.

C-DAC discussed whether there should be a certification requirement for derrick operators, but decided against recommending such a provision. The Committee noted that there are no accredited testing criteria to use for testing derrick operators. Nor are there nationally recognized accredited testing facilities readily available. C-DAC questioned whether testing providers would find it cost-effective to establish accredited testing programs for derrick operators, noting that most training for derricks must be site specific because the types of derricks used, their support structures, and the hazards associated with specific projects vary from company to company. Moreover, the accident investigation data reviewed by C-DAC did not indicate that there was a need to require derrick operators to meet certification requirements similar to those proposed for crane operators.

One commenter opposed excluding derrick operators from the certification requirements of § 1926.1427 of this subpart because derrick operations require similar

skills to make a safe pick as those required for cranes. (ID -0172.1.) Testimony from hearing participants confirmed that the industry was unable to accommodate a need for accredited testing facilities or applicable testing criteria for derrick operators. (ID -0343.) A commenter asserted there were no organizations that provided accredited testing for derrick operators in the industry. (ID -0130.1.) Overall OSHA did not find sufficient evidence in the record to support a requirement for derrick operators to meet the certification requirements of § 1926.1427. More general discussion of this topic is provided in § 1926.1427.

In reviewing the C-DAC language of §§ 1926.1430 and 1926.1436, OSHA realized that the Committee did not specify any training requirements for derrick operators, which OSHA concludes was an inadvertent omission.

The Agency noted in the preamble to the proposed rule that it was planning to add a training requirement to § 1926.1436 and requested public comment on the addition of such a provision.

Commenters supported OSHA's recommended addition, so this section now includes a requirement that derrick operators be trained on the specific type of equipment being used. (ID -0130.1; -0205.1; -0213.1.) This provision has been modified from the proposed rule to specifically address the training that is required for derrick operators.

A commenter asked that employers be allowed to train and qualify their operators and that the qualification be valid for a limit of five years. (ID -0130.1.) Since this final rule does not require qualification for derrick operators beyond that of the training requirement, OSHA disagrees with this proposition. For additional information on

comments received about training to particular types of equipment, see the discussion at § 1926.1427(j)(1)(i).

Section 1926.1437 Floating Cranes/Derricks and Land Cranes/Derricks on Barges

Section 1926.1437 covers two types of equipment in a marine environment. The first type is referred to as "floating cranes/derricks," defined in § 1926.1401, *Definitions*, as "equipment designed by the manufacturer (or employer) for marine use by permanent attachment to a barge, pontoons, vessel, or other means of flotation." The second type, "Land cranes/derrick" is defined in § 1926.1401 as "equipment not originally designed by the manufacturer for marine use by permanent attachment to barges, pontoons, vessels, or other means of flotation. Section 1926.1437(m) applies only to floating cranes/derricks, and § 1926.1437(n) applies only to land cranes/derricks used on barges, pontoons, vessels or other means of flotation.

Paragraph (a)

Paragraph (a) of this section specifies that the requirements of § 1926.1437 are supplemental requirements; therefore, all other requirements of this subpart apply unless specifically noted otherwise. Section 1926.1437(a) exempts equipment operating on jacked barges from the requirements of § 1926.1437 when the jacks are deployed to the river, lake, or sea bed and the barge is fully supported by the jacks.

A jacked barge deployed in this manner has four "spuds" on its corners that are grounded into the sea-bottom, providing a level and stable platform on which employees work. This configuration results in work conditions similar to a crane working on land,

unlike the work conditions pertinent to equipment covered by this section. Therefore, equipment used on a jacked barge deployed in this manner is subject to all other applicable requirements of this proposed subpart but not to the requirements of this section.

One commenter raised a question as to whether the exclusion of jacked barges would apply when the barge is supported by jacks anchored to the river, lake, or sea bed, but not fully supported "in a more permanent condition." (ID -0172.1.) However, the commenter does not explain what is meant by "a more permanent condition." The test for whether the jacks, on deployment in the river, lake, or sea bed, fully support the barge.

OSHA received no substantive comments or information indicating that the exception for jacked barges is unsafe for employees. Therefore, OSHA is retaining the exception in the final rule because it determines that employees on jacked barges will be protected by the other provisions of this subpart. OSHA also is retaining the language explaining the application of the section because it provides useful explanatory information to the regulated community regarding compliance obligations.

Paragraph (b) General requirements

Paragraph (b) of this section specifies that paragraphs (c) – (k) of this section apply to both floating cranes/derricks and land cranes/derricks. As noted above and discussed below, § 1926.1437(m) applies only to floating cranes/derricks, and § 1926.1437(n) applies only to land cranes/derricks mounted on vessels/flotation devices. OSHA received no comments on the proposed paragraph. OSHA is retaining the

paragraph as proposed because it provides useful explanatory information to the regulated community regarding compliance obligations

Paragraph (c) Work Area Control

Paragraph (c) of this section provides that the requirements of § 1926.1424, *Work area control*, apply to equipment covered by this section, except for the requirements of § 1926.1424(a)(2)(ii). Paragraph (c)(2) of this section closely parallels § 1926.1424(a)(2)(ii) but omits the requirement that employers demonstrate infeasibility before using a combination of warning signs and high visibility markings in place of erecting and maintaining control lines, warning lines, railings, or similar boundaries of hazard areas. Because equipment covered by this section typically operates within a very limited physical work space, employers often need increased flexibility in determining which work area control method is most appropriate in light of special site-specific circumstances. To help ensure that employees are adequately protected if the employer uses high visibility markings to supplement warning signs, this paragraph requires the employer to train employees to understand the meaning of the markings.

OSHA received no comments on this provision as proposed. Upon review of this provision, the Agency determined the two examples provided in the regulatory text were redundant. Therefore, except for the removal of one of the examples, OSHA is retaining the provision as proposed, because it will ensure maximum worker safety under the limited space available on many of these vessels.

Paragraph (d) Keeping Clear of the Load

Paragraph (d) of this section states that the requirements of § 1926.1425, *Keeping clear of the load*, do not apply to the equipment covered by § 1926.1437. Due to the limited space available for equipment on worksites covered by this section (i.e., the decks of barges and other vessels), the requirements of § 1926.1425 are infeasible under these worksite conditions, in the experience of C-DAC. OSHA received no comments on this provision, and, therefore, is promulgating it in the final rule as proposed because it strikes a balance between the practicalities of the worksite and safety for employees. Other provisions within this section provide other means of protecting employees in the unique worksites covered by this section.

Paragraph (e) Additional Safety Devices

Paragraph (e) of this section lists additional safety devices required for equipment covered by this section. Equipment covered by § 1926.1437 is required to have the safety devices listed in § 1926.1415, *Safety devices*, unless otherwise noted in § 1926.1415. The additional safety devices required by § 1926.1437(e) address the special conditions of a marine worksite, especially with respect to vessel stability, inadvertent movement due to water conditions, and the greater effect of wind and other environmental conditions on equipment operating at these sites. However, note that § 1926.1415 excepts floating cranes/derricks and land cranes/derricks on barges, pontoons, vessels, or other means of flotation from having crane level indicators and floating cranes from having foot pedal brake locks. (See the discussion above under §§ 1926.1415(a)(1)(iii) and 1926.1415(a)(4) for an explanation of these exceptions.)

Paragraph (e)(1) requires equipment covered by this section to have a list and trim device. It is necessary to have this device since the degrees of list and trim are directly related to the stability of the vessel/flotation device and therefore to the stability of the equipment and its safe operation.

Proposed paragraph (e)(2) required equipment covered in this section to have a horn. In the experience of C-DAC, the sounding of the equipment's horn is commonly understood in the marine industry as a way to warn employees about the presence of or movement of the equipment or its load. In the final rule, OSHA has added the requirement of a horn to the general list of safety devices required in § 1926.1415. See § 1926.1415(a)(7). As noted above, the requirements of § 1926.1415 apply to floating cranes/derricks, so restating the requirement in § 1926.1437(e)(2) would be redundant. OSHA is therefore removing the horn requirement from this section and renumbering the remainder of § 1926.1437(e).

Paragraph (e)(2), as renumbered in the final rule, now requires that all equipment with a rotating superstructure have a positive crane house lock. This device is necessary for equipment covered within this section because it positively locks the rotating superstructure. The lock provides additional protection from the superstructure's accidental movement that can result due to the action of wind, waves, or current.

Because the speed and direction of the wind can directly affect equipment operations, such as by diminishing equipment capacity and inducing unintended movement of the load, § 1926.1437(e)(3) requires equipment covered by this section to have and use a wind speed and direction indicator when a competent person determines that wind is a factor that needs to be considered during operations.

OSHA received no comments on proposed paragraphs (e)(1)-(e)(4), and is retaining all of these provisions in the final rule, except for the requirement of a horn and with renumbering, because they improve the safety of the vessels, and, therefore, the safety of the employee involved in crane/derrick operations onboard the vessel.

Paragraph (f) Operational Aids

Paragraph (f) of this section modifies the application of some of the requirements in proposed § 1926.1416, *Operational aids*, for equipment covered by this section. Apart from these differences, § 1926.1416 applies to equipment covered by this section.

Paragraph (f)(1) requires that equipment covered by this section to be equipped with an anti-two-block device when hoisting personnel or when hoisting over an occupied cofferdam or shaft. As discussed at § 1926.1416(d)(3), two-blocking can result in a sudden drop of the load on the line. Anti-two-block devices protect against this danger. However, anti-two-blocking devices have a high rate of failure in a marine environment due to wind and other environmental factors. Also, the equipment covered by this section is often performing live boom/fast-moving functions, causing an anti-two-block device to consistently malfunction. Therefore, an anti-two-block device is only required when hoisting personnel or hoisting over an occupied cofferdam or shaft due to the additional risk to employees during these operations.

Paragraph (f)(2) specifies that employers using equipment to perform dragline, clamshell (grapple), magnet, drop ball, container handling, concrete bucket, and pile driving work covered by this section, are exempt from the requirements of § 1926.1416(e)(4), *Load weighing and similar devices*. These operations add heavy loads

and repetitive motion to the marine characteristics described above. As a result, load weighing devices used during these operations consistently malfunction. Additionally, the listing and tilting that is typical in marine worksites often prevents these devices from providing accurate load readings.

OSHA received no comments on these provisions as proposed. However, OSHA is retaining these provisions in the final rule because the provisions afford protection to workers involved in personnel lifting operations or exposed to a load failure while working in cofferdams or shafts. The provisions also prevent employers from relying on malfunctioning equipment to the detriment of employees using or exposed to the equipment.

Paragraph (g) Accessibility of Procedures Applicable to Equipment Operation

Paragraph (g) of this section sets forth requirements regarding accessibility of equipment operation procedures. The provision requires equipment with a cab to comply with the requirements of § 1926.1417(c), *Operation – accessibility of procedures*. If the equipment does not have a cab then the requirements of this paragraph apply.

The Agency determined that it is necessary to have the load chart located where the operator is stationed. Under § 1926.1437(g)(1), if the operator's station is movable, such as with pendant-controlled equipment, the load chart must be posted on the equipment. Under § 1926.1437(g)(2), the remaining procedures (other than load charts) must be readily available on board the vessel/flotation device. Where there is no cab for the equipment, it is impractical to require these other procedures to be next to the

operator; however, it is still necessary for the operator to have easy access to these procedures for reference during operations.

While OSHA received no comments on the proposed provisions, it is retaining the provisions in the final rule because, as explained elsewhere in this preamble, having this procedural information as readily available as possible is critical to operating cranes/derricks safely, thereby ensuring the protection of the workers involved in the crane/derrick operations.

Paragraph (h) Inspections

Paragraph (h) of this section sets forth additional inspection requirements applicable to equipment covered by this section. The introductory sentence to this paragraph states that § 1926.1412, ***Inspections***, applies to the inspection of the crane/derrick, and that the additional inspection requirements in this paragraph apply to the vessel/flotation device that supports the crane/derrick.

In the proposed rule, the Agency modified the language of the C-DAC consensus document for this introductory sentence by including coverage for floating cranes/derricks and requested comment on this modification. Two commenters responded and both agreed with the modified language as used in the proposed rule. (ID -0205.1; -0213.1.) OSHA is retaining this language in the final rule because the increased coverage enhances employee protection, and the introductory language provides useful explanatory information to the regulated community regarding compliance obligations.

With respect to the requirements of § 1926.1437(h)(2)(ii), a commenter expressed concern that the Agency expected an employer to physically open the hatch on a barge to inspect for "taking on water." (ID -0345.26.) The commenter further explained that hatch covers are usually sealed, and generally are removed only if there is suspected damage to the hull. (ID -0345.26.) Another commenter confirmed that most non-freshwater vessels have permanently sealed hatches. (ID -0344.1.)

Under this provision, as proposed, a competent person must inspect the vessel for "taking on water" and does not specify any particular method for making this determination. As one commenter suggested, measuring freeboards is a way to determine if a vessel is listing more than a couple of degrees and, therefore, possibly taking on water. (ID -0344.1.) The requirement here is for the competent person to use an effective means of determining if the vessel is taking on water, which can vary depending on the type of vessel.

With respect to § 1926.1437(h)(2)(iv), a commenter was concerned that the requirement to check the "fuel compartments . . . for serviceability as a water-tight appliance" included an expectation that the hatch cover would be removed to inspect the fuel compartment. (ID -0345.26.) The commenter further stated the usual means of checking for water in a fuel tank is by using a plumb bob and clear coat that changes color if water is present. The proposed provision requires a competent person to inspect the fuel compartments, among other areas, for "serviceability as a water-tight appliance." The provision does not specify any particular method for making this determination, provided the competent person uses an effective method for doing so.

Based on the need to ensure the integrity of the vessel/flotation device for employee safety, and the availability of nonintrusive means of determining this integrity, OSHA is retaining §§ 1926.1437(h)(2)(ii) and 1926.1437(h)(2)(iv) in the final rule. OSHA received no comments on the remaining provisions proposed for paragraphs (h)(2) and (h)(3) and OSHA is retaining these provisions to ensure that vessels/flotation devices used for crane/derrick operations remain safe for employees, and that the employer corrects deficiencies in the vessels/flotation devices that are hazardous to employees.

Under § 1926.1437(h), inspections are required at four distinct times: each shift, each month, annually, and every four years. As specified in paragraph (h)(3), a competent person must conduct the shift and monthly inspections. If the competent person identifies a deficiency, an immediate determination by a qualified person is then required to ascertain if the deficiency constitutes a hazard. If the deficiency constitutes a hazard, the vessel must be removed from service until the deficiency is corrected.

These requirements differ from the shift and monthly general inspection requirements of § 1926.1412, in which the competent person who identifies a deficiency then determines whether the deficiency is a safety hazard requiring immediate correction. The reason for this difference is that the equipment covered under this section is highly specialized and therefore requires a high level of knowledge.

With respect to the annual inspections, § 1926.1437(h)(4) requires the equipment and vessel/flotation device to be inspected by a qualified person with expertise with respect to vessels/flotation devices. The Agency concludes it is important to state explicitly that the qualified person conducting these inspections must have the necessary expertise for the items listed for the annual inspection with respect to barges, pontoons,

vessels or other means of flotation. Accordingly, OSHA is retaining the provision in the final rule.

The qualified person required for the shift and monthly inspections must have expertise with respect to the work conditions, the crane/derrick, and the vessel/flotation device. However, the annual inspection is more extensive than the shift or monthly inspections. The qualified person for the annual inspection must have a greater level of expertise than the qualified person required for determining whether deficiencies identified in shift and monthly inspections constitute hazards. The qualified person for the annual inspection must have expertise in all the areas covered by the annual inspection, in addition to general expertise regarding the equipment and vessel/flotation device. This expertise will ensure that the operational conditions are safe for employees, and, therefore, OSHA is retaining these requirements in the final rule.

Section 1926.1437(h)(4)(i)(C) requires an inspection of various component parts of the vessel to determine if there is significant corrosion, wear, deterioration or deformation. The use of the word significant is to indicate that the functionality of these components is not impaired in any way due to exposure to the elements or use. The Committee determined, and OSHA agrees, that these components are essential to safe operation of the vessel and therefore critical to employee safety.

A commenter indicated that the requirement to check for "external evidence of leaks and structural damage" in § 1926.1437(h)(4)(i)(C) should not apply below the waterline of the hull. (ID -0345.26.) That commenter suggested that applying the requirement below the waterline would be unduly burdensome because it would require dry-docking the vessel. Another commenter, indicated that dry-docking a vessel is

expensive – between $20,000 and $60,000 per dry-docking, depending on the type of vessel. (ID -0344.1.) This cost estimate was supported by another commenter, who noted the average cost for its fleet was $50,000 to dry-dock a vessel. (ID -0383.1.) A commenter indicated that industry practice is to conduct the routine annual inspection from the waterline up, and that inspecting below the waterline would not enhance safety. (ID -0344.1.)

The Agency agrees that it is not necessary to require dry-docking on an annual basis. Instead, OSHA modified the language used in the proposed rule to allow employers to check for leaks and damage below the waterline inside the vessel/flotation device, by, for example, opening hatches and access/inspection ports, but not by opening sealed compartments or cutting openings.

Paragraph (h)(4)(iii)(A) requires the removal from service of any vessel/flotation device when a qualified person determines a deficiency in the equipment constitutes a immediate hazard. As with other removal from service requirements, OSHA is including a cross-reference to the tag-out requirement in § 1926.1417(f), which is triggered when equipment is removed from service.

Paragraph (h)(5) requires an inspection every four years of the internal portion of the barge, pontoons, vessel, or other means of flotation by a marine engineer, marine architect, licensed surveyor, or other qualified person who has expertise with respect to vessels/flotation devices. A higher level of expertise is necessary for performing the four-year inspection than the annual inspection. By listing "other qualified person" together with "marine engineer," "marine architect," and "licensed surveyor," the Agency clarifies that the expertise of the "other qualified person" must be equivalent to that of a

marine engineer, marine architect, or licensed surveyor. In this regard, the proposal did not list inspection items for the four-year inspection. Instead, OSHA determines (based on C-DAC's recommendation) that a better approach is to rely on the expert knowledge of the marine engineer, marine architect, licensed surveyor, or other qualified person who has expertise with respect to vessels/flotation devices.

OSHA received two comments regarding the use of the term "quadrennial" in the proposed rule. (ID -0343; -0344.1.) Both recommended using the term "four-year" because it is consistent with current terminology used by the marine industry. In light of this information OSHA revised the term "quadrennial" to "four-year" in the final rule in paragraphs (h)(5) and (h)(6) of § 1926.1437.

Paragraph (h)(6) sets forth the documentation requirements for the monthly, annual, and four-year inspections, which follow those in § 1926.1412, *Inspections*, at §§ 1926.1412(e)(3) and 1926.1412(f)(7). However, with respect to four-year inspections the written documentation of the inspection must be maintained for four years. This provision enables the employer to track changes in the condition of the vessel from the previous inspection, thereby correcting hazards in a timely manner. Therefore, OSHA is retaining this provision in the final rule. The Agency is adding language to paragraph (h)(6) to clarify that all of the inspection documentation (including the four year inspection documentation) must be made available, for the duration of the document retention period, to persons performing inspections, in accordance with § 1926.1412(k).

Paragraph (i) [*Reserved*.]

Paragraph (j) Working with a Diver

Paragraph (j) of this section sets forth supplemental requirements designed to ensure that a diver is hoisted safely from the vessel and back onto the vessel when equipment covered by this section is used for this purpose. Extra precautions and measures are needed when engaged in this activity due to the drowning, struck-by, crushed-by, and other hazards involved.

Marine environments and the condition of a diver can change quickly and unexpectedly; the crane/derrick operator must be constantly aware of the diving operation and in position to take immediate action when necessary. Therefore, under proposed § 1926.1437(j)(1), when one or more divers are being hoisted into and out of the water, the employer is prohibited from using the equipment for any other purpose until all divers have returned back on board. This requirement ensures the operator's attention is not diverted from the welfare of the divers. Paragraph (j)(2) of this section requires the equipment operator to remain at the equipment controls during the entire diving operation. This provision ensures that the operator is able to respond when necessary.

Paragraph (j)(3) requires that, in addition to the signal requirements in §§ 1926.1419-1926.1422, the diver tender must be in direct communication with the equipment operator. This communication must be done either through maintaining a clear line of sight between the operator and tender or by electronic transmission between the operator and tender. The tender is the individual responsible for monitoring and communicating with the diver. In this section, the diver tender is required to maintain effective communication with the equipment operator when the equipment is used to get the diver in and out of the water. The tender is the member of the dive team who closely

monitors the diver's condition during the dive and checks the equipment prior to the dive. Therefore, the tender is able to let the operator know when a diver needs to be lifted out of the water or when other action by the equipment operator is needed.

Paragraph (j)(4) specifies that when using a crane/derrick to hoist a diver, the crane/derrick must be secured in such a way that there is no amount of shifting in any direction. A small shift of a crane/derrick on a barge can result in movement that can injure the diver.

OSHA notes that § 1926.1431, *Hoisting personnel*, applies when a crane/derrick is used to hoist personnel. In most instances when personnel are hoisted, they must be located in a personnel platform that meets criteria specified in § 1926.1431. However, § 1926.1431(b)(2) contains exceptions to the use a personnel platform and one such exception, specified by § 1926.1431(b)(2)(iii), applies when an employer transfers an employee to or from a marine worksite in a marine-hoisted personnel-transfer device. Under the definition in § 1926.1401, "marine worksite" includes a worksite in the water; therefore, the exception specified by § 1926.1431(b)(2)(iii) to the requirement to use a personnel platform applies when a diver is hoisted into or out of the water in a marine-hoisted personnel-transfer device.

OSHA received no comments on any of the provisions in proposed paragraph (j). Accordingly, OSHA is retaining these provisions in the final rule because, in the Committee's view, use of a personnel platform could be infeasible or more hazardous to employees than an alternative means of hoisting personnel such as marine-hoisted personnel-transfer devices (see the discussion above in this preamble for § 1926.1431(b)(2)(iii)).

Paragraph (k)

Paragraph (k) of this section requires the employer to adhere to the specifications and limitations established by the manufacturer of the barge, pontoon, vessel, or other means of flotation with respect to imposed environmental, operational, and in-transit loads. The purpose of this provision is to ensure that the equipment can operate safely under the forces imposed on it. In its deliberations, the Committee noted that the manufacturer is in the best position to determine the maximum external loads the vessel/flotation device can withstand while maintaining necessary stability and buoyancy, and that requiring employers to adhere to the manufacturer's specifications and limitations would provide employees with the requisite level of protection.

The language of the proposed rule varied from the text in the C-DAC consensus document. OSHA made this revision to clarify that it was an employer's responsibility to follow the manufacturer's specifications and limitations. OSHA requested public comment on this revision. OSHA received two comments in response to this request. (ID -0205.1; -0213.1.) Both commenters stated the C-DAC language showed the Committee's "original intent of this paragraph was a design specification," and further stated that the revision as proposed by OSHA did not consider the Committee's language was addressing design specifications.

On reviewing these comments, the C-DAC consensus document, and OSHA's proposed text, OSHA determines that paragraph (k) needs to address both the commenters' position that there is a need for a design specification, and OSHA's position

in the proposed rule that employers must comply to the manufacturer's specifications and limitations. OSHA revised proposed paragraph (k) accordingly.

In addition, another commenter raised the issue that, for many vessels covered by this section, the manufacturer no longer exists, or that the vessel has been modified and an expert has established the appropriate specifications and limitations for the vessel. (ID -0345.26.) One commenter noted the company's fleet had vessels that were 60 years old and the manufacturers of some of these vessels were no longer in business. (ID -0344.1.) OSHA finds these comments persuasive, and is adding a provision to paragraph (k) to require the employer to follow specifications and limitations established by a qualified person in such instances.

Paragraph (l) [*Reserved*.]

Paragraph (m) Floating Cranes/Derricks

Paragraph (m) of this section sets forth requirements with respect to load charts, rated capacity, allowable list, allowable trim, wind speed and related measures for floating cranes/derricks. The requirements in §§ 1926.1437(m)(1) through (5) address the various hazards that contribute to instability of the vessel/flotation device and the effect of marine conditions that can lead to boom/equipment failure.

As defined in § 1926.1401, a floating crane/derrick includes equipment built either by a manufacturer or by the employer using the equipment. Both types must meet the criteria in §§ 1926.1437(m)(1) through (m)(3). These provisions are designed to

prevent the crane/derrick portion of the equipment from failure due to overloading, thereby, preventing the vessel/flotation device from capsizing.

Paragraph (m)(1) requires that load charts applicable to operations on water not be exceeded. Paragraph (m)(2) establishes criteria (in Table M1) for maximum allowable list and trim relative to the rated capacity of the equipment. Section 1926.1437(m)(3) provides two charts that set the stability criteria for specific conditions. The first of these charts (Table M2) contains the minimum requirements to maintain stability with respect to wind speed and freeboard distance of the vessel/flotation device. The second chart (Table M3) addresses the backward stability of the boom.

The Agency requested public comment on a definition of freeboard as it is used in Table M2. In response, a commenter offered this definition: "Freeboard is the vertical distance between the water line and the main deck of the vessel." (ID -0383.1.) This definition is consistent with OSHA's review of the definition of freeboard; therefore, OSHA is adding this definition to the regulatory text of § 1926.1437(m)(2) in the final rule and is including it in § 1926.1401, *Definitions*.

Under paragraph (m)(4), employer-made equipment must meet the same criteria specified by §§ 1926.1437(m)(1) – (m)(3) for manufacturer-made equipment. In addition, an employer using equipment it builds is required to have documents demonstrating that these criteria have been met. Such documents must be signed by a registered professional engineer who is a qualified person with respect to the design of the type of equipment involved.

Manufacturers have sufficient expertise with respect to the development of load charts, rated capacities, and related operational limitations, so there is no need for a

documentation requirement for manufacturer-built floating cranes/derricks. However, given the variety of employer-made equipment, the Agency included this documentation requirement to ensure that employer-made equipment has the same level of safety as manufactured equipment.

Paragraph (m)(5) addresses structural and access requirements for the barge, pontoon, vessel, or other means of flotation. These requirements are related to the stability of the vessel, including minimizing movement while operating equipment, thereby increasing employee safety by reducing the likelihood of capsizing.

Paragraph (m)(5)(i) requires the vessel to be structurally sufficient to withstand the stress of both static and dynamic loads of the crane/derrick when operating at the crane/derrick's maximum rated capacity with all planned deck loads and ballasted compartments. This provision is necessary to minimize the likelihood of the vessel's structure failing, which would expose employees to a drowning hazard, or endanger them because of inadvertent movement during equipment operations.

Paragraph (m)(5)(ii) requires a subdivided hull with at least one longitudinal watertight bulkhead to reduce the free surface effect on the vessel. Subdividing the hull limits the effects of liquid movement on vessel stability, thereby, reducing the risk of the vessel capsizing.

Paragraph (m)(5)(iii) requires void compartments to be accessible for inspection and pumping. This requirement ensures that the employer evaluates the amount of water in the compartments to determine the potential free surface effect on vessel stability, and then to initiate pumping when necessary to avoid capsizing.

OSHA received no comments were received on paragraphs (m)(3) through (m)(5). OSHA is retaining these provisions in the final rule to ensure the stability of vessels/flotation devices during crane/derrick operations, thereby preventing employee exposure to drowning, impact, and other hazards associated with crane/derrick operations onboard vessels/flotation devices.

Paragraph (n) Land cranes/derricks

Paragraph (n) of this section sets forth the requirements for land cranes/derricks when used on a barge, pontoons, vessel or other means of flotation. As noted above, land cranes/derricks are not originally designed for marine use but are covered by this section when they are mounted on a vessel/flotation device and used on water. The Agency determined that special requirements are needed to address the distinctive safety issues presented when using such equipment.

The stability of the vessel/flotation device is affected by the use of a land crane/derrick on board. Implementing a system that keeps the equipment properly located on the vessel is essential for maintaining stability. In addition, land cranes/derricks have less capacity when on a vessel/flotation device than when on land, due to the fact that the crane/derrick is not originally designed for the special conditions on a vessel/flotation device. Consequently, the employer must adjust the rated capacity of the crane/derrick when used on the vessel/flotation device. If not properly determined, the land crane/derrick may be overloaded, which can cause loss of stability (including tip-over) and boom/equipment failure, thereby endangering employees.

Paragraph (n)(1) sets forth the requirements for determining the rated capacity for land cranes/derricks used on a vessel/flotation device. Load charts for this equipment developed for use on land do not address the use of the equipment on a flotation device or the environmental conditions of a marine worksite. Therefore, under § 1926.1437(n)(1)(i), the rated capacity (as depicted in the load charts) must be reduced for list, trim, wave action, and wind.

In establishing the rated capacity for use on the vessel/flotation device, the capacity of the vessel/flotation device also must be considered. Since some locations on the vessel/flotation device will have less ability to support the crane/derrick than others, under § 1926.1437(n)(1)(ii), the rated capacity must be applicable to a specified location(s) on the vessel/flotation device. This assessment must be made considering the expected and encountered environmental conditions.

Paragraph (n)(2) specifies that the modification to rated capacity required by § 1926.1437(n)(1) of this section must be performed either by the manufacturer of the equipment or by a qualified person with expertise in both land crane/derrick capacity and the stability of vessels/flotation devices. Performance by a qualified person will achieve equivalent operational safety conditions as for the modified floating cranes/derricks. In the proposed rule, OSHA (at the request of the SBREFA Panel) requested public comment as to whether qualified persons are available in the industry with expertise in both land crane/derrick capacity and the stability of vessels/flotation devices with respect to equipment performing duty-cycle work (73 FR 59864, Oct. 9, 2008). Two commenters responded to this inquiry by stating that qualified persons are available in the

industry with expertise in both land crane/derrick capacity and stability of vessels with respect to equipment performing duty-cycle work. (ID -0205.1; -0213.1.)

OSHA also requested comment from the public on whether the requirements of (n)(2) are necessary for the safety of employees when equipment is engaged in duty cycle work. Two commenters found that these requirements are necessary for safety when equipment is engaged in duty cycle work. (ID -0205.1; -0213.1.) Another commenter supported this position by noting instances when the input of a qualified person is needed since the list and trim of the vessel can affect the rated capacity of the equipment. (ID -0345.26.) Based on these comments, and the employee protection afforded by the requirements of paragraph (n)(2), OSHA is including these requirements in the final rule as proposed.

Paragraph (n)(3) sets parameters for the maximum allowable list and trim for the vessel/flotation device and the land crane/derrick to ensure vessel and crane/derrick stability and to prevent the crane/derrick from exceeding its rated capacity. Under paragraph (n)(4), when a land crane/derrick is used on a flotation device, all deck surfaces must be above water and the entire bottom area must be submerged. This provision is necessary to ensure a stable platform when operating the land crane/derrick, to protect against loads that would cause the system used to secure the land crane/derrick (see § 1926.1437(n)(5)) to fail, and to protect against overloading the vessel/flotation device land/crane derrick.

Even though OSHA received no comments on these two paragraphs, it is retaining the paragraphs in the final rule because maintaining proper list and trim, as well

as buoyancy, is critical to the stability of the vessel/flotation device, which will prevent the vessel/flotation device from capsizing and endangering employees.

Paragraph (n)(5) sets forth four options for securing[139] the land crane/derrick on the vessel/flotation device. Providing several options to employers addresses the various of work scenarios found in the industry. Each option is effective in preventing the land crane/derrick from rolling, sliding, or in any way shifting away from its proper location. These horizontal movements can cause the vessel/flotation device to become unstable, or the land crane/derrick to slide or fall into the water. Additionally, OSHA determines that an exception is appropriate for use of mobile auxiliary cranes on a vessel. The requirements for this type of equipment are specified by § 1926.1437(n)(5)(vi).

Paragraphs (n)(5)(i) through (iv) provide the four options for securing the land crane/derrick to the vessel/flotation device. The options for preventing equipment shifting include direct physical attachment, corralling, a rail system or a centerline cable system. These options serve to prevent inadvertent movement of the equipment away from its proper location on the vessel/flotation device, which can harm employees working nearby, or such movement can endanger employees by capsizing the vessel. However, it is not the purpose of these options to prevent any portion of the land crane/derrick from pulling vertically up from the deck when handling loads beyond the

[139] In this preamble the Agency uses the term "securing" and "secured" to refer collectively to the systems described in Options (1)-(4) in §§ 1926.1437(n)(5)(i) through (iv). The Agency notes that this definition differs from the term "positively secured" in subpart N in former § 1926.550(f)(1)(iv), which required that "mobile cranes on barges shall be positively secured." As OSHA stated in a letter of interpretation, the term "positively secured" in the subpart N means "physically attached" – similar to the type of system described in Option (1) of paragraph (n)(5)(i). (See OSHA's interpretation letter to Mr. Gary C. Hay, October 12, 2004 (ID -0014).)

land crane/derrick's rated capacity. Rather, these options will prevent horizontal rolling or shifting away from the land crane/derrick's proper location.

Paragraph (n)(5)(v) requires that the option selected for securing the equipment on the vessel be designed by a marine engineer, a registered professional engineer familiar with floating crane/derrick design, or a qualified person familiar with floating crane/derrick design. The Agency determined that expertise in floating crane/derrick design is necessary to design a securing system that meets the selected option's requirements and to prevent inadvertent movement of the equipment on the vessel/flotation device.

OSHA received no comments on any of the requirements in proposed paragraph (n)(5). Consequently, OSHA is retaining this paragraph in the final rule because properly securing land crane/derrick on the vessel/flotation device will maintain the stability of the vessel/flotation device, thereby preventing the vessel/flotation device from capsizing and endangering employees.

Paragraph (n)(6)[140] provides an exception stating that an employer does not have to secure mobile auxiliary cranes as required by paragraph (n)(5) when the employer demonstrates that specific conditions have been met. Typically, the movement of the mobile crane on these vessels does not adversely affect the stability of the floating crane/derrick because of the large size, displacement and design of the floating crane/derrick. The size and design of the floating crane/derrick also makes it less susceptible than other vessels to the effects of wind, waves, and other environmental conditions. OSHA finds that when the employer demonstrates meeting the criteria

[140] Formerly paragraph (n)(5)(vi) in the proposed rule.

specified by §§ 1926.1437(n)(6)(v) and (vi), employees will receive adequate protection from inadvertent horizontal movement of a mobile crane located on the deck of a floating crane/derrick.

Under paragraph (n)(6)(i), a written plan that is developed and signed by a marine engineer, or a registered professional engineer familiar with floating crane/derrick design, is required. OSHA finds that developing a written plan for the use of these cranes requires specialized knowledge and skill because of the catastrophic consequences to employees that could result if the task is not performed correctly.

Paragraph (n)(6)(ii), requires that the written plan be developed so that the applicable requirements of § 1926.1437 are met despite the position, travel, operation, and lack of physical attachment, corralling, use of rails, or use of cable system of the mobile auxiliary crane. For example, a section of the plan could address a vessel's stability while it is operating within specified dynamic and environmental conditions (see §§ 1926.1437(n)(6)(v) and (vi)), i.e., that the movement of the vessel under these conditions does not cause the mobile crane to shift horizontally, or that the maximum list and trim specified for vessel and mobile crane are not exceeded.

Under paragraph (n)(6)(iii), the plan must specify the areas of the deck where the mobile auxiliary crane is permitted to be positioned, travel, and operate. It must also specify the parameters (that is, limitations) of such movements and operation. For example, a section of the plan could limit movement of the mobile crane to a specified area without a load, and to another specified area while handling a load.

Under paragraph (n)(6)(iv), the employer must mark the deck to identify the permitted areas for positioning, traveling, and operating the mobile crane. This provision

is necessary so that the operator maneuvers and operates the crane within the permitted areas specified by the plan, thereby ensuring the stability of the vessel/flotation device and the safety of employees.

Under paragraph (n)(6)(v), the plan must specify the dynamic and environmental conditions that have to be present for the mobile auxiliary crane to move and operate on the vessel. Under § 1926.1437(n)(6)(v), if the specific dynamic and environmental conditions are not present, the mobile auxiliary crane must be secured according to one of the four options outlined in §§ 1926.1437(n)(5)(i) through (iv). For example, the plan must address environmental conditions, such as the maximum amount of wind and wave action permitted; if these conditions are exceeded, the mobile crane must be secured using one of the four options specified by § 1926.1437(n)(5). While OSHA received no comments on the requirements of this paragraph in the proposal, it is retaining this paragraph in the final standard as proposed because a properly prepared plan will ensure the structural integrity and stability of the vessel/flotation device, thereby protecting employees from drowning, impact, and other hazards.

Paragraph (n)(7)[141] contains requirements regarding the barge, pontoon, vessel or other means of flotation on which the land crane/derrick is located. The requirements § 1926.1437(n)(7) are identical to those listed at paragraph (m)(5) of this section. These requirements ensure the structural capacity of the vessel/flotation device to support the land crane/derrick and the loads handled by this equipment, as well as the stability of the vessel/flotation device. These provisions are designed to help prevent unintended movement while operating equipment and to prevent capsizing. OSHA finds these

[141] Formerly paragraph (n)(6) in the proposal.

requirements necessary to provide a safe, stable work environment. OSHA received no comments on this paragraph in the proposed rule. However, as with paragraph (m)(5), OSHA is retaining this paragraph in the final rule to ensure the stability of vessels/flotation devices during crane/derrick operations, thereby preventing employee exposure to drowning, impact, and other hazards associated with crane/derrick operations onboard vessels/flotation devices.

Section 1926.1438 Overhead and gantry cranes

As defined in § 1926.1401, overhead and gantry cranes include overhead/bridge cranes, semigantry cranes, cantilever gantry cranes, wall cranes, storage bridge cranes, launching gantry cranes, and similar equipment, irrespective of whether it travels on tracks, wheels, or other means. The Committee developed this definition to reflect the wide range of this type of equipment.

Overhead and gantry cranes are commonly found on general industry as well as construction worksites. Sometimes overhead and gantry cranes installed in general industry facilities are used for construction purposes (for example, the overhead/gantry crane in a factory is sometimes used when a part of the factory is being renovated). The Committee determined that applying the general industry standard for overhead and gantry cranes, § 1910.179, to the use of those cranes for construction work, rather than the requirements of new subpart CC, would reduce compliance burdens without jeopardizing employee protection. All comments received agreed it is reasonable to require cranes fitting this particular description to comply with § 1910.179 in lieu of requirements imposed under this subpart.

The rule therefore distinguishes between permanently installed overhead and gantry cranes and those that are not permanently installed. Overhead and gantry cranes permanently installed in a facility are considered an irremovable part of the property and are primarily used in general industry but may, on rare occasions, be used for construction activities. Generally, these cranes are installed in facilities and are not easily assembled or disassembled. They are typically physically fastened to a building and enhance the utility of the property. The requirements of § 1910.179, the general industry standard, and not subpart CC, apply to these permanently installed overhead and gantry cranes.

In contrast, overhead and gantry cranes used frequently for construction activities are generally not permanently installed in a facility. They tend to be more easily assembled or disassembled than their permanently installed counterparts. The determining factor of whether an overhead or gantry crane is or is not permanently installed is whether or not it is regarded as a permanent part of the facility. If it is intended as a temporary installation or meant to be removed from the property, then the overhead or gantry crane is not considered permanently installed, and subpart CC applies. For example, if an employer attaches the base of a gantry crane to a concrete slab at a building construction site for use in constructing the building, that gantry crane would be covered by the provisions in subpart CC.

Paragraph (a) Permanently installed overhead and gantry cranes

Section 1926.1438(a) applies the requirements of § 1910.179, with the exception of § 1910.179(b)(1), to six listed types of cranes and "others with fundamentally similar

characteristics," when they are used in construction and are permanently installed in a facility.. The requirements in subpart CC do not apply to these cranes. Section 1910.179(b)(1) sets forth the scope of the general industry standard as defined under 29 CFR part 1910. It is excluded to avoid any confusion that might arise from having two separate scope provisions applicable to § 1926.1438(a). Nonetheless, the types of overhead and gantry cranes covered under §§ 1926.1438(a) and 1910.179(b)(1) are the same, in that they all share fundamental characteristics. These cranes are grouped because they all have trolleys and similar travel characteristics.

Paragraph (b) Overhead and gantry cranes that are not permanently installed in a facility

Paragraph (b)(1) of this section provides the scope of § 1926.1438(b). By its terms, § 1926.1438(b) pertains to overhead and gantry cranes, overhead/bridge cranes, semigantry cranes, cantilever gantry cranes, wall cranes, storage bridge cranes, launching gantry cranes, and similar equipment having the same fundamental characteristics, when they are used in construction and are not permanently installed in a facility. The words "having the same fundamental characteristics" have been added to be consistent with the language in § 1926.1438(a).

Paragraph (b)(2) specifies which requirements apply to the equipment identified in § 1926.1438(b)(1).

Paragraph (b)(2)(i) requires overhead and gantry cranes not permanently installed in a facility to comply with §§ 1926.1400 through 1926.1414; §§ 1926.1417 through 1926.1425; §1926.1426(d); §§ 1926.1427 through 1926.1434; §§ 1926.1437, 1926.1439, and 1926.1441 of subpart CC. Sections 1926.1435, 1926.1436 and 1926.1440, entitled

Tower cranes, Derricks, and Sideboom cranes, respectively, are not applicable because they pertain to different kinds of equipment. Sections 1926.1415, 1926.1416 and 1926.1426(a)-(c) do not apply because they refer to devices not used on overhead and gantry cranes.

Paragraph (b)(2)(ii) requires employers to comply with the requirements of § 1910.179.

Paragraph (b)(2)(ii)(A) specifies the portions of § 1910.179 that are applicable to the equipment identified in § 1926.1438(b)(1). The Committee selected these requirements because each is a safety requirement that applies to this type of crane regardless of whether it is used in construction or general industry. Other than certain definitions (described below), these are the only provisions of § 1910.179 that apply to the equipment identified in § 1926.1438(b)(1). These requirements are:

§ 1910.179(b)(5) - Rated load marking
§ 1910.179(b)(6) - Clearance from obstruction
§ 1910.179(b)(7) - Clearance between parallel cranes
§ 1910.179(e)(1) - Trolley stops
§ 1910.179(e)(3) - Trolley bumpers
§ 1910.179(e)(5) - Guards for hoisting ropes
§ 1910.179(e)(6) - Guards for moving parts
§ 1910.179(f)(1) - Brakes for hoists
§ 1910.179(f)(4) - Brakes for trolleys and bridges
§ 1910.179(g) - Electric equipment
§ 1910.179(h)(1) - Sheaves
§ 1910.179(h)(3) - Equalizers
§ 1910.179(k) - Testing
§ 1910.179(n) - Handling the load

Section 1926.1438(b)(2)(ii)(B) states that the definitions in § 1910.179(a), except for “hoist” and “load,” apply to equipment covered by § 1926.1438(b). For those words, the definitions in § 1926.1401 apply. Only three terms are defined in both § 1926.1401 and § 1910.179: “hoist,” “load,” and “runway.”

With respect to "hoist" and "load," the definitions in §§ 1926.1401 and 1910.179(a) are similar but worded differently. "Hoist" is defined in § 1926.1401 as "a mechanical device for lifting and lowering loads by winding rope onto or off a drum." In § 1910.179, "hoist" is defined as "an apparatus which may be part of a crane, exerting a force for lifting and lowering." "Load" is defined in § 1926.1401 as "the object to be hoisted and the weight of the object being lifted or lowered, including the weight of the load-attaching equipment such as the load block, ropes, slings, shackles, and any other ancillary equipment." Section 1910.179 defines "load" as "the total superimposed weight on the load block or hook." In both cases, the § 1926.1401 definition is clearer and more precise.

With respect to "runway," the § 1926.1401 and § 1910.179 definitions address different subject matter. The definition in § 1926.1401 addresses the criteria for a ground surface used as a path of travel for a mobile crane traveling with a suspended personnel platform. The definition in § 1910.179 refers to the rails, beams, and other structural components along which an overhead or gantry crane travels. Because the § 1926.1401 definition of "runway" does not pertain to overhead and gantry cranes, the § 1910.179 definition applies under this section.

Paragraph (b)(2)(ii)(C) limits the application of § 1910.179(b)(2) to equipment identified in § 1926.1438(b)(1) that was manufactured before September 19, 2001. Section 1910.179(b)(2) requires cranes manufactured after August 31, 1971, to comply with the design specifications in American National Standard Safety Code for Overhead and Gantry Cranes, ANSI B30.2.0-1967. As discussed below, equipment manufactured after September 19, 2001, must comply with the updated provisions of ASME B30.2-

2001. Section 1926.1438(b)(2)(ii)(C) is a transitional provision covering equipment manufactured between August 31, 1971 and September 19, 2001. OSHA has made minor grammatical revisions to (b)(2)(ii)(C) for clarity.

Paragraph (b)(2)(iii) incorporates several sections of the 2001 version of ASME B30.2 into this section. Previously, ANSI B30.2.0-1967 applied through subpart N's former § 1926.550(d). The Committee agreed that the 2001 version should be used because it is more comprehensive than the 1967 version and thus more conducive to safety. The following sections are incorporated by reference: 2-1.3.1- Foundations and Anchorages; 2-1.3.2- Crane Runways; 2-1.4.1- Welded Construction; 2-1.6- Lubrication; 2-1.7.2- Ladders and Stairways; 2-1.8.2- Bridge Bumpers; 2-1.9.1- Bridge Rail Sweeps; 2-1.9.2- Trolley Rail Sweeps; 2-1.11- Truck Frame Drop; 2-1.12.2- Hoist Control Braking Means; 2-1.13.7- Lifting Magnets; 2-1.14.2- Drums; 2-1.14.3- Ropes; 2-1.14.5- Hooks; 2-1.15- Warning Devices or Means for a Crane with a Power-Traveling Mechanism; 2-2.2.2- Load Test; 2-3.2.1.1- Planned Engineered Lifts; and 2-3.5- Crane Lockout/Tagout, except that in 2-3.5.1(b), "29 CFR 1910.147," the OSHA general industry Lockout/Tagout standard, is substituted for "ANSI Z244.1."

When C-DAC drafted § 1926.1438(b)(2)(ii)(C), the current version of ASME B30.2 was the 2001 edition. That has since been superseded by a 2005 edition. OSHA notes that, in all material respects, the 2001 and 2005 versions of the provisions listed in § 1926.1438(b)(2)(iii) are the same. Except for sec. 2-1.8.2, the 2001 and 2005 provisions are identical.

Section 2-1.8.2 contains a wording change that does not substantively alter that provision. The 2001 version of sec. 2-1.8.2 contains the following requirement, among

others, for bridge bumpers: “energy-absorbing (or –dissipating) capacity to stop the bridge when traveling with power off in either direction at a speed of at least 40% of rated load speed.” In the 2005 version “(or –dissipating)” is changed to “(or energy-dissipating).” This is clearly a clarification rather than a substantive change. Accordingly, OSHA has changed § 1926.1438(b)(2)(iii) to refer to the 2005 version of ASME B30.2.

When employers engaged in construction work must lock or tag components of overhead and gantry cranes during maintenance and repair work, § 1926.1438(b)(2)(iii) requires them to comply with OSHA’s general industry lockout/tagout standard at § 1910.147 instead of the ANSI lockout/tagout standard (ANSI Z244.1) referenced in sec. 2-3.5.1(b) of ASME B30.2-2005. The Committee determined that the OSHA general industry lockout/tagout standard would be more accessible and familiar to employers in the construction industry than the ANSI standard. Therefore, requiring compliance with the OSHA standard will promote compliance and, as a result, improve worker protection.

One commenter suggested exempting all overhead and gantry cranes from the scope of subpart CC because they are rarely used in construction. (ID -0178.1.) While OSHA understands they are rarely used in construction, these cranes are at least occasionally used in construction. Were the Agency to delete this section entirely, these cranes (overhead and gantry cranes used in construction) would not be explicitly covered by any OSHA standard.

The same commenter reasoned that, because overhead cranes are primarily used in general industry and § 1910.179 does not require operator certification, an overhead crane operator who performs construction work only occasionally would need to be

certified for the occasional construction-related pick, but not for any other part of the job. As explained above, the rule distinguishes between permanently installed overhead and gantry cranes, which are primarily used in general industry, and those that are not permanently installed, which are primarily used in construction work.

The Committee determined that applying the general industry standard (§ 1910.179) to overhead and gantry cranes that are permanently installed in a facility and used for construction would reduce compliance burdens without jeopardizing employee protection. However, the use of overhead and gantry cranes that are not permanently installed in a facility, which are more frequently used for construction, presents concerns about employee safety that are particular to the construction environment. For these overhead and gantry cranes, the Committee applied the safety requirements in § 1910.179, which apply whether the crane is used in general industry or construction, along with portions of subpart CC to address the specific concerns about cranes used in construction. OSHA agrees.

The commenter recognized the Committee's concern when he stated that, unlike operators of rented or subcontracted mobile cranes, employers that deal with overhead cranes are very aware of the qualifications of their operators. (ID -0178.1.) OSHA determines that non-permanently installed overhead and gantry cranes used in construction present the same concerns as rented or subcontracted mobile cranes.

Finally, the commenter suggests that § 1926.1438 requires operator certification for certain classes of lifting equipment – pile drivers, derricks, and service trucks with hoisting devices – for which no certification programs currently exist. These three types of lifting equipment are not covered by § 1926.1438: dedicated pile drivers are covered

by § 1926.1439, which requires qualification or certification; operators of cranes used with a pile-driving attachment must be qualified or certified under § 1926.1427, and derricks are covered by § 1926.1436, which specifically states that § 1926.1427, *Operator qualification and certification*, does not apply. See the discussion above of § 1926.1400 regarding service trucks with hoisting devices. As noted in the explanation of § 1926.1427, OSHA has modified its operator certification requirements from the proposed rule to address certification of operators of equipment for which no certification program currently exists.

Another commenter sought clarification on whether § 1926.1438 applies to permanently installed overhead and gantry cranes located in facilities that may also involve construction related activities. (ID -0162.1.) As explained above, this section applies to permanently installed overhead and gantry cranes that are used in construction. Section 1926.1438(a) clearly states that the requirements of § 1910.179, except for § 1910.179(b)(1), apply to these cranes; in these instances, the requirements of subpart CC would not apply. Section 1926.1438 does not apply to permanently installed overhead and gantry cranes that are merely located in a facility that may also be involved in construction activities. The crane itself must be used in construction activities to trigger § 1926.1438.

Except as explained above, the Agency has therefore promulgated this provision as proposed.

Section 1926.1439 Dedicated pile drivers

This section covers equipment that is designed to function exclusively as a pile driver, as defined in § 1926.1401. Unlike the other equipment covered by this subpart, dedicated pile drivers are not designed primarily to hoist, lower, and horizontally move suspended loads. However, the Committee decided that the scope of this standard should cover dedicated pile drivers because their functions, and related hazards, are similar to those of cranes. For a complete discussion of the rationale for the coverage of dedicated pile drivers by this standard, see the discussion in the proposed rule at § 1926.1400, *Scope* (73 FR 59714, 59727-59728, Oct. 9, 2008).

As discussed below, most of the provisions of this subpart apply to dedicated pile drivers; however, this section includes provisions that address the unique characteristics of such equipment. In addition to the requirements of this subpart, pile driving equipment continues to be covered by § 1926.603, Pile driving equipment.

One commenter expressed support for the inclusion of § 1926.1439. (ID - 0158.1.) OSHA received no public comment in opposition.

Paragraph (a)

This paragraph provides that the requirements of subpart CC apply to dedicated pile drivers except as noted elsewhere in this section. The Agency changed the words "this standard" to "Subpart CC" in the final rule. With the exception of the clarification, this provision is promulgated as proposed.

Paragraph (b)

Paragraph (b) of this section provides that the requirements of § 1926.1416(d)(3) do not apply to dedicated pile drivers. Section 1926.1416(d)(3) requires that cranes manufactured after February 28, 1992, be equipped with anti two-blocking devices. This does not apply to dedicated pile drivers. As explained in the discussion of § 1926.1416(d)(3), anti two-block devices are not required during pile driving operations because the heavy repetitive forces imposed on such devices during pile driving cause the devices to malfunction.

For discussion of alternative requirements to anti two-blocking devices when hoisting an employee during pile driving operations, see § 1926.1431(p)(2). No comments were received for this paragraph; it is promulgated as proposed.

Paragraph (c)

Paragraph (c) of this section provides that the requirements of § 1926.1416(e)(4) (load weighing and similar devices) are applicable only to dedicated pile drivers manufactured more than one year after the effective date of this final rule. A load weighing and rated capacity device provides the operator of a dedicated pile driver with a reliable load weight prior to each lift to prevent equipment overload. C-DAC found that a phase-in period was necessary because of the technical challenges in designing this device to work consistently and reliably on a dedicated pile driver.

OSHA solicited public comment on the availability of load-weighing or rated capacity devices for dedicated pile drivers and the related issue of whether a date other than one year after the effective date of this standard would be an appropriate date for application of this requirement. OSHA received no public comment regarding the phase-

in requirements. The Agency changed the words "this standard" to "Subpart CC" in the final rule. With the exception of the clarification, this provision is promulgated as proposed.

Paragraph (d)

Paragraph (d) of this section provides that for § 1926.1433, only paragraphs (d) and (e) of § 1926.1433 apply to dedicated pile drivers. Paragraphs (d) and (e) of § 1926.1433, *Design, construction and testing*, are applicable to all equipment covered by this subpart, whereas the other provisions are applicable to specific types of equipment and are not relevant to dedicated pile drivers. (See discussion in § 1926.1433 for further explanation.)

In the proposed rule this paragraph referred to §§ 1926.1433(e) and (f); this was a clerical error. For the proposed rule, § 1926.1433 had been renumbered from what was in the C-DAC consensus document, but paragraph (d) did not get updated accordingly. OSHA has made this correction in the final rule. With the exception of the corrected referencing, this provision is promulgated as proposed.

Deletion of Proposed Paragraph (e)

The Committee concluded that there was no reason to exclude dedicated pile drivers from the requirements of § 1926.1427, *Operator qualification and certification*. The Committee was concerned, however, that because of the relatively few dedicated pile drivers in use, there would not be adequate market demand to support the availability of certification testing specific to such equipment. For the same reasons, the Committee

was concerned about the availability of auditors for auditing employer qualification programs for dedicated pile driver operators. C-DAC concluded that any lack of qualification or certification services specific to dedicated pile drivers would be alleviated by allowing qualification or certification on similar equipment, so proposed paragraph (e) of this section read:

> Section 1926.1427 (Operator qualification and certification) applies, except that the qualification or certification shall be for operation of either dedicated pile drivers or equipment that is the most similar to dedicated pile drivers.

After reviewing comments regarding § 1926.1427, OSHA decided to add language similar to proposed § 1926.1439(e) to § 1926.1427. See discussion of § 1926.1427(b)(2). In light of that change, OSHA has decided that it is not necessary to include proposed § 1926.1439(e) in the dedicated pile driver section of the final rule. The concerns addressed by that paragraph, as proposed, are now dealt with in § 1926.1427(b)(2), which covers dedicated pile drivers as well as other types of equipment covered by subpart CC.

Section 1926.1440 Requirements for Sideboom Cranes

"Sideboom crane" is defined in § 1926.1401 as "a track-type or wheel-type tractor having a boom mounted on the side of the tractor, used for lifting, lowering or transporting a load suspended on the load hook. The boom or hook can be lifted or lowered in a vertical direction only." No comments were submitted on this definition; it is promulgated as proposed. (See the discussion in the proposed rule explaining this definition at 73 FR 59868, Oct. 9, 2008.)

This section identifies which of the other sections of the final rule apply to this equipment and sets additional requirements. The limited requirements for sideboom cranes, compared to the requirements for other types of cranes, reflect the particular construction and limited functions of sideboom cranes. Sideboom cranes are of a limited capacity and require a relatively simple operation.

Paragraph (a)

Section 1926.1440(a) of the final rule states that the provisions of this standard apply with the exception of §§ 1926.1402, *Ground conditions*, 1926.1415, *Safety devices*, 1926.1416, *Operational aids*, and 1926.1427, *Operator qualification and certification*. As noted in the preamble to the proposed rule, the Committee exempted sideboom cranes from the requirements of these four sections because the Committee determined that, in light of the limited capacity and relative simplicity of operation of sideboom cranes, these requirements would be unnecessary (73 FR 59868, Oct. 9, 2008).

During the SBREFA process, one Small Entity Representative (SER) raised a question as to whether small sideboom cranes incapable of lifting above the height of a truck bed and with a capacity of not more than 6,000 pounds should be covered by the proposed rule. This SER recommended that these small sideboom cranes be exempted from the scope of subpart CC. Accordingly, OSHA asked for public comment about the appropriateness of such an exemption (see 73 FR 59868, Oct. 9, 2008). Two commenters responded to this issue. (ID -0205; -0213.) Both commenters expressed their belief that such equipment should be exempted from the final rule unless the equipment is being used outside the parameters of the equipment's design, but neither commenter provided

any explanation as to why the final rule should exempt such equipment. (ID -0205; -0213.) As discussed above, OSHA decided to exempt sideboom cranes from several provisions of the final rule. Absent any justification to provide additional relief for small-capacity sideboom cranes, OSHA concludes that the exemptions already provided in the final rule are appropriate, and will ensure the safety of workers who operate these cranes.

Paragraph (b)

This paragraph addresses the hazards posed by boom free fall (that is, "live" booms). As noted above in the discussion of § 1926.1426 (Free fall and controlled load lowering), in general, the use of equipment with live booms is prohibited. However, equipment manufactured before the ANSI B30.5 series prohibited live booms may use live booms under conditions specified in § 1926.1426(a)(2). The prohibition in § 1926.1426 applies to equipment manufactured on or after October 31, 1984. Equipment manufactured before that date may only use live booms when none of the free fall prohibitions outlined in § 1926.1426(a)(1) are present.

OSHA received no comments on proposed § 1926.1440(b). Therefore, in the final rule, this paragraph will retain the approach to live booms described in the proposal. Accordingly, final paragraph (b) of this section applies an approach to live booms used with sideboom cranes that is similar to the approach discussed above for § 1926.1426. The only difference is the cut-off date of manufacture for sideboom cranes with live booms. As explained above in the discussion of § 1926.1426(a)(2), in light of the history of the ANSI B30.5 prohibition against live booms, most equipment covered by this

standard manufactured after October 31, 1984, does not have live booms. In contrast, the ANSI/ASME standards applicable to sideboom cranes (ANSI/ASME B30.14) have never prohibited live booms. As a result, sideboom cranes with live booms continued to be manufactured after 1984. Consequently, under § 1926.1440(b), to avoid undue burden on employers, OSHA is designating the cut-off date of manufacture for sideboom cranes with live booms as the effective date of this final standard. Therefore, employers may continue to use sideboom cranes manufactured prior to this date in which the boom is designed to free fall, except under the conditions specified in § 1926.1426(a)(1). OSHA determines that these conditions will increase employee safety compared to current practices. No comments were submitted on this paragraph; it is promulgated as proposed.

Paragraph (c)

As drafted by C-DAC, this paragraph would have required that sideboom cranes meet specific requirements of ASME B30.14-1996 ("Side Boom Tractors"), as amended by ASME B30.14a-1997, B30.14b-1999, and B30.14c -2001. After the Committee completed its work, ASME consolidated the requirements of the 1996 standard and the amendments into ASME B30.14-2004. Final § 1926.1440(c) incorporates by reference several sections of ASME B30.14-2004 into the same 12 subparagraphs described in the proposed rule. While OSHA received no comments to proposed § 1926.1440(c), it decided to retain these 12 subparagraphs in the final rule because the Committee determined that these ASME requirements are necessary and appropriate for sideboom cranes, and represent current best practices for the industry.

The 12 subparagraphs retained in § 1926.1440(c) of the final rule refer to the following sections of ASME B30.14-2004: 14-1.1 ("Load Ratings"); 14-1.3 ("Side Boom Tractor Travel"); 14-1.5 ("Ropes and Reeving Accessories"); 14-1.7.1 ("Booms"); 14-1.7.2 ("General Requirements—Exhaust Gases"); 14-1.7.3 ("General Requirements—Stabilizers (Wheel-Type Side Boom Tractors)"); 14-1.7.4 ("General Requirements—Welded Construction"); 14-1.7.6 ("General requirements—Clutch and Brake Protection"); 14-2.2.2 ("Testing—Rated Load Test"), except that it applies only to equipment that has been altered or modified; paragraph (a) of 14-3.1.2 ("Operator Qualifications") except that the phrase "when required by law" is omitted; paragraphs (e), (f)(1)-(f)(4), (f)(6), (f)(7), (h), and (i) of 14-3.1.3 ("Operating Practices"), and paragraphs (j), (l),and (m) of § 1926.14-3.2.3 ("Moving the Load"). Regarding the last four of these sections, OSHA is stipulating exceptions, or requiring employers to comply with only specified provisions. OSHA wanted to avoid any duplication, conflicts or possible confusion, so the final rule does not incorporate provisions of the ASME standard that deal with issues addressed by other provisions of this standard. The incorporated provisions consist of requirements that are specific to sideboom cranes.

Section 1926.1441 Requirements for equipment with a rated hoisting/lifting capacity of 2,000 pounds or less

Section 1926.1441 establishes the requirements applicable for equipment with a maximum-rated hoisting/lifting capacity of 2,000 pounds. The section covers equipment designed and built at the jobsite, as well as manufactured equipment. In the proposal, the introductory paragraph used the term "manufacturer-rated" that appeared in the C-DAC

Document. OSHA requested public comment on this whether to use the term "rated" instead of "manufacturer-rated" to clarify that the section applied to both jobsite-built and manufactured equipment. OSHA received only two comments, and both commenters supported this revision because it would clarify application of the section. (ID -0205.1; -0213.1.) Therefore, OSHA made the proposed revision in the final rule.

OSHA also solicited public comment on whether the maximum rated capacity for application of this section should be revised because of crane-technology advancements or other considerations. Two commenters, one from the sign-installation industry and the other from the utilities industry, commented that OSHA should increase the maximum rated capacity cut-off for application of this section to not more than 10,000 pounds. (ID -0162.1; -0189.1.) The sign-installation representative commented that the operator-qualification requirements of § 1926.1441 would encourage employers to use smaller cranes at or near their maximum rated capacity. This commenter indicated that using 2,000-pound rated-capacity equipment in such a way is less safe than using higher capacity equipment, which would be operated below its rated capacity, and at a more optimum boom angle. The utilities-industry commenter suggested coupling the 10,000 pound cut-off with a boom length of 25 feet. A representative from the materials-delivery industry, testified during the hearing of the proposed rule that OSHA should exempt truck-mounted articulated-boom loaders of 10,000 pounds or less, stating that the state of California has such an exemption. (ID -0343.)

Another commenter, from the home-building industry, believed that OSHA should raise the capacity cut-off to 70,000 pounds and 120 feet of boom because this industry frequently performs light load lifts such as hoisting roofing and framing

materials. (ID -0232.) OSHA notes that the ground conditions at residential construction sites are often hazardous to crane operation because the soil at new-home construction sites is often disturbed. In addition, there may be voids, such as conduits and sewers, underneath the soil around existing homes. Power lines also are common at these sites. Furthermore, cranes used in residential construction not only hoist loads to structures, but also hold loads in position during installation activities, often with significant boom extension. A representative from a major crane-rental company shared similar concerns during the public hearing about the hazards of boom trucks used to perform relatively light lifts in support of residential-construction activities. (ID -0344.) This witness stated that boom-truck cranes present greater risk of tip over than larger cranes with wider outrigger bases and greater stability, and that an inexperienced operator with a rented crane (i.e., bare rental) may not have this knowledge. This witness believed that the operators of bare rental cranes do not completely understand how much the capacity of the equipment decreases as the boom extends further. The witness described crane incidents in which operators of small cranes tipped equipment or dropped bundles of roofing materials at residential-construction sites, and provided numerous photographs of crane failures at these sites. (ID -0345.7.)

Two commenters stated that they believe the 2,000-pound limit is appropriate. (ID -0205.1; -0213.1.) Discussion at the hearing also addressed the appropriateness of the 2,000 pound capacity limitation. For example, a representative of a major local government testified about the city's experiences with smaller cranes, and explained that smaller cranes, like some knuckle-boom cranes, lift heavier loads and extend their booms further than older cranes, allowing materials-delivery personnel at construction sites to

position and hold materials for contractors during installation and erection activities. (ID -0342.) The city representative stated that, when employers perform these activities with greater capacity equipment, employers typically plan for those operations; however, the same planning is not necessarily done by employers when using smaller capacity equipment for the same activities (i.e., lifting, moving, and landing materials).

After reviewing the comments and testimony received on this issue, OSHA finds no persuasive evidence that justifies revising the capacity cut-off for the application of the requirements § 1926.1441. The record provides no evidence that the hazards are different for equipment in the rated capacity range from 2,000 to 10,000 pounds than the hazards associated with equipment not covered by § 1926.1441. The myriad hazards addressed by this standard, including, for example, inadequate ground conditions, power lines, ineffective signal communications, overloading, and inadequate operator knowledge/ability, also are applicable to equipment in this capacity range. As noted in the discussion of § 1926.1427, some hazards may be increased because these cranes are often used in tight spaces. Therefore, OSHA determines that the cut-off point of 2000 pounds or less as proposed is appropriate. This conclusion is consistent with the judgment of the Committee as described in the proposal (73 FR 59869, Oct. 9, 2008).

Paragraph (a) of this section lists the provisions of this subpart that apply to equipment covered by this section. OSHA did not receive any comments on proposed paragraph (a) and is deferring to the Committee's determination that the hazards addressed by these provisions apply irrespective of the equipment's rated capacity. For example, the dangers associated with making electrical contact with a power line do not depend on the lifting capacity of the equipment, so C-DAC determined that §§

1926.1407-1926.1411 on power line safety should apply to all equipment regardless of rated capacity. Similarly, the other provisions listed in this paragraph apply to equipment with a rated capacity of 2,000 pounds or less to the same extent that those sections apply to that type of equipment with a rated capacity in excess of 2,000 pounds. To avoid confusion, OSHA is including references in this final paragraph (a) to provisions located and required in other paragraphs of proposed § 1926.1441. Therefore, paragraph (a) now also references §§ 1926.1403, 1926.1406, 1926.1412(c), and 1926.1425 (except 1926.1425(c)(3)).

Paragraph (b) of this section sets forth requirements for the assembly/disassembly of cranes covered by this section, and duplicates requirements specified elsewhere in this subpart. In this regard, paragraph (b)(1) requires that equipment covered by this section meet the requirements of §§ 1926.1403 and 1926.1406 for assembly/disassembly, while paragraph (b)(2) consists of requirements for the components and configuration of equipment covered by this section. OSHA received no comments on these two paragraphs. Paragraph (b)(1) refers to §§ 1926.1403 and 1926.1406 of this subpart, and the preamble discussion above provides an explanation of these sections, and OSHA's rationale for including, them in the final rule. Because §§ 1926.1403 and 1926.1406 are included in paragraph (a), OSHA has modified the language in paragraph (b)(1) for clarity. The requirements set forth under paragraph (b)(2) duplicate the requirements specified by §§ 1926.1404(m)(1), (m)(1)(i), (m)(1)(ii), (m)(2), and (n) of this subpart; see the discussion under § 1926.1404(m) and (n) of this preamble for an explanation of these provisions, and OSHA's rationale for adopting them in the final rule.

Paragraph (b)(3) requires employers to comply with manufacturer prohibitions for equipment covered by this section. The same requirement applies to higher-capacity equipment under § 1926.1404(n). OSHA received no comments on the proposed paragraph and is including the provision in the final rule as proposed because the Committee agreed that manufacturers' prohibitions are designed to prevent hazards that can arise with the use of their products.

Paragraph (c) of this section specifies procedural requirements for operating the equipment. Paragraph (c)(1) requires the employer to comply with all manufacturer procedures applicable to equipment operation, including equipment operation with attachments. The same requirement applies to higher-capacity equipment under § 1926.1417(a). OSHA received no comments on the proposed paragraph and is including the provision in the final rule as proposed because the Committee agreed that manufacturer procedures are designed to prevent hazards that can arise with the use of their products.

The requirements in paragraph (c)(2) apply to equipment for which manufacturer operating procedures are unavailable. Under these conditions, paragraph (c)(2)(i) requires the employer to develop, and ensure compliance with, the procedures necessary for the safe operation of the equipment and its attachments.

Paragraph (c)(2)(ii) specifies that the employer must ensure that a qualified person develops the procedures for operational controls. The Committee concluded that, because these procedures are highly complex and critical to operational control of the equipment, a qualified person has the high degree of expertise necessary to ensure proper development of the control procedures.

When the employer develops the operating procedures for this equipment, paragraph (c)(2)(iii) requires that procedures related to the capacity of the equipment be developed and signed by a professional engineer familiar with the equipment. The Committee concluded that, because the type and complexity of engineering analysis needed to develop safe procedures related to capacity, a registered professional engineer who is familiar with the equipment must perform this task. The Committee also agreed that signing the procedures was necessary to ensure that the engineer performed the task with the requisite level of care.

No commenters responded to the provisions of proposed paragraph (c). OSHA is adopting these provisions in the final rule as proposed because 1) the provisions are consistent with the consensus reached by the Committee, and 2) will ensure that, absent manufacturer procedures, employers develop procedures that will protect workers as effectively as operating procedures developed by the equipment manufacturer when implemented as required.

Paragraph (c)(3) of the final rule addresses the provision of operating information to the equipment operator. Equipment covered by this section may not have an operator's cab; therefore, paragraph (c)(3)(i) requires that the load chart be made available to the operator at the control station rather than in the cab. The Committee developed this provision to prevent cranes from being used to perform operations beyond their rated capacities. The Committee determined that the load chart must be readily available to crane operators since capacity varies according to a variety of factors addressed in such charts, including, for example, boom length, radius, boom angle, and equipment configuration. OSHA received no comments on the proposed paragraph and

is including the provision in the final rule as proposed based on the rationale provided by the Committee

Under paragraph (c)(3)(ii), employers must ensure that required procedures, recommendations, warnings, instructions, and operator's manual be readily available for use by the operator. Again, this provision covers equipment with and without a cab. The consensus of the Committee was that operators must have easy access to the information in these materials to operate the equipment safely. No comments were received on this provision and OSHA is including this provision in the final rule as proposed.

When rated capacities are available at the control station only in electronic form and a failure occurs that makes the rated capacities inaccessible, paragraph (c)(3)(iii) requires employers to ensure that the crane operator immediately ceases operations or follows safe shut-down procedures until the rated capacities become available again. The Committee agreed that it is unsafe to continue to operate the equipment if the rated capacities are inaccessible to the operator. No comments were received on this provision and OSHA is adopting this requirement in the final rule as proposed.

Paragraph (d) of this section specifies requirements for safety devices and operational aids for the equipment. In this regard, paragraph (d)(1) requires that employers maintain safety devices and operational aids that are part of the original equipment in accordance with manufacturer procedures. (Note: This requirement applies to anti two-block devices used on equipment covered by this section manufactured before the effective date of this final standard; see discussion of anti two-block device under paragraph (d)(3) below.) The Committee determined that the full range of safety devices and operational aids required by §§ 1926.1415 and 1926.1416 of this subpart were not

generally needed for the safe operation of this low-capacity equipment. However, the Committee also concluded that, if the manufacturer included such devices or aids, it is probable that the manufacturer's design relies on them working properly for the equipment to operate safely. Therefore, it is appropriate for the standard to require them to be maintained in accordance with the manufacturer's procedures. No comments were received on this provision and OSHA is retaining this paragraph in the final standard as proposed.

Under paragraph (d)(2), employers must ensure that the equipment covered by this section and manufactured more than one year after the effective date of this final standard be equipped either with an anti-two block device that meets the requirements of § 1926.1416(d)(3), or be designed so that no damage or load failure occurs in the event of a two-block situation. The provision also identifies an example of equipment designed to prevent equipment damage load failure, i.e., when the power unit of the machine stalls in the event of a two-block situation. In such a case, the power unit does not have sufficient power to cause the load to fail or to damage the equipment. Instead, when the two-block situation occurs, the power unit stalls, which prevents the load from falling. The purpose of this paragraph is to prevent equipment damage or failure stemming from contact between a component on the hoist line and the boom tip, which occurs during a two-block situation. Such contact can lead to a damaged or severed load line, as well as other types of equipment failure.

The Committee agreed to provide employers with discretion to choose between two options for eliminating two-block hazards. The first option prevents a two-block situation from occurring, while the second option prevents equipment damage and load

failure if a two-block situation occurs. The Committee determined that, for the equipment cover by this section, each option protects employees equally well. Regarding the first option, the anti two-block device used must meet the requirements for such devices specified by § 1926.1416(d)(3). Paragraph (d)(3) of § 1926,1416 addresses two types of anti two-block devices: the warning type, and the automatic-prevention type (see the discussion of these devices above under § 1926.1416(d)(3) of this preamble). The type required depends on the type of crane and the date of manufacture. However, § 1926.1416(d)(3) requires that employers use the automatic-prevention type on equipment manufactured more than one year after the effective date of this final standard. Therefore, since the requirement in § 1926.1441(d)(2) only applies to equipment manufactured more than one year after the effective date of this final standard, and to remain consistent with § 1926.1416(d)(3), the anti two-block device used on equipment covered by this section must be the automatic-prevention type. The Committee concluded that it would be inappropriate to apply this requirement to equipment manufactured before either a voluntary consensus standard or federal requirement is in place. Therefore, this paragraph applies to equipment manufactured more than one year after the effective date of this final standard.

OSHA received no comments on any provision of proposed paragraph (c). Based on the Committee's rationale for these provisions, and the increased safety afforded to employees, OSHA is adopting these provisions in the final rule as proposed.

Paragraph (e) of this section requires that, before operating equipment, employers train operators on the safe operation of the type of equipment the operator will be using. OSHA received two comments on the proposed paragraph. The first commenter believed

the 2,000 pound cut-off was too low and, because the operators would not have to be certified, employers will use lower-capacity cranes to perform construction jobs that require higher-capacity equipment. (ID -0189.) The second commenter stated that certification of the operators of low-capacity cranes is unnecessary in the home-building industry, but offered no rationale for this position. (ID -0232.)

OSHA notes that the problem of overloading equipment would exist even at a higher cut-off point. The only way to eliminate this problem would be to require operator qualification/certification pursuant to § 1926.1427 for all equipment, including equipment covered by this section. The Committee concluded that it is appropriate to exempt lower-capacity equipment from the operator qualification/certification requirements of § 1926.1427. Consistent with the Committee's consensus, OSHA finds that training operators in the safe operation of the equipment as required by this final standard reduces the likelihood of accidents and injuries by minimizing operator error; therefore, the operator certification/qualification procedures required for higher-capacity equipment under § 1926.1427 are not necessary for this lower-capacity equipment.

Under paragraph (f) of this section, employers must ensure that signal persons are trained in the proper use of signals applicable to the use of equipment covered by this section. Although the equipment covered by this section has a low capacity, in some circumstances its safe operation depends on signals given by a signal person. Accordingly, this paragraph ensures that communication between the crane operator and the signal person is clear and effective. However, the Committee concluded that the comprehensive signal-person qualification procedures required for higher-capacity equipment under § 1926.1428, *Signal person qualifications*, are not needed for this

equipment. OSHA received no comments on proposed paragraph (f) and is including the provision in the final rule as proposed based on the rationale provided by the Committee.

Proposed paragraph (g) of this section required that equipment covered by this section comply with § 1926.1425, *Keeping clear of the load*, except for § 1926.1425(c)(3); § 1926.1425(c)(3) specifies that materials be rigged by a qualified rigger. The Committee determined that, in light of the limited capacity of this equipment, it was unnecessary to require a qualified rigger. OSHA received no comments on the proposed provision and is deferring to the Committee's determination. As noted in the discussion of paragraph (a) above, the requirement for the employer to comply with § 1926.1425 (except for § 1926.1425(c)(3)) has been added to the provisions listed in paragraph (a). Therefore, OSHA is removing and reserving paragraph (g) in this final rule because the requirements proposed in paragraph (g) are now required in final paragraph (a).

According to paragraph (h) of this section, employers must ensure that equipment covered by this section is inspected pursuant to the manufacturer's procedures. The Committee concluded that these inspections are sufficient to detect conditions that could lead to equipment failure because manufacturers typically recommend procedures designed to prevent hazards that can arise during equipment operation. The Committee concluded that the comprehensive inspection procedures required for higher-capacity equipment under § 1926.1412 are not needed for lighter, less complicated, equipment. OSHA received no comments on the proposed paragraph and is adopting this paragraph in the final rule as proposed based on the rationale provided by the Committee.

Paragraph (j) of this section prohibits using equipment covered by this section to hoist personnel. OSHA received no comments on the proposed paragraph and is including it in the final rule as proposed because the Committee determined that the low capacity and light construction of this equipment makes it unsuited for lifting personnel safely.

Under paragraph (k) of this section, employers must ensure that a qualified engineer designs the equipment. The Committee noted that some employers may design and construct this type of equipment themselves, rather than using equipment built by a manufacturer. The Committee developed this provision to ensure that, in such cases, the design of such equipment is sufficient to protect employees exposed to it. OSHA received no comments on the proposed paragraph and is retaining it in the final standard as proposed based on the Committee's rationale.

Section 1926.1442 Severability

The Agency is including a standard severability clause to express the Agency's intent that if any court of competent jurisdiction renders any provision in subpart CC unenforceable, the remaining provisions of the subpart would remain in effect.

V. PROCEDURAL DETERMINATIONS

A. Legal Authority

The purpose of the Occupational Safety and Health Act, 29 U.S.C. 651 et seq. ("the Act"), is "to assure so far as possible every working man and woman in the Nation

safe and healthful working conditions and to preserve our human resources." 29 U.S.C. 651(b). To achieve this goal, Congress authorized the Secretary of Labor to promulgate and enforce occupational safety and health standards. See 29 U.S.C. 654, 655(b), and 658. A safety or health standard "requires conditions, or the adoption or use of one or more practices, means, methods, operations, or processes, reasonably necessary or appropriate to provide safe or healthful employment and places of employment." 29 U.S.C. 652(8).

A safety standard is reasonably necessary or appropriate within the meaning of 29 U.S.C. 652(8) if it substantially reduces or eliminates a significant risk of material harm in the workplace; is economically and technologically feasible; uses the most cost effective protective measures; is consistent with or is a justified departure from prior Agency action; is supported by substantial evidence; and is better able to effectuate the Act's purposes than any relevant national consensus standard. See *UAW v. OSHA*, 37 F.3d 665, 668 (D.C. Cir. 1994)("LOTO"). In addition, safety standards must be highly protective. See *id.* at 669.

A standard is technologically feasible if the protective measures it requires already exist, can be brought into existence with available technology, or can be created with technology that can reasonably be expected to be developed. See, e.g., *American Iron & Steel Inst., Inc. v. OSHA*, 939 F.2d 975, 980 (D.C. Cir. 1991) (per curiam) ("AISI"). A standard is economically feasible if industry can absorb or pass on the costs of compliance without threatening its long-term profitability or competitive structure. See, e.g., *AISI*, 939 F.2d at 980. A standard is cost effective if the protective measures it requires are the least costly of the available alternatives that achieve the same level of

protection. See *LOTO*, 37 F.3d at 668.

Section 6(b)(7) authorizes OSHA to include among a standard's requirements labeling, monitoring, medical testing, and other information gathering and transmittal provisions. 29 U.S.C. 655(b)(7). Finally, the OSH Act requires that, when promulgating a rule that differs substantially from a national consensus standard, OSHA must explain why the promulgated rule is a better method for effectuating the purpose of the Act. 29 U.S.C. 655(b)(8). Deviations from relevant consensus standards are explained elsewhere in this preamble.

B. Executive Summary of the Final Economic Analysis; Final Regulatory Flexibility Analysis

1. Introduction and Summary

For the final Cranes and Derricks standard, the Agency is presenting this Executive Summary of the Final Economic Analysis (FEA) in this preamble; while the full FEA will be available in the docket. The complete Final Regulatory Flexibility Analysis is also presented here.

The Occupational Safety and Health Act of 1970 (OSH Act) requires OSHA to demonstrate the technological and economic feasibility of its rules. Executive Order (E.O.) 12866 and the Regulatory Flexibility Act (RFA), as amended in 1996, require federal agencies to analyze the costs, benefits, and other consequences and impacts, including small business impacts, of their rules.

The final cranes standard is an economically significant action under E.O. 12866 and a major rule under the Congressional Review Act (SBREFA). In addition, as required by the RFA, the Agency has assessed the potential impacts of this final rule on small entities and has prepared a Final Regulatory Flexibility Analysis. This rule is not a significant federal intergovernmental mandate, and the Agency has no obligations to conduct analyses of this rule under the Unfunded Mandates Reform Act of 1995; however the rule has costs of over $100 million per year on the private sector, and is thus subject to the requirement under UMRA for review of private-sector costs. These requirements are met in this section.

The purpose of the Final Economic Analysis is to identify the establishments and industries affected by the final standard; evaluate the standard's costs, benefits, and economic impacts; assess the technological and economic feasibility of the final standard for affected industries; and evaluate the appropriateness of regulatory and non-regulatory alternatives to the rule. The FEA has been developed according to the requirements of E.O. 12866 and the OSH Act. In addition, in accordance with the RFA as amended by the SBREFA, this analysis identifies and estimates the impacts of the proposal on small businesses, using the Small Business Administration's (SBA's) industry-specific definitions of small businesses. In addition, OSHA assessed the impacts of the rule on very small businesses; i.e., those with fewer than 20 employees.

The FEA differs in several respects from the preliminary economic analysis (PEA). Several affected general industry sectors have been added to the original analysis, based on comment during the rulemaking—for example, electric utilities, telecommunications, sign manufacturers, natural gas pipelines, and shipyards—an

estimated 22,000 potentially affected establishments in all. Costs have been revised for employer duties for assembly/disassembly and ground conditions, power line work, and crane operator certification, as well as inspections (due to an error in the PEA). New costs have been estimated for meeting ground conditions' provisions ($2.3 million annually). Estimated costs for assembly/disassembly have been decreased in this final analysis, from about $33 million annually in the PEA to about $16 million, primarily due to an increase in current compliance (baseline) and estimated costs also fell for inspections (from $21 million annually to $16.5 million). Estimated costs for several provisions have been increased from the PEA: for work near power lines (from $30 million annually to $68 million) and for crane operator certification (from $37 million annually to about $51 million, primarily due to an increase in the unit cost, many more operators potentially needing certification in the affected general industry sectors, but decreased by the higher current baseline). Overall, estimated costs increased from the $83 million annually in the PEA to about $154 million. The final benefits analysis is based on four years' of IMIS fatality reports, rather than BLS's Census of Fatal Occupational Injuries as in the preliminary analysis, as it was not possible to use the CFOI data to estimate the number of fatalities that were occurring due to crane construction activity by employers in general industry sectors. The Agency estimates that compliance with the final standard will prevent 22 fatalities and 175 non-fatal injuries per year, compared to 53 fatalities estimated to be avoided in the PEA.

The Agency also estimates that compliance will result in considerable cost saving by preventing many more accidents that do not result in injury. The Agency has estimated that annual savings from avoiding project delay, damage to cranes and

structures, and lost productivity is at least $7 million annually just from one type of crane accident—tipovers. The Agency has not attempted to quantify all of the costs avoided by all crane accidents prevented by the final standard, but concludes these cost savings are also substantial. In addition, the Agency has noted that a significant portion of these benefits will be passed back immediately to employers in the form of $51 million annual savings in liability insurance costs for the affected industries.

OMB requires agencies to monetize benefits where possible. The Agency is revising its estimate of the VSL presented in the PEA, which was based on an EPA estimate from the early 1990s. The VSL is estimated to be about $7 million in terms of 2000 dollars (Viscusi and Aldy, 2003). At the same time the willingness-to-pay to avoid serious injury was estimated to be about $50,000. The Agency is adjusting the values based on the change in the GDP implicit price deflator from 2000 to 2010 of about 25 percent (Bureau of Economic Analysis, "National Economic Accounts," Table 1.1.9 at www.bea.gov/national/nipaweb). The VSL is then $8.7 million and the monetized value of avoiding a serious, non-fatal injury is $62,500. When fatalities and injuries are monetized, the total monetized benefits of the standard from preventing crane accidents is $202.3 million annually from those sources.

The Agency estimates that the total cost of the final standard is about $154.1 million annually. Based on comment in the record, the Agency increased unit costs for ground conditions and "controlling entity" duties for some sectors, crane operator certification, and power line compliance provisions. The record showed that relatively more crane operators are already certified, and the Agency reduced costs by that factor. The total estimated costs increased due to the inclusion of some general industry sectors

which perform construction activities, as well as increases in unit costs. The net benefit of the standard is $55.2 million annually (total benefits of $ 209.3 million less costs of $154.1 million annually).

The economic impact on affected employers, in terms of costs versus revenues, ranged from 0.01 percent to 0.2 percent, for an average-size employer. When annual costs are compared to profits, impacts range from 0.1 percent to 4 percent, for the average employer. Impacts were highest for employers who owned and rented cranes. The final standard is technologically feasible for employers as it does not contain any requirements that are not capable of being done. The Agency also concludes that the final standard is economically feasible, as the highest impacts are on employers who own and rent cranes and even that impact is no more than 4 percent. Cost and impacts of that magnitude are far less than the typical yearly swings in revenues and profits for the construction industry. Economic impacts on small business are presented below in the Final Regulatory Flexibility Analysis.

Based on comment in the record, some employees may bear the cost of crane operator certification (that is, pay for their own certification). The Agency attributes all costs of crane operator certification to employers in the analysis, though. There may also be language and literacy barriers for operator certification that some current operators may not be able to surmount. Table B-1 summarizes the benefits and costs of this final standard.

Table B-1

Annual Benefits, Costs, and Net Benefits, 2010 dollars

Annualized Costs*

Crane Assembly/Disassembly	$16.3 million
Power Line Safety	$68.2 million
Crane Inspections	$16.5 million
Ground Conditions	$ 2.3 million
Operator Qualification and Certification	$50.7 million
Total Annual Costs:	$154.1 million
Annual Benefits	
Number of Injuries Prevented	175
Number of Fatalities Prevented	22
Property Damage from Tipovers Prevented	$7 million
Total Monetized Benefits	$209.3 million
Annual Net Benefits (Benefits minus Costs):	$55.2 million

Source: OSHA Office of Regulatory Analysis.
*Costs with 7% discount rate. Total costs with 3% discount rate: $150.4 million annually.

2. Need for the Rule and Market Failure

Occupational safety problems, such as safety problems associated with cranes and derricks, routinely involve the following characteristics that lead to market failures:

1) A variety of situations in which one party (employers, fellow employees) take actions that impose risks of death and injuries on other parties (employees);
2) The risk in question may not be well understood by any party, or also subject to asymmetric information (the employer will typically no more about the risks than employees);
3) The costs of the risks are routinely transferred to other parties who typically lack the information necessary for a precise estimate of the costs of the transfer, or are not permitted to price transfers appropriately (insurers are routinely forced to use premium systems that do not capture all possible knowledge about risk).

These characteristics mean that markets will not adequately capture the risk involved, and thus regulations are needed. (See Chapter 1 of the FEA for more detail.)

3. Industry Profile/Affected Industries

The final standard would affect employers and employees across most construction industry sectors as well as some in some general industry sectors where cranes and derricks are used as part of the performance of work duties. These industries include firms involved in renting cranes for use in construction projects such as: multi-family housing; industrial buildings and warehouses; other nonresidential buildings; highway and street construction; and water, sewer, power, and communication line construction. As in the preliminary economic analysis (PEA), the Agency has grouped affected establishments, by industry, into the following categories for analyzing the final standard:

- Crane Rental with Operators,
- Crane Rental without Operators,
- Own and Rent Cranes with Operators,
- Own but Do Not Rent, and
- Crane Lessees in the Construction Industry (referred to simply as "Crane Lessees" throughout).

The affected firms and establishments, including information on number of employees, revenues, and profits, are presented below in Table B-2. In some sectors the number of cranes has changed from the PEA because the analysis has been updated with revenue data from the 2006 County Business Patterns (CPB) and Statistics of U.S. Businesses (SUSB), and in those sectors the number of cranes was estimated from revenues.

The PEA accompanying the proposed standard presented an industry profile describing crane use in all sectors of the traditional construction industries, the current NAICS 233-236 (the older SICs 16, 17, and 18) and the crane rental industry sector in general industry, NAICS 53214. There were no comments objecting to the inclusion of these sectors in the economic analysis. However, there was comment from some general industry sectors following publication of the proposal. They noted that the PEA had focused exclusively on the construction industry and had not captured costs or benefits for general industry employers who own equipment covered by the standard and engage in construction activity in addition their primary work in the various general industry sectors.

Table B-2
Industrial Profile of Affected Firms and Establishments for the Proposed Standard

NAIC	Industry	Affected			Profit	Average Per Estab.	
		Firms	Estabs	Employees	Rate	Revenues $1,000	Profits $1,000
Crane Rental with Operators							
238990	All Other Specialty Trade Cont.	1,244	1,304	16,244	4.56%	$1,918	$88
Crane Rental without Operators (Bare Rentals)							
532412	Const./Min./For. Machine & Equip.	2,137	3,702	48,481	6.42%	$3,427	$220
Own and Rent Cranes with Operators							
236115	New Single-Family Housing Const.	178	178	261	4.67%	$220	$10
236118	Residential Remodelers	25	25	45	4.67%	$443	$21
236210	Industrial Building Construction	9	12	1,067	4.67%	$12,213	$571
236220	Commercial and Institutional Building	23	31	757	4.67%	$4,157	$194
237110	Water and Sewer Line and Related Struct.	52	69	1,432	5.22%	$4,107	$214
237120	Oil and Gas Pipeline and Related Struct.	20	26	1,457	5.22%	$5,510	$288
237130	Power and Communication Line and Rel.	34	34	666	5.22%	$2,880	$150
237310	Highway, Street, and Bridge Construction	80	107	6,456	5.22%	$11,783	$615
237990	Other Heavy and Civil Engineering Const.	76	101	5,857	5.22%	$10,201	$533
238110	Poured Concrete Foundation and Struct.	261	261	4,328	4.42%	$2,273	$101
238120	Structural Steel and Precast Concrete	200	266	7,389	4.42%	$3,439	$152
238130	Framing Contractors	26	26	120	4.42%	$153	$7
238150	Glass and Glazing Contractors	42	42	328	4.42%	$616	$27
238170	Siding Contractors	5	5	18	4.42%	$496	$22
238190	Other Foundation, Structure, and Building	49	65	1,145	4.42%	$1,509	$67
238210	Electrical Contractors	15	15	176	4.32%	$1,303	$56
238220	Plumbing, Heating, and Air-Conditioning	2	3	196	3.86%	$5,835	$225
238290	Other Building Equipment Contractors	113	151	4,076	4.42%	$3,474	$154
238320	Painting and Wall Covering Contract.	21	21	159	4.42%	$916	$41
238910	Site Preparation Contractors	400	400	4,706	4.56%	$1,668	$76

	Subtotal	**1,630**	**1,838**	**40,639**			
Own but Do Not Rent							
236115	New Single family housing construction	3,097	3,097	13,621	4.67%	$1,520	$71
236116	New Multifamily housing construction	217	217	2,219	4.67%	$5,477	$256
236117	New housing operative builders	1,699	1,699	12,015	4.67%	$6,021	$281
236118	Residential Remodelers	985	985	3,201	4.67%	$646	$30
236210	Industrial building construction	276	325	9,359	4.67%	$5,931	$277
236220	Commercial and Institutional Bldg. Const.	4,141	4,141	71,536	4.67%	$7,177	$335
237110	Water and Sewer Line Const.	1,028	1,371	20,306	5.22%	$3,239	$169
237120	Oil and gas pipeline construction	128	171	9,276	5.22%	$9,189	$480
237130	Power and communication line const.	213	285	12,600	5.22%	$5,581	$291
237210	Land subdivision	0	0	0	11.04%	$2,878	$318
237310	Highway, street and bridge const.	88	118	4,308	5.22%	$8,279	$432
237990	Other heavy and civil eng.	273	273	7,564	5.22%	$3,965	$207
238110	Poured Concrete foundation and struct.	267	267	3,070	4.42%	$1,682	$74
238120	Structural steel and precast concrete	334	334	7,250	4.42%	$2,712	$120
238130	Framing Contractors	1,395	1,395	11,834	4.42%	$936	$41
238140	Masonry Contractors	137	137	1,304	4.42%	$876	$39
238150	Glass & Glazing Contractors	54	54	504	4.42%	$1,470	$65
238160	Roofing Contractors	197	197	2,262	4.42%	$1,390	$61
238170	Siding Contractors	53	53	215	4.42%	$580	$26
238190	Other foundation, structure, building, ext.	25	25	158	4.42%	$1,013	$45
238210	Electrical Contractors	78	78	771	4.32%	$1,321	$57
238220	Plumbing, Heating and Air-conditioning Cont.	98	98	974	3.86%	$1,473	$57
238290	Other building equipment cont.	49	65	1,237	4.42%	$2,959	$131
238310	Drywall and insulation contractors	0	0	0	4.42%	$1,751	$77
238320	Painting and wall covering contractors	41	41	234	4.42%	$530	$23
238330	Flooring Contractors	0	0	0	4.42%	$811	$36
238340	Tile and Terrazzo contractors	0	0	0	4.42%	$698	$31
238350	Finish Carpentry contractors	0	0	0	4.42%	$678	$30
238390	Other building finishing contractors	0	0	0	4.42%	$1,091	$48
238910	Site Preparation	389	389	2,825	4.56%	$1,416	$65
221110	Electric Power Generation	524	2,101	117,236	4.44%	$43,042	$1,911
221120	Electric Power Transmission, Control, and Distribution	1,232	7,393	376,434	4.44%	$37,443	$1,662
221210	Natural Gas Distribution	526	2,458	78,813	2.98%	$30,459	$907
321213	Engineered Wood Member (except Truss) Manufacturing	132	162	8,499	3.87%	$19,027	$737
321214	Truss Manufacturing	902	1,085	51,270	3.87%	$5,972	$231
336611	Ship Building and Repairing	575	635	87,352	6.09%	$23,071	$1,406
339950	Sign Manufacturing	6,291	6,415	89,360	5.83%	$1,761	$103

423310	Lumber, Plywood, Millwork, and Wood Panel Merchant Wholesalers	6,450	8,715	153,761	2.89%	$14,905	$430
423330	Roofing, Siding, and Insulation Material Merchant Wholesalers	1,142	2,762	40,643	2.89%	$8,985	$259
423390	Other Construction Material Merchant Wholesalers	2,363	3,155	36,914	2.89%	$4,859	$140
423730	Warm Air Heating and Air-Cond. Equip. and Supplies	2,533	5,193	55,606	3.08%	$5,413	$167
444110	Home Centers	2,553	6,749	573,183	7.70%	$21,816	$1,679
454312	Liquefied Petroleum Gas (Bottled Gas) Dealers	2,307	5,567	43,583	4.22%	$1,698	$72
482110	Railroads	NA	NA	NA	NA	NA	NA
486210	Pipeline Transportation of Natural Gas	127	1,363	22,248	13.24%	$15,037	$1,990
517110	Wired Telecommunications Carriers	2,517	27,159	634,540	7.10%	$7,294	$518
	Subtotal	**45,436**	**96,725**	**2,568,084**			
Crane Lessees in the Construction Industry							
236115	New Single family housing construction	31,054	31,054	136,601	4.67%	$3,040	$142
236116	New Multifamily housing construction	2,173	2,173	22,192	4.67%	$10,954	$512
236117	New housing operative builders	16,989	16,989	120,146	4.67%	$12,041	$563
236118	Residential Remodelers	9,848	9,848	32,021	4.67%	$6,456	$302
236210	Industrial building construction	3,264	3,264	93,931	4.67%	$5,931	$277
236220	Commercial and Institutional Bldg. Construction	41,438	41,438	715,896	4.67%	$7,177	$335
237110	Water and Sewer Line Const.	13,774	13,774	204,085	5.22%	$3,239	$169
237120	Oil and gas pipeline construction	1,301	1,734	94,176	5.22%	$9,189	$480
237130	Power and communication line const.	2,147	2,862	126,753	5.22%	$11,163	$583
237210	Land subdivision	0	0	0	11.04%	$0	$0
237310	Highway, street and bridge const.	890	1,186	43,471	5.22%	$82,791	$4,323
237990	Other heavy and civil eng.	2,781	2,781	77,036	5.22%	$7,931	$414
238110	Poured Concrete foundation and struct.	1,348	1,348	15,498	4.42%	$33,636	$1,487
238120	Structural steel and precast concrete	3,608	3,608	78,266	4.42%	$2,712	$120
238130	Framing Contractors	13,974	13,974	118,502	4.42%	$1,249	$55
238140	Masonry Contractors	1,372	1,372	13,035	4.42%	$17,527	$775
238150	Glass & Glazing Contractors	547	547	5,080	4.42%	$14,698	$650
238160	Roofing Contractors	1,966	1,966	22,620	4.42%	$13,903	$615
238170	Siding Contractors	527	527	2,152	4.42%	$11,596	$513
238190	Other foundation, structure, building, ext.	258	258	1,599	4.42%	$20,266	$896
238210	Electrical Contractors	776	776	7,712	4.32%	$132,128	$5,714
238220	Plumbing, Heating and Air-conditioning Cont.	981	981	9,744	3.86%	$147,307	$5,685
238290	Other building equipment cont.	4,997	6,663	126,559	4.42%	$2,959	$131
238310	Drywall and insulation contractors	0	0	0	4.42%	$0	$0
238320	Painting and wall covering contractors	415	415	2,346	4.42%	$52,995	$2,343
238330	Flooring Contractors	0	0	0	4.42%	$0	$0
238340	Tile and Terrazzo contractors	0	0	0	4.42%	$0	$0

238350	Finish Carpentry contractors	0	0	0	4.42%	$0	$0
238390	Other building finishing contractors	0	0	0	4.42%	$0	$0
238910	Site Preparation	3,927	3,927	28,543	4.56%	$14,164	$647
	Subtotal	**160,352**	**163,463**	**2,097,963**			
	Total	**210,800**	**267,032**	**4,771,411**			

Source: U.S. Census Bureau data
Country Business Patters, 2006; Statistics of U.S. Businesses 2006
Internal Revenue Service, Source Book, profit rates over 2000-2006

These employers either routinely have a few tasks that can be considered construction activity or infrequently engage in construction projects with cranes at their own facilities. ("Cranes" will be used throughout this section to refer to all covered equipment by the final standard: cranes, derricks, pile driving equipment, and so forth.) Comment in the record indicates that the industry sectors in the table below have some construction activity involving cranes within the scope of the final standard, and the Agency has made a determination that their construction activity with cranes does, in fact, fall under the final standard. Table B-3 below identifies the sectors in general industry that were identified during the rulemaking, and the Agency concludes will be affected by the final standard.

Table B-3

General Industry Sectors that Perform Construction Work Involving Cranes

NAICS	INDUSTRY	Exhibits that Identify Affected General Industry Sector
221110	Electric Power Generation	ID -0155.1; -0201.1; -0203.1; -0215.1; -0328.1; -0342; -0344; -0367.1; -0369.1; -0408.1
221120	Electric Power Transmission, Control, and Distribution	
221210	Natural Gas Distribution	ID -0163.1; -0234; -0238.1; -0344
321213	Engineered Wood Member Mfg.	ID -0218.1
321214	Truss Mfg.	ID -0218.1
336611	Ship Building and Repairing	ID -0195.1
339950	Sign Manufacturing	ID -0189.1; -0344; -0386.1; -0386.2
423310	Lumber, Plywood, Millwork, and Wood Panel Merchant	
423330	Roofing, Siding, and Insulation Material Merchant W	ID -0145.1; -0147.1; -0184.1; -0206.1; -0208; -0218.1; -0232.1; -0233.1; -0299.1; -0341; -0343; -0372.1; -0380.1; -0380.2; -0381.1; -0384.1
423390	Other Construction Material Merchant Wholesalers	
423730	Warm Air Heating and Air-Cond. Equip. and Supplies	ID -0165.1; -0235.1
454312	Liquefied Petroleum Gas (Bottled Gas) Dealers	ID -0198.1
482110	Railroads	ID -0170.1; -0176.1; -0291; -0342
486210	Pipeline Transportation of Natural Gas	ID -0163.1; -0328.1; -0344
517110	Wired Telecommunications Carriers	ID -0155.1; -0234; -0328.1; -0344

Source: Office of Regulatory Analysis

The Agency concludes that general industry's permanently installed overhead and gantry cranes should be covered under general industry standards rather than the final construction crane standard, even if they perform incidental construction work (see discussion of § 1926.1400, *Scope*). However, all other general industry cranes, whether mobile or permanently installed, are covered under the final standard to the extent that they perform construction work.

Several general industry sectors that commented in the rulemaking will not be affected by the final standard because their only interaction with construction consists of making deliveries of materials to the ground at construction sites. Several commenters noted that their industry only made deliveries to the ground. (ID -0236; -0299.1.) The Agency has made clear in the Scope section above that the delivery process from truck to ground is not considered to be a construction activity covered by its construction standards. For that reason, brick manufacturers, pre-cast concrete products manufacturers, and all other distributors of similar supplies are not affected by the standard because they only deliver materials from truck bed to ground.

However, the Agency views deliveries into or onto structures differently—as construction activity within the purview of the standard. Therefore, industries that deliver materials into or onto structures with articulating cranes are included in the industry profile. The final standard exempts such deliveries for articulating cranes with automatic overload protection devices (AOPDs). If all such articulating cranes had these devices, then affected industries (building supply, lumber yards, HVAC distributors, for example) would be exempt. The Agency had comment in the record that newer

articulating cranes for building material supply are equipped with AOPDs, but the Agency concludes that there are still older models of articulating cranes making building supply deliveries, and that these affected employers would be covered by the standard—chiefly by the requirement for operator certification.

The electric utility industry made several comments to the record. (ID -0144; -0155.1; -0163.1; -0200; -0203.1; -0213; -0215; -0226; -0345.17; -0408.1.) This industry is affected by the standard both because they have digger derricks and other cranes that perform construction work from time to time, and because utilities must provide voltage information and participate in meetings with contractors to determine power line safety. Although digger derricks are exempted from the final standard for all work on utility poles, several commenters made clear that they are routinely used for lifting in other work settings (ID -0328.1; -0344). For construction crane activities by electric utilities, the main impact of the final standard is to require that operators be certified, as all linemen currently received extensive training in crane safety practices and procedures otherwise (ID -0155.1; -0344; -0345.17). The Agency also learned through comment that the telecommunications industry uses digger derricks and truck-mounted cranes, and this industry is included in the standard's industry profile as well.

The Federal Railroad Agency has jurisdiction over most of the work done by railroads. The Agency has concluded that railroads will not be affected by the final standard.

All of the affected general industry sectors have been added to the industry profile in the category of employers who "Own but do not Rent." With respect to the industries not included in the PEA, the Agency has taken a conservative approach to not

underestimate costs, and therefore economic impacts, on these sectors. The traditional construction industry sectors have remained unchanged. The data for all sectors has been updated with information from the 2007 Economic Census, 2006 County Business Patterns, and 2006 Statistics for U.S. Businesses for number of firms, establishments, and revenues. Table B-2 presents information about the affected industry sectors: the number of affected establishments, employees, industry profit rates, and average revenues and profits for affected establishments.

Estimating the number of establishments and cranes covered by the standard in general industry

To estimate the number establishments and cranes in general industry sectors affected by the final cranes standard, the Agency relied on: comment in the record; 2006 CPB and SUSB, and occupational data from the Bureau of Labor Statistics' Occupational and Employment Statistics, May, 2008 Occupational Employment and Wage Estimates, extracted from 4-digit NAICS industry-specific estimates (Nov. 4, 2009 from htt;://bls.gov/oes/oes_dl.htm). The Agency's purpose in estimating the number of cranes in the affected general industry sectors is to estimate the costs employers will bear and demonstrate that the standard is economically feasible. For some industries below, the Agency's estimates are certainly high—overestimates, but the ultimate purpose here is not to predict or forecast cost estimates, but to show that even if more cranes are affected and more costs result from the final standard, the standard is still economically feasible. In addition, since economic impacts are measured as the costs for affected employers, the total number of affected cranes in a sector does not alter the measure of

impact on an affected employer. Although a higher total number of cranes in a sector obviously changes the estimated total cost of the entire standard. For example, if an average employer in the industry sector has 10 employees and, the Agency estimates one crane and one crane operator, it does not affect how economic impact is measured whether there is one crane in the industry or 50. The impact of costs as a fraction of revenues and profits are, on average, the same for each affected employer. As a result, though the Agency will try to estimate the number of affected employers, the exact number is not critical to the economic feasibility finding that is essential for the rule. In addition, although all of the sectors below engage in crane construction activities, some likely may contract such work out and would then only be affected by the final standard indirectly.

Estimating the number of cranes and crane operators in affected general industry sectors

- Electric Power Generation (NAICS 221110) and Electric Power Transmission Control, and Distribution (NAICS 221120). The Agency is basing its estimate of affected cranes and crane operators on the industry profile and cost analysis for subpart V, Table 5.1. (ID -0389.2.) Table 5.1 shows that the two industries had about 114,500 employees working on power lines affected by subpart V in about 7,600 crews for Electric Power Generation and about 12,600 crews in the Transmission, Control, and Distribution sector. Together, in total, the Agency estimated that the industry was using about 20,200 powered vehicles, one for each crew. OSHA concludes that each sector has one piece of equipment, such as a digger derrick, bucket truck, or truck-mounted crane that each crew works with

(in crew sizes of 3 or 6). Further, based on several comments in the record that digger derricks perform crane-related work in substations and other locations (ID -0155.1; -0201.1; -0328.1; -0344), the Agency concludes that each digger derrick would need a certified operator to work as the industry customarily has. Other comment in the record suggests that journeymen are often hired as if each is completely trained in all aspects of work (ID -0155.1; -0344); hence the industry has asserted that to maintain this arrangement all linemen would have to receive crane operator certification, which would be prohibitively expensive (ID -0203.1; -0367.1). However, another comment in the record indicated that for each crew, individuals have specific assignments—that not all journeymen are given responsibility for operating lifting devices, whether that be a bucket truck or aerial lift, a crane, or a digger derrick. (ID -0344.) Comment in the record indicates that, roughly, equipment is equally divided between equipment that is covered by the standard (digger derricks and boom trucks) and bucket trucks, which are not. (ID -0344.) The record also indicates that journeymen are extensively trained in apprenticeship programs in the use of their powered equipment, and that the primary cost of meeting the duties of the final standard is certifying crane operators. (ID -0155.1; -0344.) The Agency can also estimate based on comment in the record that there are far more digger derricks than boom trucks, in a ratio of about 85:15, based on reports of 16 of Edison Electric's members who provided information in the record and identified their types of equipment. The PEA in subpart V was based on the 2002 Economic Census. The 2007 Census shows that employment in NAICS 221110 has fallen to 78 percent of the 2002 level and

employment in NAICS 221120 has fallen to 90 percent of the 2002 figure. However, there was no information in the record that showed the number of linemen or pieces of equipment had declined; so the Agency is basing its estimate of the number of employees who would be certified to use the equipment covered under the final standard as presented in subpart V's PEA Table 5.1. Neither of the affected industry sectors has objected to certifying operators of their truck-mounted cranes; yet if it were necessary that every lineman perform every function, that would surely also necessitate certifying every journeyman as well. The Agency concludes that it is not necessary to certify every journeyman as a crane operator for the industry to continue to efficiently use their equipment and manpower. If the industries are still operating as many as 20,200 powered vehicles, and about one-half are digger derricks and truck-mounted cranes, then, at the very bare minimum, to have an operator in each piece of equipment potentially covered by the final standard would require certifying 10,100 as crane operators. However, having the bare minimum, the Agency recognizes, would not afford the industries the same flexibility and efficiency as it now has nor is every employee available to work every day of the year. However, the Agency believes that certifying 30,000 journeymen as crane operators would afford a sufficient number that each piece of covered equipment (digger derricks and truck-mounted cranes) would in almost all situations have a journeyman certified as a crane operator available to perform work addressed by the final standard in a crew. Work that is construction work and covered by the final standard, and not subpart V, is not an every day occurrence for the two industry sectors. Indeed, the

Agency believes that this estimate is likely higher than the most efficient solution that these two industries will devise, but, for purposes of showing that the final standard is economically feasible even with this many journeymen certified as crane operators, the Agency believes it is sufficient. Accordingly, the Agency estimates that NAICS 221110 Electric Power Generation will expend resources to certify about 10,000 journeymen as crane operators, and NAICS 221120 Electric Power Transmission, Control, and Distribution about 20,000.

- Two natural gas sectors are potentially affected by the final standard: NAICS 221210 Natural Gas Distribution and 486210 Pipeline Transportation of Natural Gas. Both industries were reported to be impacted by the final standard. (ID -0155.1; -0328.1; -0344.) NAICS 237120 Oil and Gas Pipeline Construction performs much of the construction of new gas pipelines, the Agency concludes. However, the two natural gas sectors likely also perform some pipeline work themselves—or at least some employers in the industries do. Sideboom cranes are commonly used in pipeline construction, but are exempt from the requirement for crane operator certification. The Agency concludes that the major significant cost for these industries is certifying operators for their other, mostly truck-mounted cranes. Power line safety issues occur most often below ground, and the Agency concludes that the industry already addresses these issues, based on comments (ID -0155.1; -0344). The 2006 CPB and SUSB shows that Natural Gas Distribution sector has 2,458 establishments and 78,813 employees; while Pipeline Transportation of Natural Gas has 1,363 establishments with 22,248 employees. According to BLS' 2008 Occupational Employment survey, Natural

Gas Distribution has 2,390 employees who are electric line installers, 950 who are operating engineers and other construction equipment operators, 1,180 heavy truck drivers and tractor trailer drivers, and no crane operators. For the Pipeline Transportation of Natural Gas, the employment figures are 50, 130, zero, and also no crane operators, respectively, for the same employment categories. The Agency concludes that the Natural Gas Distribution industry is performing significant pipeline work, mainly with excavation equipment, and each company on average has over 30 employees. The Agency concludes that the average employer in this industry may be using one crane that is not a sideboom crane and needs to certify the operator for new construction work that would be covered by the standard. The Agency also concludes that the Pipeline Transportation of Natural Gas has considerably less construction activity that would involve cranes covered by the final standard and that the average establishment or employer only has about 10 employees. The Agency estimates that as few as 50 employers in this industry sector are using equipment in construction activity that would necessitate certifying crane operators.

- The Structural Building Components Association (SBCA) commented in the record that many of their members use "boom crane trucks to deliver and/or set their products at the jobsite." (ID -0218.1.) Their members manufacture "roof and floor trusses, wall panels, I-joists, engineered wood beams, plywood and oriented strand board….In most instances the components are simply unloaded at the jobsite, using either a custom roll-off trailer, a forklift, or a boom truck crane, and left for the builder to install. It is not uncommon for a component

manufacturer who utilizes a boom truck to deliver both in markets that require hoisting and setting of components (thus engaging in construction activity) and those that require delivery of the components and other building materials on the ground (not a construction activity)." (ID -0208.1.) SBCA viewed their crane operations as low risk and asked for an exemption to eliminate training burden. Under the final standard, delivery of materials onto or into the structure, such as setting components, is a construction activity covered under the final standard. SBCA did not mention the use of articulating cranes, which with a lifting movement limiting device, would in fact exempt their equipment from the standard, and thus OSHA concludes that these affected industries are only employing boom trucks. The Agency, based on SBCA's comment, concludes that the primary affected industries are NAICS 321213 Engineered Wood Member (except Truss) Manufacturing and NAICS 321214 Truss Manufacturing. Engineered Wood Member Manufacturing has 162 establishments and 51,270 employees (2006 CPB and SUSB). Truss Manufacturing has 1,085 establishments and 51,270 employees. According to the 2008 Occupational Employment Survey, the four-digit NACIS 32120 Veneer, Plywood, and Engineered Products industry has 120 crane operators, 2,240 drivers of heavy trucks and tractor trailers, and 420 drivers of delivery trucks (total employment of 98,000). The Agency concludes that typical employers in these two sectors, with about 50 employees, likely employ one to two boom trucks for delivery. Truss manufacturers are much more likely to use boom trucks for delivery and placement of components—and therefore fall under the scope of the standard—

than manufacturers of engineered wood members, the Agency concludes, because the small equipment typically used by the latter employers would not be capable of lifting heavy members for placement (ID -0208.1). In addition, the relatively few engineered wood member manufacturers produce specialty items and do not simply serve more local or regional markets as do truss manufacturers. The Agency concludes that employers in this latter industry are much more likely to transport their products longer distances and deliver to the ground. These products are also more typically used only in larger residential and commercial applications, where an on-site crane would lift and position them for installation. As SBCA noted in its comment, most deliveries are made to the ground. The Agency concludes that, on average, employers in the Engineered Wood Member industry employ one truck-mounted crane and employers in the Wood Truss manufacturing industry also employ one, on average. According to comments by SBCA, employers are likely already meeting all of the other safety requirements in the final standard save for crane operator certification. (ID -0208.1.)

- A comment by a major shipyard alerted the Agency to the potential impact of the final construction cranes standard on the Shipbuilding and Repair Industry NACIS 336611. (ID -0195.1.) When shipyard cranes perform construction activities, they will be covered by the final standard; although the final standard exempts permanently installed overhead and gantry cranes in general industry. According to the 2008 Occupational Employment Survey, there are 550 crane operators in the shipyard and boatbuilding industries (the four-digit NAICS 33660). Northrup-Grumann in its comment reported that it alone employs 600

cranes throughout its shipyards around the country. (ID -0195.1.) Northrup-Grumann's 40,000 current employees represent about one-half of the employment in the shipbuilding and ship repair industry, and the Agency estimates that: there are about 1,200 cranes in use in shipyards and about one-half would be potentially covered by the standard if construction activities are performed with them, since many large cranes in shipyards are permanently installed. The 1,200 figure is surely not an underestimate as Northrup-Grumann is the largest shipbuilder in the country and likely the most intense user of cranes for its larger projects. Since construction activities in shipyards are episodic or irregular, the Agency estimates that if shipyard employers provide certification for crane operators for one-half of the number of non-permanent cranes (with 300 certified operators) that would be sufficient to perform their own construction activities without hiring outside construction contractors for their needs.

- The final standard potentially affects the general industry sector NAICS 339950 Sign Manufacturing. In its comment to the record, the International Sign Association reported that it had 2,600 members, most of whom are small businesses. (ID -0247; -0344.) Not all sign manufacturers have cranes or provide installation services, nor does the industry build or erect billboards, which is an industry properly represented among the traditional construction industries. The average employer has about 10 employees, according to the 2006 CPB and SUSB data. Although many manufacturers do not use cranes or install signs, those that do were said to have one or two cranes (ID -0344). A sign manufacturer who participated in the public hearings described his business: revenues of less than

$10 million annually, with 70 employees, nine of whom were in the installation department. (ID -0344.) Gelberg sign has two crane trucks for installation, and one bucket truck for servicing. Sign manufacturers reported that for large projects, employers typically hired crane companies. Based on the comment in the record, the Agency has estimated the number of cranes and operators in the sign manufacturing sector in the table below. The Agency has assumed that the sign making industry has one trained crane operator for each crane it uses for installation.

Estimation of Number of Cranes in NAICS 339950 Sign Mfg

Size class (No. of employees)	Number of estabs	Estabs with cranes	Employees	Avg. number of employees	Cranes per estab.	Total cranes for size class
"1-4	3,308		6,171	2	0	0
"5-9	1,229		8,603	7	0	0
"10-19	854	400	11,586	14	1	400
20-49	646	646	19,246	30	1	646
50-99	229	229	16,053	70	2	458
100-249	124	124	18,540	150	5	577
250-500	24	24	7,618	317	10	246
500-999	0		0		0	0
1000+	1	1	1,543	1543	51	51
Total	6415		89360			2,378

Source: ORA; 2006 County Business Patterns, SUSB.

- Retail and commercial building supply associations and employers provided comment to the record in regard to how the standard would affect their businesses. (ID -0184; -0326.1; -0380.1.) The Agency concludes that

commercial and retail building supply dealers are represented in the industries in the table below:

NAICS	Name
423310	Lumber, Plywood, Millwork, and Wood Panel Merchant Wholesalers
423330	Roofing, Siding, and Insulation Material Merchant Wholesalers
423390	Other Construction Material Merchant Wholesalers
444110	Home Centers

The building supply dealers provided extensive and detailed comment to the record—both written comment as well as testimony at the public hearings. The key issue for these industries was that their deliveries to construction sites were typically not construction work and about one-half of all deliveries are to the ground. (ID -0341: -0343.) For deliveries onto or into structures, such as drywall into buildings and roofing materials up to roofs, they use articulating cranes which have controls to prevent tipover, called lifting moment limiting devices (LMLD). The Specialty Building Material Distributors and Safety Coalition (SBMDSC) in testimony described truck-mounted cranes used to deliver drywall, for example, and "knuckle" cranes used to deliver roofing materials. The Agency has concluded that these are both versions of articulating cranes. Both SBMDSC and the National Lumber and Building Material Dealers Association repeated several times in written comment and public testimony that their articulating cranes had LMLDs. (ID -0184; -0326.1; -0341; -0344; -0380.1.) Since the truck-mounted cranes in use are articulating cranes with LMLDs, they are exempt from the rule and these industries will not incur any costs of compliance. Although the

industries did not report any older truck-mounted cranes used for deliveries without LMLDs, if these do exist, the employer would have the option to use them for deliveries to the ground (and be unaffected by the final standard since this is not a "construction activity") or to deliver materials into or onto structures by complying with the rule, which would essentially be to ensure that their operators are certified, as well as following the final standard's specific safety precautions. In addition, operator certification is required only within four years after the standard is effective, and any older equipment may be replaced in the interim if still extant.

- The Heating and Air Conditioning Equipment Distributors reported that their deliveries to buildings would be affected by the final standard because they often must hoist equipment to the first or second floor of buildings, which would qualify as construction work. (ID -0235.1.) Deliveries are also made to the ground, and some employers do hire crane trucks for some deliveries. The Heating, Air Conditioning, and Refrigeration Distributors International (HARDI) reported that their 450 members who are wholesale distributors in the industry have, on average, 11 branch companies each. According the 2006 CPB and SUSB, there are 5,193 establishments with 55,606 employees, or about 10 to 11 employees per employer. The Agency estimates that the typical establishment in the industry operates one truck-mounted crane with a single, trained operator who must become a certified crane operator under the final standard to deliver HVAC equipment onto structures.

- Direct-selling propane dealers use cranes to deliver and install LP, or propane, tanks, mostly in rural areas. Installing a new tank would constitute a construction activity, and crane use for that activity would fall under the final crane standard. The affected industry is identified as NAICS 434312 Liquefied Petroleum Gas Dealers. According to the 2006 CPB and SUSB there are 5,567 establishments in the direct selling sector with 43,583 employees. Clearly, the industry is predominantly made up of small businesses, with the average establishment having about eight employees, and this is attested to by the industry's comment (ID -0198.1). The National Propane Gas Association noted that delivering tanks is "one of the most common activities" performed by propane retail marketers and that "to install these tanks, it often requires the need of a truck-mounted crane to lift and/or place the empty ASME tank onto its support or foundation." (ID -0198.1.) The Agency estimates that each of the retail establishments has, on average, a truck-mounted crane that would be engaged occasionally in construction activity covered under the rule.
- Locomotive cranes are listed as one of the types of cranes covered by the final standard, and several railroads participated in the rulemaking. But the Agency has concluded that the Federal Railroad Authority has primary authority over crane activity performed by railroads. The Agency has concluded that no railroad employers will be impacted by the final rule.
- Telecommunications employers were identified by several commenters as an industry that would be affected by final standard. (ID -0155.1; -0234; -0326.1; -0344.) The telecommunications industry is identified as NAICS 517110 Wired

Telecommunications Carriers. According to the Economic Census the telecommunications industry has about 2,500 firms, 27,000 establishments and 634,000 employees. There are 89,000 employees in the industry who are "telecommunications line installers and repairers"—as opposed to the electric power industry's journeymen who are "electric power installers and repairers" (2008 Occupational Employment Survey, or OES). OES reports only 50 power line installers are employed in the industry. The telecommunications industry was described in comment as engaged in work similar to that of the electric power industry—using digger derricks and radial boom trucks to install or replace utility poles or in laying underground cable. The Agency concludes that telecommunications workers are not primarily engaged in constructing and replacing structural members, but in running or maintaining communications lines on poles or underground, and therefore are far less intensely engaged in activities that require digger derricks or cranes. In addition, the industry likely also employs construction contractors for its construction work. There is nothing in the record to suggest that digger derricks in the telecommunications industry are used for activities other than utility pole work. For example, they would not be used to hoist transformers or other moderately heavy equipment onto utility poles, or at substations or other facilities, because telecommunications equipment does not consist of such hardware. Digger derricks therefore will largely be exempt from the final standard in the telecommunications industry because they do not perform construction work in which they hoist loads in other construction activities. The Agency estimates that the industry employs about 1 truck-mounted

crane per firm (for a total of about 3,000), on average, that will be covered by the final standard.

The self-employed owner-operators of cranes doing construction work would not be required under the standard to be certified crane operators as they do not have employees and are themselves not employees. The Agency estimates that about 5 percent of cranes are owned and operated by the self-employed, based on BLS data (ID -0025).

Table B-2 summarizes the industries affected, and the number of cranes they use. As can be seen from this table, adding the general industry sectors in the manner outlined above results in approximately 35,000 additional cranes and crane operators. Table B-4 presents information about "small entity" establishments, as defined by SBA. Table B-5 presents information about establishments with fewer than 20 employees.

Table B-4

Industrial Profile of SBA Defined Small Entities for the Proposed Standard

NAIC	Industry	SBA Size Standard (Less Than)	Affected			Profit	Avg. Revenues Per Estab.	Avg. Profits Per Estab.
			Firms	Estabs	Employees	Rate	($1,000)	($1,000)
Crane Rental with Operators								
238990	All Other Specialty Trade Cont.	$13.0 mil.	1,231	1,286	13,473	4.56%	$1,550	$71
Crane Rental without Operators (Bare Rentals)								
532412	Const./Min./For. Machine & Equip.	$6.5 mil	1,782	3,018	19,423	6.42%	$482	$31
Own and Rent Cranes with Operators								
236115	New Single-Family Housing Const.	$31.0 mil.	178	178	261	4.67%	$220	$10
236118	Residential Remodelers	$31.0 mil.	25	25	45	4.67%	$443	$21
236210	Industrial Building Construction	$31.0 mil.	9	12	1,067	4.67%	$12,213	$571
236220	Commercial and Institutional Building	$31.0 mil.	23	31	757	4.67%	$4,157	$194
237110	Water and Sewer Line and Related Struct.	$31.0 mil.	52	69	1,432	5.22%	$4,107	$214
237120	Oil and Gas Pipeline and Related Struct.	$31.0 mil.	20	26	1,457	5.22%	$5,510	$288
237130	Power and Communication Line and Rel.	$31.0 mil.	34	34	666	5.22%	$2,880	$150
237310	Highway, Street, and Bridge Construction	$31.0 mil.	80	107	6,456	5.22%	$11,783	$615
237990	Other Heavy and Civil Engineering Const.	$31.0 mil.	76	101	5,857	5.22%	$10,201	$533
238110	Poured Concrete Foundation and Struct.	$13.0 mil.	261	261	4,328	4.42%	$2,273	$101
238120	Structural Steel and Precast Concrete	$13.0 mil.	200	266	7,389	4.42%	$3,439	$152
238130	Framing Contractors	$13.0 mil.	26	26	120	4.42%	$153	$7
238150	Glass and Glazing Contractors	$13.0 mil.	42	42	328	4.42%	$616	$27
238170	Siding Contractors	$13.0 mil.	5	5	18	4.42%	$496	$22
238190	Other Foundation, Structure, and Building	$13.0 mil.	49	65	1,145	4.42%	$1,509	$67
238210	Electrical Contractors	$13.0 mil.	15	15	176	4.32%	$1,303	$56
238220	Plumbing, Heating, and Air-Conditioning	$13.0 mil.	2	3	196	3.86%	$5,835	$225
238290	Other Building Equipment Contractors	$13.0 mil.	113	151	4,076	4.42%	$3,474	$154
238320	Painting and Wall Covering Contract.	$13.0 mil.	21	21	159	4.42%	$916	$41
238910	Site Preparation Contractors	$13.0 mil.	400	400	4,706	4.56%	$1,668	$76
	Subtotal		**1,630**	**1,838**	**40,639**			
Own but Do Not Rent								
236115	New Single family housing construction	$31.0 mil.	2,905	2,905	11,578	4.67%	$1,000	$47

236116	New Multifamily housing construction	$31.0 mil.	213	213	1,886	4.67%	$3,400	$159
236117	New housing operative builders	$31.0 mil.	1,263	1,263	10,212	4.67%	$5,104	$239
236118	Residential Remodelers	$31.0 mil.	825	825	2,721	4.67%	$543	$25
236210	Industrial building construction	$31.0 mil.	223	262	7,955	4.67%	$2,570	$120
236220	Commercial and Institutional Bldg. Const.	$31.0 mil.	3,614	3,614	60,806	4.67%	$3,661	$171
237110	Water and Sewer Line Const.	$31.0 mil.	917	1,223	17,260	5.22%	$2,324	$121
237120	Oil and gas pipeline construction	$31.0 mil.	98	131	7,885	5.22%	$3,743	$195
237130	Power and communication line const.	$31.0 mil.	219	291	10,710	5.22%	$4,656	$243
237210	Land subdivision	$6.0 mil.	0	0	0	11.04%	$0	$0
237310	Highway, street and bridge const.	$31.0 mil.	69	93	3,662	5.22%	$3,225	$168
237990	Other heavy and civil eng.	$31.0 mil.	511	511	6,429	5.22%	$1,500	$78
238110	Poured Concrete foundation and struct.	$13.0 mil.	108	108	2,609	4.42%	$1,000	$44
238120	Structural steel and precast concrete	$13.0 mil.	394	394	6,162	4.42%	$1,425	$63
238130	Framing Contractors	$13.0 mil.	1,060	1,060	10,059	4.42%	$798	$35
238140	Masonry Contractors	$13.0 mil.	128	128	1,108	4.42%	$675	$30
238150	Glass & Glazing Contractors	$13.0 mil.	48	48	428	4.42%	$900	$40
238160	Roofing Contractors	$13.0 mil.	230	230	1,923	4.42%	$801	$35
238170	Siding Contractors	$13.0 mil.	33	33	183	4.42%	$600	$27
238190	Other foundation, structure, building, ext.	$13.0 mil.	7	7	134	4.42%	$900	$40
238210	Electrical Contractors	$13.0 mil.	60	60	655	4.32%	$1,100	$48
238220	Plumbing, Heating and Air-conditioning Cont.	$13.0 mil.	86	86	828	3.86%	$1,100	$42
238290	Other building equipment cont.	$13.0 mil.	33	44	1,051	4.42%	$1,664	$74
238310	Drywall and insulation contractors	$13.0 mil.	0	0	0	4.42%	$0	$0
238320	Painting and wall covering contractors	$13.0 mil.	37	37	199	4.42%	$419	$19
238330	Flooring Contractors	$13.0 mil.	0	0	0	4.42%	$0	$0
238340	Tile and Terrazzo contractors	$13.0 mil.	0	0	0	4.42%	$0	$0
238350	Finish Carpentry contractors	$13.0 mil.	0	0	0	4.42%	$0	$0
238390	Other building finishing contractors	$13.0 mil.	0	0	0	4.42%	$0	$0
238910	Site Preparation	$13.0 mil.	262	262	2,401	4.56%	$962	$44
221110	Electric Power Generation	4M mwh	293	301	99,651	4.44%	$7,313	$325
221120	Electric Power Transmission, Control, and Distribution	4M mwh	337	358	319,969	4.44%	$6,882	$306
221210	Natural Gas Distribution	500	442	591	66,991	2.98%	$28,428	$847
321213	Engineered Wood Member (except Truss) Manufacturing	500	121	127	7,224	3.87%	$4,720	$183
321214	Truss Manufacturing	500	871	914	43,580	3.87%	$4,706	$182
336611	Ship Building and Repairing	1000	575	635	74,249	6.09%	$10,204	$622
339950	Sign Manufacturing	500	6,261	6,339	75,956	5.83%	$1,532	$89
423310	Lumber, Plywood, Millwork, and Wood Panel Merchant Wholesalers	100	5,971	6,326	130,697	2.89%	$7,084	$204
423330	Roofing, Siding, and Insulation Material Merchant Wholesalers	100	1,025	1,173	34,547	2.89%	$7,159	$207
423390	Other Construction Material Merchant Wholesalers	100	2,181	2,296	31,377	2.89%	$3,260	$94
423730	Warm Air Heating and Air-Cond. Equip. and Supplies	100	2,364	2,958	47,265	3.08%	$3,790	$117
444110	Home Centers	$7.0 mil.	2,409	2,575	487,206	7.70%	$2,335	$180

454312	Liquefied Petroleum Gas (Bottled Gas) Dealers	50	2,044	2,317	37,046	4.22%	$2,415	$102
482110	Railroads	NA	NA	NA	NA	NA	NA	NA
486210	Pipeline Transportation of Natural Gas	$7.0 mil.	65	66	18,911	13.24%	$8,345	$1,105
517110	Wired Telecommunications Carriers	1500	2,517	27,159	539,359	7.10%	$7,294	$518
	Subtotal		**32,430**	**59,267**	**2,182,872**			
Crane Lessees in the Construction Industry								
236115	New Single family housing construction	$31.0 mil.	31,038	31,038	134,788	4.67%	$1,480	$69
236116	New Multifamily housing construction	$31.0 mil.	2,086	2,086	13,738	4.67%	$3,085	$144
236117	New housing operative builders	$31.0 mil.	16,562	16,562	53,224	4.67%	$2,860	$134
236118	Residential Remodelers	$31.0 mil.	9,846	9,846	29,319	4.67%	$644	$30
236210	Industrial building construction	$31.0 mil.	3,000	3,000	21,431	4.67%	$2,493	$117
236220	Commercial and Institutional Bldg. Construction	$31.0 mil.	40,530	40,530	393,560	4.67%	$4,024	$188
237110	Water and Sewer Line Const.	$31.0 mil.	13,715	13,715	162,842	5.22%	$2,863	$149
237120	Oil and gas pipeline construction	$31.0 mil.	1,667	1,667	34,584	5.22%	$4,118	$215
237130	Power and communication line const.	$31.0 mil.	2,811	2,811	48,229	5.22%	$2,289	$120
237210	Land subdivision	$6.0 mil.	0	0	0	11.04%	$0	$0
237310	Highway, street and bridge const.	$31.0 mil.	1,114	1,114	14,473	5.22%	$3,606	$188
237990	Other heavy and civil eng.	$31.0 mil.	2,760	2,760	67,210	5.22%	$2,919	$152
238110	Poured Concrete foundation and struct.	$13.0 mil.	13,273	13,273	10,782	4.42%	$1,189	$53
238120	Structural steel and precast concrete	$13.0 mil.	3,487	3,487	57,764	4.42%	$1,927	$85
238130	Framing Contractors	$13.0 mil.	13,779	13,779	60,116	4.42%	$559	$25
238140	Masonry Contractors	$13.0 mil.	1,368	1,368	10,174	4.42%	$814	$36
238150	Glass & Glazing Contractors	$13.0 mil.	542	542	4,397	4.42%	$1,319	$58
238160	Roofing Contractors	$13.0 mil.	1,945	1,945	18,573	4.42%	$1,125	$50
238170	Siding Contractors	$13.0 mil.	526	526	1,455	4.42%	$529	$23
238190	Other foundation, structure, building, ext.	$13.0 mil.	256	256	881	4.42%	$628	$28
238210	Electrical Contractors	$13.0 mil.	765	765	4,674	4.32%	$874	$38
238220	Plumbing, Heating and Air-conditioning Cont.	$13.0 mil.	970	970	6,803	3.86%	$1,049	$40
238290	Other building equipment cont.	$13.0 mil.	644	644	6,996	4.42%	$2,068	$91
238310	Drywall and insulation contractors	$13.0 mil.	0	0	0	4.42%	$0	$0
238320	Painting and wall covering contractors	$13.0 mil.	414	414	2,103	4.42%	$513	$23
238330	Flooring Contractors	$13.0 mil.	0	0	0	4.42%	$0	$0
238340	Tile and Terrazzo contractors	$13.0 mil.	0	0	0	4.42%	$0	$0
238350	Finish Carpentry contractors	$13.0 mil.	0	0	0	4.42%	$0	$0
238390	Other building finishing contractors	$13.0 mil.	0	0	0	4.42%	$0	$0
238910	Site Preparation	$13.0 mil.	3,889	3,889	19,650	4.56%	$1,101	$50
	Subtotal		**166,985**	**166,985**	**1,177,769**			

Total	**204,058**	**232,394**	**3,434,175**

Source: U.S. Census Bureau data
Country Business Patters, 2006; Statistics of U.S. Businesses 2006
Internal Revenue Service, Source Book, profit rates over 2000-2006
Statistics of U.S. Business (SUSB)

Table B-5

Industrial Profile of Very Small Entities (Less than 20 Employees) by Major Category

NAIC	Industry	Firms	Estabs	Employees	Profit Rate	Average Revenues Per Estab. ($1,000)	Average Profits Per Estab. ($1,000)
Crane Rental with Operators							
238990	All Other Specialty Trade Cont.	1,065	1,065	4,824	4.10%	$614	$25
Crane Rental without Operators (Bare Rentals)							
532412	Const./Min./For. Machine & Equip.	1,782	3,018	19,423	6.42%	$129	$8
Own and Rent Cranes with Operators							
236115	New Single-Family Housing Const.	178	178	261	4.67%	$220	$10
236118	Residential Remodelers	25	25	45	4.67%	$443	$21
236210	Industrial Building Construction	9	12	1,067	4.67%	$12,213	$571
236220	Commercial and Institutional Building	23	31	757	4.67%	$4,157	$194
237110	Water and Sewer Line and Related Struct.	52	69	1,432	5.22%	$4,107	$214
237120	Oil and Gas Pipeline and Related Struct.	20	26	1,457	5.22%	$5,510	$288
237130	Power and Communication Line and Rel.	34	34	666	5.22%	$2,880	$150
237310	Highway, Street, and Bridge Construction	80	107	6,456	5.22%	$11,783	$615
237990	Other Heavy and Civil Engineering Const.	76	101	5,857	5.22%	$10,201	$533
238110	Poured Concrete Foundation and Struct.	261	261	4,328	4.42%	$2,273	$101
(All other sectors in this category have no very small affected firms)							
	Subtotal	**758**	**844**	**22,326**			
Own Cranes But Do Not Rent Them							
236115	New Single family housing construction	2,763	2,763	12,155	4.67%	$823	$38
236116	New Multifamily housing construction	197	197	2,010	4.67%	$1,350	$63
236117	New housing operative builders	1,206	1,206	8,528	4.67%	$1,854	$87
236118	Residential Remodelers	808	808	2,627	4.67%	$443	$21
236210	Industrial building construction	209	209	6,015	4.67%	$1,247	$58
236220	Commercial and Institutional Bldg. Construction	2,943	2,943	50,843	4.67%	$1,526	$71
237110	Water and Sewer Line Const.	900	900	13,335	5.22%	$702	$37
237120	Oil and gas pipeline construction	63	63	3,416	5.22%	$708	$37
237130	Power and communication line const.	207	207	9,177	5.22%	$655	$34
237210	Land subdivision	0	0	0	11.04%	$0	$0
237310	Highway, street and bridge const.	66	66	2,423	5.22%	$976	$51
237990	Other heavy and civil eng.	378	378	10,483	5.22%	$589	$31

238110	Poured Concrete foundation and struct.	46	46	531	4.42%	$494	$22
238120	Structural steel and precast concrete	90	90	1,954	4.42%	$659	$29
238130	Framing Contractors	981	981	8,322	4.42%	$374	$17
238140	Masonry Contractors	115	115	1,093	4.42%	$343	$15
238150	Glass & Glazing Contractors	44	44	405	4.42%	$619	$27
238160	Roofing Contractors	207	207	2,378	4.42%	$447	$20
238170	Siding Contractors	31	31	127	4.42%	$408	$18
238190	Other foundation, structure, building, ext.	10	10	62	4.42%	$394	$17
238210	Electrical Contractors	54	54	541	4.32%	$444	$19
238220	Plumbing, Heating and Air-conditioning Contractors	77	77	768	3.86%	$509	$20
238290	Other building equipment cont.	30	30	570	4.42%	$714	$32
238310	Drywall and insulation contractors	0	0	0	4.42%	$0	$0
238320	Painting and wall covering contractors	37	37	208	4.42%	$265	$12
238330	Flooring Contractors	0	0	0	4.42%	$0	$0
238340	Tile and Terrazzo contractors	0	0	0	4.42%	$0	$0
238350	Finish Carpentry contractors	0	0	0	4.42%	$0	$0
238390	Other building finishing contractors	0	0	0	4.42%	$0	$0
238910	Site Preparation	271	271	1,970	4.56%	$497	$23
221110	Electric Power Generation	293	301	1,288	4.44%	$7,513	$334
221120	Electric Power Transmission, Control, and Distribution	337	358	2,272	4.44%	$7,311	$325
221210	Natural Gas Distribution	360	368	1,736	2.98%	$9,483	$283
321213	Engineered Wood Member (except Truss) Manufacturing	82	82	534	3.87%	$1,674	$65
321214	Truss Manufacturing	408	408	3,438	3.87%	$1,130	$44
336611	Ship Building and Repairing	370	371	2,041	6.09%	$950	$58
339950	Sign Manufacturing	5,312	5,316	25,236	5.83%	$1,303	$76
423310	Lumber, Plywood, Millwork, and Wood Panel Merchant Wholesalers	4,774	4,844	24,410	2.89%	$3,970	$115
423330	Roofing, Siding, and Insulation Material Merchant Wholesalers	831	857	4,764	2.89%	$4,461	$129
423390	Other Construction Material Merchant Wholesalers	1,886	1,907	9,298	2.89%	$2,199	$63
423730	Warm Air Heating and Air-Cond. Equip. and Supplies	1,929	2,017	11,007	3.08%	$2,537	$78
444110	Home Centers	1,879	1,904	12,389	7.70%	$1,344	$103
454312	Liquefied Petroleum Gas (Bottled Gas) Dealers	1,881	2,001	11,711	4.22%	$1,333	$56
482110	Railroads	NA	NA	NA	NA	NA	NA
486210	Pipeline Transportation of Natural Gas	65	66	238	13.24%	$8,473	$1,122
517110	Wired Telecommunications Carriers	1,828	1,882	9,022	7.10%	$1,431	$102
	Subtotal	**33,969**	**11,734**	**139,941**			
Crane Lessees in the Construction Industry							
236115	New Single family housing construction	29,962	29,962	95,670	4.67%	$1,192	$56
236116	New Multifamily housing construction	1,904	1,904	7,946	4.67%	$1,986	$93
236117	New housing operative builders	15,927	15,927	50,782	4.67%	$2,063	$96

236118	Residential Remodelers	9,606	9,606	25,611	4.67%	$527	$25
236210	Industrial building construction	2,669	2,669	13,978	4.67%	$1,120	$52
236220	Commercial and Institutional Bldg. Construction	33,784	33,784	179,125	4.67%	$1,649	$77
237110	Water and Sewer Line Const.	11,306	11,306	59,055	5.22%	$841	$44
237120	Oil and gas pipeline construction	1,083	1,083	4,293	5.22%	$666	$35
237130	Power and communication line const.	2,149	2,149	8,580	5.22%	$630	$33
237210	Land subdivision	0	0	0	11.04%	$0	$0
237310	Highway, street and bridge const.	862	862	4,675	5.22%	$993	$52
237990	Other heavy and civil engg.	2,295	2,295	10,166	5.22%	$1,261	$66
238110	Poured Concrete foundation and struct.	11,886	11,886	52,606	4.42%	$677	$30
238120	Structural steel and precast concrete	2,679	2,679	14,995	4.42%	$945	$42
238130	Framing Contractors	13,043	13,043	48,914	4.42%	$345	$15
238140	Masonry Contractors	1,243	1,243	4,720	4.42%	$376	$17
238150	Glass & Glazing Contractors	485	485	2,457	4.42%	$758	$34
238160	Roofing Contractors	1,722	1,722	7,015	4.42%	$637	$28
238170	Siding Contractors	506	506	1,627	4.42%	$359	$16
238190	Other foundation, structure, building, ext.	237	237	909	4.42%	$290	$13
238210	Electrical Contractors	691	691	2,953	4.32%	$434	$19
238220	Plumbing, Heating and Air-conditioning Contractors	872	872	3,855	3.86%	$551	$21
238290	Other building equipment cont.	524	524	2,726	4.42%	$868	$38
238310	Drywall and insulation contractors	0	0	0	4.42%	$0	$0
238320	Painting and wall covering contractors	392	392	1,267	4.42%	$326	$14
238330	Flooring Contractors	0	0	0	4.42%	$0	$0
238340	Tile and Terrazzo contractors	0	0	0	4.42%	$0	$0
238350	Finish Carpentry contractors	0	0	0	4.42%	$0	$0
238390	Other building finishing contractors	0	0	0	4.42%	$0	$0
238910	Site Preparation	3,579	3,579	13,406	4.56%	$561	$26
	Subtotal	**149,403**	**149,403**	**617,328**			
	Total	**186,977**	**166,064**	**803,843**			

Source: ORA
U.S. Census Bureau data
Country Business Patterns, 2006; Statistics of U.S. Businesses 2006
Internal Revenue Service, Source Book, profit rates over 2000-2006

4. Benefits

The Agency received several comments in the record on the benefits analysis in the Preliminary Economic Analysis (PEA). For example, the commercial building supply industry noted that their industry had not been included in the economic analysis, nor, consequently, included in the Agency's characterization of risks and benefits. The industry provided 2008 accident data (5 injuries related to work with cranes) to the rulemaking record in their comments. (ID -0184; -0342; -0345.17; -0384.1.) Stephen Yohay, representing Edison Electric Institute noted that there was no explanation of the benefit that would result for the electric utility industry or electric industry employees, and therefore no evaluation of whether the benefit was reasonably related to the cost of compliance. (ID -0203; -0335; -0342; -0345; -0372; -0380; -0381; -0408.) The Agency was also made aware of the potential overlap of costs and benefits of industries affected by both the construction cranes' standard and the Agency's previously proposed standard Electric Power Generation, Transmission, and Distribution; Electrical Protective Equipment (subpart V), which essentially resulted in double counting of risk reduction, or benefits, in the electric utility industry as well as the construction industries working for the electric utility industry in the cranes proposed standard. This oversight has been corrected.

The proposed standard's benefits analysis rested upon BLS' Census of Fatal Occupational Injuries (CFOI) data for total annual fatalities in the construction industry, an estimate that eight percent of (CFOI) construction fatalities were crane related, and an analysis of a small sample of fatality reports from OSHA's IMIS data indicating that 58 percent of construction crane-related fatalities could be prevented by the proposed cranes

standard. The application of the construction crane standard to general industry sectors and the necessity of disentangling the affect of subpart V required a different approach. The Agency instead is relying on an analysis of four years of IMIS fatality reports across all industries to estimate the risk reduction, or benefits, attributed to the final cranes standard. This method has been used by the Agency to evaluate risk reduction in virtually all of its safety standards. The Agency collected 506 fatality reports from IMIS across all industries for the years 2004-2007. Of these, over 200 were found to be construction related, including some in general industry sectors. One hundred and twenty-six of these (with 132 fatalities) were accidents that the Agency concluded were potentially impacted by the final standard, and the Agency estimates that 88 of these will be prevented by the final standard, or about 22 per year. The Agency also estimated that the final standard would prevent 175 injuries annually. The table below describes the industry sectors with IMIS accident fatalities that the Agency concludes are impacted (i.e., potentially avoided) by the final standard.

Table B- 6

Avoidable Fatalities in the Construction Industry 2004 – 2007

SIC	Industry Name	Fatalities
1521	Single-family housing construction	4
1541	Industrial buildings and warehouses	5
1542	Nonresidential construction, nec	4
1611	Highway and street construction	11
1622	Bridge, tunnel & elevated highway	11
1623	Water, sewer, and utility lines	13
1629	Heavy construction, nec	7
1721	Painting and paper hanging	1
1731	Electrical work	3
1742	Plastering, drywall, and insulation	1
1751	Carpentry work	3
1761	Roofing, siding, and sheet metal work	3
1771	Concrete work	12

1781	Water well drilling	2
1791	Structural steel erection	14
1794	Excavation work	2
1795	Wrecking and demolition work	1
1796	Installing building equipment, nec	3
1799	Special trade contractors, nec	15

The Agency provides a full explanation of its method of evaluating risk reduction in the FEA in the docket, along with an Appendix (Excel spreadsheet) of the IMIS records examined. The Agency evaluated reports from the effect of crane regulations in California as well as the Canadian province of Ontario. The Agency concluded that results from these two regulatory efforts are consistent with OSHA's conclusion that the final standard reduces risk of construction crane accidents and injures; however, the Agency determined that review of IMIS records would provide a better method to quantify benefits.

This same analysis also showed that there is a serious risk of fatalities in General Industry construction work. Table 7 shows the fatalities in construction related work in the General Industry sectors that have been added to the economic analysis.

Table B-7 Fatalities that occurred outside traditional construction Industries that could be avoided by the final standard, 2004-07

Number of Fatalities	**SIC**	**Industry name**
1	3441	fabricated metal products
1	4789	transportation services
1	4911	electric services
1	4931	elec services and more
1	5031	lumber, plywood, wholesale
2	5211	lumber and other bldg. materials dealers

6	7353	heavy construction equipment rental and leasing		
1	7389	business services, nec		
1	8731	commercial physical and biological research		
1	9223	correctional institutions		
1	9999	non-classifiable establishments		

Source: ORA; IMIS

Analyzing IMIS crane fatality reports

OSHA typically measures the risk reduction, or benefit, of its safety standards by examining accident reports. Accidents that occur because of a failure to comply with an existing standard are not counted as a benefit, or risk reduction, that is attributed to the effect of the new standard. In addition, the Agency does not try to estimate, or factor in, compliance with the new standard in estimating costs and benefits. It estimates costs as if all employers fully comply, and estimates benefits as if employer efforts prevent all types of accidents, or risks, the standard addresses. The chief purpose of the analysis is to demonstrate feasibility while providing a measure of the size of the rule, its possible impact on industries and the economy, and the ability to weigh and compare its costs and benefits. The analysis is not trying to predict with precision exactly the outcomes under the rule, which depend on employer compliance, changes in technology and the way employers react to the new standard, and many other factors.

The Agency is taking a somewhat different approach to estimating the risk reduction under the crane standard. OSHA's current construction crane standards were adopted in 1972 under the OSH Act's sec. 6(a), permitting the Agency to adopt existing standards and current consensus standards without informal rulemaking. Thus, for example, former § 1926.550(b)(2) referred to the ANSI B30.5-1968 standard (that is, from the year 1968) for requirements for design, inspection, testing, and maintenance of

crawler, locomotive, and truck cranes. The current standards were widely believed to be out of date and ineffective; hence, the creation of the Negotiated Rulemaking Committee (C-DAC) from affected industries and labor representatives to address weaknesses.

For example, the former construction crane standard had in former § 1926.550(a)(15)(i) a prohibition from working within 10 feet of any energized overhead power line. Yet power line contact causes more crane-related employee deaths than any other source, and the negotiated rulemaking committee produced provisions that are meant to reduce those fatalities. Technically, however, one could argue that it is a failure to comply with the current standard that results in electrocutions. If the crane, boom, wire, or load were not getting closer than 10 feet to power lines, there would be no electrocutions. The final standard increases the prohibited distance to 20 feet, but also includes a number of other precautions. California recently increased the prohibited distance to 20 feet, and reported that electrocutions due to cranes have fallen from five over a two and one-half year period prior to the regulation to just one in the same period of time afterward. The reduction in the California fatalities also can be attributed to a requirement for operator certification; this final OSHA standard also includes this requirement.

The Agency concludes that its final standard will result in fewer fatalities and injuries due to a number of the provisions in the final standard, even though there are some existing construction crane provisions that address the same risk. This is attributed to more specific precautions in particular sections of the rule as well as the requirement for certifying crane operators, which potentially affects safety in all aspects of crane operations.

Another example where the final standard will be more protective than current standards is in assembly/disassembly operations. Assembly/disassembly operations are, along with power line contact, a leading cause of fatalities in crane work. Technically, one could argue that these fatalities could always be avoided by compliance with the current crane standard--to follow manufacturers' specifications--which is a general, passive, and non-specific duty. The final standard has lengthy provisions in the final standard to prevent these types of accidents.

OSHA believes that these types of accidents will be prevented by compliance with the provisions of this final standard for assembly and disassembly of equipment. Section 1926.1403 requires that equipment be assembled in compliance with manufacturer procedures or with alternative employer procedures designed to prevent the equipment from collapsing. In addition, under § 1926.1404, assembly must be conducted under the supervision of a person who understands the hazards associated with an improperly assembled crane and is well-qualified to understand and comply with the proper assembly procedures. Section 1926.1404(f) would prohibit employees from being under the boom when pins are removed. In situations where site constraints require an employee to be under the boom when pins are removed, the employer must implement other procedures, such as ensuring that the boom sections are adequately supported, to prevent the sections from falling onto the employee. This specific work practice alone will prevent virtually all fatalities associated with assembly/disassembly of lattice boom cranes. Section 1926.1404(q) contains several provisions designed to ensure that outriggers are deployed properly before lifting a load. In addition, the operator qualification and certification requirement of proposed § 1926.1427, which is intended to

ensure that operators understand and follow the safety requirements for the equipment they are operating, would help prevent this type of accident.

For informational purposes, as required by E.O. 12866 (also following the guidance of OMB's Circular A-4), OSHA monetizes the safety benefits of standards. OSHA assigns a value of statistical life (VSL) to fatalities prevented by the final standard of $8.7 million per VSL. This estimate is based on the median value found by Viscusi and Aldy in their 2003 review ($7 million in 2000 dollars), adjusted by the GDP implicit price deflator 2000 to 2010). The total monetized value of preventing 22 fatalities annually is about $191.4 million. For accidents, OSHA uses a willingness-to-pay methodology to monetize the value of injuries avoided, of $50,000 in 2000 dollars; which, when adjusted by the GDP deflator is about $62,500 in 2010 dollars. Thus, the monetized annual value of an estimated 175 injuries avoided by the standard annually is about $10.9 million. The total annual monetized value of avoided injuries and fatalities is about $202.3 million.

Costs of Crane Accidents

Several commenters noted that crane accidents represented a substantial cost to employers in the crane industry. (ID -0341; -0342; -0343; -0344.) In the PEA the Agency did not estimate cost savings from avoiding crane accidents, but only estimated monetized benefits for avoiding fatalities (the value of a statistical life, or VSL) or injuries (a value based on willingness to pay). These cost savings do not represent other losses associated with accidents, such as production time lost to provide medical services to injured employees, damage to cranes, damage to the work site or beyond, damage to

the load materials or rigging, lost time in cleaning up and repairing damage to the worksite, lost production time while the crane is removed, repaired, or replaced with a substitute. More obviously they do not account for costs of crane accidents where no fatality or injury was recorded. There are many more crane accidents that do not involve any injury than those represented in the IMIS reports, and the Agency concludes that the final standard will avoid these just as effectively as the accidents where injuries occur.

For example, there were ten tipover accidents with fatalities in OSHA's IMIS records for 2008, and data collected in the state of California over a three year period showed that there were 35 (mobile) crane tipovers for the single tipover accident fatality (Op cit. Yow, Philip, "Crane Accidents 1997-1999…."). Since California has about ten percent of the U.S. population and economy, this suggests that there are on the order of 350 crane tipover accidents over a three year period, or about 120 per year. Tipovers typically require crane repair, lost production time for all employees at the site, and schedule delays. Since there are firms that specialize in repairing cranes damaged in accidents, the Agency believes that they are in fact frequent. If the cost of these kinds of accidents are only, on average, $100,000 each, the total annual cost savings from avoiding two-thirds (the fraction of current crane fatalities prevented by the final standard) of them would be about $7 million per year. That represents a cost saving of avoiding accidents from just one cause. Although tipovers and crane or boom collapses are likely the most expensive type of crane accident, they represent only about 10 percent of the types of fatal accidents.

Tower crane collapses in urban areas, while infrequent, are very costly, as the crane is typically lost, considerable damage done to the worksites and structures beyond,

and days if not weeks of lost production. The Agency believes that this cost is significant, but has no information in the record with which to estimate this source of cost savings.

Similarly, there are costs associated with all crane accidents, whether or not there is an employee injury. The Agency does not have information in the record upon which to estimate the overall number of crane accidents, or the particular costs of the different types of accidents, such as dropping a load, contact with power lines, and so forth. But the Agency believes that the potential economic benefits from reducing these with compliance with the final standard is likely very substantial.

Insurance savings

An expert from the insurance industry reported that his company offers a 10 percent reduction in general liability premiums if all an employer's operators are certified. (ID -0343; -0345.34; -0347.) Several commenters confirmed that fact and also said that this saving alone more than paid for the cost of certifying operators. (ID -0343.) There was no information in the record about the cost of general liability insurance to employers with cranes, and so the Agency cannot compute any cost saving based on their cost or prices. However, this possible saving clearly shows that it is not simply OSHA that sees savings associated with operator certification, and that employers can reasonably expect some immediate savings associated with operator certification (projected to cost about $51 million annually).

Net Benefits

The monetized benefits and other benefits of the final standard are estimated by the Agency to be $209.3 million annually ($202.3 million from fatalities and injuries avoided, plus $7 million in avoided tipover accident costs). The Agency has not quantified the cost savings from many accidents which do not involve injury that will be prevented by the final standard.

5. Technological Feasibility

In accordance with the OSH Act, OSHA is required to demonstrate that occupational safety and health standards promulgated by the Agency are technologically feasible. Accordingly, OSHA reviewed the requirements that would be imposed by the final regulation, and assessed their technological feasibility. As a result of this review, OSHA has determined that compliance with the requirements of the final standard is technologically feasible for all affected industries. The standard would require employers to perform crane inspections, utilize qualified or certified crane operators, address ground conditions, maintain safe distances from power lines using the encroachment prevention precautions, and to fulfill other obligations under the standard. Compliance with all of these requirements can be achieved with readily and widely available technologies. Some businesses in the affected industries already implement the requirements of the standard to varying degrees (some states have requirements), as noted during the SBREFA Panel. OSHA believes that there are no technological constraints in complying with any of the proposed requirements, and received no comments that suggested that these standards were technologically infeasible.

6. Costs

The Agency received comment on some unit cost estimates of specific provisions in the PEA: operator certification, the number of crane jobs involving work near power lines, electric utilities providing voltage information, de-energizing power lines, locking out automatic line re-energizing devices, providing line wraps for power lines, and conducting power line meetings. Based on that comment, the Agency has revised the original cost analysis ($123 million annually), and corrected errors noted below. The Agency estimates that the final construction cranes standard will cost employers $154.1 million annually.

The Agency did not receive comment on its estimate of the number of cranes and crane jobs per year; nor on the time and cost of provisions on assembly/disassembly (except for ground conditions), and inspections. The Agency also did not receive any comment on its estimates of "baseline" compliance, or the fraction of affected employers who are already performing or providing protections required in the final standard. For example, the Agency had estimated that, as a baseline, 30 percent of affected crane operators are already certified. However, the Agency did receive considerable comment and new information in several areas: the number of operators already certified; the number of cranes, crane jobs, and certified crane operators from individual employers or industries; the extent of current compliance (baseline) with providing safe ground conditions and assembly/disassembly operations; frequency of crane inspections; and the frequency of work close to high-voltage power lines. Based on the new information in the record, the Agency has revised several of its baseline figures, discussed below.

The Agency also received considerable new information about general industry sectors that would be affected by the final standard. The Agency has incorporated that information into its estimates of costs for those sectors. The Agency has also updated its information about wages, establishments, and revenues from the 2006 Statistics for U.S. Business (SUSB) and County Business Patterns. As the number of cranes in the PEA was, for some sectors, based on an estimate of revenues, the number of cranes for some sectors has changed from the PEA based on newer revenue data.

Employers have four years from the publication date of the final rule to comply with the requirements for operator certification. The Agency could assess that cost across the next four years and discount those values back to the present to add to the other annual costs of the standard. However, assessing benefits for only part of the final standard for several years is problematic. The Agency has concluded that the clearest picture of cost, benefits, and impacts will be given as if all costs and benefits of the final standard occur in the first year. This removes the problems of parsing risk reduction from separate provisions of the final standard for several years, in addition to assessing when employers might comply with certification and the resulting effects on discounting. Presenting full benefits and costs side by side also provides the easiest view of the long-run effects of the final standard.

The Agency presents and discusses comment on the PEA, new information in the record, and revisions to cost estimates in the following sections: operator certification, power lines, assembly/disassembly (A/D), inspections, and ground conditions. Unit costs are explained below and presented in Table B-8. Wage rates in the PEA were based on 2003 BLS data. The Agency has increased these base wage rates by 19 percent for the

FEA, based on more recent BLS data. Summarized costs by provision are presented in Table B-9.

Cost of operator certification

For the FEA, the Agency has increased the estimated cost of test preparation (a course) for a third party operator exam from $500 in the PEA to $1,500, plus, as before, $250 for the exam itself and 18 hours of wages ($31.37/ hour, total of $564). When the total initial cost ($2,064) is annualized over 5 years, the annualized amount is about $500. In addition, based on comment in the record the Agency has increased the baseline of current compliance in the traditional construction industries from 30 percent to 60 percent, and assumed that no crane operators in the affected general industry sectors have been certified (ID -0341; -0342; -0343; -0344). The Agency also reduced the turnover rate of crane operators from 23 percent to 5 percent, thus reducing the number of new entrants each year who would require certification. The annualized cost of crane operator certification is estimated to be about $59 million per year.

The PEA had estimated that a two-day preparation and testing would cost employers $750 for each employee taking the operators certification test ($500 for the prep course, and $250 for the written and practical exam). In addition, employers would have to pay the wages of a crane operator ($31.37 per hour with benefits) for 16 hours of his time, plus an additional 2 hours, on average, for travel. The total cost was estimated to be $1,314 per employee taking the crane certification exam. The Agency annualized that one-time figure over 10 years, for an annual per operator costs of $187.

The Agency erred in the PEA in annualizing the cost of the training and testing over 10 years instead of five, since the certification is only good for five years. Although, re-certification does not typically entail the prep course and time, and future costs of certification are therefore probably considerably much lower, the Agency concludes that for purposes of weighing the costs and impact of the final standard, that it will rely on the initial costs annualized over five years. However, because the Agency accounted for turnover of operators and estimated costs for new operators as a result of retirement for the industry, a simple five year annualization would overestimate costs. As a result, the Agency introduced a factor to the formula to assure that no costs were taken for recertification of retired operators. (See full formulas in the FEA.)

Operator certification was the primary focus of comments on costs. Many commenters stated that in regard to the means of crane operator certification Option (1), or third-party testing, was the only viable alternative. (See, e.g., ID -0151; -0342.) The Agency agrees that this will be the primary means of certification and notes there are several testing organizations now available, with more reportedly in the process of being accredited. (ID -0341; -0343.)

Michael Eggenberger of Bay Ltd provided several comments on the unit cost of operator certification. (ID -0254.) Mr. Eggenberger provided photocopies of invoices that showed Bay Ltd paying for NCCCO written and practical exams, over two days, for $1,375 each. The invoice does not make clear whether the two days included prep training, but handwritten on each invoice is the additional information that the invoice costs did not include prep training at $500, plus five days' wages for each employee. The Agency concludes that Bay Ltd provided a course of prep training and testing that lasted

five days. If Mr. Eggenberger's employees were paid the average wage (including benefits) of $31.36 per hour that OSHA is relying on, based on BLS data, then the total cost per employee would be $3,129 (about $1,250 in wages, $1,375 for prep and the exam, and $500 in prep training.)

Edison Electric Institute, representing the electric utility industry, submitted cost data for certification "utilizing $1,750 as the base cost for a training course and the actual exam. EEI has estimated that it would cost approximately $1,500 for an employee training course, and $250 for the certification program." (ID -0345.17; -0370.1.) EEI did not provide any detail about its figures.

Comment received from James Nevel of the National Utility Training & Safety Education Association (NUTSEA) said that "typical training programs that we have seen run $1200 to $1400 for classroom training and then an additional $450+ or so for the certification testing." (ID -0155.1.) NUTSEA's membership of 250 "provides safety and training services to most of the electric cooperatives in the United States."

California enacted a requirement for crane operator certification which took effect in June, 2005. That state's operator certification requirement did not apply to digger derricks and mobile—usually truck-mounted--cranes with a capacity below 15,000 pounds. The state estimated that there were 5,000 mobile cranes and 700 tower cranes affected and that about 10,000 operators would require certification ("Economic Impact Statement," Attachment #1 for Crane Operator Qualifications/Certification, Economic and Fiscal Impact Statement, STD, 399). California estimated that there were almost 2,000 businesses that owned, operated, or leased cranes affected by the state's regulation. Further, the state's impact report estimated that the cost of certification would include a

physical examination ($320), a substance abuse test ($120), and cost of a written and practical exam from a NCCCO testing agent ($550), or a total of $990 per operator.

The Agency received several estimates of the cost of operator certification as part of the Small Business Advocacy Review Panel (SBAR). John Anderson reported that he estimated certification costs at $2,900 per employee, including five days for training, exam, and wages (OSHA-S030A-2006-0064-0019), with the average cost of an exam $382 and with training or prep courses $1,260 on average, and wages $1,255. Mr. Anderson also cited a general contractor's cost of exams and prep class of $1,375. Art Daniels of AR Daniels Construction estimated the cost of certifying one operator to be $6,141.59, but did not provide any detail of how the estimate was determined. Mr. Daniel also commented that the Agency's wage estimate was too low, but his estimate included wages for overtime which accounted for much of the difference. (OSHA-S030A-2006-0064-0019.) Mr. Daniel also stated that no costs were included for re-testing or loss of production. However, the Agency did include costs for re-testing (when an operator initially fails the test) and the value of lost production is accounted for in operator's wages. Several participants in the SBAR panel also noted that they have no turnover among their crane operators.

Current OSHA standards require operators of construction cranes to ensure that operators are trained. The Agency does not agree that the final standard requires a five-day training and prep course for employees to take and pass the crane operator's certification. Five-day courses are designed not just to prepare potential operators for certification, but to train newcomers. For example, Bob Behlman of Behlman Builders in describing the training that he sends his crane operator to, notes that the five-day course

by a national consulting firm that specializes in mobile crane training and inspection services is "designed for both newcomers to the crane operators field [and] to those who have years of experience." (ID -0373.1.) Mr. Behlman notes that the current five-day course that he provides for his crane operators as of this time still does not include a written and practical test, such as NCCCO or the International Union of Operating Engineers (IUOE) offers. As Mr. Brent of NCCCO said at the public hearing, "a lot of those costs…are not associated with certification at all. They're associated with the training process." (ID -0343.)

Many testing companies provide testing along with a preparation in either two-day or five-day courses, but virtually all commenters on the record note that few certified operators take the preparation course when re-certifying is done, and that re-certification is much less costly. The preparation course is designed not to train operators on cranes, but to help them negotiate the written test. Again, as noted above, the Agency was not including in its estimates of the cost of operator certification any training related to obtaining knowledge about, or operating, a crane, which is already a duty of operators of cranes in construction. Operators have been taking certification exams without benefit of special preparatory courses for many years in cities and states (such as Connecticut and New York City) that perform their own testing of crane operators for licensing or certification. As was pointed out in testimony, part of the resistance to third-party certification may be that current crane operators may lack the requisite training or skills. (ID -0343.)

It was not incumbent upon the Agency to include purchased, preparatory training from third party providers as a cost of the standard. The final standard requires no such

purchased training. The Agency concludes that while many employers and crane operators will avail themselves of the test preparation, not all will do so, and this was recognized in comment. (ID -0343.) In terms of estimating the costs of the final standard, it is reasonable that employees and independent crane operators, who have already been sufficiently trained in crane operation and may have many years' experience, certainly need no more than a short preparation to successfully pass the crane operator certification tests. Thus, the Agency has included as part of the cost of the standard, $1,500 as the price of a two-day prep course for taking the operator's written and hands-on exams.

The Agency did not include costs of operator certification for users of sideboom cranes found in pipeline construction (NAICS 237120 Oil and Gas Pipeline Construction) and derricks, found in water tank construction (NAICS Water and Sewer Line Construction). Both types of cranes are exempted from requirements for operator certification in the final standard.

The Agency increased the number of current crane operators in construction who already are certified. NCCCO reported that since 1996 they had provided exams for 65,000 operators who had taken over 365,000 exams. (Operators frequently choose to be certified on several different types of cranes. (ID -0343.)) NCCCO reported that crane certification was primarily sought for construction cranes. The IUOE reported that they have provided 12,000 written and 8,000 practical, or hands-on, exams. (ID -0341.) Sixteen states now have a requirement for operator certification or licensing. (See, e.g., -0347.1.) Four states have their own state licensing programs. In addition, the nation's largest cities also have their own licensing or certification requirements. One commenter

noted that in Ohio, which has no requirement for crane operator certification, hiring certified construction crane operators had become the norm for the industry. (ID -0341.) Insurance representatives and other commenters at the public hearings noted that many employers were getting their crane operators certified as the cost was recouped from premium reductions. (ID -0341; -0343; -0344.) Accordingly, the Agency has increased its estimate of the number of construction crane operators who already are certified to 60 percent of current operators.

The Agency is confident that the estimated costs of operator certification are not underestimated. The Agency concludes that at least 5 percent of construction cranes are owner-operated. (ID -0025; -0341.) Since these self-employed individuals or family-owned businesses have no employees, they will not--for purposes of following the standard--have to be certified. In some areas, it is the custom for crane operators to pay for their own certification. (ID -0343.) However, a new provision in the final standard requires employers to pay for certification in any event. NCCCO's Mr. Brent testified that: "There are some candidates who are paying outright. Some employers have instituted a vesting program where some fees are due to be repaid if the employee leaves in a certain period." (ID -0343.) In addition, in situations where crane operators are union members, who may be hired out of union hiring halls, it is likely that training and certification will be performed through the union rather than an employer. The IUOE pays for their members' crane training and certifications costs out of union dues (ID -0341); so while employers, and ultimately owners of new construction projects, may pay for the cost of union operators' certification via somewhat higher wages, there is no immediate cost to employers or general contractors for operator certification. In addition,

many certification prep courses and exams are offered on weekends, and there will not be any lost time of production in such cases. (ID -0343.)

Several small employer representatives on the Small Business Advocacy Review Panel remarked that they had no turnover of crane operators. (OSHA-S030A-2006-0664-0019.) Similarly, employers and associations who provided public testimony at the standard's public hearings also noted little or no turnover among operators. Accordingly, the Agency concludes that although there may be transfer between employers, crane operators are a select and highly paid group who are unlikely to exit their field. Employers who lease cranes with operators, which is the predominant mode of crane jobs, or who hire from union hiring halls would experience no turnover of crane operators at all.

Power lines

The Agency has revised its estimates in the PEA of the "unit" costs of power line work for: assembly/disassembly; crane operations closer than 20 feet to a power line (§ 1926.1408); and crane operations within the Table A distances (within 10 feet in most instances) (§ 1926.1410). Comment in the record indicated that crane operators routinely assess sites for potential power line risks. (ID -0341; -0344.) Thus the Agency concludes that the current baseline of compliance with assessing power line risks is 100 percent and this provision does not impose new costs on affected employers. The Agency did not estimate costs for work near power lines within Table A distances for the electric utility industries, power line construction, and electric contractors, as these employers work near power lines under subpart V.

The Agency has revised estimates of unit costs for some operations near power lines. There were two primary sources for the revision of some unit costs of power line work: the written submission by Edison Electric Institute (EEI) reporting cost information from 16 members and the testimony and written comment from EEI itself. (ID -0343; -0345.17.) Based on the EEI member's information, the Agency concludes that the cost of providing voltage information is about $200 per occurrence; that the cost of locking out automatic line re-energizing devices is about $320; and that it takes electric "utility owner/operator" or engineers a total of six hours ($360) for travel and for participation in planning meetings, review of procedures, and identification of a person to implement procedures. These figures represent approximately the median or average of estimates provided by EEI members, although each member did not provide information about each operation. In addition, the Agency had estimated the cost of using an insulating link when working very close to power lines as $427 per use. Comment in the record showed that the average cost of these devices is lower than the Agency's estimate in the PEA of $15,000, that their working lifetime is 20 years rather than 10, and that they may require recertification each year. (ID -0085; -0085.1; -0085.2.) Accordingly the Agency has revised its estimated cost per use to $210 (based on the information and model in ID -0085, but with a 7 percent discount rate). Although the final standard may not require the use of NRTL-approved insulating links until up to three years after the standard takes effect, the Agency is including costs for this provision as if employers will replace their inventory by purchasing and beginning use of NRTL-approved insulating links in the first year that these links are available.

The Agency has also revised the costs of planning meetings. In the PEA the Agency concluded that four individuals would participate in such a meeting. That model fits with operations of a traditional lattice-boom crane. However, most cranes jobs today are of short duration by truck-mounted cranes, and the Agency estimates that only three individuals will typically be involved in a planning meeting.

Operations closer than Table A distance

The Agency received comment about work close to power lines that has significantly increased its estimates of costs. (ID -0342; -0345.17.) Unit costs for the time required of electric utilities or professional engineers has been revised to $360 per episode; costs of de-activating or locking automatic line reclosure devices has been increased from about $30 to $320, and the cost of supplying voltage information is $200.

The Agency had estimated that cranes were performing operations closer than 10 feet, or the Table A distance, in about 5 percent of all crane jobs that were not assembled near power lines (which was 75 percent of the total estimated 859,000 cranes jobs per year). In testimony, EEI's David Highland, also from Allegheny Power, referred to the frequency of close-to-power-line work as OSHA's estimate of "50,000 episodes" per year. The 50,000 figure was also noted in EEI's written testimony. (ID -0345.17.) However, OSHA's estimate of the actual number (5 percent of 75 percent of 859,000) was approximately 32,000. Mr. Highland also said, "We thought it would double," in speaking of the number of times construction employers would operate cranes closer than the Table A distances.

The former OSHA standard at former § 1926.550(a)(15) permitted work near power lines no closer than 10 feet except where they are de-energized and grounded or when they have "insulating barriers." If power lines are not de-energized or do not have insulating barriers, all parts of the crane, line and load, must maintain a 10-foot clearance, with a designated person to observe clearance in situations where the crane operator would have difficulty ensuring clearance by visual means; and insulating links may be used as well (former § 1926.550(a)(15(iv)). In oral testimony and written comment, EEI noted that electric utilities provide line covers now for construction crane operations, with practices varying from region to region. All electric utilities make use of line hoses for protection. (ID -0342.) Mr. Highland reported that his company gave "free line hose up to a certain length. . . . After 20 feet, they [crane users] start paying about 10 bucks apiece." (ID -0342.) Earlier in testimony, EEI said, "Currently, many electric utilities also place line hoses on power lines when so requested by non-utility crane contractors who need to work within 10 feet of a power line. Usually the utility owner/operator receives a call from a contractor prior to this work. More often than not, however, the utility discovered that work is being performed close to a power line when it is observed by happenstance, for many contractors simply do not call." (ID -0342.) Although the electric utility industry predicted that the number of these episodes involving construction cranes would double or increase exponentially, and thereby force them to incur greater costs under the standard, the Agency disagrees. The final standard imposes significant new procedures and costs beyond what current standards require. Generally, one expects crane users in the affected industries to take further steps to avoid working closer than the Table A distances to power lines, rather than more.

The Agency included in its cost estimates for work closer than Table A distances the following:

- a planning meeting (2 hours for three individuals costing about $132);
- time and costs for the utility owner/operator or engineer for all of their duties (6 hours or $360), i.e., planning, voltage information, determining a minimum clearance distance, reviewing procedures, and identification of an individual to implement procedures;
- request that electric utilities de-activate the automatic re-energizing devices, which the Agency assumes will cost crane employers $320, on average, to be paid to electric utilities;
- use a dedicated spotter at all times (average of 4 hours, $64.06);
- use of an insulating link ($210); and
- provision of barricades and grounding of equipment ($4.04 and $8.08).

The crane user must also secure voltage information from the electric utility, but the Agency assumes that since the utility's owner/operator or an engineer is present, this information is at hand; therefore, for work within Table A distances, there is no separate, additional cost.

Since line hoses or barriers are already required, and terms are currently arranged between the crane employer and the utility, there is no new cost for line covers under the final standard. The Agency concludes that the crane employer faces, at a minimum, about $800 in new costs under the final standard to work within 10 feet or the Table A distance of a power line. If the employer must also fully compensate the electric utility for the utility owners or engineer's time, the total cost is estimated at $1,100.

The final standard seems to shift the duty and expense of line covers wholly onto electric utilities, with crane contractors reported as compensating electric utilities to some degree currently. (ID -0342.) However, the limited comment on this issue in the record does not permit an estimate of any effect.

All other provisions of the final standard's § 1926.1410 are already being performed in current construction crane jobs close to power lines, the Agency concludes.

Assembly/disassembly near power lines

Under the proposed standard, before beginning crane assembly/disassembly, the crane operator or employer must determine if any parts of the crane or equipment may get closer than 20 feet to a power line during A/D. If so, either the employer must have the line de-energized (Option (1)); stay farther than 20 feet from the power line (Option (2)); or follow the procedures in Option (3): determine the line voltage and minimum clearance distance; prevent encroachment by having a planning meeting and use either a dedicated spotter, proximity alarm, a "range control warning device," or an elevated warning line. The Agency believes that by far the most common method will be to provide a dedicated spotter during A/D. There was considerable comment in the record that de-energizing lines was rare, difficult for regulatory reasons, and expensive. (ID -0342.)

The Agency has estimated costs as if A/D operations near power lines follow Option (3) and that crane employers or owners use a spotter to ensure that cranes stay far enough away. In the PEA, the Agency estimated that this happened in 25 percent of

crane jobs. There was no comment on that estimate in the rulemaking, and the Agency concludes that A/D near power lines occurs about 200,000 times per year.

The Agency has estimated A/D costs near power lines as follows:

- crane operators and employers already assess distance to power lines; so the Agency takes this as a baseline and concludes there are no new costs due to this provision in the final standard;
- to determine voltage and the minimum clearance distance, the Agency estimates that A/D will be close enough to the power line to contact the utility about 25 percent of the time, costing about $50 (one-fourth of $200), on average, for each A/D episode. Most crane operations will be near typical residential power lines of less than 50 kV, with a minimum clearance distance from Table A of 10 feet.
- hold a planning meeting which for the typical crane operation will consist of the crane operator, spotter, and any on-site employer or contractor (for a lattice-boom crane that truly performs A/D operations, many more individuals are involved in the planning meeting as required in § 1926.1407(b)(1);
- employ a spotter to ensure that the minimum clearance distance is maintained, and provide training for the spotter, if needed (2 hours plus 15 minutes training).

The Agency estimates that the total costs of providing protective procedures during A/D near power lines for a typical crane job will cost less than $100. Table B-9, Cost by Provision, shows that the total costs of these operations for all affected employers is estimated to be about $16 million annually.

Crane operations within 20 feet of power lines (§ 1926.1408)

Under the proposed standard, before beginning crane or derrick operations, employers must either: (1) define a work zone with demarcated boundaries by using flags or a device such as a range-limiting device or range-control warning device that prohibits the operator from operating the crane past those boundaries, or (2) define the work zone as the area 360 degrees around the crane based on the crane's maximum working radius (see proposed § 1926.1408(a)(1)). The Agency estimates that, in most cases, the least-cost option would be to mark the zone with flags. Based on the defined work zone, the employer must determine whether the crane, load, or load line, if operated to its maximum working radius, could get closer than 20 feet to a power line

If the 20-foot determination is positive, then the employer would be required to follow one of three options. If any part of the crane, load, or load line could not come within more than 20 feet of a power line at the crane's maximum radius, the employer would not be required to take any further action. If the crane operations could take the crane closer than 20 feet, the employer must either: (1) de-energize and visibly ground the power line, (2) maintain the 20-foot clearance by employing a spotter or other warning device, after having a planning meeting, or (3) determine the line voltage and minimum clearance distance and maintain that distance between all crane parts and the power line by employing a spotter or other warning device, after having a planning meeting.

If the employer follows Option (2) or (3), the employer must then maintain the appropriate distance by implementing several encroachment-prevention procedures to ensure that the crane does not contact the energized power lines, including: having a planning meeting with the operator and other workers who will be in the area of the

crane, and using either a proximity alarm, operational aids/limiting devices, a dedicated spotter, or an elevated warning line. The Agency estimates that a designated spotter would be used to ensure that the appropriate distance is maintained between the crane and power line.

In the SBAR panel process, many small entity representatives commented on this provision. The majority believed that, most of the time, a dedicated spotter would be used. For some, work near electric lines was rare; for others, it occurred several times each year. In the PEA, the Agency estimates that work potentially within 20 feet of a power line, occurred on 22.5 percent of all crane jobs. The Agency has simplified this estimate for the final analysis, and estimates that, as for A/D operations near power lines, operations within 20 feet of power lines occur about 200,000 times per year.

Costs for working within 20 feet of power lines thus consists of:

- identifying and demarcating a work zone and determining the maximum swing radius of the crane (0.5 hours)
- ensure that the crane does not come within 20 feet of the power line by using a dedicated spotter (2 hours), or
- determine the line voltage and maintain the minimum Table A clearance distance by using a dedicated spotter (2 hours).
- seek voltage information.

The Agency estimates that, for operations near power lines, crane employers will do so about half the time ($100, or one-half of $200), on average, for each occurrence.

The Agency estimates the average cost for protective measures in the final standard for cranes to work within 20 feet of a power line is about $160.

Crane Inspections

The Agency received little comment on its estimates of costs of inspections. Inspections were frequently mentioned by commenters as necessary and already being performed. However, the industry consensus standard requires frequent (daily to monthly) inspections and periodic inspections (monthly to annual ones). The final standard requires daily visual inspections, and monthly and annual inspections that must be documented. In addition, the final standard adds more specific checks on more equipment that the consensus standards. Thus, the Agency is keeping its estimate that monthly and annual inspections will take 15 minutes longer than is typically done today. Due to an error in the spreadsheet calculations, in the PEA estimates of the monthly inspections were too high--based on an additional 30 minutes per month rather than 15 minutes. When this error was corrected the annual additional cost for inspections fell from about $21 million per year in the PEA to $16 million annually. The final standard has a new provision requiring written notification when an operational aid is broken or a repair is necessary (§ 1926.1417(j)(1)). The Agency has estimated that condition will occur to 30 percent of (122,091) cranes annually and require 0.17 hours (10 minutes) of a crane operator's time (wage $35.62). This cost of written notification (about $257,000 annually, or $2 per crane, on average) has been added to the inspection costs in the tables. The Agency has also included in the inspection costs the estimated the cost of providing affected employees notice at the beginning of each shift that a crane function or part is broken (§ 1926.1417(j)(2)). The Agency estimates that such notice will take an average of 3 minutes for, on average, 20 days by the crane operator.

Ground conditions and assembly/disassembly

In the PEA the Agency estimated that for each crane job an assembly/disassembly (A/D) supervisor—likely the crane operator in many instances—would assess ground conditions and power line risks. Many commenters reported that these functions were routinely already performed, and the Agency has adopted that practice as its baseline. (ID -0341; -0343.) More pointedly, most crane jobs today are performed by truck-mounted cranes. Several commenters noted in both written comment and oral testimony that these cranes have no assembly or disassembly. While there is a lengthy description in the A/D provision in the final standard, with pictures, of steps and procedures for lattice-boom cranes, these cranes perform relatively few crane jobs. A large lattice-boom crane may be assembled for a job lasting several months—one crane job—while a truck-mounted hydraulic crane may perform three or four jobs in a day. While truck-mounted cranes have safety hazards when extending stabilizers or outriggers, these are not the same hazards associated with lattice-boom cranes—or tower cranes which have their own specific provisions for erection and climbing at § 1926.1435, Tower Cranes. There are also relatively few tower cranes, which also perform a single "crane job" that may last many months.

No commenter denied that current crane operators assess conditions prior to setting up and operating a crane. In addition to comment in the record, several organizations provided training materials that indicated an assessment of conditions was standard operating procedures for crane work. (ID -0345.14; -0345.17; -0380.) The

Agency eliminated these assessment costs in the final standard, but still included A/D costs related to work near power lines.

There was considerable comment about ground conditions. The final standard places responsibility for providing sufficient ground conditions on the "controlling entity." Small builders and general contractors objected to this provision. There were several parts to most of the criticisms. First, many builders and contractors now rely on the crane company or the crane operator to assess conditions for safe crane operations, for example, when hiring a crane company to set roof trusses. (ID -0341: -0343.) In addition, many builders or contractors who hire cranes for particular construction jobs have no expertise in ground conditions (ID -0341), which the Agency acknowledged in the proposal's preamble. In response to these comments, the Agency accounted for the new burden which controlling entities will have under the final standard.

These costs fall primarily on the lessees of cranes or of cranes with operators, not employers affected by the crane standard who own their own cranes. The Agency concludes that, for estimating the costs of the ground conditions provision, builders of large commercial, residential, and industrial buildings and contractors do not face a new cost since they are, in general, at the building site. However, small builders and developers, or their supervisors or representative, may not be at one of their sites. (ID -0341.) The Agency estimates that the ground conditions duty will require two hours of employer time to be present at the site to meet their obligations. However, the standard does not require that controlling entities be physically present, and the Agency concludes that in most cases their attendance at the site will not be necessary because, in most situations, the ground conditions will be dry and reasonably level, and the cranes will be

lifting materials such as roof trusses and pre-fabricated wall sections—i.e., low-risk ground conditions. Any information that the controlling entity has about underground risks can be communicated by telephone. The Agency concludes that small builders in three industries will, at most, be affected by the ground condition provision at 10 percent of their projects involving crane operations. The Agency concludes that the typical crane job—setting roof trusses—and the fact that these loads are generally not close to the capacity of the truck-mounted cranes that perform the task, means that concern about ground conditions will not arise often. The three affected industries are: NAICS 236115 New Single Family Housing Construction; NAICS 236117 New Housing Operative Builders; and NAICS 236118 Residential Remodelers.

The Agency has estimated the costs of complying with the controlling entities' duties in regard to ground conditions for SBA-size small entities in the three affected industries. The criterion for "small entity" for these industries by SBA is revenue of less than $31 million. This is roughly comparable to construction of about 100 single family homes, and the Agency concludes that all small builders are certainly captured within this category. Accordingly, the Agency calculated the costs of expending two hours of time by employers for 10 percent of all crane jobs within the industry sectors by small employers. The costs for the affected sectors are presented in Table B-9. Table B-10 presents average annual costs per establishment across the affected sectors. Table B-11 provides the Agency's estimate of the number of cranes and crane jobs.

Language and literacy

There was also comment in the record about the difficulty some current crane operators may have in achieving crane operator certification due to a language barrier or weak literacy skills, and thus the FEA also describes possible impacts on current and future crane operators. Two testing organizations reported in the public hearings that they neither offer crane operator testing in languages other than English nor had any plans to do so. (ID -0341: -0343.) Testing in other languages would not merely require translating existing written and practical test materials, but developing and evaluating tests as if they were completely original. There was comment in the record that some current crane operators would not be able to read and therefore successfully pass a test in English. (ID -0100.1; -0243.1; -0387.) The Agency is not presenting any quantitative estimate of the impact of the final standard on individuals with language or literacy issues. The final standard has a new provision requiring that certification exams "must be administered in a language understood by the operator candidate" which may alleviate any burden imposed on non-English speaking crane operators.

Table B-8

Unit Cost Estimates for the Cranes and Derricks Proposed Standard

Section	Requirement	Incremental Time/Cost	Employee Type (Wage)
Assembly/Disassembly Near Power Lines	Assess power line hazards		Current practice
	If w/in 20', determine voltage	$200	25% of episodes = $50 on avg. per episode
	Planning meeting	20 mins	Spotter ($18.35); operator or A/D director ($35.62); rigger ($21.12)
	Spotter	1 hour	Spotter/ee ($18.35)
Power Line Safety – Operations within 20 feet	Demarcate work zone	30 mins/instance	Employee ($18.35)
	Planning Meeting	20 minutes	AD director or operator ($35.62); Rigger ($21.12) Employee ($18.35)

	Voltage information	$200	50% of time = $100 avg.
	A dedicated spotter is needed Spotter training	2 hours per incident 15 minutes (each)	Employee ($18.35), AD director/operator ($35.62) Employee ($18.35)
Power Line Safety – Operations (Closer Than Table A)	Min. clearance determination; voltage information; planning meeting, review procedures, identification of implementer	6 hours, including travel	Professional engineer (PE) ($72.22) or line owner/operator
	Planning meeting, review procedures, identify implementer	2 hours	Rigger ($21.12); spotter ($18.35); A/D director or crane operator ($35.62)
	Dedicated spotter	4 hours	Employee ($18.35)
	Barricades/work zone	15 minutes	Employee ($18.35)
	Equipment grounding	30 minutes	PE ($72.22)
	Insulating Link	$210 per use	
	Written procedures	Developed during planning meeting	
	Barricades	15 minutes	Employee ($18.36)
	Limit access	Discussed during instruction/training	
	Non-conductive rigging	Current practice	
	Line covers	$400-800	Current practice
	Deactivate automatic Reclosure devices	$320	Crane employer
Crane Inspections	Monthly inspection	15 minutes per crane in addition to current time spent (includes 2 minutes per crane for recordkeeping)	Competent person ($22.88)
	Annual inspection	15 minutes per crane in addition to current time spent (includes 2 minutes per crane for recordkeeping)	Qualified person ($41.25)
	Repair inspections	15 minutes per crane (includes 2 minutes per crane for recordkeeping)	Qualified person ($41.25)
	Written notification of inoperable operational aid or repair needed	30% of cranes annually; 0.17 hrs;	Crane Operator ($35.62)

	Notify affected employees each shift of a broken crane part or operational aid	30% of cranes annually, notify on avg. for 20 days, 3 minutes each day	Crane Operator ($35.62)
Operator Training for Certification/ Qualification	Certify operators	Wages for operator's training time (16 hours) for a 2-day prep course with exams, plus 2 additional hours for travel time. Thus, the total operator's pre-course and exam time is 18 hours. Cost for a 2-day course estimated to be $1,500. Total cost $2,054. Annualized and adjusted for 5 percent turnover. Base line: 60% of construction operators certified; 0% of crane operators in affected gen. indus sectors.	

Source: Office of Regulatory Analysis; BLS 2010 Wages and Earnings

Table B-9

Annualized Compliance Cost By Sector and Major Provision

NAIC	Industry	Number of Affected Firms	Number of Affected Estabs	Ground Conds	Crane Assembly/ Disassembly	Power Line Safety	Crane Inspections	Operator Qualification Certification	Total Annualized Cost
Crane Rental with Operators									
238990	All Other Specialty Trade Cont.	1,244	1,304	-	-	-	$823,510	$1,689,387	$2,512,898
Crane Rental without Operators (Bare Rentals)									
532412	Const./Min./For. Machine & Equip.	2,137	3,702	-	-	-	$6,644,845	$3,407,886	$10,052,732
Own and Rent Cranes with Operators									
236115	New Single-Family Housing Const.	178	178	$0	$6,321	$26,332	$13,337	$26,331	$72,322
236118	Residential Remodelers	25	25	$0	$1,786	$7,442	$3,798	$7,441	$20,467
236210	Industrial Building Construction	9	12	$0	$23,633	$98,449	$50,242	$98,441	$270,766
236220	Commercial and Institutional Building	23	31	$0	$20,783	$86,575	$44,183	$86,568	$238,109
237110	Water and Sewer Line and Related Struct.	52	69	$0	$45,692	$190,340	$97,138	$190,326	$523,496
237120	Oil and Gas Pipeline and Related Struct.	20	26	$0	$23,103	$96,241	$49,116	$96,233	$264,693
237130	Power and Communication Line and Rel.	34	34	$0	$15,788	$65,769	$33,565	$65,765	$180,887
237310	Highway, Street, and Bridge Construction	80	107	$0	$0	$0	$432,238	$846,896	$1,279,134
237990	Other Heavy and Civil Engineering Const.	76	101	$0	$166,149	$692,126	$353,220	$692,074	$1,903,569
238110	Poured Concrete Foundation and Struct.	261	261	$0	$95,662	$398,499	$203,371	$398,470	$1,096,002
238120	Structural Steel and Precast Concrete	200	266	$0	$147,527	$614,552	$313,631	$614,507	$1,690,217
238130	Framing Contractors	26	26	$0	$643	$2,680	$1,368	$2,680	$7,372
238150	Glass and Glazing Contractors	42	42	$0	$4,174	$17,387	$8,873	$17,386	$47,819
238170	Siding Contractors	5	5	$0	$400	$1,667	$851	$1,666	$4,584
238190	Other Foundation, Structure, and Building	49	65	$0	$15,817	$65,888	$33,625	$65,883	$181,212
238210	Electrical Contractors	15	15	$0	$0	$0	$6,700	$13,128	$19,828
238220	Plumbing, Heating, and Air-Conditioning	2	3	$0	$2,823	$11,760	$6,001	$11,759	$32,343
238290	Other Building Equipment Contractors	113	151	$0	$84,587	$352,364	$179,826	$352,338	$969,116
238320	Painting and Wall Covering Contract.	21	21	$0	$3,103	$12,926	$6,597	$12,925	$35,552
238910	Site Preparation Contractors	400	400	$0	$107,618	$448,301	$228,787	$448,268	$1,232,974
	Subtotal	**1,630**	**1,838**	**$0**	**$765,611**	**$3,189,297**	**$2,066,467**	**$4,049,086**	**$10,070,461**
Own but Do Not Rent									
236115	New Single family housing construction	3,097	3,097	$0	$242,637	$832,026	$424,617	$831,965	$2,331,245
236116	New Multifamily housing construction	217	217	$0	$17,027	$58,388	$29,798	$58,384	$163,597
236117	New housing operative builders	1,699	1,699	$0	$133,123	$456,493	$232,967	$456,459	$1,279,042
236118	Residential Remodelers	985	985	$0	$77,148	$264,548	$135,010	$264,528	$741,233

236210Industrial building construction	276	325	$0	$25,482	$87,381	$44,594	$87,374	$244,832
236220Commercial and Institutional Bldg. Const.	4,141	4,141	$0	$324,459	$1,112,602	$567,806	$1,112,520	$3,117,387
237110Water and Sewer Line Const.	1,028	1,371	$0	$107,390	$368,252	$187,934	$231,198	$894,775
237120Oil and gas pipeline construction	128	171	$0	$13,384	$45,894	$23,421	$9,178	$91,877
237130Power and communication line const.	213	285	$0	$0	$0	$39,013	$76,439	$115,452
237210Land subdivision	0	0	$0	$0	$0	$0	$0	$0
237310Highway, street and bridge const.	88	118	$0	$9,209	$31,580	$16,117	$31,578	$88,484
237990Other heavy and civil eng.	273	273	$0	$21,392	$73,355	$37,436	$73,349	$205,532
238110Poured Concrete foundation and struct.	267	267	$0	$20,914	$71,716	$36,599	$71,710	$200,940
238120Structural steel and precast concrete	334	334	$0	$26,187	$89,799	$45,828	$89,793	$251,607
238130Framing Contractors	1,395	1,395	$0	$109,345	$374,956	$191,355	$374,928	$1,050,585
238140Masonry Contractors	137	137	$0	$10,747	$36,852	$18,807	$36,849	$103,255
238150Glass & Glazing Contractors	54	54	$0	$4,253	$14,582	$7,442	$14,581	$40,858
238160Roofing Contractors	197	197	$0	$15,405	$52,826	$26,959	$52,822	$148,013
238170Siding Contractors	53	53	$0	$4,129	$14,158	$7,225	$14,157	$39,668
238190Other foundation, structure, building, ext.	25	25	$0	$1,997	$6,849	$3,495	$6,849	$19,191
238210Electrical Contractors	78	78	$0	$0	$0	$10,633	$20,834	$31,468
238220Plumbing, Heating and Air-conditioning Cont.	98	98	$0	$7,690	$26,371	$13,458	$26,369	$73,889
238290Other building equipment cont.	49	65	$0	$5,103	$17,498	$8,930	$17,496	$49,027
238310Drywall and insulation contractors	0	0	$0	$0	$0	$0	$0	$0
238320Painting and wall covering contractors	41	41	$0	$3,248	$11,139	$5,685	$11,138	$31,211
238330Flooring Contractors	0	0	$0	$0	$0	$0	$0	$0
238340Tile and Terrazzo contractors	0	0	$0	$0	$0	$0	$0	$0
238350Finish Carpentry contractors	0	0	$0	$0	$0	$0	$0	$0
238390Other building finishing contractors	0	0	$0	$0	$0	$0	$0	$0
238910Site Preparation	389	389	$0	$30,454	$104,430	$53,295	$104,422	$292,601
221110Electric Power Generation	524	2,101	$0	$0	$2,304,000	$363,390	$4,063,374	$6,730,763
221120Electric Power Transmission, Control, Dist	1,232	7,393	$0	$0	$9,216,000	$777,517	$8,694,086	$18,687,603
221210Natural Gas Distribution	526	2,458	$0	$192,605	$660,462	$337,061	$1,256,324	$2,446,452
321213Engineered Wood Member (exc Truss) Mfg	132	162	$0	$12,694	$43,529	$22,215	$82,801	$161,239
321214Truss Manufacturing	902	1,085	$0	$85,019	$291,538	$148,784	$554,561	$1,079,902
336611Ship Building and Repairing	575	635	$0	$21,549	$73,892	$37,710	$281,114	$414,265
339950Sign Manufacturing	6,291	6,415	$0	$186,336	$638,966	$326,091	$1,215,434	$2,366,828
423310Lumbr, Plywd, Millwork, Wd Pnl Mrchnt Whle	6,450	8,715	$0	$0	$0	$0	$0	$0
423330Roofing, Siding, and Insul Material Merch Whle	1,142	2,762	$0	$0	$0	$0	$0	$0
423390Other Construction Material Merchant Whle	2,363	3,155	$0	$0	$0	$0	$0	$0
423730Warm Air Heating and Air-Cond. Equip.& Suppl	2,533	5,193	$0	$813,831	$2,790,707	$1,424,213	$5,308,453	$10,337,204
444110Home Centers	2,553	6,749	$0	$0	$0	$0	$0	$0
454312Liquefied Petroleum Gas (Bottled Gas) Dealers	2,307	5,567	$0	$436,222	$1,495,847	$763,392	$2,845,384	$5,540,845
482110Railroads	NA	NA	NA	NA	NA	NA	NA	$0
486210Pipeline Transportation of Natural Gas	127	1,363	$0	$106,803	$366,237	$186,906	$696,651	$1,356,596
517110Wired Telecommunications Carriers	2,517	27,159	$0	$0	$0	$411,384	$1,533,349	$1,944,733

Subtotal	**45,436**	**96,725**	**$0**	**$3,065,783**	**$22,032,873**	**$6,967,089**	**$30,606,452**	**$62,672,198**
Crane Lessees in the Construction Industry								
236115New Single family housing construction	31,054	31,054	$1,276,695	$2,433,344	$8,344,177	-	$2,085,890	$14,140,107
236116New Multifamily housing construction	2,173	2,173	$0	$170,273	$583,883	-	$145,960	$900,116
236117New housing operative builders	16,989	16,989	$681,229	$1,331,232	$4,564,926	-	$1,141,147	$7,718,535
236118Residential Remodelers	9,848	9,848	$404,986	$771,674	$2,646,147	-	$661,488	$4,484,296
236210Industrial building construction	3,264	3,264	$0	$255,762	$877,033	-	$219,242	$1,352,038
236220Commercial and Institutional Bldg. Construction	41,438	41,438	$0	$3,247,019	$11,134,347	-	$2,783,381	$17,164,747
237110Water and Sewer Line Const.	13,774	13,774	$0	$1,079,310	$3,701,059	-	$925,197	$5,705,566
237120Oil and gas pipeline construction	1,301	1,734	$0	$135,874	$465,924	-	$116,472	$718,270
237130Power and communication line const.	2,147	2,862	$0	$0	$0	-	$192,240	$192,240
237210Land subdivision	0	0	$0	$0	$0	-	$0	$0
237310Highway, street and bridge const.	890	1,186	$0	$92,933	$318,677	-	$79,663	$491,273
237990Other heavy and civil eng.	2,781	2,781	$0	$217,876	$747,117	-	$186,766	$1,151,759
238110Poured Concrete foundation and struct.	1,348	1,348	$0	$105,592	$362,085	-	$90,515	$558,192
238120Structural steel and precast concrete	3,608	3,608	$0	$282,717	$969,466	-	$242,349	$1,494,532
238130Framing Contractors	13,974	13,974	$0	$1,094,981	$3,754,799	-	$938,630	$5,788,411
238140Masonry Contractors	1,372	1,372	$0	$107,469	$368,521	-	$92,123	$568,113
238150Glass & Glazing Contractors	547	547	$0	$42,854	$146,951	-	$36,735	$226,541
238160Roofing Contractors	1,966	1,966	$0	$154,053	$528,262	-	$132,056	$814,371
238170Siding Contractors	527	527	$0	$41,307	$141,645	-	$35,409	$218,360
238190Other foundation, structure, building, ext.	258	258	$0	$20,228	$69,365	-	$17,340	$106,933
238210Electrical Contractors	776	776	$0	$0	$0	-	$52,096	$52,096
238220Plumbing, Heating and Air-conditioning Cont.	981	981	$0	$76,906	$263,720	-	$65,925	$406,552
238290Other building equipment cont.	4,997	6,663	$0	$522,103	$1,790,341	-	$447,552	$2,759,996
238310Drywall and insulation contractors	0	0	$0	$0	$0	-	$0	$0
238320Painting and wall covering contractors	415	415	$0	$32,501	$111,448	-	$27,860	$171,809
238330Flooring Contractors	0	0	$0	$0	$0	-	$0	$0
238340Tile and Terrazzo contractors	0	0	$0	$0	$0	-	$0	$0
238350Finish Carpentry contractors	0	0	$0	$0	$0	-	$0	$0
238390Other building finishing contractors	0	0	$0	$0	$0	-	$0	$0
238910Site Preparation	3,927	3,927	$0	$307,675	$1,055,046	-	$263,742	$1,626,463
Subtotal	**160,352**	**163,463**	**$2,362,911**	**$12,523,682**	**$42,944,942**	**-**	**$10,979,778**	**$68,811,312**
Total	**210,800**	**267,032**	**$2,362,911**	**$16,355,077**	**$68,167,112**	**$16,501,911**	**$50,732,589**	**$154,119,600**

Source: ORA

Table B-10

Annualized Compliance Costs Per Establishments By Sector

NAIC	Industry	Number of Affected Firms	Number of Affected Estabs	Annualized Compliance Cost	Cost Per Estab.
Crane Rental with Operators					
238990	All Other Specialty Trade Cont.	1,244	1,304	$2,512,898	$1,927
Crane Rental without Operators (Bare Rentals)					
532412	Const./Min./For. Machine & Equip.	2,137	3,702	$10,052,732	$2,934
Own and Rent Cranes with Operators					
236115	New Single-Family Housing Const.	178	178	$72,322	$406
236118	Residential Remodelers	25	25	$20,467	$819
236210	Industrial Building Construction	9	12	$270,766	$22,564
236220	Commercial and Institutional Building	23	31	$238,109	$7,681
237110	Water and Sewer Line and Related Struct.	52	69	$523,496	$7,587
237120	Oil and Gas Pipeline and Related Struct.	20	26	$264,693	$10,180
237130	Power and Communication Line and Rel.	34	34	$180,887	$5,320
237310	Highway, Street, and Bridge Construction	80	107	$1,279,134	$11,955
237990	Other Heavy and Civil Engineering Const.	76	101	$1,903,569	$18,847
238110	Poured Concrete Foundation and Struct.	261	261	$1,096,002	$4,199
238120	Structural Steel and Precast Concrete	200	266	$1,690,217	$6,354
238130	Framing Contractors	26	26	$7,372	$284
238150	Glass and Glazing Contractors	42	42	$47,819	$1,139
238170	Siding Contractors	5	5	$4,584	$917
238190	Other Foundation, Structure, and Building	49	65	$181,212	$2,788
238210	Electrical Contractors	15	15	$19,828	$1,322
238220	Plumbing, Heating, and Air-Conditioning	2	3	$32,343	$10,781
238290	Other Building Equipment Contractors	113	151	$969,116	$6,418
238320	Painting and Wall Covering Contract.	21	21	$35,552	$1,693
238910	Site Preparation Contractors	400	400	$1,232,974	$3,082
	Subtotal	**1,630**	**1,838**	**$10,070,461**	
Own but Do Not Rent					
236115	New Single family housing construction	3,097	3,097	$2,331,245	$753
236116	New Multifamily housing construction	217	217	$163,597	$753

236117	New housing operative builders	1,699	1,699	$1,279,042	$753
236118	Residential Remodelers	985	985	$741,233	$753
236210	Industrial building construction	276	325	$244,832	$753
236220	Commercial and Institutional Bldg. Const.	4,141	4,141	$3,117,387	$753
237110	Water and Sewer Line Const.	1,028	1,371	$894,775	$653
237120	Oil and gas pipeline construction	128	171	$91,877	$538
237130	Power and communication line const.	213	285	$115,452	$406
237210	Land subdivision	0	0	$0	$0
237310	Highway, street and bridge const.	88	118	$88,484	$753
237990	Other heavy and civil eng.	273	273	$205,532	$753
238110	Poured Concrete foundation and struct.	267	267	$200,940	$753
238120	Structural steel and precast concrete	334	334	$251,607	$753
238130	Framing Contractors	1,395	1,395	$1,050,585	$753
238140	Masonry Contractors	137	137	$103,255	$753
238150	Glass & Glazing Contractors	54	54	$40,858	$753
238160	Roofing Contractors	197	197	$148,013	$753
238170	Siding Contractors	53	53	$39,668	$753
238190	Other foundation, structure, building, ext.	25	25	$19,191	$753
238210	Electrical Contractors	78	78	$31,468	$406
238220	Plumbing, Heating and Air-conditioning Cont.	98	98	$73,889	$753
238290	Other building equipment cont.	49	65	$49,027	$753
238310	Drywall and insulation contractors	0	0	$0	$0
238320	Painting and wall covering contractors	41	41	$31,211	$753
238330	Flooring Contractors	0	0	$0	$0
238340	Tile and Terrazzo contractors	0	0	$0	$0
238350	Finish Carpentry contractors	0	0	$0	$0
238390	Other building finishing contractors	0	0	$0	$0
238910	Site Preparation	389	389	$292,601	$753
221110	Electric Power Generation	524	2,101	$6,730,763	$3,204
221120	Electric Power Transmission, Control, Dist	1,232	7,393	$18,687,603	$2,528
221210	Natural Gas Distribution	526	2,458	$2,446,452	$995
321213	Engineered Wood Member (exc Truss) Mfg	132	162	$161,239	$995
321214	Truss Manufacturing	902	1,085	$1,079,902	$995
336611	Ship Building and Repairing	575	635	$414,265	$652
339950	Sign Manufacturing	6,291	6,415	$2,366,828	$369
423310	Lumbr, Plywd, Millwork, Wd Pnl Mrchnt Whle	6,450	8,715	$0	$0
423330	Roofing, Siding, and Insul Material Merch Whle	1,142	2,762	$0	$0
423390	Other Construction Material Merchant Whle	2,363	3,155	$0	$0
423730	Warm Air Heating and Air-Cond. Equip.& Suppl	2,533	5,193	$10,337,204	$1,991
444110	Home Centers	2,553	6,749	$0	$0

454312	Liquefied Petroleum Gas (Bottled Gas) Dealers	2,307	5,567	$5,540,845	$995
482110	Railroads	NA	NA	NA	NA
486210	Pipeline Transportation of Natural Gas	127	1,363	$1,356,596	$995
517110	Wired Telecommunications Carriers	2,517	27,159	$1,944,733	$72
	Subtotal	**45,436**	**96,725**	**$62,672,198**	
Crane Lessees in the Construction Industry					
236115	New Single family housing construction	31,054	31,054	$14,140,107	$455
236116	New Multifamily housing construction	2,173	2,173	$900,116	$414
236117	New housing operative builders	16,989	16,989	$7,718,535	$454
236118	Residential Remodelers	9,848	9,848	$4,484,296	$455
236210	Industrial building construction	3,264	3,264	$1,352,038	$414
236220	Commercial and Institutional Bldg. Construction	41,438	41,438	$17,164,747	$414
237110	Water and Sewer Line Const.	13,774	13,774	$5,705,566	$414
237120	Oil and gas pipeline construction	1,301	1,734	$718,270	$552
237130	Power and communication line const.	2,147	2,862	$192,240	$90
237210	Land subdivision	0	0	$0	NA
237310	Highway, street and bridge const.	890	1,186	$491,273	$552
237990	Other heavy and civil eng.	2,781	2,781	$1,151,759	$414
238110	Poured Concrete foundation and struct.	1,348	1,348	$558,192	$414
238120	Structural steel and precast concrete	3,608	3,608	$1,494,532	$414
238130	Framing Contractors	13,974	13,974	$5,788,411	$414
238140	Masonry Contractors	1,372	1,372	$568,113	$414
238150	Glass & Glazing Contractors	547	547	$226,541	$414
238160	Roofing Contractors	1,966	1,966	$814,371	$414
238170	Siding Contractors	527	527	$218,360	$414
238190	Other foundation, structure, building, ext.	258	258	$106,933	$414
238210	Electrical Contractors	776	776	$52,096	$67
238220	Plumbing, Heating and Air-conditioning Cont.	981	981	$406,552	$414
238290	Other building equipment cont.	4,997	6,663	$2,759,996	$552
238310	Drywall and insulation contractors	0	0	$0	NA
238320	Painting and wall covering contractors	415	415	$171,809	$414
238330	Flooring Contractors	0	0	$0	NA
238340	Tile and Terrazzo contractors	0	0	$0	NA
238350	Finish Carpentry contractors	0	0	$0	NA
238390	Other building finishing contractors	0	0	$0	NA
238910	Site Preparation	3,927	3,927	$1,626,463	$414
	Subtotal	**160,352**	**163,463**	**$68,811,312**	

Total	**210,800**	**267,032**	**$154,119,600**

Source: ORA

Table B-11
Estimates of Cranes, Crane Jobs, and Affected Crane Operators for All Establishments

NAIC	Industry	Number of Affected Firms	Number of Affected Estabs	Total Cranes	Crane Jobs	Affected Operators
Crane Rental with Operators						
238990	All Other Specialty Trade Cont.	1,244	1,304	6,288	-	6,288
Crane Rental without Operators (Bare Rentals)						
532412	Const./Min./For. Machine & Equip.	2,137	3,702	50,735	-	12,684
Own and Rent Cranes with Operators						
236115	New Single-Family Housing Const.	178	178	98	490	98
236118	Residential Remodelers	25	25	28	138	28
236210	Industrial Building Construction	9	12	366	1,832	366
236220	Commercial and Institutional Building	23	31	322	1,611	322
237110	Water and Sewer Line and Related Struct.	52	69	708	3,542	708
237120	Oil and Gas Pipeline and Related Struct.	20	26	358	1,791	358
237130	Power and Communication Line and Rel.	34	34	245	1,224	245
237310	Highway, Street, and Bridge Construction	80	107	3,152	15,760	3,152
237990	Other Heavy and Civil Engineering Const.	76	101	2,576	12,879	2,576
238110	Poured Concrete Foundation and Struct.	261	261	1,483	7,415	1,483
238120	Structural Steel and Precast Concrete	200	266	2,287	11,436	2,287
238130	Framing Contractors	26	26	10	50	10
238150	Glass and Glazing Contractors	42	42	65	324	65
238170	Siding Contractors	5	5	6	31	6
238190	Other Foundation, Structure, and Building	49	65	245	1,226	245
238210	Electrical Contractors	15	15	49	244	49
238220	Plumbing, Heating, and Air-Conditioning	2	3	44	219	44
238290	Other Building Equipment Contractors	113	151	1,311	6,557	1,311
238320	Painting and Wall Covering Contract.	21	21	48	241	48
238910	Site Preparation Contractors	400	400	1,668	8,342	1,668
	Subtotal	**1,630**	**1,838**	**15,070**	**75,352**	**15,070**
Own but Do Not Rent						
236115	New Single family housing construction	3,097	3,097	3,097	15,483	3,097

236116	New Multifamily housing construction	217	217	217	1,087	217
236117	New housing operative builders	1,699	1,699	1,699	8,495	1,699
236118	Residential Remodelers	985	985	985	4,923	985
236210	Industrial building construction	276	325	325	1,626	325
236220	Commercial and Institutional Bldg. Const.	4,141	4,141	4,141	20,704	4,141
237110	Water and Sewer Line Const.	1,028	1,371	1,371	6,853	1,371
237120	Oil and gas pipeline construction	128	171	171	854	171
237130	Power and communication line const.	213	285	285	1,423	285
237210	Land subdivision	0	0	0	0	0
237310	Highway, street and bridge const.	88	118	118	588	118
237990	Other heavy and civil eng.	273	273	273	1,365	273
238110	Poured Concrete foundation and struct.	267	267	267	1,335	267
238120	Structural steel and precast concrete	334	334	334	1,671	334
238130	Framing Contractors	1,395	1,395	1,395	6,977	1,395
238140	Masonry Contractors	137	137	137	686	137
238150	Glass & Glazing Contractors	54	54	54	271	54
238160	Roofing Contractors	197	197	197	983	197
238170	Siding Contractors	53	53	53	263	53
238190	Other foundation, structure, building, ext.	25	25	25	127	25
238210	Electrical Contractors	78	78	78	388	78
238220	Plumbing, Heating and Air-conditioning Cont.	98	98	98	491	98
238290	Other building equipment cont.	49	65	65	326	65
238310	Drywall and insulation contractors	0	0	0	0	0
238320	Painting and wall covering contractors	41	41	41	207	41
238330	Flooring Contractors	0	0	0	0	0
238340	Tile and Terrazzo contractors	0	0	0	0	0
238350	Finish Carpentry contractors	0	0	0	0	0
238390	Other building finishing contractors	0	0	0	0	0
238910	Site Preparation	389	389	389	1,943	389
221110	Electric Power Generation	524	2,101	2,650	13,250	7,950
221120	Electric Power Transmission, Control, and Distribution	1,232	7,393	5,670	28,350	17,010
221210	Natural Gas Distribution	526	2,458	2,458	12,290	2,458
321213	Engineered Wood Member (except Truss) Manufacturing	132	162	162	810	162
321214	Truss Manufacturing	902	1,085	1,085	5,425	1,085
336611	Ship Building and Repairing	575	635	275	1,375	550
339950	Sign Manufacturing	6,291	6,415	2,378	11,890	2,378
423310	Lumber, Plywood, Millwork, and Wood Panel Merchant Wholesalers+B42	6,450	8,715	0	0	0
423330	Roofing, Siding, and Insulation Material Merchant Wholesalers	1,142	2,762	0	0	0
423390	Other Construction Material Merchant Wholesalers	2,363	3,155	0	0	0
423730	Warm Air Heating and Air-Cond. Equip. and Supplies	2,533	5,193	10,386	51,930	10,386

444110	Home Centers	2,553	6,749	0	0	0
454312	Liquefied Petroleum Gas (Bottled Gas) Dealers	2,307	5,567	5,567	27,835	5,567
482110	Railroads	NA	NA	NA	NA	NA
486210	Pipeline Transportation of Natural Gas	127	1,363	1,363	6,815	1,363
517110	Wired Telecommunications Carriers	2,517	27,159	3,000	15,000	3,000
	Subtotal	**45,436**	**96,725**	**50,807**	**254,036**	**67,722**
Crane Lessees in the Construction Industry						
236115	New Single family housing construction	31,054	31,054	-	155,270	7,764
236116	New Multifamily housing construction	2,173	2,173	-	10,865	543
236117	New housing operative builders	16,989	16,989	-	84,945	4,247
236118	Residential Remodelers	9,848	9,848	-	49,240	2,462
236210	Industrial building construction	3,264	3,264	-	16,320	816
236220	Commercial and Institutional Bldg. Construction	41,438	41,438	-	207,190	10,360
237110	Water and Sewer Line Const.	13,774	13,774	-	68,870	3,444
237120	Oil and gas pipeline construction	1,301	1,734	-	8,670	434
237130	Power and communication line const.	2,147	2,862	-	14,310	716
237210	Land subdivision	0	0	-	0	0
237310	Highway, street and bridge const.	890	1,186	-	5,930	297
237990	Other heavy and civil eng.	2,781	2,781	-	13,903	695
238110	Poured Concrete foundation and struct.	1,348	1,348	-	6,738	337
238120	Structural steel and precast concrete	3,608	3,608	-	18,040	902
238130	Framing Contractors	13,974	13,974	-	69,870	3,494
238140	Masonry Contractors	1,372	1,372	-	6,858	343
238150	Glass & Glazing Contractors	547	547	-	2,735	137
238160	Roofing Contractors	1,966	1,966	-	9,830	492
238170	Siding Contractors	527	527	-	2,636	132
238190	Other foundation, structure, building, ext.	258	258	-	1,291	65
238210	Electrical Contractors	776	776	-	3,878	194
238220	Plumbing, Heating and Air-conditioning Cont.	981	981	-	4,907	245
238290	Other building equipment cont.	4,997	6,663	-	33,315	1,666
238310	Drywall and insulation contractors	0	0	-	0	0
238320	Painting and wall covering contractors	415	415	-	2,074	104
238330	Flooring Contractors	0	0	-	0	0
238340	Tile and Terrazzo contractors	0	0	-	0	0
238350	Finish Carpentry contractors	0	0	-	0	0
238390	Other building finishing contractors	0	0	-	0	0
238910	Site Preparation	3,927	3,927	-	19,633	982

	Subtotal	**160,352**	**163,463**	**-**	**817,315**	**40,866**
	Total	**210,800**	**267,032**	**122,901**	**1,146,703**	**142,630**

Source: ORA
U.S. Census Bureau data

7. Economic Feasibility and Impacts

This section presents OSHA's analysis of the potential economic impacts of the final standard and an assessment of its economic feasibility. A separate analysis of the potential economic impacts on small entities (as defined by the Small Business Administration) and on very small entities (employers with fewer than 20 employees) is presented in the following section as part of the Final Regulatory Flexibility Analysis, conducted in accordance with the Regulatory Flexibility Act.

A standard is economically feasible if it does not threaten massive dislocation to an industry or imperil its existence. (See *United Steelworkers v. Marshall*, 647 F.2d 1189 (D.C. Cit. 1980).) The court also found that a standard that is financially burdensome or threatens the survival of some companies in an industry is not sufficient to render it infeasible. Further, the cost of compliance with an OSHA standard must be analyzed "in relation to the financial health and profitability of the industry and the likely effect of such costs on unit consumer prices." *Id.* The court also found that "the practical question is whether the standard threatens the competitive stability of an industry, or whether any intra-industry or inter-industry discrimination in the standard might wreck such stability or lead to undue concentration." *Id.*

To assess the potential economic impacts of the final rule, OSHA compared the anticipated costs of achieving compliance against revenues and profits of establishments affected by the rule. This screening analysis is presented in Table B-12. This table is considered a screening analysis because it measures costs as a percent of pre-tax profits and revenues, but does not predict impacts on pre-tax profits and sales. This screening

analysis is used to determine whether the compliance costs potentially associated with the standard would lead to significant impacts on establishments in the affected industries. The actual impact of the standard on the profits and revenues of establishments in a given industry will depend on the price elasticity of demand for the services sold by establishments in that industry.

Price elasticity refers to the relationship between the price charged for a service and the demand for that service; the more elastic the relationship, the less able an establishment is to pass the costs of compliance through to its customers in the form of a price increase, and the more it will have to absorb the costs of compliance in the form of reduced profits. In general, "when an industry is subject to a higher cost, it does not simply swallow it, it raises its price and reduces its output, and in this way shifts a part of the cost to its consumers and a part to its suppliers." *American Dental Association v. Secretary of Labor*, 984 F.2d 823, 829 (7th Cir. 1993).

Table B-12

Estimates of Economic Impacts for Affected Establishments Across Industry Sectors

NAIC	Industry	Affected Firms	Affected Estabs	Avg. Revenues Per Estab. $1,000	Avg. Profits Per Estab. ($1,000)	Cost Per Estab.	Cost as a Percent of Revenues	Cost as a Percent of Profits
Crane Rental with Operators								
238990	All Other Specialty Trade Cont.	1,244	1,304	$1,918	$79	$1,927	0.10%	2.45%
Crane Rental without Operators (Bare Rentals)								
532412	Const./Min./For. Machine & Equip.	2,137	3,702	$2,258	$145	$2,934	0.13%	2.02%
Own and Rent Cranes with Operators								
236115	New Single-Family Housing Const.	178	178	$220	$10	$406	0.18%	3.95%
236118	Residential Remodelers	25	25	$443	$21	$819	0.18%	3.95%
236210	Industrial Building Construction	9	12	$12,213	$571	$22,564	0.18%	3.95%
236220	Commercial and Institutional Building	23	31	$4,157	$194	$7,681	0.18%	3.95%
237110	Water and Sewer Line and Related Struct.	52	69	$4,107	$214	$7,587	0.18%	3.54%
237120	Oil and Gas Pipeline and Related Struct.	20	26	$5,510	$288	$10,180	0.18%	3.54%
237130	Power and Communication Line and Rel.	34	34	$2,880	$150	$5,320	0.18%	3.54%
237310	Highway, Street, and Bridge Construction	80	107	$11,783	$615	$11,955	0.10%	1.94%
237990	Other Heavy and Civil Engineering Const.	76	101	$10,201	$533	$18,847	0.18%	3.54%
238110	Poured Concrete Foundation and Struct.	261	261	$2,273	$101	$4,199	0.18%	4.18%
238120	Structural Steel and Precast Concrete	200	266	$3,439	$152	$6,354	0.18%	4.18%
238130	Framing Contractors	26	26	$153	$7	$284	0.18%	4.18%
238150	Glass and Glazing Contractors	42	42	$616	$27	$1,139	0.18%	4.18%
238170	Siding Contractors	5	5	$496	$22	$917	0.18%	4.18%
238190	Other Foundation, Structure, and Building	49	65	$1,509	$67	$2,788	0.18%	4.18%
238210	Electrical Contractors	15	15	$1,303	$56	$1,322	0.10%	2.35%
238220	Plumbing, Heating, and Air-Conditioning	2	3	$5,835	$225	$10,781	0.18%	4.79%
238290	Other Building Equipment Contractors	113	151	$3,474	$154	$6,418	0.18%	4.18%
238320	Painting and Wall Covering Contract.	21	21	$916	$41	$1,693	0.18%	4.18%
238910	Site Preparation Contractors	400	400	$1,668	$76	$3,082	0.18%	4.05%
	Subtotal	**1,630**	**1,838**					
Own but Do Not Rent								

236115	New Single family housing construction	3,097	3,097	$1,520	$71	$753	0.05%	1.06%
236116	New Multifamily housing construction	217	217	$5,477	$256	$753	0.01%	0.29%
236117	New housing operative builders	1,699	1,699	$6,021	$281	$753	0.01%	0.27%
236118	Residential Remodelers	985	985	$646	$30	$753	0.12%	2.49%
236210	Industrial building construction	276	325	$5,931	$277	$753	0.01%	0.27%
236220	Commercial and Institutional Bldg. Const.	4,141	4,141	$7,177	$335	$753	0.01%	0.22%
237110	Water and Sewer Line Const.	1,028	1,371	$3,239	$169	$653	0.02%	0.39%
237120	Oil and gas pipeline construction	128	171	$9,189	$480	$538	0.01%	0.11%
237130	Power and communication line const.	213	285	$5,581	$291	$406	0.01%	0.14%
237210	Land subdivision	0	0	$2,878	$318	$0	0.00%	0.00%
237310	Highway, street and bridge const.	88	118	$8,279	$432	$753	0.01%	0.17%
237990	Other heavy and civil eng.	273	273	$3,965	$207	$753	0.02%	0.36%
238110	Poured Concrete foundation and struct.	267	267	$1,682	$74	$753	0.04%	1.01%
238120	Structural steel and precast concrete	334	334	$2,712	$120	$753	0.03%	0.63%
238130	Framing Contractors	1,395	1,395	$936	$41	$753	0.08%	1.82%
238140	Masonry Contractors	137	137	$876	$39	$753	0.09%	1.94%
238150	Glass & Glazing Contractors	54	54	$1,470	$65	$753	0.05%	1.16%
238160	Roofing Contractors	197	197	$1,390	$61	$753	0.05%	1.22%
238170	Siding Contractors	53	53	$580	$26	$753	0.13%	2.94%
238190	Other foundation, structure, building, ext.	25	25	$1,013	$45	$753	0.07%	1.68%
238210	Electrical Contractors	78	78	$1,321	$57	$406	0.03%	0.71%
238220	Plumbing, Heating and Air-conditioning Cont.	98	98	$1,473	$57	$753	0.05%	1.32%
238290	Other building equipment cont.	49	65	$2,959	$131	$753	0.03%	0.58%
238310	Drywall and insulation contractors	0	0	$1,751	$77	$0	0.00%	0.00%
238320	Painting and wall covering contractors	41	41	$530	$23	$753	0.14%	3.21%
238330	Flooring Contractors	0	0	$811	$36	$0	0.00%	0.00%
238340	Tile and Terrazzo contractors	0	0	$698	$31	$0	0.00%	0.00%
238350	Finish Carpentry contractors	0	0	$678	$30	$0	0.00%	0.00%
238390	Other building finishing contractors	0	0	$1,091	$48	$0	0.00%	0.00%
238910	Site Preparation	389	389	$1,416	$65	$753	0.05%	1.16%
221110	Electric Power Generation	524	2,101	$43,042	$1,911	$3,204	0.01%	0.17%
221120	Electric Power Transmission, Control, Dist	1,232	7,393	$37,443	$1,662	$2,528	0.01%	0.15%
221210	Natural Gas Distribution	526	2,458	$30,459	$907	$995	0.00%	0.11%
321213	Engineered Wood Member (exc Truss) Mfg	132	162	$19,027	$737	$995	0.01%	0.14%
321214	Truss Manufacturing	902	1,085	$5,972	$231	$995	0.02%	0.43%
336611	Ship Building and Repairing	575	635	$23,071	$1,406	$652	0.00%	0.05%
339950	Sign Manufacturing	6,291	6,415	$1,761	$103	$369	0.02%	0.36%
423310	Lumbr, Plywd, Millwork, Wd Pnl Mrchnt Whle	6,450	8,715	$14,905	$430	$0	0.00%	0.00%
423330	Roofing, Siding, and Insul Material Merch Whle	1,142	2,762	$8,985	$259	$0	0.00%	0.00%
423390	Other Construction Material Merchant Whle	2,363	3,155	$4,859	$140	$0	0.00%	0.00%

423730	Warm Air Heating and Air-Cond. Equip.& Suppl	2,533	5,193	$5,413	$167	$1,991	0.04%	1.19%
444110	Home Centers	2,553	6,749	$21,816	$1,679	$0	0.00%	0.00%
454312	Liquefied Petroleum Gas (Bottled Gas) Dealers	2,307	5,567	$1,698	$72	$995	0.06%	1.39%
482110	Railroads	NA	NA	NA	NA	NA	NA	NA
486210	Pipeline Transportation of Natural Gas	127	1,363	$15,037	$1,990	$995	0.01%	0.05%
517110	Wired Telecommunications Carriers	2,517	27,159	$7,294	$518	$72	0.00%	0.01%
	Subtotal	**45,436**	**96,725**					
Crane Lessees in the Construction Industry								
236115	New Single family housing construction	31,054	31,054	$3,040	$142	$455	0.01%	0.32%
236116	New Multifamily housing construction	2,173	2,173	$10,954	$512	$414	0.00%	0.08%
236117	New housing operative builders	16,989	16,989	$12,041	$563	$454	0.00%	0.08%
236118	Residential Remodelers	9,848	9,848	$6,456	$302	$455	0.01%	0.15%
236210	Industrial building construction	3,264	3,264	$5,931	$277	$414	0.01%	0.15%
236220	Commercial and Institutional Bldg. Construction	41,438	41,438	$7,177	$335	$414	0.01%	0.12%
237110	Water and Sewer Line Const.	13,774	13,774	$3,239	$169	$414	0.01%	0.24%
237120	Oil and gas pipeline construction	1,301	1,734	$9,189	$480	$552	0.01%	0.12%
237130	Power and communication line const.	2,147	2,862	$11,163	$583	$90	0.00%	0.02%
237210	Land subdivision	0	0	$0	$0	NA	0.00%	0.00%
237310	Highway, street and bridge const.	890	1,186	$82,791	$4,323	$552	0.00%	0.01%
237990	Other heavy and civil eng.	2,781	2,781	$7,931	$414	$414	0.01%	0.10%
238110	Poured Concrete foundation and struct.	1,348	1,348	$33,636	$1,487	$414	0.00%	0.03%
238120	Structural steel and precast concrete	3,608	3,608	$2,712	$120	$414	0.02%	0.35%
238130	Framing Contractors	13,974	13,974	$1,249	$55	$414	0.03%	0.75%
238140	Masonry Contractors	1,372	1,372	$17,527	$775	$414	0.00%	0.05%
238150	Glass & Glazing Contractors	547	547	$14,698	$650	$414	0.00%	0.06%
238160	Roofing Contractors	1,966	1,966	$13,903	$615	$414	0.00%	0.07%
238170	Siding Contractors	527	527	$11,596	$513	$414	0.00%	0.08%
238190	Other foundation, structure, building, ext.	258	258	$20,266	$896	$414	0.00%	0.05%
238210	Electrical Contractors	776	776	$132,128	$5,714	$67	0.00%	0.00%
238220	Plumbing, Heating and Air-conditioning Cont.	981	981	$147,307	$5,685	$414	0.00%	0.01%
238290	Other building equipment cont.	4,997	6,663	$2,959	$131	$552	0.02%	0.42%
238310	Drywall and insulation contractors	0	0	$0	$0	NA	0.00%	0.00%
238320	Painting and wall covering contractors	415	415	$52,995	$2,343	$414	0.00%	0.02%
238330	Flooring Contractors	0	0	$0	$0	NA	0.00%	0.00%
238340	Tile and Terrazzo contractors	0	0	$0	$0	NA	0.00%	0.00%
238350	Finish Carpentry contractors	0	0	$0	$0	NA	0.00%	0.00%
238390	Other building finishing contractors	0	0	$0	$0	NA	0.00%	0.00%
238910	Site Preparation	3,927	3,927	$14,164	$647	$414	0.003%	0.06%

Subtotal	**160,352**	**163,463**	**0.05%**	**1.17%**
Total	**210,800**	**267,032**		

Source: U.S. Census Bureau data
Country Business Patters, 2006; Statistics of U.S. Businesses 2006
Internal Revenue Service, Source Book, profit rates over 2000-2006

In the extreme, if demand is perfectly inelastic (i.e., the price elasticity is 0), then the expected impact of compliance costs equal to 1 percent of revenues would be a 1 percent increase in the price of the product or service, with no decline in demand or profit. Such a situation would be most likely when there are few, if any, substitutes for the product or service offered by the affected sector or if the products or services of the affected sector account only for a small portion of the income of its consumers. On the other hand, if demand is perfectly elastic (i.e., the price elasticity is infinitely large), then no increase in price is possible, and before-tax profits would be reduced by an amount equal to the costs of compliance (minus any cost savings resulting from compliance, such as improved worker health and reduced insurance costs). Under this scenario, if the costs of compliance represent a large percentage of the sector's profits, some establishments might be forced to close. This scenario is highly unlikely to occur, however, because it can only arise when there are other goods and services that are, in the eye of the consumer, perfect substitutes for the goods and services the affected establishments produce or provide.

A common intermediate case would be a price elasticity of one. In this situation, if the costs of compliance amount to 1 percent of revenues, then production would decline by 1 percent and prices would rise by 1 percent. The sector would be expected to remain in business and maintain a comparable profit rate as before implementation of the standard, but would produce 1 percent less of its services. Consumers would effectively absorb the costs through a combination of increased prices and reduced consumption; this, as the court described in *ADA v. Secretary of Labor*, is the more typical case.

Table B-12 presents estimates for the number of affected establishments, average establishment revenues and profits, and average establishment costs for each affected industry sector. Economic impacts in the table (the two right-most columns) are represented by two ratios: of average establishment costs to revenues, and of costs to profits.

The average (unweighted) cost of the final standard per establishment is about $560 annually. As is evident from the data and estimates in Table B-12, average establishment costs of compliance for the final standard are not large in relation to the corresponding average establishment revenues and profits in each of the industry sectors. The estimated per establishment cost of compliance represents less than 0.2 percent (or 0.002) of average establishment revenues for all affected sectors. In most sectors it is lower. The average cost as a percentage of revenues across all sectors is 0.05 percent (0.0005).

The impact of the final standard measured by the ratio of costs to profits varies across the affected sectors. Among the sectors in the Crane Lessees sector, which includes about 163,000 of the 267,000 affected establishments; in this sector, employers, on average, are expected to have costs that represent about 1 percent of profits. Within the sector of employers Own but Do Not Rent, affected establishments in 14 of the 46 sectors have average costs as a percent of profits of 1 percent or higher (from 1 to 3 percent); this impact of costs as a percentage of profits is relatively low.

In the two sectors that are most intensively involved in crane use, Crane Rental with Operators (employers primarily in the crane rental business) and Crane Rental without Operators (bare rentals), estimated costs are about 2 percent of profits. In the

Own and Rent Cranes with Operators sectors, costs as a percentage of profits are estimated at about 4 percent. Because these employers both own and use cranes, as well as rent them, the cost model estimates significantly higher average establishment costs for them--even in relation to the sectors involved primarily in crane rentals. In addition, as noted above for the Own but Do Not Rent sector, most employers in these sectors are quite small, with only a few employees, and a relatively small fraction of employers in the sectors that own cranes. Consequently, average establishment revenues and profits may be lower for the average establishment than for establishments that own cranes. If so, the cost as a percentage of profits overestimates that impact for affected establishments.

The Agency concludes that the final standard is economically feasible for the affected industries. As described above, a standard is economically feasible if there is a reasonable likelihood that the estimated costs of compliance "will not threaten the existence or competitive structure of an industry, even if it does portend disaster for some marginal firms." *United Steelworkers of America v. Marshall*, 647 F.2d 1189, 1272 (D.C. Cir. 1980). The potential impacts on employer costs associated with achieving compliance with the final standard fall well within the bounds of economic feasibility in each industry sector. Costs of 0.2 percent of revenues and 4 percent of profits will not threaten the existence of the construction industry, affected general industry sectors, or the use of cranes in affected industry sectors. OSHA does not expect compliance with the requirements of the final standard to threaten the viability of employers or the competitive structure of any of the affected industry sectors. When viewed in the larger context of the construction sector, an increase in costs of $148.2 million a year is

effectively negligible, and will have no noticeable effect on the demand for construction services. Even when viewed as an increase in the costs of using cranes, an increase in the cost of rentals services of 0.2 percent will not cause the construction industry to forego the use of cranes and, thus, put crane leasing firms out of business.

For several reasons, the Agency believes that the impact of compliance costs will be less than estimates in Table B-12. For the affected construction sectors, the economic impact of the final standard is most likely to consist of a very small increase in prices for construction projects involving work with cranes (0.2 percent or less, depending on the sector). Crane rental companies, all of which must incur the costs of compliance unless they are already in compliance, should be able to pass through costs to lessees. The additional costs of crane safety measures are extremely small in relation to the value of construction, and there are no economic substitutes, or alternatives, to the use of cranes in construction. It is unlikely that a price increase of this magnitude would significantly alter the services demanded by the public or any other affected customers or intermediaries. If the compliance costs of the final standard are substantially recouped with an increase in rental prices, there would be little effect on profits. Impacts on all affected general industry sectors are slight, and far below any test of economic feasibility.

Given the small incremental increases in prices potentially resulting from compliance with the final standard, and the lack of readily available substitutes for the products and services provided by the covered construction and general industry sectors, demand is expected to be sufficiently inelastic in each affected industry to enable entities to substantially offset compliance costs through minor price increases without experiencing any significant reduction in revenues or profits.

Final Regulatory Flexibility Analysis

The Regulatory Flexibility Act, as amended in 1996, requires the preparation of a Final Regulatory Flexibility Analysis (FRFA) for specified proposed rules (5 U.S.C. 601-612). Under the provisions of the law, each such analysis must contain:

1) a description of the impact of the rule on small entities;

2) a succinct statement of the need for, and objectives of, the rule;

3) a summary of the significant issues raised by the public comments in response to the initial regulatory flexibility analysis, a summary of the assessment of the agency of such issues, and a statement of any changes made in the proposed rule as a result of such comments;

4) a description of and an estimate of the number of small entities to which the rule will apply or an explanation of why no such estimate is available; and

5) a description of the projected reporting, recordkeeping and other compliance requirements of the rule, including an estimate of the classes of small entities which will be subject to the requirement and the type of professional skills necessary for preparation of the report or record.

1. Impact of the final rule on small entities.

OSHA has analyzed the potential impact of the final standard on small entities. The total annual cost of compliance with the final for small entities is estimated to be $101 million, as shown by industry in Table B-13. The costs per establishment in the table are identical in several sectors because the cost model assumed that, on average, the

number of cranes, operators, and crane jobs were the same for each affected establishment. In the crane-rental sectors, the Agency had rental income data for each sector and estimated the number of cranes owned per establishment for each sector. Different sizes of firms with different numbers of cranes in the rental sectors resulted in per establishment (average) costs varying by industry NAICS.

Table B-13

Annualized Compliance Costs for SBA Defined Small Entities by Major Category

	Industry	Firms	Estabs.	Annualized Compliance Costs	Cost Per Estab.
Crane Rental with Operators					
238990	All Other Specialty Trade Cont.	1,231	1,286	$1,991,485	$1,618
Crane Rental without Operators (Bare Rentals)					
532412	Const./Min./For. Machine & Equip.	1,782	3,018	$309,609	$103
Own and Rent Cranes with Operators					
236115	New Single-Family Housing Const.	178	178	$72,322	$406
236118	Residential Remodelers	25	25	$20,467	$819
236210	Industrial Building Construction	9	12	$270,766	$22,564
236220	Commercial and Institutional Building	23	31	$238,109	$7,681
237110	Water and Sewer Line and Related Struct.	52	69	$523,496	$7,587
237120	Oil and Gas Pipeline and Related Struct.	20	26	$264,693	$10,180
237130	Power and Communication Line and Rel.	34	34	$180,887	$5,320
237310	Highway, Street, and Bridge Construction	80	107	$1,279,134	$11,955
237990	Other Heavy and Civil Engineering Const.	76	101	$1,903,569	$18,847
238110	Poured Concrete Foundation and Struct.	261	261	$1,096,002	$4,199
238120	Structural Steel and Precast Concrete	200	266	$1,690,217	$6,354
238130	Framing Contractors	26	26	$7,372	$284
238150	Glass and Glazing Contractors	42	42	$47,819	$1,139
238170	Siding Contractors	5	5	$4,584	$917
238190	Other Foundation, Structure, and Building	49	65	$181,212	$2,788
238210	Electrical Contractors	15	15	$19,828	$1,322
238220	Plumbing, Heating, and Air-Conditioning	2	3	$32,343	$10,781
238290	Other Building Equipment Contractors	113	151	$969,116	$6,418
238320	Painting and Wall Covering Contract.	21	21	$35,552	$1,693
238910	Site Preparation Contractors	400	400	$1,232,974	$3,082
	Subtotal	**1,630**	**1,838**	**$10,070,461**	
Own but Do Not Rent					
236115	New Single family housing construction	2,905	2,905	$2,151,333	$741

236116	New Multifamily housing construction	213	213	$157,700	$741
236117	New housing operative builders	1,263	1,263	$935,573	$741
236118	Residential Remodelers	825	825	$610,894	$741
236210	Industrial building construction	223	262	$194,098	$741
236220	Commercial and Institutional Bldg. Const.	3,614	3,614	$2,676,568	$741
237110	Water and Sewer Line Const.	917	1,223	$905,470	$741
237120	Oil and gas pipeline construction	98	131	$96,790	$741
237130	Power and communication line const.	219	291	$114,664	$393
237210	Land subdivision	0	0	$0	$0
237310	Highway, street and bridge const.	69	93	$68,575	$741
237990	Other heavy and civil eng.	511	511	$378,643	$741
238110	Poured Concrete foundation and struct.	108	108	$79,805	$741
238120	Structural steel and precast concrete	394	394	$291,554	$741
238130	Framing Contractors	1,060	1,060	$785,316	$741
238140	Masonry Contractors	128	128	$94,975	$741
238150	Glass & Glazing Contractors	48	48	$35,872	$741
238160	Roofing Contractors	230	230	$170,275	$741
238170	Siding Contractors	33	33	$24,105	$741
238190	Other foundation, structure, building, ext.	7	7	$5,273	$741
238210	Electrical Contractors	60	60	$23,612	$393
238220	Plumbing, Heating and Air-conditioning Cont.	86	86	$63,721	$741
238290	Other building equipment cont.	33	44	$32,355	$741
238310	Drywall and insulation contractors	0	0	$0	$0
238320	Painting and wall covering contractors	37	37	$27,267	$741
238330	Flooring Contractors	0	0	$0	$0
238340	Tile and Terrazzo contractors	0	0	$0	$0
238350	Finish Carpentry contractors	0	0	$0	$0
238390	Other building finishing contractors	0	0	$0	$0
238910	Site Preparation	262	262	$194,105	$741
221110	Electric Power Generation	293	301	$73,588	$244
221120	Electric Power Transmission, Control, and Distribution	337	358	$112,369	$314
221210	Natural Gas Distribution	442	591	$255,619	$433
321213	Engineered Wood Member (except Truss) Manufacturing	121	127	$59,770	$471
321214	Truss Manufacturing	871	914	$744,121	$814
336611	Ship Building and Repairing	575	635	$410,878	$647
339950	Sign Manufacturing	6,261	6,339	$245,747	$39
423310	Lumber, Plywood, Millwork, and Wood Panel Merchant Wholesalers	5,971	6,326	$0	$0
423330	Roofing, Siding, and Insulation Material Merchant Wholesalers	1,025	1,173	$0	$0
423390	Other Construction Material Merchant Wholesalers	2,181	2,296	$0	$0

423730	Warm Air Heating and Air-Cond. Equip. and Supplies	2,364	2,958	$4,851,281	$1,640
444110	Home Centers	2,409	2,575	$0	$0
454312	Liquefied Petroleum Gas (Bottled Gas) Dealers	2,044	2,317	$2,460,790	$1,062
482110	Railroads	NA	NA	NA	NA
486210	Pipeline Transportation of Natural Gas	65	66	$14,333	$217
517110	Wired Telecommunications Carriers	2,517	27,159	$1,907,788	$70
	Subtotal	**32,430**	**59,267**	**$21,254,828**	
Crane Lessees in the Construction Industry					
236115	New Single family housing construction	31,038	31,038	$14,133,479	$455
236116	New Multifamily housing construction	2,086	2,086	$864,078	$414
236117	New housing operative builders	16,562	16,562	$7,541,453	$455
236118	Residential Remodelers	9,846	9,846	$4,483,343	$455
236210	Industrial building construction	3,000	3,000	$1,242,682	$414
236220	Commercial and Institutional Bldg. Construction	40,530	40,530	$16,788,629	$414
237110	Water and Sewer Line Const.	13,715	13,715	$5,681,126	$414
237120	Oil and gas pipeline construction	1,667	1,667	$690,517	$414
237130	Power and communication line const.	2,811	2,811	$188,781	$67
237210	Land subdivision	0	0	$0	NA
237310	Highway, street and bridge const.	1,114	1,114	$461,532	$414
237990	Other heavy and civil eng.	2,760	2,760	$1,143,060	$414
238110	Poured Concrete foundation and struct.	13,273	13,273	$5,498,038	$414
238120	Structural steel and precast concrete	3,487	3,487	$1,444,410	$414
238130	Framing Contractors	13,779	13,779	$5,707,637	$414
238140	Masonry Contractors	1,368	1,368	$566,539	$414
238150	Glass & Glazing Contractors	542	542	$224,387	$414
238160	Roofing Contractors	1,945	1,945	$805,589	$414
238170	Siding Contractors	526	526	$217,821	$414
238190	Other foundation, structure, building, ext.	256	256	$106,104	$414
238210	Electrical Contractors	765	765	$51,356	$67
238220	Plumbing, Heating and Air-conditioning Cont.	970	970	$401,941	$414
238290	Other building equipment cont.	644	644	$266,845	$414
238310	Drywall and insulation contractors	0	0	$0	NA
238320	Painting and wall covering contractors	414	414	$171,627	$414
238330	Flooring Contractors	0	0	$0	NA
238340	Tile and Terrazzo contractors	0	0	$0	NA
238350	Finish Carpentry contractors	0	0	$0	NA
238390	Other building finishing contractors	0	0	$0	NA

238910	Site Preparation	3,889	3,889	$1,610,805	$414
	Subtotal	**166,985**	**166,985**	**$70,291,778**	
	Total	**204,058**	**232,394**	**$103,918,161**	

Source: ORA
U.S. Census Bureau data
Country Business Patters, 2006; Statistics of U.S. Businesses 2006
Statistics of U.S. Business (SUSB)

To assess the potential economic impact of the proposal on small entities, OSHA calculated the ratios of compliance costs to profits and to revenues. These impacts are presented for each affected industry in Table B-14. OSHA expects that, among small entities potentially affected by the proposal, the average increase in prices necessary to completely offset the compliance costs is 0.06 percent. The average price increase necessary to completely offset compliance costs would not exceed 0.18 percent among small entities in any industry. Only to the extent that such price increases are not possible would there be any effect on the average profits of small entities. Even in the unlikely event that no costs could be passed through, the compliance costs could be completely absorbed through an average reduction in profits of 1.2 percent. In most affected industries, the compliance costs, without any pass-through, could be completely absorbed through an average reduction in profits of less than 1 percent; the reduction would be no more than 5.0 percent in any of the affected industries.

To further ensure that potential impacts on small entities were fully analyzed and considered, OSHA also separately examined the potential impacts of the final standard on very small entities, defined as employers with fewer than 20 employees. To assess the potential economic impact of the final standard on very small entities, OSHA calculated the ratios of compliance costs to profits and to revenues. These ratios are presented for each affected industry in Table B-15. OSHA expects that among very small entities potentially affected by the final standard, the average increase in prices necessary to completely offset the compliance costs would be 0.08 percent (less than 1 percent). Only to the extent that such price increases are not possible, would there be any effect on the average profits of very small entities. Even in the unlikely event that no costs could be

passed through, the compliance costs could be completely absorbed through an average reduction in profits of 1.68 percent among affected very small entities.

Table B-14

Economic Impacts for SBA Defined Small Entities by Major Categories

0	Industry	Firms	Estabs.	Avg. Rev's Per Estab. ($1,000)	Avg. Profits Per Estab. ($1,000)	Cost Per Estab.	Cost as a Percent of Revenues	Cost as a Percent of Profits
Crane Rental with Operators								
238990	All Other Specialty Trade Cont.	1,231	1,286	$1,550	$71	$1,618	0.10%	2.29%
Crane Rental without Operators (Bare Rentals)								
532412	Const./Min./For. Machine & Equip.	1,782	3,018	$482	$31	$103	0.13%	2.02%
Own and Rent Cranes with Operators								
236115	New Single-Family Housing Const.	178	178	$220	$10	$406	0.18%	3.95%
236118	Residential Remodelers	25	25	$443	$21	$819	0.18%	3.95%
236210	Industrial Building Construction	9	12	$12,213	$571	$22,564	0.18%	3.95%
236220	Commercial and Institutional Building	23	31	$4,157	$194	$7,681	0.18%	3.95%
237110	Water and Sewer Line and Related Struct.	52	69	$4,107	$214	$7,587	0.18%	3.54%
237120	Oil and Gas Pipeline and Related Struct.	20	26	$5,510	$288	$10,180	0.18%	3.54%
237130	Power and Communication Line and Rel.	34	34	$2,880	$150	$5,320	0.18%	3.54%
237310	Highway, Street, and Bridge Construction	80	107	$11,783	$615	$11,955	0.10%	1.94%
237990	Other Heavy and Civil Engineering Const.	76	101	$10,201	$533	$18,847	0.18%	3.54%
238110	Poured Concrete Foundation and Struct.	261	261	$2,273	$101	$4,199	0.18%	4.18%
238120	Structural Steel and Precast Concrete	200	266	$3,439	$152	$6,354	0.18%	4.18%
238130	Framing Contractors	26	26	$153	$7	$284	0.18%	4.18%
238150	Glass and Glazing Contractors	42	42	$616	$27	$1,139	0.18%	4.18%
238170	Siding Contractors	5	5	$496	$22	$917	0.18%	4.18%
238190	Other Foundation, Structure, and Building	49	65	$1,509	$67	$2,788	0.18%	4.18%
238210	Electrical Contractors	15	15	$1,303	$56	$1,322	0.10%	2.35%
238220	Plumbing, Heating, and Air-Conditioning	2	3	$5,835	$225	$10,781	0.18%	4.79%
238290	Other Building Equipment Contractors	113	151	$3,474	$154	$6,418	0.18%	4.18%
238320	Painting and Wall Covering Contract.	21	21	$916	$41	$1,693	0.18%	4.18%
238910	Site Preparation Contractors	400	400	$1,668	$76	$3,082	0.18%	4.05%

	Subtotal	**1,630**	**1,838**					
Own but Do Not Rent								
236115	New Single family housing construction	2,905	2,905	$1,000	$47	$741	0.07%	1.58%
236116	New Multifamily housing construction	213	213	$3,400	$159	$741	0.02%	0.47%
236117	New housing operative builders	1,263	1,263	$5,104	$239	$741	0.01%	0.31%
236118	Residential Remodelers	825	825	$543	$25	$741	0.14%	2.92%
236210	Industrial building construction	223	262	$2,570	$120	$741	0.03%	0.62%
236220	Commercial and Institutional Bldg. Const.	3,614	3,614	$3,661	$171	$741	0.02%	0.43%
237110	Water and Sewer Line Const.	917	1,223	$2,324	$121	$741	0.03%	0.61%
237120	Oil and gas pipeline construction	98	131	$3,743	$195	$741	0.02%	0.38%
237130	Power and communication line const.	219	291	$4,656	$243	$393	0.01%	0.16%
237210	Land subdivision	0	0	$0	$0	$0	0.00%	0.00%
237310	Highway, street and bridge const.	69	93	$3,225	$168	$741	0.02%	0.44%
237990	Other heavy and civil eng.	511	511	$1,500	$78	$741	0.05%	0.95%
238110	Poured Concrete foundation and struct.	108	108	$1,000	$44	$741	0.07%	1.67%
238120	Structural steel and precast concrete	394	394	$1,425	$63	$741	0.05%	1.18%
238130	Framing Contractors	1,060	1,060	$798	$35	$741	0.09%	2.10%
238140	Masonry Contractors	128	128	$675	$30	$741	0.11%	2.48%
238150	Glass & Glazing Contractors	48	48	$900	$40	$741	0.08%	1.86%
238160	Roofing Contractors	230	230	$801	$35	$741	0.09%	2.09%
238170	Siding Contractors	33	33	$600	$27	$741	0.12%	2.79%
238190	Other foundation, structure, building, ext.	7	7	$900	$40	$741	0.08%	1.86%
238210	Electrical Contractors	60	60	$1,100	$48	$393	0.04%	0.83%
238220	Plumbing, Heating and Air-conditioning Cont.	86	86	$1,100	$42	$741	0.07%	1.74%
238290	Other building equipment cont.	33	44	$1,664	$74	$741	0.04%	1.01%
238310	Drywall and insulation contractors	0	0	$0	$0	$0	0.00%	0.00%
238320	Painting and wall covering contractors	37	37	$419	$19	$741	0.18%	4.00%
238330	Flooring Contractors	0	0	$0	$0	$0	0.00%	0.00%
238340	Tile and Terrazzo contractors	0	0	$0	$0	$0	0.00%	0.00%
238350	Finish Carpentry contractors	0	0	$0	$0	$0	0.00%	0.00%
238390	Other building finishing contractors	0	0	$0	$0	$0	0.00%	0.00%
238910	Site Preparation	262	262	$962	$44	$741	0.08%	1.69%
221110	Electric Power Generation	293	301	$7,313	$325	$244	0.00%	0.08%
221120	Electric Power Trans, Control, Dist	337	358	$6,882	$306	$314	0.00%	0.10%

221210	Natural Gas Distribution	442	591	$28,428	$847	$433	0.00%	0.05%
321213	Engineered Wd Member (exct Truss) Mfg	121	127	$4,720	$183	$471	0.01%	0.26%
321214	Truss Manufacturing	871	914	$4,706	$182	$814	0.02%	0.45%
336611	Ship Building and Repairing	575	635	$10,204	$622	$647	0.01%	0.10%
339950	Sign Manufacturing	6,261	6,339	$1,532	$89	$39	0.00%	0.04%
423310	Lumber, Plywd, Millwork, Wood Panel Whle	5,971	6,326	$7,084	$204	$0	0.00%	0.00%
423330	Roofing, Siding, and Insulation Merch Whle	1,025	1,173	$7,159	$207	$0	0.00%	0.00%
423390	Other Construction Material Merch Whle	2,181	2,296	$3,260	$94	$0	0.00%	0.00%
423730	Warm Air Heating and A-C Equip & Supplies	2,364	2,958	$3,790	$117	$1,640	0.04%	1.41%
444110	Home Centers	2,409	2,575	$2,335	$180	$0	0.00%	0.00%
454312	Liquefied Petroleum Gas (Bottled Gas) Dlrs	2,044	2,317	$2,415	$102	$1,062	0.04%	1.04%
482110	Railroads	NA	NA	NA	NA	NA	NA	NA
486210	Pipeline Transportation of Natural Gas	65	66	$8,345	$1,105	$217	0.00%	0.02%
517110	Wired Telecommunications Carriers	2,517	27,159	$7,294	$518	$70	0.00%	0.01%
	Subtotal	**32,430**	**59,267**					
Crane Lessees in the Construction Industry								
236115	New Single family housing construction	31,038	31,038	$1,480	$69	$455	0.03%	0.32%
236116	New Multifamily housing construction	2,086	2,086	$3,085	$144	$414	0.01%	0.08%
236117	New housing operative builders	16,562	16,562	$2,860	$134	$455	0.02%	0.08%
236118	Residential Remodelers	9,846	9,846	$644	$30	$455	0.07%	0.15%
236210	Industrial building construction	3,000	3,000	$2,493	$117	$414	0.02%	0.15%
236220	Commercial and Institutional Bldg. Construction	40,530	40,530	$4,024	$188	$414	0.01%	0.12%
237110	Water and Sewer Line Const.	13,715	13,715	$2,863	$149	$414	0.01%	0.24%
237120	Oil and gas pipeline construction	1,667	1,667	$4,118	$215	$414	0.01%	0.09%
237130	Power and communication line const.	2,811	2,811	$2,289	$120	$67	0.00%	0.01%
237210	Land subdivision	0	0	$0	$0	NA	0.00%	0.00%
237310	Highway, street and bridge const.	1,114	1,114	$3,606	$188	$414	0.01%	0.01%
237990	Other heavy and civil eng.	2,760	2,760	$2,919	$152	$414	0.01%	0.10%
238110	Poured Concrete foundation and struct.	13,273	13,273	$1,189	$53	$414	0.03%	0.03%
238120	Structural steel and precast concrete	3,487	3,487	$1,927	$85	$414	0.02%	0.35%
238130	Framing Contractors	13,779	13,779	$559	$25	$414	0.07%	0.75%
238140	Masonry Contractors	1,368	1,368	$814	$36	$414	0.05%	0.05%
238150	Glass & Glazing Contractors	542	542	$1,319	$58	$414	0.03%	0.06%
238160	Roofing Contractors	1,945	1,945	$1,125	$50	$414	0.04%	0.07%

238170	Siding Contractors	526	526	$529	$23	$414	0.08%	0.08%
238190	Other foundation, structure, building, ext.	256	256	$628	$28	$414	0.07%	0.05%
238210	Electrical Contractors	765	765	$874	$38	$67	0.01%	0.00%
238220	Plumbing, Heating and Air-conditioning Cont.	970	970	$1,049	$40	$414	0.04%	0.01%
238290	Other building equipment cont.	644	644	$2,068	$91	$414	0.02%	0.32%
238310	Drywall and insulation contractors	0	0	$0	$0	NA	0.00%	0.00%
238320	Painting and wall covering contractors	414	414	$513	$23	$414	0.08%	0.02%
238330	Flooring Contractors	0	0	$0	$0	NA	0.00%	0.00%
238340	Tile and Terrazzo contractors	0	0	$0	$0	NA	0.00%	0.00%
238350	Finish Carpentry contractors	0	0	$0	$0	NA	0.00%	0.00%
238390	Other building finishing contractors	0	0	$0	$0	NA	0.00%	0.00%
238910	Site Preparation	3,889	3,889	$1,101	$50	$414	0.04%	0.06%
	Subtotal	**166,985**	**166,985**					
	Total	**204,058**	**232,394**					
					Simple Average of impacts:		**0.06%**	**1.25%**

Source: ORA
U.S. Census Bureau data
Country Business Patters, 2006; Statistics of U.S. Businesses 2006
Internal Revenue Service, Source Book, profit rates over 2000-2006
Statistics of U.S. Business (SUSB)

Table B-15

Economic Impacts for Very Small Entities (Less than 20 Employees) by Major Category

	Industry	Firms	Estabs	Employees	Profit Rate	Revenues Per Estab. ($1,000)	Profits Per Estab. ($1,000)	Cost Per Estab.	Cost as a Percent of Revenues	Cost as a Percent of Profits
Crane Rental with Operators										
238990	All Other Specialty Trade Cont.	1,065	1,065	4,824	4.10%	$614	$25	$614	0.10%	2.44%
Crane Rental without Operators (Bare Rentals)										
532412	Const./Min./For. Machine & Equip.	1,782	3,018	19,423	6.42%	$129	$8	$103	0.08%	1.23%
Own and Rent Cranes with Operators										
236115	New Single-Family Housing Const.	178	178	261	4.67%	$220	$10	$407	0.18%	4.19%
236118	Residential Remodelers	25	25	45	4.67%	$443	$21	$819	0.18%	4.19%
236210	Industrial Building Construction	9	12	1,067	4.67%	$12,213	$571	$22,564	0.18%	4.19%
236220	Commercial and Institutional Building	23	31	757	4.67%	$4,157	$194	$7,681	0.18%	4.19%
237110	Water and Sewer Line and Related Struct.	52	69	1,432	5.22%	$4,107	$214	$7,587	0.18%	3.97%
237120	Oil and Gas Pipeline and Related Struct.	20	26	1,457	5.22%	$5,510	$288	$10,180	0.18%	3.97%
237130	Power and Communication Line and Rel.	34	34	666	5.22%	$2,880	$150	$5,320	0.18%	3.97%
237310	Highway, Street, and Bridge Construction	80	107	6,456	5.22%	$11,783	$615	$21,770	0.18%	3.97%
237990	Other Heavy and Civil Engineering Const.	76	101	5,857	5.22%	$10,201	$533	$18,847	0.18%	3.97%
238110	Poured Concrete Foundation and Struct.	261	261	4,328	4.42%	$2,273	$101	$4,199	0.18%	4.18%
		758	**844**	**22,326**						
Own Cranes But Do Not Rent Them										
236115	New Single family housing construction	2,763	2,763	12,155	4.67%	$823	$38	$628	0.08%	1.63%
236116	New Multifamily housing construction	197	197	2,010	4.67%	$1,350	$63	$628	0.05%	1.00%
236117	New housing operative builders	1,206	1,206	8,528	4.67%	$1,854	$87	$628	0.03%	0.73%
236118	Residential Remodelers	808	808	2,627	4.67%	$443	$21	$628	0.14%	3.03%
236210	Industrial building construction	209	209	6,015	4.67%	$1,247	$58	$628	0.05%	1.08%
236220	Commercial and Institutional Bldg. Construc	2,943	2,943	50,843	4.67%	$1,526	$71	$628	0.04%	0.88%

237110	Water and Sewer Line Const.	900	900	13,335	5.22%	$702	$37	$628	0.09%	1.71%
237120	Oil and gas pipeline construction	63	63	3,416	5.22%	$708	$37	$628	0.09%	1.70%
237130	Power and communication line const.	207	207	9,177	5.22%	$655	$34	$281	0.04%	0.82%
237210	Land subdivision	0	0	0	11.04%	$0	$0	$0	NA	NA
237310	Highway, street and bridge const.	66	66	2,423	5.22%	$976	$51	$628	0.06%	1.23%
237990	Other heavy and civil eng.	378	378	10,483	5.22%	$589	$31	$628	0.11%	2.04%
238110	Poured Concrete foundation and struct.	46	46	531	4.42%	$494	$22	$628	0.13%	2.87%
238120	Structural steel and precast concrete	90	90	1,954	4.42%	$659	$29	$628	0.10%	2.16%
238130	Framing Contractors	981	981	8,322	4.42%	$374	$17	$628	0.17%	3.80%
238140	Masonry Contractors	115	115	1,093	4.42%	$343	$15	$628	0.18%	4.14%
238150	Glass & Glazing Contractors	44	44	405	4.42%	$619	$27	$628	0.10%	2.29%
238160	Roofing Contractors	207	207	2,378	4.42%	$447	$20	$628	0.14%	3.18%
238170	Siding Contractors	31	31	127	4.42%	$408	$18	$628	0.15%	3.48%
238190	Other foundation, structure, building, ext.	10	10	62	4.42%	$394	$17	$628	0.16%	3.60%
238210	Electrical Contractors	54	54	541	4.32%	$444	$19	$281	0.06%	1.47%
238220	Plumbing, Heating and Air-conditioning Contractors	77	77	768	3.86%	$509	$20	$628	0.12%	3.20%
238290	Other building equipment cont.	30	30	570	4.42%	$714	$32	$628	0.09%	1.99%
238310	Drywall and insulation contractors	0	0	0	4.42%	$0	$0	$0	NA	NA
238320	Painting and wall covering contractors	37	37	208	4.42%	$265	$12	$628	0.24%	5.36%
238330	Flooring Contractors	0	0	0	4.42%	$0	$0	$0	NA	NA
238340	Tile and Terrazzo contractors	0	0	0	4.42%	$0	$0	$0	NA	NA
238350	Finish Carpentry contractors	0	0	0	4.42%	$0	$0	$0	NA	NA
238390	Other building finishing contractors	0	0	0	4.42%	$0	$0	$0	NA	NA
238910	Site Preparation	271	271	1,970	4.56%	$497	$23	$628	0.13%	2.77%
221110	Electric Power Generation	293	301	1,288	4.44%	$7,513	$334	$234	0.00%	0.07%
221120	Electric Power Trans, Control, and Dist.	337	358	2,272	4.44%	$7,311	$325	$303	0.00%	0.09%
221210	Natural Gas Distribution	360	368	1,736	2.98%	$9,483	$283	$128	0.00%	0.05%
321213	Engineered Wood Member (except Truss) Mfg	82	82	534	3.87%	$1,674	$65	$108	0.01%	0.17%
321214	Truss Manufacturing	408	408	3,438	3.87%	$1,130	$44	$156	0.01%	0.36%
336611	Ship Building and Repairing	370	371	2,041	6.09%	$950	$58	$24	0.00%	0.04%
339950	Sign Manufacturing	5,312	5,316	25,236	5.83%	$1,303	$76	$66	0.01%	0.09%
423310	Lumber, Plywd, Millwork, & Panel Merch Whl	4,774	4,844	24,410	2.89%	$3,970	$115	$0	0.00%	0.00%
423330	Roofing, Siding, and Insul Merchant Wholes.	831	857	4,764	2.89%	$4,461	$129	$0	0.00%	0.00%
423390	Other Construction Material Merch Whleslrs	1,886	1,907	9,298	2.89%	$2,199	$63	$0	0.00%	0.00%
423730	Warm Air Heating and A-C Equip.& Supplies	1,929	2,017	11,007	3.08%	$2,537	$78	$888	0.03%	1.14%
444110	Home Centers	1,879	1,904	12,389	7.70%	$1,344	$103	$0	0.00%	0.00%

454312	Liquefied Petroleum Gas (Bottled Gas) Dlrs	1,881	2,001	11,711	4.22%	$1,333	$56	$651	0.05%	1.16%
482110	Railroads	NA	NA	NA	NA	NA	NA	NA	NA	NA
486210	Pipeline Transportation of Natural Gas	65	66	238	13.24%	$8,473	$1,122	$192	0.00%	0.02%
517110	Wired Telecommunications Carriers	1,828	1,882	9,022	7.10%	$1,431	$102	$12	0.00%	0.01%
	Subtotal	**33,969**	**11,734**	**139,941**						
Crane Lessees in the Construction Industry										
236115	New Single family housing construction	29,962	29,962	95,670	4.67%	$1,192	$56	$455	0.04%	0.82%
236116	New Multifamily housing construction	1,904	1,904	7,946	4.67%	$1,986	$93	$414	0.02%	0.45%
236117	New housing operative builders	15,927	15,927	50,782	4.67%	$2,063	$96	$455	0.02%	0.47%
236118	Residential Remodelers	9,606	9,606	25,611	4.67%	$527	$25	$455	0.09%	1.85%
236210	Industrial building construction	2,669	2,669	13,978	4.67%	$1,120	$52	$414	0.04%	0.79%
236220	Commercial and Institutional Bldg. Construction	33,784	33,784	179,125	4.67%	$1,649	$77	$414	0.03%	0.54%
237110	Water and Sewer Line Const.	11,306	11,306	59,055	5.22%	$841	$44	$414	0.05%	0.94%
237120	Oil and gas pipeline construction	1,083	1,083	4,293	5.22%	$666	$35	$414	0.06%	1.19%
237130	Power and communication line const.	2,149	2,149	8,580	5.22%	$630	$33	$67	0.01%	0.20%
237210	Land subdivision	0	0	0	11.04%	$0	$0	$0	0.00%	0.00%
237310	Highway, street and bridge const.	862	862	4,675	5.22%	$993	$52	$414	0.04%	0.80%
237990	Other heavy and civil engg.	2,295	2,295	10,166	5.22%	$1,261	$66	$414	0.03%	0.63%
238110	Poured Concrete foundation and struct.	11,886	11,886	52,606	4.42%	$677	$30	$414	0.06%	1.38%
238120	Structural steel and precast concrete	2,679	2,679	14,995	4.42%	$945	$42	$414	0.04%	0.99%
238130	Framing Contractors	13,043	13,043	48,914	4.42%	$345	$15	$414	0.12%	2.72%
238140	Masonry Contractors	1,243	1,243	4,720	4.42%	$376	$17	$414	0.11%	2.49%
238150	Glass & Glazing Contractors	485	485	2,457	4.42%	$758	$34	$414	0.05%	1.24%
238160	Roofing Contractors	1,722	1,722	7,015	4.42%	$637	$28	$414	0.07%	1.47%
238170	Siding Contractors	506	506	1,627	4.42%	$359	$16	$414	0.12%	2.61%
238190	Other foundation, structure, building, ext.	237	237	909	4.42%	$290	$13	$414	0.14%	3.24%
238210	Electrical Contractors	691	691	2,953	4.32%	$434	$19	$67	0.02%	0.36%
238220	Plumbing, Heating and Air-conditioning Contractors	872	872	3,855	3.86%	$551	$21	$414	0.08%	1.95%
238290	Other building equipment cont.	524	524	2,726	4.42%	$868	$38	$414	0.05%	1.08%
238310	Drywall and insulation contractors	0	0	0	4.42%	$0	$0	$0	0.00%	0.00%
238320	Painting and wall covering contractors	392	392	1,267	4.42%	$326	$14	$414	0.13%	2.87%
238330	Flooring Contractors	0	0	0	4.42%	$0	$0	$0	0.00%	0.00%
238340	Tile and Terrazzo contractors	0	0	0	4.42%	$0	$0	$0	0.00%	0.00%
238350	Finish Carpentry contractors	0	0	0	4.42%	$0	$0	$0	0.00%	0.00%

238390	Other building finishing contractors	0	0	0	4.42%	$0	$0	$0	0.00%	0.00%
238910	Site Preparation	3,579	3,579	13,406	4.56%	$561	$26	$414	0.07%	1.62%
	Subtotal	**149,403**	**149,403**	**617,328**						
	Total	**186,977**	**166,064**	**803,843**						

Source: ORA
U.S. Census Bureau data
Country Business Patterns, 2006; Statistics of U.S. Businesses 2006 0.08% 1.69%
Internal Revenue Service, Source Book, profit rates over 2000-2006

2. A succinct statement of the need for, and objectives of, the rule

The primary objective of the proposed standard is to provide an increased degree of occupational safety for employees performing construction work involving cranes/derricks. As stated above, an estimated 157 injuries and 21 fatalities would be prevented annually through compliance with this standard. Another objective of the rulemaking is to provide employers and employees updated and more complete safety standards for construction work involving cranes/derricks.

The legal basis for the rule is the Occupational Safety and Health (OSH) Act of 1970. The OSH Act authorizes and obligates the Secretary of Labor to promulgate mandatory occupational safety and health standards as necessary "to assure so far as possible every working man and woman in the Nation safe and healthful working conditions and to preserve our human resources." 29 U.S.C. 651(b).

3. Summary of the significant issues raised by the public comments in response to the initial regulatory flexibility analysis, a summary of the assessment of the agency of such issues, and a statement of any changes made in the proposed rule as a result of such comments

On August 18, 2006, OSHA convened a Small Business Advocacy Review Panel (the Panel) for this rulemaking in accordance with the provisions of the Small Business Regulatory Enforcement Fairness Act of 1996 (P.L. 104-121), as codified at 5 U.S.C. 601 et seq. The Panel consisted of representatives of OSHA, the Office of Information and Regulatory Affairs in the Office of Management and Budget, and of the Office of Advocacy within the U.S. Small Business Administration. The Panel received oral and

written comments on a draft proposal and a draft economic analysis from small entities (businesses) that would potentially be affected by the rule. The Panel, in turn, prepared a written report which was delivered to the Assistant Secretary for Occupational Safety and Health (which can be found in the docket for this rulemaking). The report summarized the comments received from the small entities, and included recommendations from the Panel to OSHA regarding the proposal and the associated analysis of compliance costs. OSHA sought comment on a variety of issues of particular interest to small businesses as a result of the recommendations of the SBREFA Panel. Table B-16 below summarizes the responses to these Panel recommendations.

Table B-16 Response to SBREFA Panel Recommendations

SBREFA PANEL RECOMMENDATION	OSHA RESPONSE
The Panel recommends that OSHA provide full documentation for how it estimated the number of affected small entities and all other calculations and estimates provided in the PIRFA.	OSHA has developed a full preliminary economic analysis (PEA) for the proposal which explains all assumptions used in estimating the costs and benefits of the proposed standard. The Final Economic Analysis (FEA) also explains the changes made to the analysis as a result of comments on the proposed rule, and OSHA's responses to these comments.
The Panel recommends that OSHA reexamine its estimate of crane use in home building, the coverage of crane trucks used for loading and unloading, and the estimates of the number of jobs per crane. Changes in these estimates should be incorporated into the estimates of costs and economic impacts.	OSHA included homebuilding industries in the "Own but Do Not Rent "and "Crane Lessees" industrial profile categories. OSHA has also made a number of additions to the industrial profile to cover firms in general industry that sometimes use cranes for construction work, and has added costs for these sectors.
The Panel recommends that OSHA review its estimates for the direct costs of operator certification and seek comment on these cost estimates.	OSHA sought comments on the estimates and methodology. As a result of these comments, OSHA has increased its estimate of the unit costs of certification.
The Panel recommends that OSHA carefully examine certain types of impact that could result from an operator certification requirement,	OSHA sought public comment on all aspects (including economic impacts, wages, number of operators, demand, etc.)

including reports of substantial increases in the wages of operators; the possibility of increased market power for firms renting out cranes; and loss of jobs for existing operators due to language, literacy, or knowledge problems; and seek comment on these types of impacts. The Panel also recommends studying the impacts of the implementation of operator certification in CA.	of the operator certification requirements, specifically as it pertains to the State of California. OSHA has included 2 hours of travel time per operator into the unit costs for operator certification. OSHA also increased the unit costs of operator certification as a result of comments. However, based on comments, OSHA also reduced the OSHA percentage of crane operators still needing certification. The Agency reviewed data on wage rates for operators in California immediately before and after operator certification was required (Employment Development Department, Labor Market Information Division, State of California, 2007). The data did not show much change in operators' wages. OSHA also evaluated the changes in crane related fatality rates in California and found these had significantly declined after the California certification requirements were put into place.
The Panel recommends that OSHA reexamine its estimates for the amount of time required to assess ground conditions, the number of persons involved in the assessment, and the amount of coordination involved; clarify the extent to which such assessments are currently being conducted and what OSHA estimates as new costs for this rule represent; and seek comments on OSHA's cost estimates.	OSHA sought comment on the methodology used to calculate all of the costs in the PEA, which includes the costs for assessing ground conditions. As a result of these comments, OSHA has added costs for examination of ground conditions. This addition of costs does not change OSHA's conclusion that this standard is economically feasible.
The Panel recommends that OSHA carefully review the documentation requirements of the standard, including documentation that employers may consider it prudent to maintain; estimate the costs of such requirements; seek ways of minimizing these costs consistent with the goals of the OSH Act; and solicit comment on these costs and ways of minimizing these costs.	The Agency describes the documentation requirements, along with cost estimates, in the section of this preamble entitled "OMB Review Under the Paperwork Reduction Act of 1995."
The Panel recommends that OSHA examine whether the inspection requirements of the	As explained in the discussion of § 1926.1412, *Inspections*, OSHA's former

proposed rule require procedures not normally conducted currently, such as lowering and fully extending the boom before the crane can be used, and removing non-hinged inspection plates during the shift inspection, estimate the costs of any such requirements, and seek comment on these issues.	standard at former § 1926.550 required inspections each time the equipment is used, as well as thorough annual inspections. In addition, national consensus standards that are incorporated by reference include additional inspection requirements. This final standard would list the inspection requirements in one place rather than rely on incorporated consensus standards. This final standard does not impose significant new requirements for inspections. OSHA received comments on the issue of lowering and fully extending the boom before the crane can be used. However, OSHA concludes that the comments were based on a general misunderstanding of the requirements. Section 1926.1413(a) explicitly says that booming down is not required for shift (and therefore monthly) inspections. Similarly, OSHA stated in the proposed preamble (73 FR 59770, Oct. 9, 2008) that it does not believe inspection of any of those items would require removal of non-hinged inspection plates. In the discussion of proposed § 1926.1412, OSHA requested public comment on this point. OSHA finalized § 1926.1412 as proposed because comments did not confirm that non-hinged plates needed to be removed to meet the requirements of a shift inspection.
The Panel recommends that OSHA consider the costs of meeting the requirements for original load charts and full manuals, and solicit comments on such costs.	Previous subpart N, at former § 1926.550(a)(2), required load charts; this is not a new cost. Subpart N did not require manuals. OSHA concludes that most crane owners and operators have and maintain crane manuals, which contain the load charts and other critical technical information about crane operations and maintenance. The Agency determined that the cost of obtaining a copy of a manual should be modest and solicited comment on how many owners or operators do not have full manuals for their cranes or derricks. Few commenters saw this as a major problem.
The Panel recommends that OSHA provide full documentation for its analysis of the benefits the	The Agency placed additional materials in the rulemaking docket to aid in the

proposed rule are expected to produce and assure that the benefits analysis is reproducible by others.	reproduction of the benefits analysis. The Agency also developed a full benefits analysis (sec. 4 of the FEA) which includes the methodology and data sources for the calculations.
The Panel recommends that OSHA consider and solicit public comment on whether the scope language should be clarified to explicitly state whether forklifts that are modified to perform tasks similar to equipment (cranes and derricks) modified in that manner would be covered.	In the discussion of proposed § 1926.1400(c)(8), OSHA requested public comment on this issue.
The Panel recommends that there be a full explanation in the preamble of how responsibility for ensuring adequate ground conditions is shared between the controlling entity, and the employer of the individual supervising assembly/disassembly and/or the operator.	OSHA explained in the discussion of proposed § 1926.1402(e) how the various employers, including the controlling entity, the employer whose employees operate the equipment, and the employer of the A/D director share responsibility for ensuring adequate ground conditions. OSHA did not receive any significant comments on this issue and, therefore, considers this matter resolved.
The Panel recommends that OSHA restate the applicable corrective action provisions (which are set forth in the shift inspection) in the monthly inspection section.	OSHA addressed this recommendation in the discussion of proposed § 1926.1412(e) and requested public comment on the issue. Based on these comments, OSHA concludes that the requirements were clear as proposed, and repeating the provisions will create confusion. Therefore, OSHA did not restate the corrective actions in § 1926.1412(e).
The Panel recommends that OSHA solicit public comment on whether, and under what circumstances, booming down should be specifically excluded as a part of the shift inspection, and whether the removal of non-hinged inspection plates should be required during the shift inspection.	OSHA addressed this recommendation in the discussion of proposed § 1926.1412(d) and requested public comment on the issues raised in the recommendation.
The Panel recommends that OSHA solicit public comment on whether to include an exception for transportation systems in proposed § 1926.1412(a), which requires an inspection of equipment that has had modifications or additions that affect its safe operation, and, if so, what the appropriate terminology for such an exception would be.	OSHA solicited comments on this issue, but the Agency did not receive any significant comments supporting an exception for transportation systems. Based on the analysis of comments received about § 1926.1412(a), OSHA concludes that the inspections of modifications as required by the final rule are sufficient to ensure that safe equipment is used. Therefore, OSHA did include the recommended exclusion in the final rule.
The Panel recommends that OSHA explain in the	In the explanation of § 1926.1412(d)(1) of

preamble that the shift inspection does not need to be completed prior to each shift but may be completed during the shift.	the proposed rule, OSHA explained that the shift inspection may be completed during the shift. OSHA finalized § 1926.1412(d)(1) as proposed because the comments did not demonstrate how it was safer to deviate from the rule as proposed.
The Panel recommends that OSHA solicit public comment about whether it is necessary to clarify the requirement of proposed § 1926.1412(d)(1)(xi) that the equipment be inspected for "level position."	OSHA requested public comment on this issue and revised the regulatory text of § 1926.1412(d)(1)(xi) to provide more clarity, in response to the comments the Agency received.
The Panel recommends that OSHA solicit comment on whether proposed § 1926.1412(f)(2)(xii)(D) should be changed to require that pressure be inspected "at the end of the line," as distinguished from "at each and every line," and if so, what the best terminology would be to meet this purpose. (An SER indicated that proposed § 1926.1412(f)(2)(xiv)(D) should be modified to "checking pressure setting," in part to avoid having to check the pressure at "each and every line" as opposed to "at the end of the line.")	There is no requirement to check the pressure "at each and every line." The provision simply states that relief valves should be checked for failure to reach correct pressure. If this can be done at one point for the entire system, then that would satisfy the requirement.
The Panel recommends that OSHA solicit public comment on whether proposed § 1926.1412(f)(2)(xx) should be deleted because an SER believes that it is not always appropriate to retain originally-equipped steps and ladders, such as in instances where they are replaced with "attaching dollies."	Section 1926.1412(f)(2)(xx) of the final rule does not require the corrective action to which the SER refers. If an inspection under § 1926.1412(f) reveals a deficiency, a qualified person must determine whether that deficiency is a safety hazard requiring immediate correction. If the inspection reveals that original equipment, such as stairs and ladders, have been replaced with something equally safe, there would be no safety hazard and no requirement for corrective action.
The Panel recommends that OSHA solicit public comment on the extent of documentation of monthly and annual/comprehensive inspections the rule should require.	In the discussion of proposed § 1926.1412(f)(7), OSHA requested public comment on this issue. OSHA finalized § 1926.1412(f)(7) as proposed because the comments did not demonstrate a need to modify the extent of required documentation**.**
The Panel recommends that OSHA solicit public comment on whether the provision for monthly inspections should, like the provision for annual inspections, specify who must keep the documentation associated with monthly inspections.	In the discussion of proposed § 1926.1412(e), OSHA requested public comment on this issue. In response to these comments, OSHA has explained in the final preamble that the employer who performs the inspection must maintain documentation. If another employer wants to rely on this inspection, but cannot ensure

	completion and documentation of the inspection, then that employer must conduct a monthly inspection.
The Panel recommends that OSHA consider ways to account for the possibility that there may sometimes be an extended delay in obtaining the part number for an operational aid for older equipment and solicit public comment on the extent to which this is a problem.	OSHA addressed this recommendation in the discussion of proposed § 1926.1416(d), and requested public comment on the issue. The Agency did not receive any significant comments.
The Panel recommends that the provision on fall protection (proposed § 1926.1423) be finalized as written and that OSHA explain in the preamble how and why the Committee arrived at this provision.	Except for a minor change to § 1926.1423(h), which was made for clarity purposes, OSHA has finalized § 1926.1423 as proposed. OSHA explained the Committee's rationale in the proposed preamble discussion of § 1926.1423.
The Panel recommends that OSHA consider the potential advantages of and solicit public comment on adding provisions to proposed § 1926.1427 that would allow an operator to be certified on a particular model of crane; allow tests to be administered by an accredited educational institution; and allow employers to use manuals that have been re-written to accommodate the literacy level and English proficiency of operators.	OSHA addressed these recommendations in the discussion of proposed § 1926.1427, and requested public comment on the issues raised by the Panel. Based on these comments, OSHA is not permitting certification on a particular crane model because the body of knowledge and skills required to be qualified/certified on a particular model of crane is not less than that needed to be qualified/certified for that model's type and capacity. OSHA is not allowing an institution accredited by the Department of Education (DOE) to certify crane operators solely on the basis of DOE accreditation; such institutions would, like other operator-certification entities used to fulfill Option (1), be accredited by a "nationally recognized" accrediting body. Finally, OSHA is permitting employers to re-write manuals to accommodate the literacy level and English proficiency of operators.
The Panel recommends that OSHA clarify in the preamble how the proposed rule addresses an SER's concern that his crane operator would not be able to pass a written qualification/certification exam because the operator has difficulty in taking written exams.	In the discussion of proposed § 1926.1427(h), OSHA proposed to allow the oral administration of tests if two prerequisites are met. None of the comments explained why the rule as proposed was not effective for evaluating the knowledge of the candidate.
The Panel recommends soliciting public comment on whether the phrase "equipment capacity and type" in proposed § 1926.1427(b)(1)(ii)(B) needs clarification, suggestions on how to accomplish this, and whether the categories represented in Figures 1 through 10 contained in ANSI B30.5-	OSHA received public comments on this issue. In the final preamble discussion of § 1926.1427(b)(1)(ii)(B), OSHA explains that the Agency added a definition of "type" in response to public comment. The Agency also references ANSI crane

2000 (i.e., commercial truck-mounted crane – telescoping boom; commercial truck-mounted crane – non-telescoping boom; crawler crane; crawler crane – telescoping boom; locomotive crane; wheel- mounted crane (multiple control station); wheel- mounted crane – telescoping boom (multiple control station); wheel-mounted crane (single control station); wheel-mounted crane – telescoping boom (single control station)) should be used.	categories to illustrate the meaning of "type" in this standard.
The Panel recommends that OSHA ask for public comment on whether the rule needs to state more clearly that § 1926.1427(j)(1)(i) requires more limited training for operators of smaller capacity equipment used in less complex operations as compared with operators of higher capacity, more complex equipment used in more complex situations.	OSHA addressed this recommendation in the discussion of proposed § 1926.1430(c), and explained that § 1926.1427(j)(1)'s requirement for operator training in "the information necessary for safe operation of the specific type of equipment the individual will operate" addressed the SERs' concern. However, the Agency sought public comment on this issue. OSHA finalized § 1926.1427(j)(1) as proposed because the comments failed to explain how the hazards related to the operation of smaller equipment differed from larger equipment. OSHA then concluded that the comments also were not persuasive as to why operators of smaller capacity equipment should be allowed limited training.
The Panel recommends that OSHA consider and ask for public comment on whether a more limited training program would be appropriate for operations based on the capacity and type of equipment and nature of operations.	OSHA addressed this recommendation in the discussion of proposed § 1926.1430(c) requested public comment on the issue. The comments failed to explain how the hazards related to smaller equipment were any different from larger equipment. OSHA then concluded that the comments also were not persuasive as to why operators of smaller capacity equipment should be allowed limited training.
The Panel recommends that OSHA consider and ask for public comment as to whether the supervisor responsible for oversight for an operator in the pre-qualification period (§ 1926.1427(f)) should have additional training beyond that required in the C-DAC document at § 1926.1427(f)(2)(iii)(B).	OSHA addressed this recommendation in the discussion of proposed § 1926.1430(c). and requested public comment on the issue. In the proposed preamble, OSHA stated that, where a supervisor is not a certified operator, "he/she must be certified on the written portion of the test and be familiar with the proper use of the equipment's controls; the supervisor is not required to have passed a practical operating test." OSHA finalized this requirement without substantive change in § 1926.1427(f)(3)(ii) as proposed because none of the comments

	demonstrated a need to require additional training for this qualified individual.
The Panel recommends OSHA solicit comment on whether there are qualified persons in the field with the necessary expertise to assess how the rated capacity for land cranes and derricks used on barges and other flotation devices needs to be modified as required by proposed § 1926.1437(n)(2). The Panel also recommends that OSHA solicit comment on whether it is necessary, from a safety standpoint, to apply this provision to cranes used only for duty cycle work, and if so, why that is the case, and how "duty cycle work" should be defined.	In the discussion of proposed § 1926.1437(n)(2), OSHA requested public comment on this issue. Based on these comments, OSHA has concluded that there are qualified persons with dual expertise, and that the requirement in § 1926.1437(n)(2) is necessary for safety when equipment is engaged in duty cycle work.
The Panel recommends that OSHA consider and ask for comment on whether it would be appropriate to exempt from the rule small sideboom cranes incapable of lifting above the height of a truck bed and with a capacity of not more than 6,000 pounds.	In the discussion of proposed § 1926.1440(a), OSHA requested public comment on this issue. These comments did not provide any specific reason for exempting these small sideboom cranes and, therefore, OSHA has not provided a small capacity sideboom crane exemption from this standard.
The Panel recommends that OSHA solicit public comment on how the proposed rule could be simplified (without creating ambiguities) and made easier to understand. (Several SERs believed that the C-DAC document was so long and complex that small businesses would have difficulty understanding it and complying with it.)	The length and comprehensiveness of the standard is an issue for this rulemaking. In the proposed preamble Introduction, OSHA requested public comment on this issue; however, the Agency did not receive any comments objecting to the length or clarity of the overall rule or offer any suggestions as to how it could be simplified.
The Panel recommends that OSHA consider outlining the inspection requirements in spreadsheet form in an Appendix or developing some other means to help employers understand what inspections are needed and when they must be done.	OSHA will consider developing such an aid as a separate guidance document.
The Panel recommends that OSHA consider whether use of the words "determine" and "demonstrate" would mandate that the employer keep records of such determinations and if records would be required to make such demonstrations.	Some SERs requested clarification as to when documentation was required, believing that the document implicitly requires documentation when it states that the employer must "determine" or "demonstrate" certain actions or conditions. OSHA notes that it cannot cite an employer for failing to have documentation not explicitly required by a standard. See also the discussion under proposed § 1926.1402(e).

The Panel recommends soliciting public comment on whether the word "days" as used in §§ 1926.1416(d) and 1926.1416(e) should be clarified to mean calendar days or business days.	In the discussion of proposed § 1926.1416(d), OSHA requested public comment on this issue. As a clarification in response to the comments received, OSHA determines that the term "days" refers to calendar days.
The Panel recommends that OSHA carefully discuss what is included and excluded from the scope of this standard.	OSHA proposed a scope section, § 1926.1400, and discussed in detail the types of machinery proposed to be included and excluded under this standard. OSHA received public comments on this proposed scope, analyzed the comments, and provided more discussion of the scope section in the final preamble.
The Panel recommends that OSHA gather data and analyze the effects of already existing certification requirements.	OSHA obtained and evaluated a study by the Construction Safety Association of Ontario showing that Ontario's certification requirement led to a substantial decrease in crane-related fatalities there. OSHA also examined both economic data of crane operator wage rates before and after the certification requirements, and fatality rates before and after the certification requirements. This data shows that costs disruptions were minimal, and that crane fatalities were significantly reduced as a result of the California certification standard.
The Panel recommends that OSHA consider excluding and soliciting comment on whether equipment used solely to deliver materials to a construction site by placing/stacking the materials on the ground should be explicitly excluded from the proposed standard's scope.	In the discussion of proposed § 1926.1400(c), OSHA requested public comment on this issue. Based on the analysis of the comments received, OSHA recognized an exclusion for delivery materials that should exclude most true deliveries, while avoiding creating a loophole to the standard that would allow materials-delivery firms to engage in extensive construction activities
The Panel recommends that OSHA should consider the information and range of opinions that were presented by the SERs on the issue of operator qualification/certification when analyzing the public comments on this issue.	The information and opinions submitted by the SERs are part of the record for this rulemaking, and OSHA considered them along with the other public comments on the proposed rule.
The Panel recommends that OSHA consider and solicit public comment on expanding the levels of certification so as to allow an operator to be certified on a specific brand's model of crane.	OSHA addressed this recommendation in the discussion of proposed § 1926.1427, and requested public comment on the issue. Based on these comments, OSHA is not permitting certification on a particular crane model because the body of

	knowledge and skills required to be qualified/certified on a particular model of crane is not less than that needed to be qualified/certified for that model's type and capacity.
The Panel recommends that OSHA consider and solicit public comment on expanding the levels of operator qualification/certification to allow an operator to be certified for a specific, limited type of circumstance. Such a circumstance would be defined by a set of parameters that, taken together, would describe an operation characterized by simplicity and relatively low risk. The Agency should consider and solicit comment on whether such parameters could be identified in a way that would result in a clear, easily understood provision that could be effectively enforced.	OSHA addressed this recommendation in the discussion of proposed § 1926.1427(j)(1), and requested public comment on this issue. Though several commenters were in favor of this option, they did not explain how these lifts could objectively be distinguished from lifts generally. Several other commenters indicated that the types of hazards present. and the knowledge needed to address those hazards, remained the same, regardless of the capacity of the crane involved or the "routine" nature of the lift (see discussion of § 1926.1427(a)). Based on these comments, the Agency has not promulgated such a provision.
The Panel recommends that OSHA consider and solicit public comment on allowing the written and practical tests described in Option (1) to be administered by an accredited educational institution.	OSHA addressed this recommendation in the discussion of proposed § 1926.1427(b)(3), and requested public comment on the issue. Several comments were submitted in favor of allowing this option; however, they did not establish that Department of Education (DOE) accreditation would guarantee the same efficacy in certification as accreditation as a personnel certification entity. The hearing testimony of Dr. Roy Swift explained the difference in the types of accreditation and the reasons why DOE accreditation would not adequately address operator certification issues. Therefore, OSHA has finalized this provision as it was proposed.
The Panel recommends that OSHA solicit public comment on making it clear that: (1) an employer is permitted to equip its cranes with manuals re-written in a way that would allow an operator with a low literacy level to understand the material (such as substituting some text with pictures and illustrations), and (2) making it clear that, when the cranes are equipped with such re-written manuals and materials, the "manuals" and "materials" referred to in these literacy provisions would be the re-written manuals.	In the discussion of proposed § 1926.1427(h)(1), OSHA requested public comment on this issue. Based on the analysis of the comments received, OSHA concludes that these manuals may not be re-written as recommended because it could cause information important for safety to be omitted.

The Panel recommends that OSHA explain in a Small Business Compliance Guide that the certification/qualification test does not need to be administered in English but can be administered in a language that the candidate can read; and that while the employee would also need to have a sufficient level of literacy to read and understand the relevant information in the equipment manual, that requirement would be satisfied if the material is written in a language that the employee can read and understand..	OSHA will issue a Small Business Compliance Guide after the final rule is issued, and will explain these points in the Guide.

In addition to these issues brought up by the SBREFA panel, SBA's office of Advocacy provided a set of recommendations for OSHA to consider. (ID -0147.) These recommendations and OSHA's responses to them are summarized as follows:

1. **"OSHA should consider eliminating the requirement for third-party certification of crane operators – at least for some small cranes or routine lifts."** OSHA carefully examined this requirement. As noted in the benefits sections, broadly speaking, such a requirement resulted in major reductions in crane fatalities in both Ontario and California. Further, as discussed in the preamble sections, there is no easy way, beyond that already allowed, to eliminate third-party certification.
2. **"OSHA should exempt equipment used solely to deliver materials to a construction site by placing or staking the materials on the ground."** OSHA has clearly exempted such activities from the scope of the final standard.
3. **"OSHA should clarify the meaning of 'construction'.**" As noted above, OSHA has added material designed to aid in this distinction. However, the definition of construction is not an issue in this rulemaking, but is instead an issue for all construction rules.

4. **"OSHA should further limit the "controlling entity" provisions in the proposed rule."** Advocacy was concerned that small businesses may not be onsite, or may not have suitable expertise to meet the requirements for controlling entities. However, the fact remains that only the controlling entity can do what this section of the standard requires: 1) transfer any information they know of to the crane operator; and 2) authorize action that will change ground conditions to assure they are suitable for crane operations. The controlling entity could, of course, authorize the crane operator to alter site conditions as they wished to assure adequate safety—but it is the controlling entity and not the crane operator that inevitably has responsibility for site conditions.
5. **"OSHA should not mandate that employers follow manufacturers' recommendations."** Advocacy's concern here was that manufacturers may unduly limit crane operations out of liability concerns. However, only the manufacturers know the limitations of the cranes they produce. As a result, OSHA has retained these provisions. If Advocacy had provided examples of clearly unnecessary provisions in manuals, their argument might have been more convincing. In the absence of even a single example, there seems no reason to reject this provision or provide costs for it.
6. **"OSHA should consider and document any "significant alternatives" to the proposed rule."** Advocacy was concerned that some possible alternatives were not fully analyzed "because OSHA had committed to publishing the draft rule developed by C-DAC as the proposed rule, [and did not give] full consideration [to] significant alternatives that would specifically reduce the burden on small

businesses have not been documented in the proposed rule." OSHA believes that reliance on the work of C-DAC was and remains, appropriate. The two largest sources of costs in the rule are operator certification and rules covering operations close to power lines. The experience of Ontario and California shows that operator certification can make a major difference to crane fatalities. Additional work done for this final rule shows that construction crane fatalities also occur in general industry sectors where construction work is performed. As a result, and as more fully discussed in the scope and operator certification sections of this preamble, OSHA continues to believe that operator certification for cranes doing construction work is necessary to prevent crane-related deaths and injury. OSHA also believes that the power line rules developed through the expertise of C-DAC remain necessary to address the largest single source of crane-related construction fatalities—fatalities due to power line contact.

4. A description of and an estimate of the number of small entities to which the rule will apply

OSHA completed an analysis of the economic impacts associated with this final rule, including an analysis of the type and number of small entities to which the rule would apply, as described above. To determine the number of small entities potentially affected by this rulemaking, OSHA used the definitions of small entities developed by the Small Business Administration (SBA) for each industry.

For the construction industry generally, SBA defines small businesses using revenue-based criteria. For most of the affected construction industries, including those

industries that are mostly comprised of general contractors, firms with annual revenues of less than $31 million are classified as small businesses. For specialty contractors, such as structural-steel erection contractors, firms with annual revenues of less than $13 million are considered to be small businesses. Based on the definitions of small entities developed by SBA for each industry, the final rule is estimated to potentially affect a total of 204,000 small entities, as shown in Tables B-13 and B-14. Included in this number are an estimated 187,000 entities with fewer than 20 employees (Table B-15).

5. A description of the projected reporting, recordkeeping and other compliance requirements of the rule, including an estimate of the classes of small entities which will be subject to the requirement and the type of professional skills necessary for preparation of the report or record.

The final rule addresses the work practices used, as well as other requirements, for performing construction work involving cranes/derricks. Employers are required to keep specified records associated with inspections and operator certification/qualification.

Other compliance requirements in the standard include the assembly and disassembly requirements, encroachment-prevention precautions when working near power lines, and ground condition and power line assessments.

The preamble to the standard provides a comprehensive description of the standard's requirements. The final economic analysis located in the preamble provides a description of the types of business entities subject to these requirements, and the types of professional skills necessary to comply with the requirements.

Regulatory Alternatives

The Agency considered alternatives to the many provisions in the proposed standard, and these are presented and discussed in the Final Regulatory Flexibility Analysis below, as well as throughout the Preamble. Crane operator certification was one of the main issues in the rulemaking, and the Agency concludes that provisions for certification offer the most prominent way to consider both a more stringent standard (requiring certification of inspectors, riggers, and signal persons in addition to crane operators) as well as less stringent option of dropping the requirement of crane operator certification altogether.

The Agency has estimated the additional annualized costs for crane operator certification to be about $51 million annually—about one-third of the estimated total costs of the final standard. Dropping this requirement would reduce costs and impacts by that amount, roughly. Without a federal regulatory requirement, the level of operator certification would be uncertain. A substantial percentage of operators have already been certified. The Agency is convinced that certification significantly improves the safe practices of crane operators, and that increased protection has been the experienced in several venues where certification has been required. Liability insurers have reduced the premium rates on employers who use certified operators. Some states and cities also currently require crane operators to be certified. It is likely that crane services in construction work would be divided into two separate worlds without a federal regulatory requirement: one with certified operators, perhaps slightly more expensive but safer, and one where operators are not certified but employers still have a requirement to adequately

train them. As it is difficult to predict what the relative size of the market would be, it is not possible to predict or estimate what the effect would be in terms of future crane safety. The Agency did have substantial evidence in the record that operator certification, although costly, sharply reduces crane accidents, and did not adopt this alternative of dropping the operator certification requirement.

Several commenters in the rulemaking recommended that riggers, crane inspectors, and signal persons also be certified. The final standard requires riggers who perform tasks such as assembly/disassembly be qualified, as defined in the construction standards' definitions. The annualized cost of certifying a crane operator is about $400 (spread over 5 years, 7 percent discount rate). The Agency estimates that certifying a rigger would cost much less, about $100 per year; a signal person, on average, $50 per year; and inspectors as much as a crane operator. The Agency estimates that there needs to be, at most, on average, one certified rigger per crane; one signal person for every 3 cranes; and about 1,000 certified inspectors to conduct annual inspections of all the estimated 123,000 construction cranes. The Agency estimates that certification will annually cost about $100 for a rigger, $50 for a signal person, and $400 for an inspector (as much as a for a crane operator). The Agency estimates the total annual cost of certifying will be $14.5 million ($12.3 million for riggers, $2 million for signal persons, and $0.4 million for inspectors). The cost of crane inspection is likely to increase since many employers will no longer be able to have an employee perform an inspection, but the Agency is not estimating that increased cost.

Riggers are injured and killed more frequently than workers in any other occupation during construction crane activities. They are injured when cranes tip over or

booms fall, by falling loads, by electrical shock from power line contact, and through falls. The Negotiated Rulemaking Committee focused on the safety of the crane itself (capacity or loading limits, for example), crane movement or operations, assembly/disassembly, and power line risk rather than risks faced by riggers and signal persons who work with them. The Agency concludes that more training and certification for riggers could provide greater safety for them, but information in IMIS did not permit a separate analysis of the role of riggers in crane safety. No commenter who advocated certification for riggers provided more than a qualitative assertion that increased crane safety would result. There was similarly no information in the record that inspection failures had resulted in accidents, save for one accident in New York City that resulted from an inadequate repair to a tower crane part. The Agency did not have enough information in the record to recommend or support this alternative of requiring certification for riggers, signal persons, or inspectors.

C. OMB Review Under the Paperwork Reduction Act of 1995

The final Cranes and Derricks Standard contains collection of information requirements (paperwork) that are subject to review by the Office of Management and Budget (OMB). In accordance with the requirements of the Paperwork Reduction Act of 1995 (PRA-95) (44 U.S.C. 3506(c)(2)), the proposed regulation solicited comments on the information collection included in the proposal. The Department also submitted an information collection request (ICR), titled "Cranes and Derricks in Construction (29 CFR part 1926 subpart CC)," to OMB for review in accordance with 44 U.S.C. 3507(d)

on the date the proposed regulation was published. On January 8, 2009, OMB informed the Department of Labor to use OMB control number 1218-0261 in future submissions involving this rulemaking. OMB also commented, "This OMB action is not an approval to conduct or sponsor an information collection under the Paperwork Reduction Act of 1995."

OSHA received no public comments that addressed specifically the paperwork burden analysis of the information collections. A number of comments, described earlier in this preamble, contained information relevant to the costs and burden hours attendant to the non-paperwork provisions of the proposal, which OSHA considered when it developed the revised burden analysis for the ICR associated with this final rule.

Prior to publishing this final rulemaking, the Department of Labor submitted the Cranes and Derricks ICR to OMB for OMB approval. OSHA will publish a separate notice in the Federal Register that will announce the results of that review and include any applicable OMB control number. That notice also will include a summary of the information collection requirements and burdens imposed by the new standard. A copy of the ICR is available as an exhibit at http://www.regulations.gov. The Department of Labor notes that a Federal agency cannot conduct or sponsor a collection of information unless it is approved by OMB under the PRA, and displays a currently valid OMB control number. Also, notwithstanding any other provision of law, no employer shall be subject to penalty for failing to comply with a collection of information if the collection of information does not display a currently valid OMB control number.

The final Cranes and Derricks standard imposes new information-collection requirements for purposes of PRA-95. These provisions are necessary to protect the

health and safety of employees who work with equipment at construction worksites. The paperwork requirements impose on employers a duty to produce and maintain records when they implement controls and take other measures to protect workers from hazards related to cranes and derricks used in construction. For example, each construction business that has workers who operate or are in the vicinity of cranes and derricks must have, as applicable, the following documents on file and available at the job site: equipment ratings, employee training records, written authorizations from qualified individuals, and qualification program audits. During an inspection, OSHA must have access to these records to determine compliance under conditions specified by the final standard. An employer's failure to generate and disclose the information required by this standard will have a substantial affect on the Agency's effort to control and reduce injuries and fatalities related to the use of cranes and derricks in construction.

D. Federalism

The Agency reviewed this final rule according to the most recent Executive Order ("E.O.") on Federalism (E.O. 13132, 64 FR 43225, Aug. 10, 1994). This E.O. requires that Federal agencies, to the extent possible, refrain from limiting State or local policy options, consult with States before taking actions that restrict State or local policy options, and take such actions only when clear constitutional authority exists, and the problem is national in scope. The E.O. allows Federal agencies to preempt State and local law only with the expressed consent of Congress. In such cases, Federal agencies must limit preemption of State and local law to the extent possible.

Under sec. 18 of the Occupational Safety and Health Act of 1970 ("OSH Act"; 29 U.S.C. 667), Congress expressly provides that States may adopt, with Federal approval, a plan for the development and enforcement of occupational safety and health standards; States that obtain Federal approval for such a plan are referred to as "State-Plan States." (29 U.S.C. 667.) Occupational safety and health standards developed by State-Plan States must be at least as effective in providing safe and healthful employment and places of employment as the Federal standards. Subject to these requirements, State-Plan States are free to develop and enforce under State law their own requirements for occupational safety and health standards.

OSHA has authority under E.O. 13132 to promulgate the final rule in 29 CFR part 1926 because the employee exposures related to cranes and derricks used in construction addressed by the requirements of the final standard are national in scope. The Agency concludes that the requirements in this final rule will provide employers in every State with critical information to use when protecting their employees from the hazards presented when working with cranes and derricks.

A number of commenters were concerned with the preemptive effect of the final rule in jurisdictions not covered by an approved state plan. Representatives of New York City urged OSHA to make clear that the new standard will not preempt the City's ordinances governing the erection, dismantling, and operation of cranes, including crane operator licensing requirements, that protect the public in general. (ID -0342; -0404.1.)[142] The Allied Building Metal Industries Association, on the other hand, stated

[142] The City of Chicago Department of Buildings submitted a late comment expressing the same concerns as those of New York City. (ID -0348.1.) The concerns expressed by

that preemption of local crane laws is not only preferable, but is mandated by the OSH Act. (ID -0344.)

The OSH Act does not contain an express preemption provision.[143] However, in accordance with ordinary conflict preemption principles, preemption may be implied where the State law conflicts with federal law or is an impediment to full accomplishment of the federal purpose. *Gade v. National Solid Wastes Management Ass'n*, 505 U.S. 88, 100 (1992). The determination whether, under *Gade*, a State or local law is impliedly preempted by a federal occupational safety or health standard involves a detailed examination of the specific provisions and purposes of the law. The Secretary previously examined New York City's crane ordinances and concluded that they were not preempted by the prior crane standard. OSHA has placed the Secretary's amicus brief in *Steel Institute of New York v. The City of New York*, No. 09-CV-6539 (CM) (JCF) on the record. (ID -0419.1.) This brief presents the agency's interpretation of the preemptive effect of the prior rule on New York City's crane ordinances. For the same reasons set forth in the amicus brief – which are summarized below – New York City's crane ordinances are not preempted by this final rule.

In the *Steel Institute* case, the Secretary concluded that the OSH Act does not preempt municipal building codes like New York City's crane ordinances, which are designed to protect the public and neighboring structures from the hazards of cranes and do not conflict with OSHA standards. In *Gade*, a plurality read the provisions of sec. 18

Chicago are mainly the same as those of New York, and are addressed in the discussion of the New York laws.

[143] The proposed rule incorrectly stated that sec. 18 of the Act expressly provides OSHA with authority to preempt State occupational safety and health standards to the extent that the Agency promulgates a permanent federal standard (73 FR 59913, Oct. 9, 2008).

of the Act to preempt supplementary state laws that are not part of an approved state plan. 505 U.S. at 100-108. However, sec. 18 refers to states, not localities, and does not evince a clear intention to preempt local building codes. The *Gade* decision did not address local building codes, and the plurality's rationale for concluding that state laws may be preempted does not apply with equal measure to municipal building codes. The plurality relied chiefly on the availability of sec. 18's state plan mechanism for states that wish to supplement federal requirements, and Congress's intent to encourage states to assume full responsibility for safety and health through the state plan process. (ID -0419.1.) Cities and localities, however, have no authority under the Act to submit a state plan. Only a state itself may submit a plan and that plan must apply throughout the state. (ID -0419.1.) There was no majority consensus in *Gade* as to the preemptive effect of an OSHA standard on supplementary laws not addressed by sec. 18.

A variety of factors support the view that building codes are not the type of laws Congress intended to preempt in enacting sec. 18. There is legislative history supporting this conclusion. Representative Steiger, a primary sponsor of the Act, indicated that the Act would not be preemptive in the event of an overlap between an OSHA standard and a local building code. (ID -0419.1.) The Secretary has interpreted the Act as not preempting laws such as building codes and OSHA rulemaking has long proceeded on the assumption that local building codes exist in parallel to OSHA regulations and are not preempted by them. For example, in the preamble to the final rule on Exit Routes, Emergency Action Plans, and Fire Prevention Plans, OSHA commended the effectiveness of building codes while declining to recognize compliance with building codes as compliance with the OSHA standard (67 FR 67950, 67954, Nov. 7, 2002).

Strong policy considerations bolster this understanding. Work practices and conditions pose a variety of serious hazards to the public, and local jurisdictions have enacted a network of industrial codes, such as building and electrical codes, that touch on issues for which there are OSHA standards. If New York City's crane ordinances are preempted because of their incidental impact on worker safety, building and electrical codes, and many other types of local regulation will also be in jeopardy. The text and history of the Act give no indication that Congress intended such a sweeping preemptive effect. (ID -0419.1.)

A separate reason for concluding that New York City's crane laws are not preempted is that they are laws of general applicability. The *Gade* plurality stated that laws of general applicability, such as traffic or fire safety laws, that regulate the conduct of workers and nonworkers as members of the general public would not be preempted regardless of their substantial effect on worker safety. 505 U.S. at 107.

The New York City crane ordinances are not designed to protect workers as a class; they regulate crane operations only to the extent they pose a hazard to the public. The effect of the ordinances is to protect a group far larger than employees on a construction site. Cranes operate in some of the most densely populated areas of the city. (ID -0404.1; -0342.) This density makes it generally impossible to locate a crane or derrick so that it will not operate over or adjacent to crowded streets, sidewalks and occupied buildings. *Id.* For the same reason, mobile cranes, which can have booms hundreds of feet in length, must park on and operate from, the street. *Id.* On any given

day, more than 300 cranes, including 30 – 40 tower cranes, operate in New York City.[144] *Id.* A recent study concluded that a tower crane operating in NYC poses a risk to 12 to 15 surrounding buildings, several streets, and 1000-1500 people. *Id.* A crane accident on March 15, 2008 killed a woman in a brownstone one block away, destroyed eighteen buildings and damaged many more within a several-block radius, and forced hundreds of people from their homes. *Id.* Twelve members of the public were injured in crane accidents between 2006 and 2008. *Id.* Although compliance with the City's ordinances will unquestionably protect workers, such protection is incidental to protection of all persons in the vicinity regardless of their status as employees or non-employees.

The City's crane laws are analogous to fire and safety laws in that they comprehensively address a public hazard by imposing obligations on a wide variety of persons without regard to the existence of an employment relationship. Many of these duties are imposed on manufacturers, owners, engineers, designated representatives and others who need not be employers or employees. By contrast, this final rule, like the prior crane rule, applies only to construction work as defined in OSHA regulations, which relates to the performance of physical trade labor on site and does not generally include engineers, who are the subject of several of the City's ordinances.

Comparison of the City's crane ordinances to fire safety laws – a category of laws expressly recognized in *Gade* as being "generally applicable" - further bolsters the argument that the City's laws are not preempted. 505 U.S. at 107. Fire safety laws impose requirements that directly and substantially regulate workplace conduct to protect

[144] This means that tower cranes pose a risk to upwards of 60,000 people on any given day (40 X 1,500 = 60,000).

the public and property from fire. (ID -0419.1.) For example, both the International Fire Code, on which many local codes are based, and the New York City Fire Code, contain provisions applicable to specific workplaces, such as Aviation Facilities and Operations, and Semiconductor Fabrication Facilities, and specific work operations, such as Combustible Dust-Producing Operations and Welding and Other Hot Work. *Id.* The New York and International Fire Codes also contain requirements applicable during the construction of buildings, including requirements for daily disposal of waste and limitations on the use of portable oxygen containers and internal-combustion-powered equipment at the construction site. *Id.* Like the City's crane safety laws, these work-related fire safety laws include training, certification and recordkeeping requirements. *Id.* The fact that New York City's crane ordinances similarly regulate workplace conduct is therefore fully consistent with the City ordinances being laws of general applicability.

Although the interpretation outlined above was developed based on consideration of the specific provisions of New York City's crane ordinances, the preemption principles set forth are generally applicable. The agency does not believe that this final rule preempts any non-conflicting local or municipal building code designed to protect the public from the hazards of cranes.

E. State-Plan States

When Federal OSHA promulgates a new standard or more stringent amendment to an existing standard, the 27 States and U.S. Territories with their own OSHA-approved occupational safety and health plans ("State-Plan States") must amend their standards to

reflect the new standard or amendment, or show OSHA why such action is unnecessary, e.g., because an existing State standard covering this area is "at least as effective" as the new Federal standard or amendment. 29 CFR 1953.5(a). The State standard must be at least as effective as the final Federal rule, must be applicable to both the private and public (State and local government employees) sectors, and must be completed within six months of the promulgation date of the final Federal rule. When OSHA promulgates a new standard or amendment that does not impose additional or more stringent requirements than an existing standard, State-Plan States are not required to amend their standards, although the Agency may encourage them to do so. The 27 States and U.S. Territories with OSHA-approved occupational safety and health plans are: Alaska, Arizona, California, Hawaii, Indiana, Iowa, Kentucky, Maryland, Michigan, Minnesota, Nevada, New Mexico, North Carolina, Oregon, Puerto Rico, South Carolina, Tennessee, Utah, Vermont, Virginia, Washington, and Wyoming; Connecticut, Illinois, New Jersey, New York, and the Virgin Islands have OSHA-approved State Plans that apply to State and local government employees only.

This final rule results in more stringent requirements for the work it covers. Therefore, States and Territories with approved State Plans must adopt comparable amendments to their standards within six months of the promulgation date of this rule unless they demonstrate that such amendments are not necessary because their existing standards are at least as effective in protecting workers as this final rule.

F. Unfunded Mandates Reform Act

OSHA reviewed this final rule according to the Unfunded Mandates Reform Act of 1995 ("UMRA"; 2 U.S.C. 1501 et seq.) and Executive Order 12875 (58 FR 58093, Oct. 28, 1993). As discussed above in section V.B of this preamble ("Summary of the Final Economic Analysis, and Regulatory Flexibility Analysis"), the Agency estimates that compliance with this rule will require private-sector employers to expend about $154.1 million each year. However, while this rule establishes a federal mandate in the private sector, the Agency's standards do not apply to State, local, or tribal governments except in States that have elected voluntarily to adopt a State Plan approved by the Agency. Consequently, this final rule does not meet the definition of a "Federal intergovernmental mandate" (see sec. 421(5) of the UMRA (2 U.S.C. 658(5))). However, the rule imposes costs of over $100 million per year on the private sector, and is thus subject to the requirement under UMRA for review of private sector costs. That requirements is met in section V.B. of the preamble.

G. Applicability of Existing Consensus Standards

Some of the types of equipment subject to this final standard are addressed by current national consensus standards in the ASME B30 series, including: ASME B30.5-2004, "Mobile and Locomotive Cranes"; ASME B30.6–2003, "Derricks"; ASME B30.8-2004, "Floating Cranes and Floating Derricks"; ASME B30.3-2004, "Construction Tower Cranes"; ASME B30.14-2004, "Side Boom Tractors"; and ASME B30.2-2001, "Overhead and Gantry Cranes." In addition, ASME B30.7-2005, "Base-Mounted Drum Hoists," addresses a type of equipment that is often a component of derricks, and ASME

B30.23-2005, “Personnel Lifting Systems,” addresses issues that are covered by § 1926.1431, *Hoisting personnel*.

The Committee consulted these ASME standards (or the most current versions available at the time) and other resources in developing its proposal. In most instances, the ASME standards that the Committee consulted were entered into the docket, including: ASME B30.5-2000 (OSHA-S030-2006-0663-0334); ASME B30.5a-2002 Addenda (OSHA-S030-2006-0663-0335); ASME B30.6-2003 (OSHA-S030-2006-0663-0337); ASME B30.17-2003 (OSHA-S030-2006-0663-0338); ASME B30.3-1996 (OSHA-S030-2006-0663-0353); and ASME B30.23-1998 (OSHA-S030-2006-0663-0354). When newer versions of the ASME standards were issued after the Committee finished its work, OSHA examined the updated standards to determine if the provisions of the updated standards deviated in a significant way from provisions on which the Committee relied. OSHA entered the updated standards into the record of this rulemaking. For the most part, OSHA did not find significant deviations between the updated versions and the versions reviewed by the Committee. In the few instances in which deviations occurred, OSHA identified those deviations and asked for public comment on any issues raised.

As discussed in detail in the Summary and Explanation of the standard, a number of provisions in this final rule contain concepts that are similar to the concepts underlying the various ASME standards. However, the Committee determined that, in most instances, the wording of the provisions in these ASME standards needed revision to improve the enforceability, clarity, and ease of use.

For some issues, the ASME standards do not address issues covered by this final rule, or the Committee determined that a different approach was necessary. For example, in the provisions on inspections (§§ 1926.1412 and 1926.1413), the Committee concluded that shift, monthly, and annual inspection intervals are most appropriate, in contrast to the ASME approach, which uses "frequent" and "periodic" intervals. In the provisions addressing assembly/disassembly (§§ 1926.1403 through 1926.1406) and the encroachment-prevention provisions for power lines (§§ 1926.1407 through 1926.1411), the Committee adopted approaches with no comparable counterparts in the ASME standards.

In some instances, the Committee determined that it was appropriate to incorporate ASME standards by reference, in whole or in part. For example, in § 1926.1433 (*Design, construction and testing*), the rule incorporates by reference ANSI B30.5-1968, safety code for "Crawler, Locomotive, and Truck Cranes," PCSA Std. No. 2 (1968), for crawler, truck and locomotive cranes manufactured prior to the effective date of this final rule, and incorporates portions of ASME B30.5a-2004, "Mobile and Locomotive Cranes," for mobile cranes (including crawler and truck cranes) and locomotive cranes manufactured on or after the effective date of this final rule.

H. List of Subjects in 29 CFR Part 1926

Construction industry, Incorporation by reference, Occupational safety and health, Safety.

VI. AUTHORITY AND SIGNATURE

David Michaels, PhD, MPH, Assistant Secretary of Labor for Occupational Safety and Health, U.S. Department of Labor, 200 Constitution Ave., NW., Washington, DC 20210, directed the preparation of this notice. The Agency is issuing this final rule under the following authorities: Sections 4, 6(b), 8(c), and 8(g) of the Occupational Safety and Health Act of 1970 (29 U.S.C. 653, 655, 657); Section 3704 of the Contract Work Hours and Safety Standards Act (40 U.S.C. 3701 et seq.); Section 4 of the Administrative Procedure Act (5 U.S.C. 553); Secretary of Labor's Order No. 5-2007 (72 FR 31159, Jun. 5, 2007); and 29 CFR part 1911.

Signed at Washington, DC on July 16, 2010.

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David Michaels, PhD, MPH

Assistant Secretary of Labor for Occupational Safety and Health.

VII. AMENDMENTS TO STANDARDS

For the reasons stated in the preamble of this final rule, the Agency is amending 29 CFR part 1926 to read as follows:

PART 1926—[AMENDED]

Subpart A—General

1. The authority citation for subpart A of 29 CFR part 1926 is retained as follows:

Authority: Sec. 3704, Contract Work Hours and Safety Standards Act (40 U.S.C. 333); secs. 4, 6, and 8, Occupational Safety and Health Act of 1970 (29 U.S.C. 653, 655, 657); Secretary of Labor's Order No. 12–71 (36 FR 8754), 8–76 (41 FR 25059), 9–83 (48 FR 35736), 6–96 (62 FR 111), or 5–2007 (72 FR 31160) as applicable; and 29 CFR part 1911.

2. Section 1926.6 is added to read as follows:

§ 1926.6 Incorporation by reference.

(a) The standards of agencies of the U.S. Government, and organizations which are not agencies of the U.S. Government which are incorporated by reference in this part, have the same force and effect as other standards in this part. Only the mandatory provisions (i.e., provisions containing the word "shall" or other mandatory language) of standards incorporated by reference are adopted as standards under the Occupational Safety and Health Act. The locations where these standards may be examined are as follows:

(1) Offices of the Occupational Safety and Health Administration, U.S. Department of Labor, Frances Perkins Building, Washington, DC 20210.

(2) The Regional and Field Offices of the Occupational Safety and Health Administration, which are listed in the U.S. Government Manual.

(b) The materials listed in paragraphs (g) through (ff) of this section are incorporated by reference in the corresponding sections noted as they exist on the date of the approval, and a notice of any change in these materials will be published in the *Federal Register*.

These incorporations by reference were approved by the Director of the *Federal Register* in accordance with 5 U.S.C. 552(a) and 1 CFR part 51.

(c) Copies of standards listed in this section and issued by private standards organizations are available for purchase from the issuing organizations at the addresses or through the other contact information listed below for these private standards organizations. In addition, these standards are available for inspection at the National Archives and Records Administration (NARA). For information on the availability of these standards at NARA, telephone: 202–741–6030, or go to http://www.archives.gov/federal_register/code_of_federal_regulations/ibr_locations.html. Also, the standards are available for inspection at any Regional Office of the Occupational Safety and Health Administration (OSHA), or at the OSHA Docket Office, U.S. Department of Labor, 200 Constitution Avenue, NW., Room N–2625, Washington, DC 20210; telephone: 202–693–2350 (TTY number: 877–889–5627).

(d) [*Reserved*.]

(e) [*Reserved*.]

(f) [*Reserved*.]

(g) The following material is available for purchase from the American Conference of Governmental Industrial Hygienists (ACGIH), 1330 Kemper Meadow Drive, Cincinnati, OH 45240; telephone: 513-742-6163; fax: 513-742-3355; e-mail: mail@acgih.org; Web site: http://www.acgih.org:

(1) Threshold Limit Values of Airborne Contaminants for 1970, 1970, IBR approved for § 1926.55(a) and Appendix A of § 1926.55.

(h) The following material is available for purchase from the American National Standards Institute (ANSI), 25 West 43rd Street, Fourth Floor, New York, NY 10036; telephone: 212-642-4900; fax: 212-302-1286; e-mail: info@ansi.org; Web site: http://www.ansi.org/.

(1) ANSI A10.3-1970, Safety Requirements for Explosive-Actuated Fastening Tools, IBR approved for § 1926.302(e).

(2) ANSI A10.4-1963, Safety Requirements for Workmen's Hoists, IBR approved for § 1926.552(c).

(3) ANSI A10.5-1969, Safety Requirements for Material Hoists, IBR approved for § 1926.552(b).

(4) ANSI A11.1-1965 (R1970), Practice for Industrial Lighting, IBR approved for § 1926.56(b).

(5) ANSI A17.1-1965, Elevators, Dumbwaiters, Escalators, and Moving Walks, IBR approved for § 1926.552(d).

(6) ANSI A17.1a-1967, Elevators, Dumbwaiters, Escalators, and Moving Walks Supplement, IBR approved for § 1926.552(d).

(7) ANSI A17.1b-1968, Elevators, Dumbwaiters, Escalators, and Moving Walks Supplement, IBR approved for § 1926.552(d).

(8) ANSI A17.1c-1969, Elevators, Dumbwaiters, Escalators, and Moving Walks Supplement, IBR approved for § 1926.552(d).

(9) ANSI A17.1d-1970, Elevators, Dumbwaiters, Escalators, and Moving Walks Supplement, IBR approved for § 1926.552(d).

(10) ANSI A17.2-1960, Practice for the Inspection of Elevators (Inspector's Manual), IBR approved for § 1926.552(d).

(11) ANSI A17.2a-1965, Practice for the Inspection of Elevators (Inspector's Manual) Supplement, IBR approved for § 1926.552(d).

(12) ANSI A17.2b-1967, Practice for the Inspection of Elevators (Inspector's Manual) Supplement, IBR approved for § 1926.552(d).

(13) ANSI A92.2-1969, Vehicle Mounted Elevating and Rotating Work Platforms, IBR approved for §§ 1926.453(a) and 1926.453(b).

(14) ANSI B7.1-1970, Safety Code for the Use, Care, and Protection of Abrasive Wheels, IBR approved for §§ 1926.57(g), 1926.303(b), 1926.303(c), and 1926.303(d).

(15) ANSI B20.1-1957, Safety Code for Conveyors, Cableways, and Related Equipment, IBR approved for § 1926.555(a).

(16) ANSI B56.1-1969, Safety Standards for Powered Industrial Trucks, IBR approved for § 1926.602(c).

(17) ANSI J6.1-1950 (R1971), Rubber Insulating Line Hose, IBR approved for § 1926.951(a).

(18) ANSI J6.2-1950 (R1971), Rubber Insulating Hoods, IBR approved for § 1926.951(a).

(19) ANSI J6.4-1971, Rubber Insulating Blankets, IBR approved for § 1926.951(a).

(20) ANSI J6.5-1971, Rubber Insulating Sleeves, IBR approved for § 1926.951(a).

(21) ANSI J6.6-1971, Rubber Insulating Gloves, IBR approved for § 1926.951(a).

(22) ANSI J6.7-1935 (R1971), Rubber Matting for Use Around Electric Apparatus, IBR approved for § 1926.951(a).

(23) ANSI O1.1-1961, Safety Code for Woodworking Machinery, IBR approved for § 1926.304(f).

(24) ANSI Z35.1-1968, Specifications for Accident Prevention Signs, IBR approved for § 1926.200(i).

(25) ANSI Z35.2-1968, Specifications for Accident Prevention Tags, IBR approved for § 1926.200(i).

(26) ANSI Z49.1-1967, Safety in Welding and Cutting, IBR approved for § 1926.350(j).

(27) ANSI Z87.1-1968, Practice for Occupational and Educational Eye and Face Protection, IBR approved for § 1926.102(a).

(28) ANSI Z89.1-1969, Safety Requirements for Industrial Head Protection, IBR approved for § 1926.100(b).

(29) ANSI Z89.2-1971, Industrial Protective Helmets for Electrical Workers, Class B, IBR approved for §§ 1926.100(c) and 1926.951(a).

(i) [*Reserved*.]

(j) The following material is available for purchase from the American Society for Testing and Materials (ASTM), ASTM International, 100 Barr Harbor Drive, PO Box C700, West Conshohocken, PA, 19428-2959; telephone: 610–832–9585; fax: 610–832–9555; e-mail: service@astm.org; Web site: http://www.astm.org/:

(1) ASTM A370-1968, Methods and Definitions for Mechanical Testing and Steel Products, IBR approved for § 1926.1001(f).

(2) ASTM B117-1964, 50 Hour Test, IBR approved for § 1926.959(a).

(3) ASTM D56-1969, Standard Method of Test for Flash Point by the Tag Closed Tester, IBR approved for § 1926.155(i).

(4) ASTM D93-1969, Standard Method of Test for Flash Point by the Pensky Martens Closed Tester, IBR approved for § 1926.155(i).

(5) ASTM D323-1958 (R1968), Standard Method of Test for Vapor Pressure of Petroleum Products (Reid Method), IBR approved for § 1926.155(m).

(k) The following material is available for purchase from the American Society of Agricultural and Biological Engineers (ASABE), 2950 Niles Road, St. Joseph, MI 49085; telephone: 269.429.0300; fax: 269.429.3852; e-mail: hq@asabe.org; Web site: http://www.asabe.org/:

(1) ASAE R313.1-1971, Soil Cone Penetrometer, reaffirmed 1975, IBR approved for § 1926.1002(e).

(l) The following material is available for purchase from the American Society of Mechanical Engineers (ASME), Three Park Avenue, New York, NY 10016; telephone: 1-800-843-2763; fax: 973-882-1717; e-mail: infocentral@asme.org; Web site: http://www.asme.org/:

(1) ASME B30.2-2005, Overhead and Gantry Cranes (Top Running Bridge, Single or Multiple Girder, Top Running Trolley Hoist), issued Dec. 30, 2005 (“ASME B30.2-2005”), IBR approved for § 1926.1438(b).

(2) ASME B30.5-2004, Mobile and Locomotive Cranes, issued Sept. 27, 2004 ("ASME B30.5-2004"), IBR approved for §§ 1926.1414(b); 1926.1414(e); 1926.1433(b).

(3) ASME B30.7-2001, Base-Mounted Drum Hoists, issued Jan. 21, 2002 ("ASME B30.7-2001"), IBR approved for § 1926.1436(e).

(4) ASME B30.14-2004, Side Boom Tractors, issued Sept. 20, 2004 ("ASME B30.14-2004"), IBR approved for § 1926.1440(c).

(5) ASME Boiler and Pressure Vessel Code, Section VIII, 1968, IBR approved for §§ 1926.152(i), 1926.306(a), and 1926.603(a).

(6) ASME Power Boilers, Section I, 1968, IBR approved for § 1926.603(a).

(m) The following material is available for purchase from the American Welding Society (AWS), 550 N.W. LeJeune Road, Miami, Florida 33126; telephone: 1-800-443-9353; Web site: http://www.aws.org/:

(1) AWS D1.1/D1.1M:2002, Structural Welding Code – Steel, 18th ed., ANSI approved Aug. 31, 2001 ("AWS D1.1/D1.1M:2002"), IBR approved for § 1926.1436(c).

(2) ANSI/AWS D14.3-94, Specification for Welding Earthmoving and Construction Equipment, ANSI approved Jun. 11, 1993 ("ANSI/AWS D14.3-94"), IBR approved for § 1926.1436(c).

(n) The following material is available for purchase from the British Standards Institution (BSI), 389 Chiswick High Road, London, W4 4AL, United Kingdom; telephone: +44 20 8996 9001; fax: +44 20 8996 7001; e-mail: cservices@bsigroup.com; Web site: http://www.bsigroup.com/:

(1) BS EN 13000:2004, Cranes – Mobile Cranes, published Jan. 4, 2006 ("BS EN 13000:2004"), IBR approved for § 1926.1433(c).

(2) BS EN 14439:2006, Cranes – Safety – Tower Cranes, published Jan. 31, 2007 ("BS EN 14439:2006"), IBR approved for § 1926.1433(c).

(o) The following material is available for purchase from the Bureau of Reclamation, United States Department of the Interior, 1849 C Street NW, Washington DC 20240; telephone: 202-208-4501; Web site: http://www.usbr.gov/:

(1) Safety and Health Regulations for Construction, Part II, Sept. 1971, IBR approved for § 1926.1000(f).

(p) The following material is available for purchase from the California Department of Industrial Relations, 455 Golden Gate Avenue, San Francisco CA 94102; telephone: (415) 703-5070; e-mail: info@dir.ca.gov; Web site: http://www.dir.ca.gov/:

(1) Construction Safety Orders, IBR approved for § 1926.1000(f).

(q) [*Reserved*.]

(r) [*Reserved*.]

(s) [*Reserved*.]

(t) [*Reserved*.]

(u) The following material is available for purchase from the Federal Highway Administration, United Stated Department of Transportation, 1200 New Jersey Ave., SE, Washington, DC 20590; telephone: 202-366-4000; Web site: http://www.fhwa.dot.gov/:

(1) Manual on Uniform Traffic Control Devices, Millennium Edition, Dec. 2000, IBR approved for §§ 1926.200(g), 1926.201(a), and 1926.202.

(v) The following material is available for purchase from the General Services Administration (GSA), 1800 F Street, NW, Washington, DC 20405; telephone: (202) 501-0800; Web site: http://www.gsa.gov/:

(1) QQ-P-416, Federal Specification Plating Cadmium (Electrodeposited), IBR approved for § 1926.104(e).

(w) The following material is available for purchase from the Institute of Makers of Explosives (IME), 1120 19th Street NW, Suite 310, Washington, DC 20036; telephone: 202-429-9280; fax: 202-429-9280; e-mail: info@ime.org; Web site: http://www.ime.org/:

(1) IME Pub. No. 2, American Table of Distances for Storage of Explosives, Jun. 5, 1964, IBR approved for § 1926.914(a).

(2) IME Pub. No. 20, Radio Frequency Energy – A Potential Hazard in the Use of Electric Blasting Caps, Mar. 1968, IBR approved for § 1926.900(k).

(x) The following material is available for purchase from the International Organization for Standardization (ISO), 1, ch. de la Voie-Creuse, Case postale 56, CH-1211 Geneva 20, Switzerland; telephone: +41 22 749 01 11; fax: +41 22 733 34 30; Web site: http://www.iso.org/:

(1) ISO 11660-1:2008(E), Cranes – Access, guards and restraints – Part 1: General, 2d ed., Feb. 15, 2008 ("ISO 11660-1:2008(E)"), IBR approved for § 1926.1423(c).

(2) ISO 11660-2:1994(E), Cranes – Access, guards and restraints – Part 2: Mobile cranes, 1994 ("ISO 11660-2:1994(E)"), IBR approved for § 1926.1423(c).

(3) ISO 11660-3:2008(E), Cranes – Access, guards and restraints – Part 3: Tower cranes, 2d ed., Feb. 15, 2008 ("ISO 11660-3:2008(E)"), IBR approved for § 1926.1423(c).

(y) The following material is available for purchase from the National Fire Protection Association (NFPA), 1 Batterymarch Park, Quincy, MA 02169; telephone: 617-770-3000; fax: 617-770-0700; Web site: http://www.nfpa.org/:

(1) NFPA 10A-1970, Maintenance and Use of Portable Fire Extinguishers, IBR approved for § 1926.150(c).

(2) NFPA 13-1969, Standard for the Installation of Sprinkler Systems, IBR approved for § 1926.152(d).

(3) NFPA 30-1969, The Flammable and Combustible Liquids Code, IBR approved for § 1926.152(c).

(4) NFPA 80-1970, Standard for Fire Doors and Windows, Class E or F Openings, IBR approved for § 1926.152(b).

(5) NFPA 251-1969, Standard Methods of Fire Test of Building Construction and Material, IBR approved for §§ 1926.152(b) and 1926.155(f).

(6) NFPA 385-1966, Standard for Tank Vehicles for Flammable and Combustible Liquids, IBR approved for § 1926.152(g).

(z) [*Reserved*.]

(aa) The following material is available for purchase from the Power Crane and Shovel Association (PCSA), 6737 W. Washington Street, Suite 2400, Milwaukee, WI 53214; telephone: 1-800-369-2310; fax: 414-272-1170; Web site: http://www.aem.org/CBC/ProdSpec/PCSA/:

(1) PCSA Std. No. 1, Mobile Crane and Excavator Standards, 1968, IBR approved for § 1926.602(b).

(2) PCSA Std. No. 2, Mobile Hydraulic Crane Standards, 1968 ("PCSA Std. No. 2 (1968)"), IBR approved for §§ 1926.602(b), 1926.1433(a), and 1926.1501(a).

(3) PCSA Std. No. 3, Mobile Hydraulic Excavator Standards, 1969, IBR approved for § 1926.602(b).

(bb) [*Reserved*.]

(cc) [*Reserved*.]

(dd) The following material is available for purchase from the Society of Automotive Engineers (SAE), 400 Commonwealth Drive, Warrendale, PA 15096; telephone: 1-877-606-7323; fax: 724-776-0790; Web site: http://www.sae.org/:

(1) SAE 1970 Handbook, IBR approved for § 1926.602(b).

(2) SAE 1971 Handbook, IBR approved for § 1926.1001(h).

(3) SAE J166-1971, Trucks and Wagons, IBR approved for § 1926.602(a).

(4) SAE J168-1970, Protective Enclosures – Test Procedures and Performance Requirements, IBR approved for § 1926.1002(a).

(5) SAE J185 (reaf. May 2003), Access Systems for Off-Road Machines, reaffirmed May 2003 ("SAE J185 (May 1993)"), IBR approved for § 1926.1423(c).

(6) SAE J236-1971, Self-Propelled Graders, IBR approved for § 1926.602(a).

(7) SAE J237-1971, Front End Loaders and Dozers, IBR approved for § 126.602(a).

(8) SAE J319b-1971, Self-Propelled Scrapers, IBR approved for § 1926.602(a).

(9) SAE J320a-1971, Minimum Performance Criteria for Roll-Over Protective Structure for Rubber-Tired, Self-Propelled Scrapers, IBR approved for § 1926.1001(h).

(10) SAE J321a-1970, Fenders for Pneumatic-Tired Earthmoving Haulage Equipment, IBR approved for § 1926.602(a).

(11) SAE J333a-1970, Operator Protection for Agricultural and Light Industrial Tractors, IBR approved for § 1926.602(a).

(11) SAE J386-1969, Seat Belts for Construction Equipment, IBR approved for § 1926.602(a).

(12) SAE J394-1971, Minimum Performance Criteria for Roll-Over Protective Structure for Rubber-Tired Front End Loaders and Robber-Tired Dozers, IBR approved for § 1926.1001(h).

(13) SAE J395-1971, Minimum Performance Criteria for Roll-Over Protective Structure for Crawler Tractors and Crawler-Type Loaders, IBR approved for § 1926.1001(h).

(14) SAE J396-1971, Minimum Performance Criteria for Roll-Over Protective Structure for Motor Graders, IBR approved for § 1926.1001(h).

(15) SAE J397-1969, Critical Zone Characteristics and Dimensions for Operators of Construction and Industrial Machinery, IBR approved for § 1926.1001(f).

(16) SAE J743a-1964, Tractor Mounted Side Boom, 1964 (“SAE J743a-1964”), IBR approved for § 1926.1501(a).

(17) SAE J959-1966, Lifting Crane Wire-Rope Strength Factors, 1966 (“SAE J959-1966”), IBR approved for § 1926.1501(a).

(18) SAE J987 (rev. Jun. 2003), Lattice Boom Cranes – Method of Test, revised Jun. 2003 ("SAE J987 (Jun. 2003)"), IBR approved for § 1926.1433(c).

(19) SAE J1063 (rev. Nov. 1993), Cantilevered Boom Crane Structures – Method of Test, revised Nov. 1993 ("SAE J1063 (Nov. 1993)"), IBR approved for § 1926.1433(c).

(ee) The following material is available for purchase from the United States Army Corps of Engineers, 441 G Street, NW, Washington, DC 20314; telephone: 202-761-0011; e-mail: hq-publicaffairs@usace.army.mil; Web site: http://www.usace.army.mil/:

(1) EM-385-1-1, General Safety Requirements, Mar. 1967, IBR approved for § 1926.1000(f).

(ff) The following material is available for purchase from standards resellers such as the Document Center Inc., 111 Industrial Road, Suite 9, Belmont, CA 94002; telephone: 650-591-7600; fax: 650-591-7617; e-mail: info@document-center.com; Web site: http://www.document-center.com/:

(1) ANSI B15.1-1953 (R1958), Safety Code for Mechanical Power-Transmission Apparatus, revised 1958, IBR approved for §§ 1926.300(b)(2) and 1926.1501(a).

(2) ANSI B30.2.0-1967, Safety Code for Overhead and Gantry Cranes, approved May 4, 1967, IBR approved for § 1926.1501(d).

(3) ANSI B30.5-1968, Crawler, Locomotive, and Truck Cranes, approved Dec. 16, 1968, IBR approved for §§ 1926.1433(a), 1926.1501(a), and 1926.1501(b).

(4) ANSI B30.6-1969, Safety Code for Derricks, approved Dec. 18, 1967, IBR approved for § 1926.1501(e).

Subpart C—General Safety and Health Provisions

3. The authority citation for subpart C of 29 CFR part 1926 is retained as follows:

Authority: Sec. 3704, Contract Work Hours and Safety Standards Act (40 U.S.C. 333); secs. 4, 6, and 8, Occupational Safety and Health Act of 1970 (29 U.S.C. 653, 655, 657); Secretary of Labor's Order No. 12–71 (36 FR 8754), 8–76 (41 FR 25059), 9–83 (48 FR 35736), 6–96 (62 FR 111), or 5–2007 (72 FR 31160) as applicable; and 29 CFR part 1911.

§ 1926.31 [*Reserved.*]

4. Section 1926.31 is removed and reserved.

Subpart L—Scaffolds

5. The authority citation for subpart L of 29 CFR part 1926 is revised to read as follows:

Authority: Section 107, Contract Work Hours and Safety Standards Act (Construction Safety Act)(40 U.S.C. 333); Secs. 4, 6, 8, Occupational Safety and Health Act of 1970 (29 U.S.C. 653, 655, 657); Secretary of Labor's Order Nos. 1-90 (55 FR 9033) and 5-2007 (72 FR 31159); and 29 CFR part 1911.

6. Section 1926.450 is amended by revising paragraph (a) to read as follows:

§ 1926.450 Scope, application, and definitions applicable to this subpart.

(a) *Scope and application*. This subpart applies to all scaffolds used in workplaces covered by this part. It does not apply to crane or derrick suspended personnel platforms. The criteria for aerial lifts are set out exclusively in § 1926.453.

* * * * *

Subpart M—Fall Protection

7. The authority citation for subpart M of 29 CFR part 1926 is revised to read as follows:

Authority: Section 3704 of the Contract Work Hours and Safety Standards Act (Construction Safety Act) (40 U.S.C. 3701); Sections 4, 6 and 8 of the Occupational Safety and Health Act of 1970 (29 U.S.C. 653, 655, 657); Secretary of Labor's Order Nos. 1-90 (55 FR 9033), 6-96 (62 FR 111), 3-2000 (65 FR 50017), and 5-2007 (72 FR 31159); and 29 CFR part 1911.

8. Section 1926.500 is amended by revising paragraph (a)(2)(ii), adding paragraph (a)(3)(v), and revising paragraph (a)(4), to read as follows:

§ 1926.500 Scope, application, and definitions applicable to this subpart.

(a) * * *

(2) * * *

(ii) Requirements relating to fall protection for employees working on cranes and derricks are provided in subpart CC of this part.

* * * * *

(3) * * *

(v) Criteria for steps, handholds, ladders, and grabrails/guardrails/railings required by subpart CC are provided in subpart CC. Sections 1926.502(a), (c) through (e), and (i) apply to activities covered under subpart CC unless otherwise stated in subpart CC. No other paragraphs of § 1926.502 apply to subpart CC.

* * * * *

(4) Section 1926.503 sets forth requirements for training in the installation and use of fall protection systems, except in relation to steel erection activities and the use of equipment covered by subpart CC.

Subpart DD—Cranes and Derricks Used in Demolition and Underground Construction

9. New subpart DD, consisting of § 1926.1500 is added to read as follows:

Subpart DD—Cranes and Derricks Used in Demolition and Underground Construction

Authority: Section 3704 of the Contract Work Hours and Safety Standards Act (40 U.S.C. 3701); Sections 4, 6, and 8 of the Occupational Safety and Health Act of 1970 (29 U.S.C. 653, 655, 657); Secretary of Labor's Order Nos. 12-71 (36 FR 8754), 8-76 (41 FR 25059), or 9-83 (49 FR 35736), and 5-2007 (72 FR 31159).

§ 1926.1500 Scope.

This subpart applies only to employers engaged in demolition work covered by § 1926.856 and § 1926.858, and underground construction work covered by § 1926.800. This subpart applies in lieu of § 1926 subpart CC.

Subpart N—Cranes, Derricks, Hoists, Elevators, and Conveyors

10. The authority citation for subpart N of 29 CFR part 1926 is revised to read as follows:

Authority: Section 3704 of the Contract Work Hours and Safety Standards Act (40 U.S.C. 3701); Sections 4, 6, and 8 of the Occupational Safety and Health Act of 1970 (29 U.S.C. 653, 655, 657); Secretary of Labor's Order Nos. 12-71 (36 FR 8754), 8-76 (41 FR 25059), or 9-83 (49 FR 35736), and 5-2007 (72 FR 31159).

11. The heading to subpart N of 29 CFR part 1926 is revised to read as follows:

Subpart N—Helicopters, Hoists, Elevators, and Conveyors

* * * * *

§ 1926.550 [Redesignated as § 1926.1501**]**

12. Section 1926.550 is redesignated as § 1926.1501 in subpart DD.

§ 1926.550 [*Reserved*]

13. Section 1926.550 is reserved.

14. Section 1926.553 is amended by adding paragraph (c) to read as follows:

§ 1926.553 Base-mounted drum hoists.

* * * * *

(c) This section does not apply to base-mounted drum hoists used in conjunction with derricks. Base-mounted drum hoists used in conjunction with derricks must conform to § 1926.1436(e).

Subpart O—Motorized Vehicles, Mechanical Equipment, and Marine Operations

15. The authority citation for subpart O of 29 CFR part 1926 is revised to read as follows:

Authority: Section 107, Construction Work Hours and Safety Standards Act (Construction Safety Act) (40 U.S.C. 333); Secs. 4, 6, 8, Occupational Safety and Health Act of 1970 (29 U.S.C. 653, 655, 657); Secretary of Labor's Order No. 12-71 (36 FR

8754), 8-76 (41 FR 25059), 9-83 (48 FR 35736), 1-90 (55 FR 9033), 6-96 (62 FR 111), or 5-2007 (72 FR 31159), as applicable. Section 1926.602 also issued under 29 CFR part 1911.

16. Section 1926.600 is amended by revising paragraph (a)(6) to read as follows:

§ 1926.600 Equipment

(a) *General Requirements*. * * *

(6) All equipment covered by this subpart shall comply with the following requirements when working or being moved in the vicinity of power lines or energized transmitters, except where electrical distribution and transmission lines have been deenergized and visibly grounded at point of work or where insulating barriers, not a part of or an attachment to the equipment or machinery, have been erected to prevent physical contact with the lines:

(i) For lines rated 50 kV or below, minimum clearance between the lines and any part of the crane or load shall be 10 feet;

(ii) For lines rated over 50 kV, minimum clearance between the lines and any part of the crane or load shall be 10 feet plus 0.4 inch for each 1 kV over 50 kV, or twice the length of the line insulator, but never less than 10 feet;

(iii) In transit with no load and boom lowered, the equipment clearance shall be a minimum of 4 feet for voltages less than 50 kV, and 10 feet for voltages over 50 kV, up to and including 345 kV, and 16 feet for voltages up to and including 750 kV;

(iv) A person shall be designated to observe clearance of the equipment and give timely warning for all operations where it is difficult for the operator to maintain the desired clearance by visual means;

(v) Cage-type boom guards, insulating links, or proximity warning devices may be used on cranes, but the use of such devices shall not alter the requirements of any other regulation of this part even if such device is required by law or regulation;

(vi) Any overhead wire shall be considered to be an energized line unless and until the person owning such line or the electrical utility authorities indicate that it is not an energized line and it has been visibly grounded;

(vii) Prior to work near transmitter towers where an electrical charge can be induced in the equipment or materials being handled, the transmitter shall be de-energized or tests shall be made to determine if electrical charge is induced on the crane. The following precautions shall be taken when necessary to dissipate induced voltages:

(A) The equipment shall be provided with an electrical ground directly to the upper rotating structure supporting the boom; and

(B) Ground jumper cables shall be attached to materials being handled by boom equipment when electrical charge is induced while working near energized transmitters. Crews shall be provided with nonconductive poles having large alligator clips or other similar protection to attach the ground cable to the load.

(C) Combustible and flammable materials shall be removed from the immediate area prior to operations.

Subpart R—Steel Erection

17. The authority citation for subpart R of 29 CFR part 1926 is revised to read as follows:

Authority: Section 3704 of the Contract Work Hours and Safety Standards Act (40 U.S.C. 3701); Sections 4, 6, and 8 of the Occupational Safety and Health Act of 1970 (29 U.S.C. 653, 655, 657); Secretary of Labor's Order Nos. 3-2000 (65 FR 50017), 5-2002 (67 FR 65008), and 5-2007 (72 FR 31159); and 29 CFR part 1911.

18. Section 1926.753 is amended by revising paragraphs (a) and (c)(4) to read as follows:

§ 1926.753 Hoisting and rigging.

(a) All the provisions of subpart CC apply to hoisting and rigging with the exception of § 1926.1431(a).

* * * * *

(c) * * *

(4) Cranes or derricks may be used to hoist employees on a personnel platform when work under this subpart is being conducted, provided that all provisions of § 1926.1431 (except for § 1926.1431(a)) are met.

* * * * *

Subpart S—Underground Construction, Caissons, Cofferdams, and Compressed Air

19. The authority citation for subpart S of 29 CFR part 1926 is revised to read as follows:

Authority: Sec. 107, Contract Work Hours and Safety Standards Act (40 U.S.C. 333); secs. 4, 6, and 8 of the Occupational Safety and Health Act of 1970 (29 U.S.C. 653, 655, 657); Secretary of Labor's Orders 12-71 (36 FR 8754), 8-76 (41 FR 25059), 9-83 (48 FR 35736), 1-90 (55 FR 9033), 6-96 (62 FR 111), or 5-2007 (72 FR 31159) as applicable.

20. Section 1926.800 is amended by revising paragraph (t) to read as follows:

§ 1926.800 Underground construction.

* * * * *

(t) *Hoisting unique to underground construction*. Employers must comply with § 1926.1501(g) of § 1926 subpart DD. Except as modified by this paragraph (t), the following provisions of subpart N of this part apply: Requirements for material hoists are found in §§ 1926.552(a) and (b) of this part. Requirements for personnel hoists are found in the personnel hoists requirements of §§ 1926.552(a) and (c) of this part and in the elevator requirement of §§ 1926.552(a) and (d) of this part.

* * * * *

Subpart T—Demolition

21. The authority citation for subpart S of 29 CFR part 1926 is revised to read as follows:

Authority: Sec. 107, Contract Work Hours and Safety Standards Act (40 U.S.C. 333); secs. 4, 6, and 8 of the Occupational Safety and Health Act of 1970 (29 U.S.C. 653, 655, 657); Secretary of Labor's Orders 12-71 (36 FR 8754), 8-76 (41 FR 25059), 9-83 (48 FR 35736), 1-90 (55 FR 9033), 6-96 (62 FR 111), or 5-2007 (72 FR 31159) as applicable.

22. Section 1926.856 is amended by revising paragraph (c) to read as follows:

§ 1926.856 Removal of walls, floors, and material with equipment.

* * * * *

(c) Mechanical equipment used shall meet the requirements specified in subparts N and O and § 1926.1501 of § 1926 subpart DD.

23. Section 1926.858 is amended by revising paragraph (b) to read as follows:

§ 1926.858 Removal of walls, floors, and material with equipment.

* * * * *

(b) Cranes, derricks, and other hoisting equipment used shall meet the requirements specified in § 1926.1501 of § 1926 subpart DD.

Subpart V—Power Transmission and Distribution

24. The authority citation for subpart V of part 1926 is revised to read as follows:

Authority: Section 3704 of the Contract Work Hours and Safety Standards Act (40 U.S.C. 3701); Secs. 4, 6, and 8 of the Occupational Safety and Health Act of 1970 (29 U.S.C. 653, 655, 657); Secretary of Labor's Order Nos. 12-71 (36 FR 8754); 8-76 (41 FR 25059); 9-83 (48 FR 35736, 1-90 (55 FR 9033), and 5-2007 (72 FR 31159). Section 1926.951 also issued under 29 CFR part 1911.

25. Section 1926.952 is amended by revising paragraph (c) to read as follows:

§ 1926.952 Mechanical equipment.

* * * * *

(c) *Cranes and other lifting equipment.*

(1) All equipment shall comply with subparts CC and O of this part, as applicable.

(2) Digger derricks used for augering holes for poles carrying electric lines, placing and removing poles, or for handling associated materials to be installed or removed from the poles must comply with 29 CFR 1910.269.

(3) With the exception of equipment certified for work on the proper voltage, mechanical equipment shall not be operated closer to any energized line or equipment than the clearances set forth in § 1926.950(c) unless, in addition to the requirements in § 1926.1410:

(i) The mechanical equipment is insulated, or

(ii) The mechanical equipment is considered as energized.

Note to paragraph (c)(3): In accordance with 29 CFR 1926.1400(g), compliance with 29 CFR 1910.269(p) will be deemed compliance with §§ 1926.1407 through 1926.1411, including § 1926.1410.

Subpart X—Stairways and Ladders

26. The authority citation for subpart X of 29 CFR part 1926 is amended by revising paragraph (a) to read as follows:

Authority: Section 107, Contract Work Hours and Safety Standards Act (Construction Safety Act](40 U.S.C. 333); Secs. 4, 6, 8, Occupational Safety and Health Act of 1970 (29 U.S.C. 653, 655, 657); Secretary of Labor's Order Nos. 1-90 (55 FR 9033), 5-2007 (72 FR 31159); and 29 CFR part 1911.

27. Section 1926.1050 is amended by revising paragraph (a) to read as follows:

§ 1926.1050 Scope, application, and definitions applicable to this subpart.

(a) *Scope and application.* This subpart applies to all stairways and ladders used in construction, alteration, repair (including painting and decorating), and demolition workplaces covered under 29 CFR part 1926, and also sets forth, in specified circumstances, when ladders and stairways are required to be provided. Additional requirements for ladders used on or with scaffolds are contained in subpart L – Scaffolds. This subpart does not apply to integral components of equipment covered by subpart CC. Subpart CC exclusively sets forth the circumstances when ladders and stairways must be provided on equipment covered by subpart CC.

* * * * *

Appendix A to Part 1926—Designations for General Industry Standards Incorporated into Body of Construction Standards

28. Appendix A to Part 1926 is amended by removing the row containing "1926.550(a)(19)" and "1910.184(c)(9)" from the table "1926 DESIGNATIONS FOR APPLICABLE 1910 STANDARDS."

Subpart CC—Cranes and Derricks in Construction

29. Subparts AA and BB are reserved and subpart CC is added to read as follows:

Subpart CC—Cranes and Derricks in Construction

1926.1400 Scope.

1926.1401	Definitions.
1926.1402	Ground conditions.
1926.1403	Assembly/Disassembly – selection of manufacturer or employer procedures.
1926.1404	Assembly/Disassembly – general requirements (applies to all assembly and disassembly operations).
1926.1405	Disassembly – additional requirements for dismantling of booms and jibs (applies to both the use of manufacturer procedures and employer procedures).
1926.1406	Assembly/Disassembly – employer procedures – general requirements.
1926.1407	Power line safety (up to 350 kV) – assembly and disassembly.
1926.1408	Power line safety (up to 350 kV) – equipment operations.
1926.1409	Power line safety (over 350 kV).
1926.1410	Power line safety (all voltages) – equipment operations closer than the Table A zone.
1926.1411	Power line safety – while traveling.
1926.1412	Inspections.
1926.1413	Wire rope – inspection.
1926.1414	Wire rope – selection and installation criteria.
1926.1415	Safety devices.
1926.1416	Operational aids.
1926.1417	Operation.
1926.1418	Authority to stop operation.
1926.1419	Signals – general requirements.
1926.1420	Signals – radio, telephone or other electronic transmission of signals.
1926.1421	Signals – voice signals – additional requirements.
1926.1422	Signals – hand signal chart.
1926.1423	Fall protection.
1926.1424	Work area control.
1926.1425	Keeping clear of the load.
1926.1426	Free fall and controlled load lowering.
1926.1427	Operator qualification and certification.
1926.1428	Signal person qualifications.
1926.1429	Qualifications of maintenance & repair employees.
1926.1430	Training.
1926.1431	Hoisting personnel.
1926.1432	Multiple-crane/derrick lifts -- supplemental requirements.
1926.1433	Design, construction and testing.
1926.1434	Equipment modifications.
1926.1435	Tower cranes.
1926.1436	Derricks.
1926.1437	Floating cranes/derricks and land cranes/derricks on barges.
1926.1438	Overhead & gantry cranes.
1926.1439	Dedicated pile drivers.
1926.1440	Sideboom cranes.
1926.1441	Equipment with a rated hoisting/lifting capacity of 2,000 pounds or less.

1926.1442 Severability.

Appendix A to Subpart CC of part 1926--Standard Hand Signals
Appendix B to Subpart CC of part 1926--Assembly/Disassembly- Sample Procedures for Minimizing the Risk of Unintended Dangerous Boom Movement
Appendix C to Subpart CC of part 1926--Operator Certification- Written Examination- Technical Knowledge Criteria

Subpart CC—Cranes and Derricks in Construction

Authority: Section 3704 of the Contract Work Hours and Safety Standards Act (40 U.S.C. 3701); sections 4, 6, and 8 of the Occupational Safety and Health Act of 1970 (29 U.S.C. 653, 655, 657); Secretary of Labor's Order No. 5-2007 (72 FR 31159); and 29 CFR part 1911.

§ 1926.1400 Scope.

(a) This standard applies to power-operated equipment, when used in construction, that can hoist, lower and horizontally move a suspended load. Such equipment includes, but is not limited to: articulating cranes (such as knuckle-boom cranes); crawler cranes; floating cranes; cranes on barges; locomotive cranes; mobile cranes (such as wheel-mounted, rough-terrain, all-terrain, commercial truck-mounted, and boom truck cranes); multi-purpose machines when configured to hoist and lower (by means of a winch or hook) and horizontally move a suspended load; industrial cranes (such as carry-deck cranes); dedicated pile drivers; service/ mechanic trucks with a hoisting device; a crane on a monorail; tower cranes (such as a fixed jib, i.e., “hammerhead boom”), luffing boom

and self-erecting); pedestal cranes; portal cranes; overhead and gantry cranes; straddle cranes; sideboom cranes; derricks; and variations of such equipment. However, items listed in paragraph (c) of this section are excluded from the scope of this standard.

(b) *Attachments*. This standard applies to equipment included in paragraph (a) of this section when used with attachments. Such attachments, whether crane-attached or suspended include, but are not limited to: hooks, magnets, grapples, clamshell buckets, orange peel buckets, concrete buckets, drag lines, personnel platforms, augers or drills and pile driving equipment.

(c) *Exclusions*. This subpart does not cover:

(1) Machinery included in paragraph (a) of this section while it has been converted or adapted for a non-hoisting/lifting use. Such conversions/adaptations include, but are not limited to, power shovels, excavators and concrete pumps.

(2) Power shovels, excavators, wheel loaders, backhoes, loader backhoes, track loaders. This machinery is also excluded when used with chains, slings or other rigging to lift suspended loads.

(3) Automotive wreckers and tow trucks when used to clear wrecks and haul vehicles.

(4) Digger derricks when used for augering holes for poles carrying electric and telecommunication lines, placing and removing the poles, and for handling associated materials to be installed on or removed from the poles. Digger derricks used in work subject to 29 CFR part 1926, subpart V, must comply with 29 CFR 1910.269. Digger derricks used in construction work for telecommunication

service (as defined at 29 CFR 1910.268(s)(40)) must comply with 29 CFR 1910.268.

(5) Machinery originally designed as vehicle-mounted aerial devices (for lifting personnel) and self-propelled elevating work platforms.

(6) Telescopic/hydraulic gantry systems.

(7) Stacker cranes.

(8) Powered industrial trucks (forklifts), except when configured to hoist and lower (by means of a winch or hook) and horizontally move a suspended load.

(9) Mechanic's truck with a hoisting device when used in activities related to equipment maintenance and repair.

(10) Machinery that hoists by using a come-a-long or chainfall.

(11) Dedicated drilling rigs.

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

(13) Tree trimming and tree removal work.

(14) Anchor handling or dredge-related operations with a vessel or barge using an affixed A-frame.

(15) Roustabouts.

(16) Helicopter cranes.

(17) *Material Delivery*

(i) 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.

(ii) Articulating/knuckle-boom truck cranes that deliver material to a construction site when the crane is 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.

(iii) This exclusion does not apply when:

(A) The articulating/knuckle-boom 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;

(B) The material being handled by the articulating/knuckle-boom crane is a prefabricated component. Such prefabricated components include, but are not limited to: precast concrete members or panels, roof trusses (wooden, cold-formed metal, steel, or other material), prefabricated building sections such as, but not limited to: floor panels, wall panels, roof panels, roof structures, or similar items;

(C) The material being handled by the crane is a structural steel member (for example, steel joists, beams, columns, steel decking (bundled or unbundled) or a component of a systems-engineered metal building (as defined in 29 CFR 1926 subpart R).

(D) The activity is not specifically excluded under §1400(c)(17)(i) and (ii).

(d) All sections of this subpart CC apply to the equipment covered by this standard unless specified otherwise.

(e) The duties of controlling entities under this subpart include, but are not limited to, the duties specified in § 1926.1402(c), § 1926.1402(e) and § 1926.1424(b).

(f) Where provisions of this standard direct an operator, crewmember, or other employee to take certain actions, the employer must establish, effectively communicate to the relevant persons, and enforce, work rules to ensure compliance with such provisions.

(g) For work covered by subpart V of this part, compliance with 29 CFR § 1910.269(p) is deemed compliance with §§ 1926.1407 through 1926.1411.

(h) Section 1926.1402 does not apply to cranes designed for use on railroad tracks, when used on railroad tracks that are part of the general railroad system of transportation that is regulated pursuant to the Federal Railroad Administration under 49 CFR part 213, and that comply with applicable Federal Railroad Administration requirements. See § 1926.1402(f).

§ 1926.1401 Definitions.

A/D director (Assembly/Disassembly director) means an individual who meets this subpart's requirements for an A/D director, irrespective of the person's formal job title or whether the person is non-management or management personnel.

Articulating crane means a crane whose boom consists of a series of folding, pin connected structural members, typically manipulated to extend or retract by power from hydraulic cylinders.

Assembly/Disassembly means the assembly and/or disassembly of equipment covered under this standard. With regard to tower cranes, "erecting and climbing" replaces the term "assembly," and "dismantling" replaces the term "disassembly." Regardless of whether the crane is initially erected to its full height or is climbed in stages, the process of increasing the height of the crane is an erection process.

Assist crane means a crane used to assist in assembling or disassembling a crane.

Attachments means any device that expands the range of tasks that can be done by the equipment. Examples include, but are not limited to: an auger, drill, magnet, pile-driver, and boom-attached personnel platform.

Audible signal means a signal made by a distinct sound or series of sounds. Examples include, but are not limited to, sounds made by a bell, horn, or whistle.

Blocking (also referred to as "cribbing") is wood or other material used to support equipment or a component and distribute loads to the ground. It is typically used to support lattice boom sections during assembly/ disassembly and under outrigger and stabilizer floats.

Boatswain's chair means a single-point adjustable suspension scaffold consisting of a seat or sling (which may be incorporated into a full body harness) designed to support one employee in a sitting position.

Bogie means "travel bogie," which is defined below.

Boom (equipment other than tower crane) means an inclined spar, strut, or other long structural member which supports the upper hoisting tackle on a crane or derrick. Typically, the length and vertical angle of the boom can be varied to achieve increased height or height and reach when lifting loads. Booms can usually be grouped into general

categories of hydraulically extendible, cantilevered type, latticed section, cable supported type or articulating type.

Boom (tower cranes): On tower cranes, if the "boom" (i.e., principal horizontal structure) is fixed, it is referred to as a jib; if it is moveable up and down, it is referred to as a boom.

Boom angle indicator means a device which measures the angle of the boom relative to horizontal.

Boom hoist limiting device includes boom hoist disengaging device, boom hoist shut-off, boom hoist disconnect, boom hoist hydraulic relief, boom hoist kick-outs, automatic boom stop device, or derricking limiter. This type of device disengages boom hoist power when the boom reaches a predetermined operating angle. It also sets brakes or closes valves to prevent the boom from lowering after power is disengaged.

Boom length indicator indicates the length of the permanent part of the boom (such as ruled markings on the boom) or, as in some computerized systems, the length of the boom with extensions/attachments.

Boom stop includes boom stops, (belly straps with struts/standoff), telescoping boom stops, attachment boom stops, and backstops. These devices restrict the boom from moving above a certain maximum angle and toppling over backward.

Boom suspension system means a system of pendants, running ropes, sheaves, and other hardware which supports the boom tip and controls the boom angle.

Builder means the builder/constructor of equipment.

Center of gravity: The center of gravity of any object is the point in the object around which its weight is evenly distributed. If you could put a support under that point, you could balance the object on the support.

Certified welder means a welder who meets nationally recognized certification requirements applicable to the task being performed.

Climbing means the process in which a tower crane is raised to a new working height, either by adding additional tower sections to the top of the crane (top climbing), or by a system in which the entire crane is raised inside the structure (inside climbing).

Come-a-long means a mechanical device typically consisting of a chain or cable attached at each end that is used to facilitate movement of materials through leverage.

Competent person means one who is capable of identifying existing and predictable hazards in the surroundings or working conditions which are unsanitary, hazardous, or dangerous to employees, and who has authorization to take prompt corrective measures to eliminate them.

Controlled load lowering means lowering a load by means of a mechanical hoist drum device that allows a hoisted load to be lowered with maximum control using the gear train or hydraulic components of the hoist mechanism. Controlled load lowering requires the use of the hoist drive motor, rather than the load hoist brake, to lower the load.

Controlling entity means an employer that is a prime contractor, general contractor, construction manager or any other legal entity which has the overall responsibility for the construction of the project – its planning, quality and completion.

Counterweight means a weight used to supplement the weight of equipment in providing stability for lifting loads by counterbalancing those loads.

Crane/derrick includes all equipment covered by this subpart.

Crawler crane means equipment that has a type of base mounting which incorporates a continuous belt of sprocket driven track.

Crossover points means locations on a wire rope which is spooled on a drum where one layer of rope climbs up on and crosses over the previous layer. This takes place at each flange of the drum as the rope is spooled onto the drum, reaches the flange, and begins to wrap back in the opposite direction.

Dedicated channel means a line of communication assigned by the employer who controls the communication system to only one signal person and crane/derrick or to a coordinated group of cranes/derricks/signal person(s).

Dedicated pile-driver is a machine that is designed to function exclusively as a pile-driver. These machines typically have the ability to both hoist the material that will be pile-driven and to pile-drive that material.

Dedicated spotter (power lines): To be considered a dedicated spotter, the requirements of § 1926.1428 (Signal person qualifications) must be met and his/her sole responsibility is to watch the separation between the power line and: the equipment, load line and load (including rigging and lifting accessories), and ensure through communication with the operator that the applicable minimum approach distance is not breached.

Directly under the load means a part or all of an employee is directly beneath the load.

Dismantling includes partial dismantling (such as dismantling to shorten a boom or substitute a different component).

Drum rotation indicator means a device on a crane or hoist which indicates in which direction and at what relative speed a particular hoist drum is turning.

Electrical contact occurs when a person, object, or equipment makes contact or comes in close proximity with an energized conductor or equipment that allows the passage of current.

Employer-made equipment means floating cranes/derricks designed and built by an employer for the employer's own use.

Encroachment is where any part of the crane, load line or load (including rigging and lifting accessories) breaches a minimum clearance distance that this subpart requires to be maintained from a power line.

Equipment means equipment covered by this subpart.

Equipment criteria means instructions, recommendations, limitations and specifications.

Fall protection equipment means guardrail systems, safety net systems, personal fall arrest systems, positioning device systems or fall restraint systems.

Fall restraint system means a fall protection system that prevents the user from falling any distance. The system is comprised of either a body belt or body harness, along with an anchorage, connectors and other necessary equipment. The other components typically include a lanyard, and may also include a lifeline and other devices.

Fall zone means the area (including but not limited to the area directly beneath the load) in which it is reasonably foreseeable that partially or completely suspended materials could fall in the event of an accident.

Flange points are points of contact between rope and drum flange where the rope changes layers.

Floating cranes/derricks means equipment designed by the manufacturer (or employer) for marine use by permanent attachment to a barge, pontoons, vessel or other means of flotation.

For example means "one example, although there are others."

Free fall (of the load line) means that only the brake is used to regulate the descent of the load line (the drive mechanism is not used to drive the load down faster or retard its lowering).

Free surface effect is the uncontrolled transverse movement of liquids in compartments which reduce a vessel's transverse stability.

Hoist means a mechanical device for lifting and lowering loads by winding a line onto or off a drum.

Hoisting is the act of raising, lowering or otherwise moving a load in the air with equipment covered by this standard. As used in this standard, "hoisting" can be done by means other than wire rope/ hoist drum equipment.

Include/including means "including, but not limited to."

Insulating link/device means an insulating device listed, labeled, or accepted by a Nationally Recognized Testing Laboratory in accordance with 29 CFR 1910.7.

Jib stop (also referred to as a jib backstop), is the same type of device as a boom stop but is for a fixed or luffing jib.

Land crane/derrick is equipment not originally designed by the manufacturer for marine use by permanent attachment to barges, pontoons, vessels, or other means of floatation.

List means the angle of inclination about the longitudinal axis of a barge, pontoons, vessel or other means of floatation.

Load refers to the object(s) being hoisted and/or the weight of the object(s); both uses refer to the object(s) and the load-attaching equipment, such as, the load block, ropes, slings, shackles, and any other ancillary attachment.

Load moment (or rated capacity) indicator means a system which aids the equipment operator by sensing (directly or indirectly) the overturning moment on the equipment, i.e., load multiplied by radius. It compares this lifting condition to the equipment's rated capacity, and indicates to the operator the percentage of capacity at which the equipment is working. Lights, bells, or buzzers may be incorporated as a warning of an approaching overload condition.

Load moment (or rated capacity) limiter means a system which aids the equipment operator by sensing (directly or indirectly) the overturning moment on the equipment, i.e., load multiplied by radius. It compares this lifting condition to the equipment's rated capacity, and when the rated capacity is reached, it shuts off power to those equipment functions which can increase the severity of loading on the equipment, e.g., hoisting, telescoping out, or luffing out. Typically, those functions which decrease the severity of loading on the equipment remain operational, e.g., lowering, telescoping in, or luffing in.

Locomotive crane means a crane mounted on a base or car equipped for travel on a railroad track.

Luffing jib limiting device is similar to a boom hoist limiting device, except that it limits the movement of the luffing jib.

Marine hoisted personnel transfer device means a device, such as a "transfer net," that is designed to protect the employees being hoisted during a marine transfer and to facilitate rapid entry into and exit from the device. Such devices do not include boatswain's chairs when hoisted by equipment covered by this standard.

Marine worksite means a construction worksite located in, on or above the water.

Mobile crane means a lifting device incorporating a cable suspended latticed boom or hydraulic telescopic boom designed to be moved between operating locations by transport over the road.

Moving point-to-point means the times during which an employee is in the process of going to or from a work station.

Multi-purpose machine means a machine that is designed to be configured in various ways, at least one of which allows it to hoist (by means of a winch or hook) and horizontally move a suspended load. For example, a machine that can rotate and can be configured with removable forks/tongs (for use as a forklift) or with a winch pack, jib (with a hook at the end) or jib used in conjunction with a winch. When configured with the forks/tongs, it is not covered by this subpart. When configured with a winch pack, jib (with a hook at the end) or jib used in conjunction with a winch, it is covered by this subpart.

Nationally recognized accrediting agency is an organization that, due to its independence and expertise, is widely recognized as competent to accredit testing organizations. Examples of such accrediting agencies include, but are not limited to, the

National Commission for Certifying Agencies and the American National Standards Institute

Nonconductive means that, because of the nature and condition of the materials used, and the conditions of use (including environmental conditions and condition of the material), the object in question has the property of not becoming energized (that is, it has high dielectric properties offering a high resistance to the passage of current under the conditions of use).

Operational aids are devices that assist the operator in the safe operation of the crane by providing information or automatically taking control of a crane function. These include, but are not limited to, the devices listed in § 1926.1416 ("listed operational aids").

Operational controls means levers, switches, pedals and other devices for controlling equipment operation.

Operator means a person who is operating the equipment.

Overhead and gantry cranes includes overhead/bridge cranes, semigantry, cantilever gantry, wall cranes, storage bridge cranes, launching gantry cranes, and similar equipment, irrespective of whether it travels on tracks, wheels, or other means.

Paragraph refers to a paragraph in the same section of this subpart that the word "paragraph" is used, unless otherwise specified.

Pendants includes both wire and bar types. Wire type: a fixed length of wire rope with mechanical fittings at both ends for pinning segments of wire rope together. Bar type: instead of wire rope, a bar is used. Pendants are typically used in a latticed boom crane

system to easily change the length of the boom suspension system without completely changing the rope on the drum when the boom length is increased or decreased.

Personal fall arrest system means a system used to arrest an employee in a fall from a working level. It consists of an anchorage, connectors, a body harness and may include a lanyard, deceleration device, lifeline, or suitable combination of these.

Portal crane is a type of crane consisting of a rotating upperstructure, hoist machinery, and boom mounted on top of a structural gantry which may be fixed in one location or have travel capability. The gantry legs or columns usually have portal openings in between to allow passage of traffic beneath the gantry.

Power lines means electric transmission and distribution lines.

Procedures include, but are not limited to: instructions, diagrams, recommendations, warnings, specifications, protocols and limitations.

Proximity alarm is a device that provides a warning of proximity to a power line and that has been listed, labeled, or accepted by a Nationally Recognized Testing Laboratory in accordance with 29 CFR 1910.7.

Qualified evaluator (not a third party) means a person employed by the signal person's employer who has demonstrated that he/she is competent in accurately assessing whether individuals meet the Qualification Requirements in this subpart for a signal person.

Qualified evaluator (third party) means an entity that, due to its independence and expertise, has demonstrated that it is competent in accurately assessing whether individuals meet the Qualification Requirements in this subpart for a signal person.

Qualified person means a person who, by possession of a recognized degree, certificate, or professional standing, or who by extensive knowledge, training and

experience, successfully demonstrated the ability to solve/resolve problems relating to the subject matter, the work, or the project.

Qualified rigger is a rigger who meets the criteria for a qualified person.

Range control limit device is a device that can be set by an equipment operator to limit movement of the boom or jib tip to a plane or multiple planes.

Range control warning device is a device that can be set by an equipment operator to warn that the boom or jib tip is at a plane or multiple planes.

Rated capacity means the maximum working load permitted by the manufacturer under specified working conditions. Such working conditions typically include a specific combination of factors such as equipment configuration, radii, boom length, and other parameters of use.

Rated capacity indicator: See load moment indicator.

Rated capacity limiter: See load moment limiter.

Repetitive pickup points refer to, when operating on a short cycle operation, the rope being used on a single layer and being spooled repetitively over a short portion of the drum.

Running wire rope means a wire rope that moves over sheaves or drums.

Runway means a firm, level surface designed, prepared and designated as a path of travel for the weight and configuration of the crane being used to lift and travel with the crane suspended platform. An existing surface may be used as long as it meets these criteria.

Section means a section of this subpart, unless otherwise specified.

Sideboom crane means a track-type or wheel-type tractor having a boom mounted on the side of the tractor, used for lifting, lowering or transporting a load suspended on the load hook. The boom or hook can be lifted or lowered in a vertical direction only.

Special hazard warnings means warnings of site-specific hazards (for example, proximity of power lines).

Stability (flotation device) means the tendency of a barge, pontoons, vessel or other means of flotation to return to an upright position after having been inclined by an external force.

Standard Method means the protocol in Appendix A of this subpart for hand signals.

Such as means "such as, but not limited to."

Superstructure: See Upperworks.

Tagline means a rope (usually fiber) attached to a lifted load for purposes of controlling load spinning and pendular motions or used to stabilize a bucket or magnet during material handling operations.

Tender means an individual responsible for monitoring and communicating with a diver.

Tilt up or tilt down operation means raising/lowering a load from the horizontal to vertical or vertical to horizontal.

Tower crane is a type of lifting structure which utilizes a vertical mast or tower to support a working boom (jib) in an elevated position. Loads are suspended from the working boom. While the working boom may be of the fixed type (horizontal or angled) or have luffing capability, it can always rotate to swing loads, either by rotating on the top of the tower (top slewing) or by the rotation of the tower (bottom slewing). The

tower base may be fixed in one location or ballasted and moveable between locations. Mobile cranes that are configured with luffing jib and/or tower attachments are not considered tower cranes under this section.

Travel bogie (tower cranes) is an assembly of two or more axles arranged to permit vertical wheel displacement and equalize the loading on the wheels.

Trim means angle of inclination about the transverse axis of a barge, pontoons, vessel or other means of floatation.

Two blocking means a condition in which a component that is uppermost on the hoist line such as the load block, hook block, overhaul ball, or similar component, comes in contact with the boom tip, fixed upper block or similar component. This binds the system and continued application of power can cause failure of the hoist rope or other component.

Unavailable procedures means procedures that are no longer available from the manufacturer, or have never been available, from the manufacturer.

Upperstructure: See Upperworks.

Upperworks means the revolving frame of equipment on which the operating machinery (and many cases the engine) are mounted along with the operator's cab. The counterweight is typically supported on the rear of the upperstructure and the boom or other front end attachment is mounted on the front.

Up to means "up to and including."

Wire rope means a flexible rope constructed by laying steel wires into various patterns of multi-wired strands around a core system to produce a helically wound rope.

§ 1926.1402 Ground conditions.

(a) *Definitions.*

(1) "Ground conditions" means the ability of the ground to support the equipment (including slope, compaction, and firmness).

(2) "Supporting materials" means blocking, mats, cribbing, marsh buggies (in marshes/wetlands), or similar supporting materials or devices.

(b) The equipment must not be assembled or used unless ground conditions are firm, drained, and graded to a sufficient extent so that, in conjunction (if necessary) with the use of supporting materials, the equipment manufacturer's specifications for adequate support and degree of level of the equipment are met. The requirement for the ground to be drained does not apply to marshes/wetlands.

(c) The controlling entity must:

(1) Ensure that ground preparations necessary to meet the requirements in paragraph (b) of this section are provided.

(2) Inform the user of the equipment and the operator of the location of hazards beneath the equipment set-up area (such as voids, tanks, utilities) if those hazards are identified in documents (such as site drawings, as-built drawings, and soil analyses) that are in the possession of the controlling entity (whether at the site or off-site) or the hazards are otherwise known to that controlling entity.

(d) If there is no controlling entity for the project, the requirement in paragraph (c)(1) of this section must be met by the employer that has authority at the site to make or arrange for ground preparations needed to meet paragraph (b) of this section.

(e) If the A/D director or the operator determines that ground conditions do not meet the requirements in paragraph (b) of this section, that person's employer must have a

discussion with the controlling entity regarding the ground preparations that are needed so that, with the use of suitable supporting materials/devices (if necessary), the requirements in paragraph (b) of this section can be met.

(f) This section does not apply to cranes designed for use on railroad tracks when used on railroad tracks that are part of the general railroad system of transportation that is regulated pursuant to the Federal Railroad Administration under 49 CFR part 213 and that comply with applicable Federal Railroad Administration requirements.

§ 1926.1403 Assembly/Disassembly – selection of manufacturer or employer procedures.

When assembling or disassembling equipment (or attachments), the employer must comply with all applicable manufacturer prohibitions and must comply with either:

(a) Manufacturer procedures applicable to assembly and disassembly, or

(b) Employer procedures for assembly and disassembly. Employer procedures may be used only where the employer can demonstrate that the procedures used meet the requirements in § 1926.1406. NOTE: The employer must follow manufacturer procedures when an employer uses synthetic slings during assembly or disassembly rigging. (See § 1926.1404(r).)

§ 1926.1404 Assembly/Disassembly – general requirements (applies to all assembly and disassembly operations).

(a) *Supervision – competent-qualified person*.

(1) Assembly/disassembly must be directed by a person who meets the criteria for both a competent person and a qualified person, or by a competent person who is assisted by one or more qualified persons ("A/D director").

(2) Where the assembly/disassembly is being performed by only one person, that person must meet the criteria for both a competent person and a qualified person. For purposes of this standard, that person is considered the A/D director.

(b) *Knowledge of procedures*. The A/D director must understand the applicable assembly/disassembly procedures.

(c) *Review of procedures*. The A/D director must review the applicable assembly/disassembly procedures immediately prior to the commencement of assembly/disassembly unless the A/D director understands the procedures and has applied them to the same type and configuration of equipment (including accessories, if any).

(d) *Crew instructions*.

(1) Before commencing assembly/disassembly operations, the A/D director must ensure that the crew members understand all of the following:

(i) Their tasks.

(ii) The hazards associated with their tasks.

(iii) The hazardous positions/locations that they need to avoid.

(2) During assembly/disassembly operations, before a crew member takes on a different task, or when adding new personnel during the operations, the requirements in paragraphs (d)(1)(i) through (d)(1)(iii) of this section must be met.

(e) *Protecting assembly/disassembly crew members out of operator view*.

(1) Before a crew member goes to a location that is out of view of the operator and is either in, on, or under the equipment, or near the equipment (or load) where the crew member could be injured by movement of the equipment (or load), the crew member must inform the operator that he/she is going to that location.

(2) Where the operator knows that a crew member went to a location covered by paragraph (e)(1) of this section, the operator must not move any part of the equipment (or load) until the operator is informed in accordance with a pre-arranged system of communication that the crew member is in a safe position.

(f) *Working under the boom, jib or other components*.

(1) When pins (or similar devices) are being removed, employees must not be under the boom, jib, or other components, except where the requirements of paragraph (f)(2) of this section are met.

(2) *Exception*. Where the employer demonstrates that site constraints require one or more employees to be under the boom, jib, or other components when pins (or similar devices) are being removed, the A/D director must implement procedures that minimize the risk of unintended dangerous movement and minimize the duration and extent of exposure under the boom. (See Non-mandatory Appendix B of this subpart for an example.)

(g) *Capacity limits*. During all phases of assembly/disassembly, rated capacity limits for loads imposed on the equipment, equipment components (including rigging), lifting lugs and equipment accessories, must not be exceeded for the equipment being assembled/disassembled.

(h) *Addressing specific hazards*. The A/D director supervising the assembly/disassembly operation must address the hazards associated with the operation, which include:

(1) *Site and ground bearing conditions*. Site and ground conditions must be adequate for safe assembly/disassembly operations and to support the equipment during assembly/disassembly (see § 1926.1402 for ground condition requirements).

(2) *Blocking material*. The size, amount, condition and method of stacking the blocking must be sufficient to sustain the loads and maintain stability.

(3) *Proper location of blocking*. When used to support lattice booms or components, blocking must be appropriately placed to:

(i) Protect the structural integrity of the equipment, and

(ii) Prevent dangerous movement and collapse.

(4) *Verifying assist crane loads*. When using an assist crane, the loads that will be imposed on the assist crane at each phase of assembly/disassembly must be verified in accordance with § 1926.1417(o)(3) before assembly/disassembly begins.

(5) *Boom and jib pick points*. The point(s) of attachment of rigging to a boom (or boom sections or jib or jib sections) must be suitable for preventing structural damage and facilitating safe handling of these components.

(6) *Center of gravity*.

(i) The center of gravity of the load must be identified if that is necessary for the method used for maintaining stability.

(ii) Where there is insufficient information to accurately identify the center of gravity, measures designed to prevent unintended dangerous movement resulting from an inaccurate identification of the center of gravity must be used. (See Non-mandatory Appendix B of this subpart for an example.)

(7) *Stability upon pin removal*. The boom sections, boom suspension systems (such as gantry A-frames and jib struts), and components must be rigged or supported to maintain stability upon the removal of the pins.

(8) *Snagging*. Suspension ropes and pendants must not be allowed to catch on the boom or jib connection pins or cotter pins (including keepers and locking pins).

(9) *Struck by counterweights*. The potential for unintended movement from inadequately supported counterweights and from hoisting counterweights.

(10) *Boom hoist brake failure*. Each time reliance is to be placed on the boom hoist brake to prevent boom movement during assembly/disassembly, the brake must be tested prior to such reliance to determine if it is sufficient to prevent boom movement. If it is not sufficient, a boom hoist pawl, other locking device/back-up braking device, or another method of preventing dangerous movement of the boom (such as blocking or using an assist crane) from a boom hoist brake failure must be used.

(11) *Loss of backward stability*. Backward stability before swinging the upperworks, travel, and when attaching or removing equipment components.

(12) *Wind speed and weather*. The effect of wind speed and weather on the equipment.

(i) [*Reserved*.]

(j) *Cantilevered boom sections*. Manufacturer limitations on the maximum amount of boom supported only by cantilevering must not be exceeded. Where these are unavailable, a registered professional engineer familiar with the type of equipment involved must determine in writing this limitation, which must not be exceeded.

(k) *Weight of components*. The weight of each of the components must be readily available.

(l) [*Reserved*.]

(m) *Components and configuration*.

(1) The selection of components, and configuration of the equipment, that affect the capacity or safe operation of the equipment must be in accordance with:

(i) Manufacturer instructions, prohibitions, limitations, and specifications. Where these are unavailable, a registered professional engineer familiar with the type of equipment involved must approve, in writing, the selection and configuration of components; or

(ii) Approved modifications that meet the requirements of § 1926.1434 (Equipment modifications).

(2) *Post-assembly inspection*. Upon completion of assembly, the equipment must be inspected to ensure compliance with paragraph (m)(1) of this section (see § 1926.1412(c) for post-assembly inspection requirements).

(n) [*Reserved*.]

(o) *Shipping pins*. Reusable shipping pins, straps, links, and similar equipment must be removed. Once they are removed they must either be stowed or otherwise stored so that they do not present a falling object hazard.

(p) *Pile driving*. Equipment used for pile driving must not have a jib attached during pile driving operations.

(q) *Outriggers and Stabilizers*. When the load to be handled and the operating radius require the use of outriggers or stabilizers, or at any time when outriggers or stabilizers are used, all of the following requirements must be met (except as otherwise indicated):

(1) The outriggers or stabilizers must be either fully extended or, if manufacturer procedures permit, deployed as specified in the load chart.

(2) The outriggers must be set to remove the equipment weight from the wheels, except for locomotive cranes (see paragraph (q)(6) of this section for use of outriggers on locomotive cranes). This provision does not apply to stabilizers.

(3) When outrigger floats are used, they must be attached to the outriggers. When stabilizer floats are used, they must be attached to the stabilizers.

(4) Each outrigger or stabilizer must be visible to the operator or to a signal person during extension and setting.

(5) Outrigger and stabilizer blocking must:

(i) Meet the requirements in paragraphs (h)(2) and (h)(3) of this section.

(ii) Be placed only under the outrigger or stabilizer float/pad of the jack or, where the outrigger or stabilizer is designed without a jack, under the outer bearing surface of the extended outrigger or stabilizer beam.

(6) For locomotive cranes, when using outriggers or stabilizers to handle loads, the manufacturer's procedures must be followed. When lifting loads without using outriggers or stabilizers, the manufacturer's procedures must be met regarding truck wedges or screws.

(r) *Rigging*. In addition to following the requirements in 29 CFR 1926.251 and other requirements in this and other standards applicable to rigging, when rigging is used for assembly/disassembly, the employer must ensure that:

(1) The rigging work is done by a qualified rigger.

(2) Synthetic slings are protected from: abrasive, sharp or acute edges, and configurations that could cause a reduction of the sling's rated capacity, such as distortion or localized compression. NOTE: Requirements for the protection of wire rope slings are contained in 29 CFR 1926.251(c)(9).

(3) When synthetic slings are used, the synthetic sling manufacturer's instructions, limitations, specifications and recommendations must be followed.

§ 1926.1405 Disassembly – additional requirements for dismantling of booms and jibs (applies to both the use of manufacturer procedures and employer procedures).

Dismantling (including dismantling for changing the length of) booms and jibs.

(a) None of the pins in the pendants are to be removed (partly or completely) when the pendants are in tension.

(b) None of the pins (top or bottom) on boom sections located between the pendant attachment points and the crane/derrick body are to be removed (partly or completely) when the pendants are in tension.

(c) None of the pins (top or bottom) on boom sections located between the uppermost boom section and the crane/derrick body are to be removed (partly or completely) when the boom is being supported by the uppermost boom section resting on the ground (or other support).

(d) None of the top pins on boom sections located on the cantilevered portion of the boom being removed (the portion being removed ahead of the pendant attachment points) are to be removed (partly or completely) until the cantilevered section to be removed is fully supported.

§ 1926.1406 Assembly/Disassembly – employer procedures – general requirements.

(a) When using employer procedures instead of manufacturer procedures for assembly/disassembly, the employer must ensure that the procedures:

(1) Prevent unintended dangerous movement, and prevent collapse, of any part of the equipment.

(2) Provide adequate support and stability of all parts of the equipment.

(3) Position employees involved in the assembly/disassembly operation so that their exposure to unintended movement or collapse of part or all of the equipment is minimized.

(b) *Qualified person*. Employer procedures must be developed by a qualified person.

§ 1926.1407 Power line safety (up to 350 kV) – assembly and disassembly.

(a) Before assembling or disassembling equipment, the employer must determine if any part of the equipment, load line, or load (including rigging and lifting accessories) could

get, in the direction or area of assembly/disassembly, closer than 20 feet to a power line during the assembly/disassembly process. If so, the employer must meet the requirements in Option (1), Option (2), or Option (3) of this section, as follows:

(1) *Option (1) – Deenergize and ground*. Confirm from the utility owner/operator that the power line has been deenergized and visibly grounded at the worksite.

(2) *Option (2) – 20 foot clearance*. Ensure that no part of the equipment, load line or load (including rigging and lifting accessories), gets closer than 20 feet to the power line by implementing the measures specified in paragraph (b) of this section.

(3) *Option (3) – Table A clearance*.

(i) Determine the line's voltage and the minimum clearance distance permitted under Table A (see § 1926.1408).

(ii) Determine if any part of the equipment, load line, or load (including rigging and lifting accessories), could get closer than the minimum clearance distance to the power line permitted under Table A (see § 1926.1408). If so, then the employer must follow the requirements in paragraph (b) of this section to ensure that no part of the equipment, load line, or load (including rigging and lifting accessories), gets closer to the line than the minimum clearance distance.

(b) *Preventing encroachment/electrocution*. Where encroachment precautions are required under Option (2), or Option (3) of this section, all of the following requirements must be met:

(1) Conduct a planning meeting with the Assembly/Disassembly director (A/D director), operator, assembly/disassembly crew and the other workers who will be in the assembly/disassembly area to review the location of the power line(s) and the steps that will be implemented to prevent encroachment/electrocution.

(2) If tag lines are used, they must be nonconductive.

(3) At least one of the following additional measures must be in place. The measure selected from this list must be effective in preventing encroachment. The additional measures are:

(i) Use a dedicated spotter who is in continuous contact with the equipment operator. The dedicated spotter must:

(A) Be equipped with a visual aid to assist in identifying the minimum clearance distance. Examples of a visual aid include, but are not limited to: a clearly visible line painted on the ground; a clearly visible line of stanchions; a set of clearly visible line-of-sight landmarks (such as a fence post behind the dedicated spotter and a building corner ahead of the dedicated spotter).

(B) Be positioned to effectively gauge the clearance distance.

(C) Where necessary, use equipment that enables the dedicated spotter to communicate directly with the operator.

(D) Give timely information to the operator so that the required clearance distance can be maintained.

(ii) A proximity alarm set to give the operator sufficient warning to prevent encroachment.

(iii) A device that automatically warns the operator when to stop movement, such as a range control warning device. Such a device must be set to give the operator sufficient warning to prevent encroachment.

(iv) A device that automatically limits range of movement, set to prevent encroachment.

(v) An elevated warning line, barricade, or line of signs, in view of the operator, equipped with flags or similar high-visibility markings.

(c) *Assembly/disassembly below power lines prohibited*. No part of a crane/derrick, load line, or load (including rigging and lifting accessories), whether partially or fully assembled, is allowed below a power line unless the employer has confirmed that the utility owner/operator has deenergized and (at the worksite) visibly grounded the power line.

(d) *Assembly/disassembly inside Table A clearance prohibited*. No part of a crane/derrick, load line, or load (including rigging and lifting accessories), whether partially or fully assembled, is allowed closer than the minimum approach distance under Table A (see § 1926.1408) to a power line unless the employer has confirmed that the utility owner/operator has deenergized and (at the worksite) visibly grounded the power line.

(e) *Voltage information*. Where Option (3) of this section is used, the utility owner/operator of the power lines must provide the requested voltage information within two working days of the employer's request.

(f) *Power lines presumed energized*. The employer must assume that all power lines are energized unless the utility owner/operator confirms that the power line has been and continues to be deenergized and visibly grounded at the worksite.

(g) *Posting of electrocution warnings*. There must be at least one electrocution hazard warning conspicuously posted in the cab so that it is in view of the operator and (except for overhead gantry and tower cranes) at least two on the outside of the equipment.

§ 1926.1408 Power line safety (up to 350 kV) – equipment operations.

(a) *Hazard assessments and precautions inside the work zone*. Before beginning equipment operations, the employer must:

(1) *Identify the work zone by either*:

(i) Demarcating boundaries (such as with flags, or a device such as a range limit device or range control warning device) and prohibiting the operator from operating the equipment past those boundaries, or

(ii) Defining the work zone as the area 360 degrees around the equipment, up to the equipment's maximum working radius.

(2) Determine if any part of the equipment, load line or load (including rigging and lifting accessories), if operated up to the equipment's maximum working radius in the work zone, could get closer than 20 feet to a power line. If so, the employer must meet the requirements in Option (1), Option (2), or Option (3) of this section, as follows:

(i) *Option (1) – Deenergize and ground*. Confirm from the utility owner/operator that the power line has been deenergized and visibly grounded at the worksite.

(ii) *Option (2) – 20 foot clearance*. Ensure that no part of the equipment, load line, or load (including rigging and lifting accessories), gets closer than 20 feet to the power line by implementing the measures specified in paragraph (b) of this section.

(iii) *Option (3) – Table A clearance*.

(A) Determine the line's voltage and the minimum approach distance permitted under Table A (see § 1926.1408).

(B) Determine if any part of the equipment, load line or load (including rigging and lifting accessories), while operating up to the equipment's maximum working radius in the work zone, could get closer than the minimum approach distance of the power line permitted under Table A (see § 1926.1408). If so, then the employer must follow the requirements in paragraph (b) of this section to ensure that no part of the equipment, load line, or load (including rigging and lifting accessories), gets closer to the line than the minimum approach distance.

(b) *Preventing encroachment/electrocution*. Where encroachment precautions are required under Option (2) or Option (3) of this section, all of the following requirements must be met:

(1) Conduct a planning meeting with the operator and the other workers who will be in the area of the equipment or load to review the location of the power line(s), and the steps that will be implemented to prevent encroachment/electrocution.

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

(3) Erect and maintain an elevated warning line, barricade, or line of signs, in view of the operator, equipped with flags or similar high-visibility markings, at 20 feet from the power line (if using Option (2) of this section) or at the minimum approach distance under Table A (see § 1926.1408) (if using Option (3) of this section). If the operator is unable to see the elevated warning line, a dedicated spotter must be used as described in § 1926.1408(b)(4)(ii) in addition to implementing one of the measures described in §§ 1926.1408(b)(4)(i), (iii), (iv) and (v).

(4) Implement at least one of the following measures:

(i) A proximity alarm set to give the operator sufficient warning to prevent encroachment.

(ii) A dedicated spotter who is in continuous contact with the operator. Where this measure is selected, the dedicated spotter must:

(A) Be equipped with a visual aid to assist in identifying the minimum clearance distance. Examples of a visual aid include, but are not limited to: a clearly visible line painted on the ground; a clearly visible line of stanchions; a set of clearly visible line-of-sight landmarks (such as a fence post behind the dedicated spotter and a building corner ahead of the dedicated spotter).

(B) Be positioned to effectively gauge the clearance distance.

(C) Where necessary, use equipment that enables the dedicated spotter to communicate directly with the operator.

(D) Give timely information to the operator so that the required clearance distance can be maintained.

(iii) A device that automatically warns the operator when to stop movement, such as a range control warning device. Such a device must be set to give the operator sufficient warning to prevent encroachment.

(iv) A device that automatically limits range of movement, set to prevent encroachment.

(v) An insulating link/device, as defined in § 1926.1401, installed at a point between the end of the load line (or below) and the load.

(5) The requirements of paragraph (b)(4) of this section do not apply to work covered by subpart V of this part.

(c) *Voltage information*. Where Option (3) of this section is used, the utility owner/operator of the power lines must provide the requested voltage information within two working days of the employer's request.

(d) *Operations below power lines*.

(1) No part of the equipment, load line, or load (including rigging and lifting accessories) is allowed below a power line unless the employer has confirmed that the utility owner/operator has deenergized and (at the worksite) visibly grounded the power line, except where one of the exceptions in paragraph (d)(2) of this section applies.

(2) *Exceptions*. Paragraph (d)(1) of this section is inapplicable where the employer demonstrates that one of the following applies:

(i) The work is covered by subpart V of this part.

(ii) For equipment with non-extensible booms: The uppermost part of the equipment, with the boom at true vertical, would be more than 20 feet below the plane of the power line or more than the Table A of this section minimum clearance distance below the plane of the power line.

(iii) For equipment with articulating or extensible booms: The uppermost part of the equipment, with the boom in the fully extended position, at true vertical, would be more than 20 feet below the plane of the power line or more than the Table A of this section minimum clearance distance below the plane of the power line.

(iv) The employer demonstrates that compliance with paragraph (d)(1) of this section is infeasible and meets the requirements of § 1926.1410.

(e) *Power lines presumed energized*. The employer must assume that all power lines are energized unless the utility owner/operator confirms that the power line has been and continues to be deenergized and visibly grounded at the worksite.

(f) When working near transmitter/communication towers where the equipment is close enough for an electrical charge to be induced in the equipment or materials being handled, the transmitter must be deenergized or the following precautions must be taken:

(1) The equipment must be provided with an electrical ground.

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

(g) *Training*.

(1) The employer must train each operator and crew member assigned to work with the equipment on all of the following:

(i) The procedures to be followed in the event of electrical contact with a power line. Such training must include:

(A) Information regarding the danger of electrocution from the operator simultaneously touching the equipment and the ground.

(B) The importance to the operator's safety of remaining inside the cab except where there is an imminent danger of fire, explosion, or other emergency that necessitates leaving the cab.

(C) The safest means of evacuating from equipment that may be energized.

(D) The danger of the potentially energized zone around the equipment (step potential).

(E) The need for crew in the area to avoid approaching or touching the equipment and the load.

(F) Safe clearance distance from power lines.

(ii) Power lines are presumed to be energized unless the utility owner/operator confirms that the power line has been and continues to be deenergized and visibly grounded at the worksite.

(iii) Power lines are presumed to be uninsulated unless the utility owner/operator or a registered engineer who is a qualified person with respect to electrical power transmission and distribution confirms that a line is insulated.

(iv) The limitations of an insulating link/device, proximity alarm, and range control (and similar) device, if used.

(v) The procedures to be followed to properly ground equipment and the limitations of grounding.

(2) Employees working as dedicated spotters must be trained to enable them to effectively perform their task, including training on the applicable requirements of this section.

(3) Training under this section must be administered in accordance with § 1926.1430(g).

(h) Devices originally designed by the manufacturer for use as: a safety device (see § 1926.1415), operational aid, or a means to prevent power line contact or electrocution, when used to comply with this section, must meet the manufacturer's procedures for use and conditions of use.

Table A – Minimum Clearance Distances

Voltage (nominal, kV, alternating current)	Minimum clearance distance (feet)
up to 50	10
over 50 to 200	15
over 200 to 350	20
over 350 to 500	25
over 500 to 750	35
over 750 to 1,000	45
over 1,000	(as established by the utility owner/ operator or registered professional engineer who is a qualified person with respect to electrical power transmission and distribution)

Note: The value that follows "to" is up to and includes that value. For example, over 50 to 200 means up to and including

200kV.

§ 1926.1409 Power line safety (over 350 kV).

The requirements of § 1926.1407 and § 1926.1408 apply to power lines over 350 kV except:

(a) For power lines at or below 1000 kV, wherever the distance "20 feet" is specified, the distance "50 feet" must be substituted; and

(b) For power lines over 1000 kV, the minimum clearance distance must be established by the utility owner/operator or registered professional engineer who is a qualified person with respect to electrical power transmission and distribution.

§ 1926.1410 Power line safety (all voltages) – equipment operations closer than the Table A zone.

Equipment operations in which any part of the equipment, load line, or load (including rigging and lifting accessories) is closer than the minimum approach distance under Table A of § 1926.1408 to an energized power line is prohibited, except where the employer demonstrates that all of the following requirements are met:

(a) The employer determines that it is infeasible to do the work without breaching the minimum approach distance under Table A of § 1926.1408.

(b) The employer determines that, after consultation with the utility owner/operator, it is infeasible to deenergize and ground the power line or relocate the power line.

(c) *Minimum clearance distance*.

(1) The power line owner/operator or registered professional engineer who is a qualified person with respect to electrical power transmission and distribution

determines the minimum clearance distance that must be maintained to prevent electrical contact in light of the on-site conditions. The factors that must be considered in making this determination include, but are not limited to: conditions affecting atmospheric conductivity; time necessary to bring the equipment, load line, and load (including rigging and lifting accessories) to a complete stop; wind conditions; degree of sway in the power line; lighting conditions, and other conditions affecting the ability to prevent electrical contact.

(2) Paragraph (c)(1) of this section does not apply to work covered by subpart V of this part; instead, for such work, the minimum clearance distances specified in § 1926.950 Table V-1 apply. Employers engaged in subpart V work are permitted to work closer than the distances in § 1926.950 Table V-1 where both the requirements of this section and § 1926.952(c)(3)(i) or (ii) are met.

(d) A planning meeting with the employer and utility owner/operator (or registered professional engineer who is a qualified person with respect to electrical power transmission and distribution) is held to determine the procedures that will be followed to prevent electrical contact and electrocution. At a minimum these procedures must include:

(1) If the power line is equipped with a device that automatically reenergizes the circuit in the event of a power line contact, before the work begins, the automatic reclosing feature of the circuit interrupting device must be made inoperative if the design of the device permits.

(2) A dedicated spotter who is in continuous contact with the operator. The dedicated spotter must:

(i) Be equipped with a visual aid to assist in identifying the minimum clearance distance. Examples of a visual aid include, but are not limited to: a line painted on the ground; a clearly visible line of stanchions; a set of clearly visible line-of-sight landmarks (such as a fence post behind the dedicated spotter and a building corner ahead of the dedicated spotter).

(ii) Be positioned to effectively gauge the clearance distance.

(iii) Where necessary, use equipment that enables the dedicated spotter to communicate directly with the operator.

(iv) Give timely information to the operator so that the required clearance distance can be maintained.

(3) An elevated warning line, or barricade (not attached to the crane), in view of the operator (either directly or through video equipment), equipped with flags or similar high-visibility markings, to prevent electrical contact. However, this provision does not apply to work covered by subpart V of this part.

(4) *Insulating link/device*.

(i) An insulating link/device installed at a point between the end of the load line (or below) and the load.

(ii) For work covered by subpart V of this part, the requirement in paragraph (d)(4)(i) of this section applies only when working inside the § 1926.950 Table V-1 clearance distances.

(iii) For work covered by subpart V of this part involving operations where use of an insulating link/device is infeasible, the requirements of §

1910.269(p)(4)(iii)(B) or (C) may be substituted for the requirement in (d)(4)(i) of this section.

(iv) Until [INSERT DATE 1 YEAR AND 90 DAYS AFTER PUBLICATION IN THE FEDERAL REGISTER], the following procedure may be substituted for the requirement in paragraph (d)(4)(i) of this section: all employees, excluding equipment operators located on the equipment, who may come in contact with the equipment, the load line, or the load must be insulated or guarded from the equipment, the load line, and the load. Insulating gloves rated for the voltage involved are adequate insulation for the purposes of this paragraph.

(v) Until [INSERT DATE 3 YEARS AND 90 DAYS AFTER PUBLICATION IN THE FEDERAL REGISTER], the following procedure may be substituted for the requirement in (d)(4)(i) of this section:

(A) The employer must use a link/device manufactured on or before [INSERT DATE 1 YEAR AND 90 DAYS AFTER PUBLICATION IN THE FEDERAL REGISTER], that meets the definition of an insulating link/device, except that it has not been approved by a Nationally Recognized Testing Laboratory, and that is maintained and used in accordance with manufacturer requirements and recommendations, and is installed at a point between the end of the load line (or below) and the load; and

(B) All employees, excluding equipment operators located on the equipment, who may come in contact with the equipment, the load line, or the load must be insulated or guarded from the equipment, the load line, and the load through an additional means other than the device described in paragraph (d)(4)(v)(A) of this section. Insulating gloves rated for the voltage involved are adequate additional means of protection for the purposes of this paragraph.

(5) Nonconductive rigging if the rigging may be within the Table A of § 1926.1408 distance during the operation.

(6) If the equipment is equipped with a device that automatically limits range of movement, it must be used and set to prevent any part of the equipment, load line, or load (including rigging and lifting accessories) from breaching the minimum approach distance established under paragraph (c) of this section.

(7) If a tag line is used, it must be of the nonconductive type.

(8) Barricades forming a perimeter at least 10 feet away from the equipment to prevent unauthorized personnel from entering the work area. In areas where obstacles prevent the barricade from being at least 10 feet away, the barricade must be as far from the equipment as feasible.

(9) Workers other than the operator must be prohibited from touching the load line above the insulating link/device and crane. Operators remotely operating the equipment from the ground must use either wireless controls that isolate the operator from the equipment or insulating mats that insulate the operator from the ground.

(10) Only personnel essential to the operation are permitted to be in the area of the crane and load.

(11) The equipment must be properly grounded.

(12) Insulating line hose or cover-up must be installed by the utility owner/operator except where such devices are unavailable for the line voltages involved.

(e) The procedures developed to comply with paragraph (d) of this section are documented and immediately available on-site.

(f) The equipment user and utility owner/operator (or registered professional engineer) meet with the equipment operator and the other workers who will be in the area of the equipment or load to review the procedures that will be implemented to prevent breaching the minimum approach distance established in paragraph (c) of this section and prevent electrocution.

(g) The procedures developed to comply with paragraph (d) of this section are implemented.

(h) The utility owner/operator (or registered professional engineer) and all employers of employees involved in the work must identify one person who will direct the implementation of the procedures. The person identified in accordance with this paragraph must direct the implementation of the procedures and must have the authority to stop work at any time to ensure safety.

(i) [*Reserved*.]

(j) If a problem occurs implementing the procedures being used to comply with paragraph (d) of this section, or indicating that those procedures are inadequate to prevent

electrocution, the employer must safely stop operations and either develop new procedures to comply with paragraph (d) of this section or have the utility owner/operator deenergize and visibly ground or relocate the power line before resuming work.

(k) Devices originally designed by the manufacturer for use as a safety device (see § 1926.1415), operational aid, or a means to prevent power line contact or electrocution, when used to comply with this section, must comply with the manufacturer's procedures for use and conditions of use.

(l) [*Reserved*.]

(m) The employer must train each operator and crew member assigned to work with the equipment in accordance with § 1926.1408(g).

§ 1926.1411 Power line safety – while traveling under or near power lines with no load.

(a) This section establishes procedures and criteria that must be met for equipment traveling under or near a power line on a construction site with no load. Equipment traveling on a construction site with a load is governed by §§ 1926.1408, 1926.1409 or 1926.1410, whichever is appropriate, and § 1926.1417(u).

(b) The employer must ensure that:

(1) The boom/mast and boom/mast support system are lowered sufficiently to meet the requirements of this paragraph.

(2) The clearances specified in Table T of this section are maintained.

(3) The effects of speed and terrain on equipment movement (including movement of the boom/mast) are considered so that those effects do not cause the minimum clearance distances specified in Table T of this section to be breached.

(4) *Dedicated spotter*. If any part of the equipment while traveling will get closer than 20 feet to the power line, the employer must ensure that a dedicated spotter who is in continuous contact with the driver/operator is used. The dedicated spotter must:

(i) Be positioned to effectively gauge the clearance distance.

(ii) Where necessary, use equipment that enables the dedicated spotter to communicate directly with the operator.

(iii) Give timely information to the operator so that the required clearance distance can be maintained.

(5) *Additional precautions for traveling in poor visibility*. When traveling at night, or in conditions of poor visibility, in addition to the measures specified in paragraphs (b)(1) through (4) of this section, the employer must ensure that:

(i) The power lines are illuminated or another means of identifying the location of the lines is used.

(ii) A safe path of travel is identified and used.

Table T – Minimum Clearance Distances While Traveling With No Load

Voltage (nominal, kV, alternating current)	While Traveling – Minimum clearance distance (feet)
up to 0.75	4
over .75 to 50	6
over 50 to 345	10
over 345 to 750	16

Over 750 to 1,000	20
Over 1,000	(as established by the utility owner/operator or registered professional engineer who is a qualified person with respect to electrical power transmission and distribution)

§ 1926.1412 Inspections.

(a) *Modified equipment*.

(1) Equipment that has had modifications or additions which affect the safe operation of the equipment (such as modifications or additions involving a safety device or operational aid, critical part of a control system, power plant, braking system, load-sustaining structural components, load hook, or in-use operating mechanism) or capacity must be inspected by a qualified person after such modifications/additions have been completed, prior to initial use. The inspection must meet all of the following requirements:

(i) The inspection must assure that the modifications or additions have been done in accordance with the approval obtained pursuant to § 1926.1434 (Equipment modifications).

(ii) The inspection must include functional testing of the equipment.

(2) Equipment must not be used until an inspection under this paragraph demonstrates that the requirements of paragraph (a)(1)(i) of this section have been met.

(b) *Repaired/adjusted equipment*.

(1) Equipment that has had a repair or adjustment that relates to safe operation (such as: a repair or adjustment to a safety device or operator aid, or to a critical

part of a control system, power plant, braking system, load-sustaining structural components, load hook, or in-use operating mechanism), must be inspected by a qualified person after such a repair or adjustment has been completed, prior to initial use. The inspection must meet all of the following requirements:

(i) The qualified person must determine if the repair/adjustment meets manufacturer equipment criteria (where applicable and available).

(ii) Where manufacturer equipment criteria are unavailable or inapplicable, the qualified person must:

(A) Determine if a registered professional engineer (RPE) is needed to develop criteria for the repair/adjustment. If an RPE is not needed, the employer must ensure that the criteria are developed by the qualified person. If an RPE is needed, the employer must ensure that they are developed by an RPE.

(B) Determine if the repair/adjustment meets the criteria developed in accordance with paragraph (b)(1)(ii)(A) of this section.

(iii) The inspection must include functional testing of the repaired/adjusted parts and other components that may be affected by the repair/adjustment.

(4) Equipment must not be used until an inspection under this paragraph demonstrates that the repair/adjustment meets the requirements of paragraph (b)(1)(i) of this section (or, where applicable, paragraph (b)(1)(ii) of this section).

(c) *Post-assembly*.

(1) Upon completion of assembly, the equipment must be inspected by a qualified person to assure that it is configured in accordance with manufacturer equipment criteria.

(2) Where manufacturer equipment criteria are unavailable, a qualified person must:

(i) Determine if a registered professional engineer (RPE) familiar with the type of equipment involved is needed to develop criteria for the equipment configuration. If an RPE is not needed, the employer must ensure that the criteria are developed by the qualified person. If an RPE is needed, the employer must ensure that they are developed by an RPE.

(ii) Determine if the equipment meets the criteria developed in accordance with paragraph (c)(2)(i) of this section.

(3) Equipment must not be used until an inspection under this paragraph demonstrates that the equipment is configured in accordance with the applicable criteria.

(d) *Each shift*.

(1) A competent person must begin a visual inspection prior to each shift the equipment will be used, which must be completed before or during that shift. The inspection must consist of observation for apparent deficiencies. Taking apart equipment components and booming down is not required as part of this inspection unless the results of the visual inspection or trial operation indicate that further investigation necessitating taking apart equipment components or booming down is needed. Determinations made in conducting the inspection must be

reassessed in light of observations made during operation. At a minimum the inspection must include all of the following:

(i) Control mechanisms for maladjustments interfering with proper operation.

(ii) Control and drive mechanisms for apparent excessive wear of components and contamination by lubricants, water or other foreign matter.

(iii) Air, hydraulic, and other pressurized lines for deterioration or leakage, particularly those which flex in normal operation.

(iv) Hydraulic system for proper fluid level.

(v) Hooks and latches for deformation, cracks, excessive wear, or damage such as from chemicals or heat.

(vi) Wire rope reeving for compliance with the manufacturer's specifications.

(vii) Wire rope, in accordance with § 1926.1413(a).

(viii) Electrical apparatus for malfunctioning, signs of apparent excessive deterioration, dirt or moisture accumulation.

(ix) Tires (when in use) for proper inflation and condition.

(x) Ground conditions around the equipment for proper support, including ground settling under and around outriggers/stabilizers and supporting foundations, ground water accumulation, or similar conditions. This paragraph does not apply to the inspection of ground conditions for railroad tracks and their underlying support when the railroad tracks are

part of the general railroad system of transportation that is regulated pursuant to the Federal Railroad Administration under 49 CFR part 213.

(xi) The equipment for level position within the tolerances specified by the equipment manufacturer's recommendations, both before each shift and after each move and setup.

(xii) Operator cab windows for significant cracks, breaks, or other deficiencies that would hamper the operator's view.

(xiii) Rails, rail stops, rail clamps and supporting surfaces when the equipment has rail traveling. This paragraph does not apply to the inspection of rails, rail stops, rail clamps and supporting surfaces when the railroad tracks are part of the general railroad system of transportation that is regulated pursuant to the Federal Railroad Administration under 49 CFR part 213.

(xiv) Safety devices and operational aids for proper operation.

(2) If any deficiency in paragraphs (d)(1)(i) through (xiii) of this section (or in additional inspection items required to be checked for specific types of equipment in accordance with other sections of this standard) is identified, an immediate determination must be made by the competent person as to whether the deficiency constitutes a safety hazard. If the deficiency is determined to constitute a safety hazard, the equipment must be taken out of service until it has been corrected. See § 1926.1417.

(3) If any deficiency in paragraph (d)(1)(xiv) of this section (safety devices/operational aids) is identified, the action specified in § 1926.1415 and § 1926.1416 must be taken prior to using the equipment.

(e) *Monthly*.

(1) Each month the equipment is in service it must be inspected in accordance with paragraph (d) of this section (each shift).

(2) Equipment must not be used until an inspection under this paragraph demonstrates that no corrective action under paragraphs (d)(2) and (3) of this section is required.

(3) *Documentation*.

(i) The following information must be documented and maintained by the employer that conducts the inspection:

(A) The items checked and the results of the inspection.

(B) The name and signature of the person who conducted the inspection and the date.

(ii) This document must be retained for a minimum of three months.

(f) *Annual/comprehensive*.

(1) At least every 12 months the equipment must be inspected by a qualified person in accordance with paragraph (d) of this section (each shift) except that the corrective action set forth in paragraphs (f)(4), (f)(5), and (f)(6) of this section must apply in place of the corrective action required by paragraphs (d)(2) and (d)(3) of this section.

(2) In addition, at least every 12 months, the equipment must be inspected by a qualified person. Disassembly is required, as necessary, to complete the inspection. The equipment must be inspected for all of the following:

(i) Equipment structure (including the boom and, if equipped, the jib):

(A) Structural members: deformed, cracked, or significantly corroded.

(B) Bolts, rivets and other fasteners: loose, failed or significantly corroded.

(C) Welds for cracks.

(ii) Sheaves and drums for cracks or significant wear.

(iii) Parts such as pins, bearings, shafts, gears, rollers and locking devices for distortion, cracks or significant wear.

(iv) Brake and clutch system parts, linings, pawls and ratchets for excessive wear.

(v) Safety devices and operational aids for proper operation (including significant inaccuracies).

(vi) Gasoline, diesel, electric, or other power plants for safety-related problems (such as leaking exhaust and emergency shut-down feature) and conditions, and proper operation.

(vii) Chains and chain drive sprockets for excessive wear of sprockets and excessive chain stretch.

(viii) Travel steering, brakes, and locking devices, for proper operation.

(ix) Tires for damage or excessive wear.

(x) Hydraulic, pneumatic and other pressurized hoses, fittings and tubing, as follows:

(A) Flexible hose or its junction with the fittings for indications of leaks.

(B) Threaded or clamped joints for leaks.

(C) Outer covering of the hose for blistering, abnormal deformation or other signs of failure/impending failure.

(D) Outer surface of a hose, rigid tube, or fitting for indications of excessive abrasion or scrubbing.

(xi) Hydraulic and pneumatic pumps and motors, as follows:

(A) Performance indicators: unusual noises or vibration, low operating speed, excessive heating of the fluid, low pressure.

(B) Loose bolts or fasteners.

(C) Shaft seals and joints between pump sections for leaks.

(xii) Hydraulic and pneumatic valves, as follows:

(A) Spools: sticking, improper return to neutral, and leaks.

(B) Leaks.

(C) Valve housing cracks.

(D) Relief valves: failure to reach correct pressure (if there is a manufacturer procedure for checking pressure, it must be followed).

(xiii) Hydraulic and pneumatic cylinders, as follows:

(A) Drifting caused by fluid leaking across the piston.

(B) Rod seals and welded joints for leaks.

(C) Cylinder rods for scores, nicks, or dents.

(D) Case (barrel) for significant dents.

(E) Rod eyes and connecting joints: loose or deformed.

(xiv) Outrigger or stabilizer pads/floats for excessive wear or cracks.

(xv) Slider pads for excessive wear or cracks

(xvi) Electrical components and wiring for cracked or split insulation and loose or corroded terminations.

(xvii) Warning labels and decals originally supplied with the equipment by the manufacturer or otherwise required under this standard: missing or unreadable.

(xviii) Originally equipped operator seat (or equivalent): missing.

(xix) Operator seat: unserviceable.

(xx) Originally equipped steps, ladders, handrails, guards: missing.

(xxi) Steps, ladders, handrails, guards: in unusable/unsafe condition.

(3) This inspection must include functional testing to determine that the equipment as configured in the inspection is functioning properly.

(4) If any deficiency is identified, an immediate determination must be made by the qualified person as to whether the deficiency constitutes a safety hazard or, though not yet a safety hazard, needs to be monitored in the monthly inspections.

(5) If the qualified person determines that a deficiency is a safety hazard, the equipment must be taken out of service until it has been corrected, except when

temporary alternative measures are implemented as specified in § 1926.1416(d) or § 1926.1435(e). See § 1926.1417.

(6) If the qualified person determines that, though not presently a safety hazard, the deficiency needs to be monitored, the employer must ensure that the deficiency is checked in the monthly inspections.

(7) *Documentation of annual/comprehensive inspection*. The following information must be documented, maintained, and retained for a minimum of 12 months, by the employer that conducts the inspection:

(i) The items checked and the results of the inspection.

(ii) The name and signature of the person who conducted the inspection and the date.

(g) *Severe service*. Where the severity of use/conditions is such that there is a reasonable probability of damage or excessive wear (such as loading that may have exceeded rated capacity, shock loading that may have exceeded rated capacity, prolonged exposure to a corrosive atmosphere), the employer must stop using the equipment and a qualified person must:

(1) Inspect the equipment for structural damage to determine if the equipment can continue to be used safely.

(2) In light of the use/conditions determine whether any items/conditions listed in paragraph (f) of this section need to be inspected; if so, the qualified person must inspect those items/conditions.

(3) If a deficiency is found, the employer must follow the requirements in paragraphs (f)(4) through (6) of this section.

(h) *Equipment not in regular use*. Equipment that has been idle for 3 months or more must be inspected by a qualified person in accordance with the requirements of paragraph (e) (Monthly) of this section before initial use.

(i) [*Reserved*.]

(j) Any part of a manufacturer's procedures regarding inspections that relate to safe operation (such as to a safety device or operational aid, critical part of a control system, power plant, braking system, load-sustaining structural components, load hook, or in-use operating mechanism) that is more comprehensive or has a more frequent schedule of inspection than the requirements of this section must be followed.

(k) All documents produced under this section must be available, during the applicable document retention period, to all persons who conduct inspections under this section.

§ 1926.1413 Wire rope – inspection.

(a) *Shift inspection*.

(1) A competent person must begin a visual inspection prior to each shift the equipment is used, which must be completed before or during that shift. The inspection must consist of observation of wire ropes (running and standing) that are likely to be in use during the shift for apparent deficiencies, including those listed in paragraph (a)(2) of this section. Untwisting (opening) of wire rope or booming down is not required as part of this inspection.

(2) *Apparent deficiencies*.

(i) *Category I*. Apparent deficiencies in this category include the following:

(A) Significant distortion of the wire rope structure such as kinking, crushing, unstranding, birdcaging, signs of core failure or steel core protrusion between the outer strands.

(B) Significant corrosion.

(C) Electric arc damage (from a source other than power lines) or heat damage.

(D) Improperly applied end connections.

(E) Significantly corroded, cracked, bent, or worn end connections (such as from severe service).

(ii) *Category II*. Apparent deficiencies in this category are:

(A) Visible broken wires, as follows:

(1) In running wire ropes: six randomly distributed broken wires in one rope lay or three broken wires in one strand in one rope lay, where a rope lay is the length along the rope in which one strand makes a complete revolution around the rope.

(2) In rotation resistant ropes: two randomly distributed broken wires in six rope diameters or four randomly distributed broken wires in 30 rope diameters.

(3) In pendants or standing wire ropes: more than two broken wires in one rope lay located in rope beyond end connections and/or more than one broken wire in a rope lay located at an end connection.

(B) A diameter reduction of more than 5% from nominal diameter.

(iii) *Category III*. Apparent deficiencies in this category include the following:

(A) In rotation resistant wire rope, core protrusion or other distortion indicating core failure.

(B) Prior electrical contact with a power line.

(C) A broken strand.

(3) *Critical review items*. The competent person must give particular attention to all of the following:

(i) Rotation resistant wire rope in use.

(ii) Wire rope being used for boom hoists and luffing hoists, particularly at reverse bends.

(iii) Wire rope at flange points, crossover points and repetitive pickup points on drums.

(iv) Wire rope at or near terminal ends.

(v) Wire rope in contact with saddles, equalizer sheaves or other sheaves where rope travel is limited.

(4) *Removal from service*.

(i) If a deficiency in Category I (see paragraph (a)(2)(i) of this section) is identified, an immediate determination must be made by the competent person as to whether the deficiency constitutes a safety hazard. If the deficiency is determined to constitute a safety hazard, operations involving use of the wire rope in question must be prohibited until:

(A) The wire rope is replaced (see § 1926.1417), or

(B) If the deficiency is localized, the problem is corrected by severing the wire rope in two; the undamaged portion may continue to be used. Joining lengths of wire rope by splicing is prohibited. If a rope is shortened under this paragraph, the employer must ensure that the drum will still have two wraps of wire when the load and/or boom is in its lowest position.

(ii) If a deficiency in Category II (see paragraph (a)(2)(ii) of this section) is identified, operations involving use of the wire rope in question must be prohibited until:

(A) The employer complies with the wire rope manufacturer's established criterion for removal from service or a different criterion that the wire rope manufacturer has approved in writing for that specific wire rope (see § 1926.1417),

(B) The wire rope is replaced (see § 1926.1417), or

(C) If the deficiency is localized, the problem is corrected by severing the wire rope in two; the undamaged portion may continue to be used. Joining lengths of wire rope by splicing is prohibited. If a rope is shortened under this paragraph, the employer must ensure that the drum will still have two wraps of wire when the load and/or boom is in its lowest position.

(iii) If a deficiency in Category III is identified, operations involving use of the wire rope in question must be prohibited until:

(A) The wire rope is replaced (see § 1926.1417), or

(B) If the deficiency (other than power line contact) is localized, the problem is corrected by severing the wire rope in two; the undamaged portion may continue to be used. Joining lengths of wire rope by splicing is prohibited. Repair of wire rope that contacted an energized power line is also prohibited. If a rope is shortened under this paragraph, the employer must ensure that the drum will still have two wraps of wire when the load and/or boom is in its lowest position.

(iv) Where a wire rope is required to be removed from service under this section, either the equipment (as a whole) or the hoist with that wire rope must be tagged-out, in accordance with § 1926.1417(f)(1), until the wire rope is repaired or replaced.

(b) *Monthly inspection*.

(1) Each month an inspection must be conducted in accordance with paragraph (a) (shift inspection) of this section.

(2) The inspection must include any deficiencies that the qualified person who conducts the annual inspection determines under paragraph (c)(3)(ii) of this section must be monitored.

(3) Wire ropes on equipment must not be used until an inspection under this paragraph demonstrates that no corrective action under paragraph (a)(4) of this section is required.

(4) The inspection must be documented according to § 1926.1412(e)(3) (monthly inspection documentation).

(c) *Annual/comprehensive*.

(1) At least every 12 months, wire ropes in use on equipment must be inspected by a qualified person in accordance with paragraph (a) of this section (shift inspection).

(2) In addition, at least every 12 months, the wire ropes in use on equipment must be inspected by a qualified person, as follows:

(i) The inspection must be for deficiencies of the types listed in paragraph (a)(2) of this section.

(ii) The inspection must be complete and thorough, covering the surface of the entire length of the wire ropes, with particular attention given to all of the following:

(A) Critical review items listed in paragraph (a)(3) of this section.

(B) Those sections that are normally hidden during shift and monthly inspections.

(C) Wire rope subject to reverse bends.

(D) Wire rope passing over sheaves.

(iii) *Exception*: In the event an inspection under paragraph (c)(2) of this section is not feasible due to existing set-up and configuration of the equipment (such as where an assist crane is needed) or due to site conditions (such as a dense urban setting), such inspections must be conducted as soon as it becomes feasible, but no longer than an additional

6 months for running ropes and, for standing ropes, at the time of disassembly.

(3) If a deficiency is identified, an immediate determination must be made by the qualified person as to whether the deficiency constitutes a safety hazard.

(i) If the deficiency is determined to constitute a safety hazard, operations involving use of the wire rope in question must be prohibited until:

(A) The wire rope is replaced (see § 1926.1417), or

(B) If the deficiency is localized, the problem is corrected by severing the wire rope in two; the undamaged portion may continue to be used. Joining lengths of wire rope by splicing is prohibited. If a rope is shortened under this paragraph, the employer must ensure that the drum will still have two wraps of wire when the load and/or boom is in its lowest position.

(ii) If the qualified person determines that, though not presently a safety hazard, the deficiency needs to be monitored, the employer must ensure that the deficiency is checked in the monthly inspections.

(4) The inspection must be documented according to § 1926.1412(f)(7) (annual/comprehensive inspection documentation).

(d) Rope lubricants that are of the type that hinder inspection must not be used.

(e) All documents produced under this section must be available, during the applicable document retention period, to all persons who conduct inspections under this section.

§ 1926.1414 Wire rope – selection and installation criteria.

(a) Original equipment wire rope and replacement wire rope must be selected and installed in accordance with the requirements of this section. Selection of replacement wire rope must be in accordance with the recommendations of the wire rope manufacturer, the equipment manufacturer, or a qualified person.

(b) *Wire rope design criteria*: Wire rope (other than rotation resistant rope) must comply with either Option (1) or Option (2) of this section, as follows:

(1) *Option (1)*. Wire rope must comply with section 5-1.7.1 of ASME B30.5-2004 (incorporated by reference, see § 1926.6) except that section's paragraph (c) must not apply.

(2) *Option (2)*. Wire rope must be designed to have, in relation to the equipment's rated capacity, a sufficient minimum breaking force and design factor so that compliance with the applicable inspection provisions in § 1926.1413 will be an effective means of preventing sudden rope failure.

(c) Wire rope must be compatible with the safe functioning of the equipment.

(d) *Boom hoist reeving*.

(1) Fiber core ropes must not be used for boom hoist reeving, except for derricks.

(2) Rotation resistant ropes must be used for boom hoist reeving only where the requirements of paragraph (e)(4)(ii) of this section are met.

(e) *Rotation resistant ropes*.

(1) *Definitions*.

(i) *Type I rotation resistant wire rope (" Type I")*. Type I rotation resistant rope is stranded rope constructed to have little or no tendency to rotate or, if guided, transmits little or no torque. It has at least 15 outer

strands and comprises an assembly of at least three layers of strands laid helically over a center in two operations. The direction of lay of the outer strands is opposite to that of the underlying layer.

(ii) *Type II rotation resistant wire rope ("Type II")*. Type II rotation resistant rope is stranded rope constructed to have significant resistance to rotation. It has at least 10 outer strands and comprises an assembly of two or more layers of strands laid helically over a center in two or three operations. The direction of lay of the outer strands is opposite to that of the underlying layer.

(iii) *Type III rotation resistant wire rope ("Type III")*. Type III rotation resistant rope is stranded rope constructed to have limited resistance to rotation. It has no more than nine outer strands, and comprises an assembly of two layers of strands laid helically over a center in two operations. The direction of lay of the outer strands is opposite to that of the underlying layer.

(2) *Requirements*.

(i) Types II and III with an operating design factor of less than 5 must not be used for duty cycle or repetitive lifts.

(ii) Rotation resistant ropes (including Types I, II and III) must have an operating design factor of no less than 3.5.

(iii) Type I must have an operating design factor of no less than 5, except where the wire rope manufacturer and the equipment manufacturer approves the design factor, in writing.

(iv) Types II and III must have an operating design factor of no less than 5, except where the requirements of paragraph (e)(3) of this section are met.

(3) When Types II and III with an operating design factor of less than 5 are used (for non-duty cycle, non-repetitive lifts), the following requirements must be met for each lifting operation:

(i) A qualified person must inspect the rope in accordance with § 1926.1413(a). The rope must be used only if the qualified person determines that there are no deficiencies constituting a hazard. In making this determination, more than one broken wire in any one rope lay must be considered a hazard.

(ii) Operations must be conducted in such a manner and at such speeds as to minimize dynamic effects.

(iii) Each lift made under § 1926.1414(e)(3) must be recorded in the monthly and annual inspection documents. Such prior uses must be considered by the qualified person in determining whether to use the rope again.

(4) *Additional requirements for rotation resistant ropes for boom hoist reeving*.

(i) Rotation resistant ropes must not be used for boom hoist reeving, except where the requirements of paragraph (e)(4)(ii) of this section are met.

(ii) Rotation resistant ropes may be used as boom hoist reeving when load hoists are used as boom hoists for attachments such as luffing attachments

or boom and mast attachment systems. Under these conditions, all of the following requirements must be met:

(A) The drum must provide a first layer rope pitch diameter of not less than 18 times the nominal diameter of the rope used.

(B) The requirements in § 1926.1426(a) (irrespective of the date of manufacture of the equipment), and § 1926.1426(b).

(C) The requirements in ASME B30.5-2004 sections 5-1.3.2(a), (a)(2) through (a)(4), (b) and (d) (incorporated by reference, see § 1926.6) except that the minimum pitch diameter for sheaves used in multiple rope reeving is 18 times the nominal diameter of the rope used (instead of the value of 16 specified in section 5-1.3.2(d)).

(D) All sheaves used in the boom hoist reeving system must have a rope pitch diameter of not less than 18 times the nominal diameter of the rope used.

(E) The operating design factor for the boom hoist reeving system must be not less than five.

(F) The operating design factor for these ropes must be the total minimum breaking force of all parts of rope in the system divided by the load imposed on the rope system when supporting the static weights of the structure and the load within the equipment's rated capacity.

(G) When provided, a power-controlled lowering system must be capable of handling rated capacities and speeds as specified by the manufacturer.

(f) Wire rope clips used in conjunction with wedge sockets must be attached to the unloaded dead end of the rope only, except that the use of devices specifically designed for dead-ending rope in a wedge socket is permitted.

(g) Socketing must be done in the manner specified by the manufacturer of the wire rope or fitting.

(h) Prior to cutting a wire rope, seizings must be placed on each side of the point to be cut. The length and number of seizings must be in accordance with the wire rope manufacturer's instructions.

§ 1926.1415 Safety devices.

(a) *Safety devices*. The following safety devices are required on all equipment covered by this subpart, unless otherwise specified:

(1) *Crane level indicator*.

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

(ii) If a built-in crane level indicator is not working properly, it must be tagged-out or removed. If a removable crane level indicator is not working properly, it must be removed.

(iii) This requirement does not apply to portal cranes, derricks, floating cranes/derricks and land cranes/derricks on barges, pontoons, vessels or other means of flotation.

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

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

(4) Equipment with foot pedal brakes must have locks.

(5) Hydraulic outrigger jacks and hydraulic stabilizer 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*

(i) The equipment must have a horn that is either built into the equipment or is on the equipment and immediately available to the operator.

(ii) If a built-in horn is not working properly, it must be tagged-out or removed. If a removable horn is not working properly, it must be removed.

(b) *Proper operation required*. Operations must not begin unless all of the devices listed in this section are in proper working order. If a device stops working properly during operations, the operator must safely stop operations. If any of the devices listed in this section are not in proper working order, the equipment must be taken out of service and operations must not resume until the device is again working properly. See § 1926.1417 (Operation). Alternative measures are not permitted to be used.

§ 1926.1416 Operational aids.

(a) The devices listed in this section ("listed operational aids") are required on all equipment covered by this subpart, unless otherwise specified.

(1) The requirements in paragraphs (e)(1), (e)(2), and (e)(3) of this section do not apply to articulating cranes.

(2) The requirements in paragraphs (d)(3), (e)(1), and (e)(4) of this section apply only to those digger derricks manufactured after [INSERT DATE 1 YEAR AND 90 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER].

(b) Operations must not begin unless the listed operational aids are in proper working order, except where an operational aid is being repaired the employer uses the specified temporary alternative measures. The time periods permitted for repairing defective operational aids are specified in paragraphs (d) and (e) of this section. More protective alternative measures specified by the crane/derrick manufacturer, if any, must be followed.

(c) 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 under § 1926.1434.

(d) *Category I operational aids and alternative measures*. Operational aids listed in this paragraph that are not working properly must be repaired no later than 7 calendar days after the deficiency occurs. *Exception*: If the employer documents that it has ordered the necessary parts within 7 calendar days of the occurrence of the deficiency, the repair

must be completed within 7 calendar days of receipt of the parts. See § 1926.1417(j) for additional requirements.

(1) *Boom hoist limiting device*.

(i) For equipment manufactured after December 16, 1969, a boom hoist limiting device is required. *Temporary alternative measures (use at least one)*. One or more of the following methods must be used:

(A) Use a boom angle indicator.

(B) Clearly mark the boom hoist cable (so that it can easily be seen by the operator) at a point that will give the operator sufficient time to stop the hoist to keep the boom within the minimum allowable radius. In addition, install mirrors or remote video cameras and displays if necessary for the operator to see the mark.

(C) Clearly mark the boom hoist cable (so that it can easily be seen by a spotter) at a point that will give the spotter sufficient time to signal the operator and have the operator stop the hoist to keep the boom within the minimum allowable radius.

(ii) If the equipment was manufactured on or before December 16, 1969, and is not equipped with a boom hoist limiting device, at least one of the measures in paragraphs (d)(1)(i)(A) through (C) of this section must be used.

(2) *Luffing jib limiting device*. Equipment with a luffing jib must have a luffing jib limiting device. Temporary alternative measures are the same as in paragraph

(d)(1)(i) of this section, except to limit the movement of the luffing jib rather than the boom hoist.

(3) *Anti two-blocking device*.

(i) Telescopic boom cranes manufactured after February 28, 1992, must be equipped with a device which automatically prevents damage from contact between the load block, overhaul ball, or similar component, and the boom tip (or fixed upper block or similar component). The device(s) must prevent such damage at all points where two-blocking could occur. *Temporary alternative measures*: Clearly mark the cable (so that it can easily be seen by the operator) at a point that will give the operator sufficient time to stop the hoist to prevent two-blocking, and use a spotter when extending the boom.

(ii) *Lattice boom cranes*.

(A) Lattice boom cranes manufactured after Feb 28, 1992, must be equipped with a device that either automatically prevents damage and load failure from contact between the load block, overhaul ball, or similar component, and the boom tip (or fixed upper block or similar component), or warns the operator in time for the operator to prevent two-blocking. The device must prevent such damage/failure or provide adequate warning for all points where two-blocking could occur.

(B) Lattice boom cranes and derricks manufactured after [INSERT DATE 1 YEAR AND 90 DAYS AFTER DATE OF

PUBLICATION IN THE FEDERAL REGISTER] must be equipped with a device which automatically prevents damage and load failure from contact between the load block, overhaul ball, or similar component, and the boom tip (or fixed upper block or similar component). The device(s) must prevent such damage/failure at all points where two-blocking could occur.

(C) *Exception*. The requirements in paragraphs (d)(3)(ii)(A) and (B) of this section do not apply to such lattice boom equipment when used for dragline, clamshell (grapple), magnet, drop ball, container handling, concrete bucket, marine operations that do not involve hoisting personnel, and pile driving work.

(D) *Temporary alternative measures*. Clearly mark the cable (so that it can easily be seen by the operator) at a point that will give the operator sufficient time to stop the hoist to prevent two-blocking, or use a spotter.

(iii) Articulating cranes manufactured after December 31, 1999, that are equipped with a load hoist must be equipped with a device that automatically prevents damage from contact between the load block, overhaul ball, or similar component, and the boom tip (or fixed upper block or similar component). The device must prevent such damage at all points where two-blocking could occur. *Temporary alternative measures*: When two-blocking could only occur with movement of the load hoist, clearly mark the cable (so that it can easily be seen by the operator) at a

point that will give the operator sufficient time to stop the hoist to prevent two-blocking, or use a spotter. When two-blocking could occur without movement of the load hoist, clearly mark the cable (so that it can easily be seen by the operator) at a point that will give the operator sufficient time to stop the hoist to prevent two-blocking, and use a spotter when extending the boom.

(e) *Category II operational aids and alternative measures*. Operational aids listed in this paragraph that are not working properly must be repaired no later than 30 calendar days after the deficiency occurs. *Exception*: If the employer documents that it has ordered the necessary parts within 7 calendar days of the occurrence of the deficiency, and the part is not received in time to complete the repair in 30 calendar days, the repair must be completed within 7 calendar days of receipt of the parts. See § 1926.1417(j) for additional requirements.

(1) *Boom angle or radius indicator*. The equipment must have a boom angle or radius indicator readable from the operator's station. *Temporary alternative measures*: Radii or boom angle must be determined by measuring the radii or boom angle with a measuring device.

(2) Jib angle indicator if the equipment has a luffing jib. *Temporary alternative measures*: Radii or jib angle must be determined by ascertaining the main boom angle and then measuring the radii or jib angle with a measuring device.

(3) Boom length indicator if the equipment has a telescopic boom, except where the rated capacity is independent of the boom length. *Temporary alternative measures*. One or more of the following methods must be used:

(i) Mark the boom with measured marks to calculate boom length,

(ii) Calculate boom length from boom angle and radius measurements,

(iii) Measure the boom with a measuring device.

(4) *Load weighing and similar devices*.

(i) Equipment (other than derricks and articulating cranes) manufactured after March 29, 2003 with a rated capacity over 6,000 pounds must have at least one of the following: load weighing device, load moment (or rated capacity) indicator, or load moment (or rated capacity) limiter. *Temporary alternative measures*: The weight of the load must be determined from a source recognized by the industry (such as the load's manufacturer) or by a calculation method recognized by the industry (such as calculating a steel beam from measured dimensions and a known per foot weight). This information must be provided to the operator prior to the lift.

(ii) Articulating cranes manufactured after [INSERT DATE 1 YEAR AND 90 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER] must have at least one of the following: automatic overload prevention device, load weighing device, load moment (or rated capacity) indicator, or load moment (rated capacity) limiter. *Temporary alternative measures*: The weight of the load must be determined from a source recognized by the industry (such as the load's manufacturer) or by a calculation method recognized by the industry (such as calculating a steel beam from measured dimensions and a known per foot weight). This information must be provided to the operator prior to the lift.

(5) The following devices are required on equipment manufactured after [INSERT DATE 1 YEAR AND 90 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER]:

(i) Outrigger/stabilizer position (horizontal beam extension) sensor/monitor if the equipment has outriggers or stabilizers. *Temporary alternative measures*: the operator must verify that the position of the outriggers or stabilizers is correct (in accordance with manufacturer procedures) before beginning operations requiring outrigger or stabilizer deployment.

(ii) Hoist drum rotation indicator if the equipment has a hoist drum not visible from the operator's station. *Temporary alternative measures*: Mark the drum to indicate the rotation of the drum. In addition, install mirrors or remote video cameras and displays if necessary for the operator to see the mark.

§ 1926.1417 Operation.

(a) The employer must comply with all manufacturer procedures applicable to the operational functions of equipment, including its use with attachments.

(b) *Unavailable operation procedures*.

(1) Where the manufacturer procedures are unavailable, the employer must develop and ensure compliance with all procedures necessary for the safe operation of the equipment and attachments.

(2) Procedures for the operational controls must be developed by a qualified person.

(3) Procedures related to the capacity of the equipment must be developed and signed by a registered professional engineer familiar with the equipment.

(c) *Accessibility of procedures*.

(1) The procedures applicable to the operation of the equipment, including rated capacities (load charts), recommended operating speeds, special hazard warnings, instructions, and operator's manual, must be readily available in the cab at all times for use by the operator.

(2) Where rated capacities are available in the cab only in electronic form: in the event of a failure which makes the rated capacities inaccessible, the operator must immediately cease operations or follow safe shut-down procedures until the rated capacities (in electronic or other form) are available.

(d) The operator must not engage in any practice or activity that diverts his/her attention while actually engaged in operating the equipment, such as the use of cellular phones (other than when used for signal communications).

(e) *Leaving the equipment unattended*.

(1) The operator must not leave the controls while the load is suspended, except where all of the following are met:

(i) The operator remains adjacent to the equipment and is not engaged in any other duties.

(ii) The load is to be held suspended for a period of time exceeding normal lifting operations.

(iii) The competent person determines that it is safe to do so and implements measures necessary to restrain the boom hoist and telescoping, load, swing, and outrigger or stabilizer functions.

(iv) Barricades or caution lines, and notices, are erected to prevent all employees from entering the fall zone. No employees, including those listed in §§ 1926.1425(b)(1) through (3), § 1926.1425(d) or § 1926.1425(e), are permitted in the fall zone.

(2) The provisions in § 1926.1417(e)(1) do not apply to working gear (such as slings, spreader bars, ladders, and welding machines) where the weight of the working gear is negligible relative to the lifting capacity of the equipment as positioned, and the working gear is suspended over an area other than an entrance or exit.

(f) *Tag-out*.

(1) *Tagging out of service equipment/functions*. Where the employer has taken the equipment out of service, a tag must be placed in the cab stating that the equipment is out of service and is not to be used. Where the employer has taken a function(s) out of service, a tag must be placed in a conspicuous position stating that the function is out of service and is not to be used.

(2) *Response to "do not operate"/ tag-out signs*.

(i) If there is a warning (tag-out or maintenance/do not operate) sign on the equipment or starting control, the operator must not activate the switch or start the equipment until the sign has been removed by a person authorized to remove it, or until the operator has verified that:

(A) No one is servicing, working on, or otherwise in a dangerous position on the machine.

(B) The equipment has been repaired and is working properly.

(ii) If there is a warning (tag-out or maintenance/do not operate) sign on any other switch or control, the operator must not activate that switch or control until the sign has been removed by a person authorized to remove it, or until the operator has verified that the requirements in paragraphs (f)(2)(i)(A) and (B) of this section have been met.

(g) Before starting the engine, the operator must verify that all controls are in the proper starting position and that all personnel are in the clear.

(h) *Storm warning*. When a local storm warning has been issued, the competent person must determine whether it is necessary to implement manufacturer recommendations for securing the equipment.

(i) [*Reserved*.]

(j) If equipment adjustments or repairs are necessary:

(1) The operator must, in writing, promptly inform the person designated by the employer to receive such information and, where there are successive shifts, to the next operator; and

(2) The employer must notify all affected employees, at the beginning of each shift, of the necessary adjustments or repairs and all alternative measures.

(k) Safety devices and operational aids must not be used as a substitute for the exercise of professional judgment by the operator.

(l) [*Reserved*.]

(m) If the competent person determines that there is a slack rope condition requiring re-spooling of the rope, it must be verified (before starting to lift) that the rope is seated on the drum and in the sheaves as the slack is removed.

(n) The competent person must adjust the equipment and/or operations to address the effect of wind, ice, and snow on equipment stability and rated capacity.

(o) *Compliance with rated capacity*.

(1) The equipment must not be operated in excess of its rated capacity.

(2) The operator must not be required to operate the equipment in a manner that would violate paragraph (o)(1) of this section.

(3) *Load weight*. The operator must verify that the load is within the rated capacity of the equipment by at least one of the following methods:

(i) The weight of the load must be determined from a source recognized by the industry (such as the load's manufacturer), or by a calculation method recognized by the industry (such as calculating a steel beam from measured dimensions and a known per foot weight), or by other equally reliable means. In addition, when requested by the operator, this information must be provided to the operator prior to the lift; or

(ii) The operator must begin hoisting the load to determine, using a load weighing device, load moment indicator, rated capacity indicator, or rated capacity limiter, if it exceeds 75 percent of the maximum rated capacity at the longest radius that will be used during the lift operation. If it does, the operator must not proceed with the lift until he/she verifies the weight of the load in accordance with paragraph (o)(3)(i) of this section.

(p) The boom or other parts of the equipment must not contact any obstruction.

(q) The equipment must not be used to drag or pull loads sideways.

(r) On wheel-mounted equipment, no loads must be lifted over the front area, except as permitted by the manufacturer.

(s) The operator must test the brakes each time a load that is 90% or more of the maximum line pull is handled by lifting the load a few inches and applying the brakes. In duty cycle and repetitive lifts where each lift is 90% or more of the maximum line pull, this requirement applies to the first lift but not to successive lifts.

(t) Neither the load nor the boom must be lowered below the point where less than two full wraps of rope remain on their respective drums.

(u) *Traveling with a load*.

(1) Traveling with a load is prohibited if the practice is prohibited by the manufacturer.

(2) Where traveling with a load, the employer must ensure that:

(i) A competent person supervises the operation, determines if it is necessary to reduce rated capacity, and makes determinations regarding load position, boom location, ground support, travel route, overhead obstructions, and speed of movement necessary to ensure safety.

(ii) The determinations of the competent person required in paragraph (u)(2)(i) of this section are implemented.

(iii) For equipment with tires, tire pressure specified by the manufacturer is maintained.

(v) Rotational speed of the equipment must be such that the load does not swing out beyond the radius at which it can be controlled.

(w) A tag or restraint line must be used if necessary to prevent rotation of the load that would be hazardous.

(x) The brakes must be adjusted in accordance with manufacturer procedures to prevent unintended movement.

(y) The operator must obey a stop (or emergency stop) signal, irrespective of who gives it.

(z) *Swinging locomotive cranes*. A locomotive crane must not be swung into a position where railway cars on an adjacent track could strike it, until it is determined that cars are not being moved on the adjacent track and that proper flag protection has been established.

(aa) *Counterweight/ballast*.

(1) The following applies to equipment other than tower cranes:

(i) Equipment must not be operated without the counterweight or ballast in place as specified by the manufacturer.

(ii) The maximum counterweight or ballast specified by the manufacturer for the equipment must not be exceeded.

(2) Counterweight/ballast requirements for tower cranes are specified in § 1926.1435(b)(8).

§ 1926.1418 Authority to stop operation.

Whenever there is a concern as to safety, the operator must have the authority to stop and refuse to handle loads until a qualified person has determined that safety has been assured.

§ 1926.1419 Signals – general requirements.

(a) A signal person must be provided in each of the following situations:

(1) The point of operation, meaning the load travel or the area near or at load placement, is not in full view of the operator.

(2) When the equipment is traveling, the view in the direction of travel is obstructed.

(3) Due to site specific safety concerns, either the operator or the person handling the load determines that it is necessary.

(b) *Types of signals*. Signals to operators must be by hand, voice, audible, or new signals.

(c) *Hand signals*.

(1) When using hand signals, the Standard Method must be used (see Appendix A of this subpart). *Exception*: Where use of the Standard Method for hand signals is infeasible, or where an operation or use of an attachment is not covered in the Standard Method, non-standard hand signals may be used in accordance with paragraph (c)(2) of this section.

(2) *Non-standard hand signals*. When using non-standard hand signals, the signal person, operator, and lift director (where there is one) must contact each

other prior to the operation and agree on the non-standard hand signals that will be used.

(d) *New signals*. Signals other than hand, voice, or audible signals may be used where the employer demonstrates that:

(1) The new signals provide at least equally effective communication as voice, audible, or Standard Method hand signals, or

(2) The new signals comply with a national consensus standard that provides at least equally effective communication as voice, audible, or Standard Method hand signals.

(e) *Suitability*. The signals used (hand, voice, audible, or new), and means of transmitting the signals to the operator (such as direct line of sight, video, radio, etc.), must be appropriate for the site conditions.

(f) During 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 it is reestablished and a proper signal is given and understood.

(g) If the operator becomes aware of a safety problem and needs to communicate with the signal person, the operator must safely stop operations. Operations must not resume until the operator and signal person agree that the problem has been resolved.

(h) Only one person may give signals to a crane/derrick at a time, except in circumstances covered by paragraph (j) of this section.

(i) [*Reserved*.]

(j) Anyone who becomes aware of a safety problem must alert the operator or signal person by giving the stop or emergency stop signal. (NOTE: § 1926.1417(y) requires the operator to obey a stop or emergency stop signal).

(k) All directions given to the operator by the signal person must be given from the operator's direction perspective.

(l) [*Reserved*.]

(m) *Communication with multiple cranes/derricks*. Where a signal person(s) is in communication with more than one crane/derrick, a system must be used for identifying the crane/derrick each signal is for, as follows:

(1) for each signal, prior to giving the function/direction, the signal person must identify the crane/derrick the signal is for, or

(2) must use an equally effective method of identifying which crane/derrick the signal is for.

§ 1926.1420 Signals – radio, telephone or other electronic transmission of signals.

(a) The device(s) used to transmit signals must be tested on site before beginning operations to ensure that the signal transmission is effective, clear, and reliable.

(b) Signal transmission must be through a dedicated channel, except:

(1) Multiple cranes/derricks and one or more signal persons may share a dedicated channel for the purpose of coordinating operations.

(2) Where a crane is being operated on or adjacent to railroad tracks, and the actions of the crane operator need to be coordinated with the movement of other equipment or trains on the same or adjacent tracks.

(c) The operator's reception of signals must be by a hands-free system.

§ 1926.1421 Signals – voice signals – additional requirements.

(a) Prior to beginning operations, the operator, signal person and lift director (if there is one), must contact each other and agree on the voice signals that will be used. Once the voice signals are agreed upon, these workers need not meet again to discuss voice signals unless another worker is added or substituted, there is confusion about the voice signals, or a voice signal is to be changed.

(b) Each voice signal must contain the following three elements, given in the following order: function (such as hoist, boom, etc.), direction; distance and/or speed; function, stop command.

(c) The operator, signal person and lift director (if there is one), must be able to effectively communicate in the language used.

§ 1926.1422 Signals – hand signal chart.

Hand signal charts must be either posted on the equipment or conspicuously posted in the vicinity of the hoisting operations.

§ 1926.1423 Fall protection.

(a) *Application*.

(1) Paragraphs (b), (c)(3), (e) and (f) of this section apply to all equipment covered by this subpart except tower cranes.

(2) Paragraphs (c)(1), (c)(2), (d), (g), (j) and (k) of this section apply to all equipment covered by this subpart.

(3) Paragraphs (c)(4) and (h) of this section apply only to tower cranes.

(b) *Boom walkways*.

(1) Equipment manufactured after [INSERT DATE 1 YEAR AND 90 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER] with lattice booms must be equipped with walkways on the boom(s) if the vertical profile of the boom (from cord centerline to cord centerline) is 6 or more feet.

(2) *Boom walkway criteria*.

(i) The walkways must be at least 12 inches wide.

(ii) Guardrails, railings and other permanent fall protection attachments along walkways are:

(A) Not required.

(B) Prohibited on booms supported by pendant ropes or bars if the guardrails/railings/attachments could be snagged by the ropes or bars.

(C) Prohibited if of the removable type (designed to be installed and removed each time the boom is assembled/disassembled).

(D) Where not prohibited, guardrails or railings may be of any height up to, but not more than, 45 inches.

(c) *Steps, handholds, ladders, grabrails, guardrails and railings*.

(1) Section 1926.502(b) does not apply to equipment covered by this subpart.

(2) The employer must maintain in good condition originally-equipped steps, handholds, ladders and guardrails/railings/grabrails.

(3) Equipment manufactured after [INSERT DATE 1 YEAR AND 90 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER] must be equipped so as to provide safe access and egress between the ground and the operator work station(s), including the forward and rear positions, by the provision of devices such as steps, handholds, ladders, and guardrails /railings/grabrails. These devices must meet the following criteria:

(i) Steps, handholds, ladders and guardrails/railings/grabrails must meet the criteria of SAE J185 (May 2003) (incorporated by reference, see § 1926.6) or ISO 11660-2:1994(E) (incorporated by reference, see § 1926.6) except where infeasible.

(ii) Walking/stepping surfaces, except for crawler treads, must have slip-resistant features/properties (such as diamond plate metal, strategically placed grip tape, expanded metal, or slip-resistant paint).

(4) Tower cranes manufactured after [INSERT DATE 1 YEAR AND 90 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER] must be equipped so as to provide safe access and egress between the ground and the cab, machinery platforms, and tower (mast), by the provision of devices such as steps, handholds, ladders, and guardrails/railings/grabrails. These devices must meet the following criteria:

(i) Steps, handholds, ladders, and guardrails/railings/grabrails must meet the criteria of ISO 11660-1:2008(E) (incorporated by reference, see §

1926.6) and ISO 11660-3:2008(E) (incorporated by reference, see § 1926.6) or SAE J185 (May 2003) (incorporated by reference, see § 1926.6) except where infeasible.

(ii) Walking/stepping surfaces must have slip-resistant features/properties (such as diamond plate metal, strategically placed grip tape, expanded metal, or slip-resistant paint).

(d) *Personal fall arrest and fall restraint systems*. Personal fall arrest system components must be used in personal fall arrest and fall restraint systems and must conform to the criteria in § 1926.502(d) except that § 1926.502(d)(15) does not apply to components used in personal fall arrest and fall restraint systems. Either body belts or body harnesses must be used in personal fall arrest and fall restraint systems.

(e) For non-assembly/disassembly work, the employer must provide and ensure the use of fall protection equipment for employees who are on a walking/working surface with an unprotected side or edge more than 6 feet above a lower level as follows:

(1) When moving point-to-point:

(i) On non-lattice booms (whether horizontal or not horizontal).

(ii) On lattice booms that are not horizontal.

(iii) On horizontal lattice booms where the fall distance is 15 feet or more.

(2) While at a work station on any part of the equipment (including the boom, of any type), except when the employee is at or near draw-works (when the equipment is running), in the cab, or on the deck.

(f) For assembly/disassembly work, the employer must provide and ensure the use of fall protection equipment for employees who are on a walking/working surface with an

unprotected side or edge more than 15 feet above a lower level, except when the employee is at or near draw-works (when the equipment is running), in the cab, or on the deck.

(g) *Anchorage criteria*.

(1) Sections 1926.502(d)(15) and 1926.502(e)(2) apply to equipment covered by this subpart only to the extent delineated in paragraph (g)(2) of this section.

(2) *Anchorages for personal fall arrest and positioning device systems*.

(i) Personal fall arrest systems must be anchored to any apparently substantial part of the equipment unless a competent person, from a visual inspection, without an engineering analysis, would conclude that the criteria in § 1926.502(d)(15) would not be met.

(ii) Positioning device systems must be anchored to any apparently substantial part of the equipment unless a competent person, from a visual inspection, without an engineering analysis, would conclude that the criteria in § 1926.502(e)(2) would not be met.

(iii) Attachable anchor devices (portable anchor devices that are attached to the equipment) must meet the anchorage criteria in § 1926.502(d)(15) for personal fall arrest systems and § 1926.502(e)(2) for positioning device systems.

(3) *Anchorages for fall restraint systems*. Fall restraint systems must be anchored to any part of the equipment that is capable of withstanding twice the maximum load that an employee may impose on it during reasonably anticipated conditions of use.

(h) *Tower cranes*.

(1) For work other than erecting, climbing, and dismantling, the employer must provide and ensure the use of fall protection equipment for employees who are on a walking/working surface with an unprotected side or edge more than 6 feet above a lower level, except when the employee is at or near draw-works (when the equipment is running), in the cab, or on the deck.

(2) For erecting, climbing, and dismantling work, the employer must provide and ensure the use of fall protection equipment for employees who are on a walking/working surface with an unprotected side or edge more than 15 feet above a lower level.

(i) [*Reserved*.]

(j) *Anchoring to the load line*. A personal fall arrest system is permitted to be anchored to the crane/derrick's hook (or other part of the load line) where all of the following requirements are met:

(1) A qualified person has determined that the set-up and rated capacity of the crane/derrick (including the hook, load line and rigging) meets or exceeds the requirements in § 1926.502(d)(15).

(2) The equipment operator must be at the work site and informed that the equipment is being used for this purpose.

(3) No load is suspended from the load line when the personal fall arrest system is anchored to the crane/derrick's hook (or other part of the load line).

(k) *Training*. The employer must train each employee who may be exposed to fall hazards while on, or hoisted by, equipment covered by this subpart on all of the following:

(1) the requirements in this subpart that address fall protection.

(2) the applicable requirements in §§ 1926.500 and 1926.502.

§ 1926.1424 Work area control.

(a) *Swing radius hazards*.

(1) The requirements in paragraph (a)(2) of this section apply where there are accessible areas in which the equipment's rotating superstructure (whether permanently or temporarily mounted) poses a reasonably foreseeable risk of:

(i) Striking and injuring an employee; or

(ii) Pinching/crushing an employee against another part of the equipment or another object.

(2) To prevent employees from entering these hazard areas, the employer must:

(i) Train each employee assigned to work on or near the equipment ("authorized personnel") in how to recognize struck-by and pinch/crush hazard areas posed by the rotating superstructure.

(ii) Erect and maintain control lines, warning lines, railings or similar barriers to mark the boundaries of the hazard areas. *Exception*: When the employer can demonstrate that it is neither feasible to erect such barriers on the ground nor on the equipment, the hazard areas must be clearly marked by a combination of warning signs (such as "Danger –

Swing/Crush Zone") and high visibility markings on the equipment that identify the hazard areas. In addition, the employer must train each employee to understand what these markings signify.

(3) *Protecting employees in the hazard area*.

(i) Before an employee goes to a location in the hazard area that is out of view of the operator, the employee (or someone instructed by the employee) must ensure that the operator is informed that he/she is going to that location.

(ii) Where the operator knows that an employee went to a location covered by paragraph (a)(1) of this section, the operator must not rotate the superstructure until the operator is informed in accordance with a pre-arranged system of communication that the employee is in a safe position.

(b) Where any part of a crane/derrick is within the working radius of another crane/derrick, the controlling entity must institute a system to coordinate operations. If there is no controlling entity, the employer (if there is only one employer operating the multiple pieces of equipment), or employers, must institute such a system.

§ 1926.1425 Keeping clear of the load.

(a) Where available, hoisting routes that minimize the exposure of employees to hoisted loads must be used, to the extent consistent with public safety.

(b) While the operator is not moving a suspended load, no employee must be within the fall zone, except for employees:

(1) Engaged in hooking, unhooking or guiding a load;

(2) Engaged in the initial attachment of the load to a component or structure; or

(3) Operating a concrete hopper or concrete bucket.

(c) When employees are engaged in hooking, unhooking, or guiding the load, or in the initial connection of a load to a component or structure and are within the fall zone, all of the following criteria must be met:

(1) The materials being hoisted must be rigged to prevent unintentional displacement.

(2) Hooks with self-closing latches or their equivalent must be used. *Exception*: "J" hooks are permitted to be used for setting wooden trusses.

(3) The materials must be rigged by a qualified rigger.

(d) *Receiving a load*. Only employees needed to receive a load are permitted to be within the fall zone when a load is being landed.

(e) During a tilt-up or tilt-down operation:

(1) No employee must be directly under the load.

(2) Only employees essential to the operation are permitted in the fall zone (but not directly under the load). An employee is essential to the operation if the employee is conducting one of the following operations and the employer can demonstrate it is infeasible for the employee to perform that operation from outside the fall zone: (1) physically guide the load; (2) closely monitor and give instructions regarding the load's movement; or (3) either detach it from or initially attach it to another component or structure (such as, but not limited to, making an initial connection or installing bracing).

NOTE: Boom free fall is prohibited when an employee is in the fall zone of the boom or load, and load line free fall is prohibited when an employee is directly under the load; see § 1926.1426.

§ 1926.1426 Free fall and controlled load lowering.

(a) *Boom free fall prohibitions*.

(1) The use of equipment in which the boom is designed to free fall (live boom) is prohibited in each of the following circumstances:

(i) An employee is in the fall zone of the boom or load.

(ii) An employee is being hoisted.

(iii) The load or boom is directly over a power line, or over any part of the area extending the Table A of § 1926.1408 clearance distance to each side of the power line; or any part of the area extending the Table A clearance distance to each side of the power line is within the radius of vertical travel of the boom or the load.

(iv) The load is over a shaft, except where there are no employees in the shaft.

(v) The load is over a cofferdam, except where there are no employees in the fall zone of the boom or the load.

(vi) Lifting operations are taking place in a refinery or tank farm.

(2) The use of equipment in which the boom is designed to free fall (live boom) is permitted only where none of the circumstances listed in paragraph (a)(1) of this section are present and:

(i) The equipment was manufactured prior to October 31, 1984; or

(ii) The equipment is a floating crane/derrick or a land crane/derrick on a vessel/flotation device.

(b) *Preventing boom free fall*. Where the use of equipment with a boom that is designed to free fall (live boom) is prohibited, the boom hoist must have a secondary mechanism or device designed to prevent the boom from falling in the event the primary system used to hold or regulate the boom hoist fails, as follows:

(1) Friction drums must have:

(i) A friction clutch and, in addition, a braking device, to allow for controlled boom lowering.

(ii) A secondary braking or locking device, which is manually or automatically engaged, to back-up the primary brake while the boom is held (such as a secondary friction brake or a ratchet and pawl device).

(2) Hydraulic drums must have an integrally mounted holding device or internal static brake to prevent boom hoist movement in the event of hydraulic failure.

(3) Neither clutches nor hydraulic motors must be considered brake or locking devices for purposes of this subpart.

(4) Hydraulic boom cylinders must have an integrally mounted holding device.

(c) *Preventing uncontrolled retraction*. Hydraulic telescoping booms must have an integrally mounted holding device to prevent the boom from retracting in the event of hydraulic failure.

(d) *Load line free fall*. In each of the following circumstances, controlled load lowering is required and free fall of the load line hoist is prohibited:

(1) An employee is directly under the load.

(2) An employee is being hoisted.

(3) The load is directly over a power line, or over any part of the area extending the Table A of § 1926.1408 clearance distance to each side of the power line; or any part of the area extending the Table A of § 1926.1408 clearance distance to each side of the power line is within the radius of vertical travel of the load.

(4) The load is over a shaft.

(5) The load is over a cofferdam, except where there are no employees in the fall zone of the load.

§ 1926.1427 Operator qualification and certification.

(a) The employer must ensure that, prior to operating any equipment covered under subpart CC, the person is operating the equipment during a training period in accordance with paragraph (f) of this section, or the operator is qualified or certified to operate the equipment in accordance with the following:

(1) When a non-military government entity issues operator licenses for equipment covered under subpart CC, and that government licensing program meets the requirements of paragraphs (e)(2) and (j) of this section, the equipment operator must either be:

(i) licensed by that government entity for operation of equipment within that entity's jurisdiction; or

(ii) qualified in compliance with paragraph (d) of this section.

(2) Where paragraph (a)(1) of this section is not applicable, the certification or qualification must comply with one of the options in paragraphs (b) through (d) of this section.

(3) Exceptions: Operator qualification or certification under this section is not required for operators of derricks (see § 1926.1436), sideboom cranes (see § 1926.1440), or equipment with a maximum manufacturer-rated hoisting/lifting capacity of 2,000 pounds or less (see § 1926.1441).

(4) Whenever operator qualification or certification is required under § 1926.1427, the employer must provide the qualification or certification at no cost to operators who are employed by the employer on [INSERT DATE 90 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER].

(b) *Option (1): Certification by an accredited crane operator testing organization*.

(1) For a testing organization to be considered accredited to certify operators under this subpart, it must:

(i) Be accredited by a nationally recognized accrediting agency based on that agency's determination that industry recognized criteria for written testing materials, practical examinations, test administration, grading, facilities/equipment and personnel have been met.

(ii) Administer written and practical tests that:

(A) Assess the operator applicant regarding, at a minimum, the knowledge and skills listed in paragraphs (j)(1) and (2) of this section.

(B) Provide different levels of certification based on equipment capacity and type.

(iii) Have procedures for operators to re-apply and be re-tested in the event an operator applicant fails a test or is decertified.

(iv) Have testing procedures for re-certification designed to ensure that the operator continues to meet the technical knowledge and skills requirements in paragraphs (j)(1) and (2) of this section.

(v) Have its accreditation reviewed by the nationally recognized accrediting agency at least every three years.

(2) An operator will be deemed qualified to operate a particular piece of equipment if the operator is certified under paragraph (b) of this section for that type and capacity of equipment or for higher-capacity equipment of that type. If no accredited testing agency offers certification examinations for a particular type and/or capacity of equipment, an operator will be deemed qualified to operate that equipment if the operator has been certified for the type/capacity that is most similar to that equipment and for which a certification examination is available. The operator's certificate must state the type/capacity of equipment for which the operator is certified.

(3) A certification issued under this option is portable and meets the requirements of paragraph (a)(2) of this section.

(4) A certification issued under this paragraph is valid for 5 years.

(c) *Option (2): Qualification by an audited employer program*. The employer's qualification of its employee must meet the following requirements:

(1) The written and practical tests must be either:

(i) Developed by an accredited crane operator testing organization (see paragraph (b) of this section); or

(ii) Approved by an auditor in accordance with the following requirements:

(A) The auditor is certified to evaluate such tests by an accredited crane operator testing organization (see paragraph (b) of this section).

(B) The auditor is not an employee of the employer.

(C) The approval must be based on the auditor's determination that the written and practical tests meet nationally recognized test development criteria and are valid and reliable in assessing the operator applicants regarding, at a minimum, the knowledge and skills listed in paragraphs (j)(1) and (2) of this section.

(D) The audit must be conducted in accordance with nationally recognized auditing standards.

(2) *Administration of tests*.

(i) The written and practical tests must be administered under circumstances approved by the auditor as meeting nationally recognized test administration standards.

(ii) The auditor must be certified to evaluate the administration of the written and practical tests by an accredited crane operator testing organization (see paragraph (b) of this section).

(iii) The auditor must not be an employee of the employer.

(iv) The audit must be conducted in accordance with nationally recognized auditing standards.

(3) The employer program must be audited within 3 months of the beginning of the program and at least every 3 years thereafter.

(4) The employer program must have testing procedures for re-qualification designed to ensure that the operator continues to meet the technical knowledge and skills requirements in paragraphs (j)(1) and (2) of this section. The re-qualification procedures must be audited in accordance with paragraphs (c)(1) and (2) of this section.

(5) *Deficiencies*. If the auditor determines that there is a significant deficiency ("deficiency") in the program, the employer must ensure that:

(i) No operator is qualified until the auditor confirms that the deficiency has been corrected.

(ii) The program is audited again within 180 days of the confirmation that the deficiency was corrected.

(iii) The auditor files a documented report of the deficiency to the appropriate Regional Office of the Occupational Safety and Health Administration within 15 days of the auditor's determination that there is a deficiency.

(iv) Records of the audits of the employer's program are maintained by the auditor for three years and are made available by the auditor to the

Secretary of Labor or the Secretary's designated representative upon request.

(6) A qualification under this paragraph is:

(i) Not portable. Such a qualification meets the requirements of paragraph (a) of this section only where the operator is employed by (and operating the equipment for) the employer that issued the qualification.

(ii) Valid for 5 years.

(d) *Option (3): Qualification by the U.S. military*.

(1) For purposes of this section, an operator who is an employee of the U.S. military is considered qualified if he/she has a current operator qualification issued by the U.S. military for operation of the equipment. An employee of the U.S. military is a federal employee of the Department of Defense or Armed Forces and does not include employees of private contractors.

(2) A qualification under this paragraph is:

(i) Not portable. Such a qualification meets the requirements of paragraph (a) of this section only where the operator is employed by (and operating the equipment for) the employer that issued the qualification.

(ii) Valid for the period of time stipulated by the issuing entity.

(e) *Option (4): Licensing by a government entity*.

(1) For purposes of this section, a government licensing department/office that issues operator licenses for operating equipment covered by this standard is considered a government accredited crane operator testing organization if the criteria in paragraph (e)(2) of this section are met.

(2) *Licensing criteria*.

(i) The requirements for obtaining the license include an assessment, by written and practical tests, of the operator applicant regarding, at a minimum, the knowledge and skills listed in paragraphs (j)(1) and (2) of this section.

(ii) The testing meets industry recognized criteria for written testing materials, practical examinations, test administration, grading, facilities/equipment and personnel.

(iii) The government authority that oversees the licensing department/office, has determined that the requirements in paragraphs (e)(2)(i) and (ii) of this section have been met.

(iv) The licensing department/office has testing procedures for re-licensing designed to ensure that the operator continues to meet the technical knowledge and skills requirements in paragraphs (j)(1) and (2) of this section.

(3) A license issued by a government accredited crane operator testing organization that meets the requirements of this option:

(i) Meets the operator qualification requirements of this section for operation of equipment only within the jurisdiction of the government entity.

(ii) Is valid for the period of time stipulated by the licensing department/office, but no longer than 5 years.

(f) *Pre-qualification/certification training period*. An employee who is not qualified or certified under this section is permitted to operate equipment only as an operator-in-training and only where the requirements of this paragraph are met.

(1) The employer must provide each operator-in-training with sufficient training prior to operating the equipment to enable the operator-in-training to operate the equipment safely under limitations established by this section (including continuous monitoring) and any additional limitations established by the employer.

(2) The tasks performed by the operator-in-training while operating the equipment must be within the operator-in-training's ability.

(3) *Trainer*. While operating the equipment, the operator-in-training must be continuously monitored by an individual ("operator's trainer") who meets all of the following requirements:

(i) The operator's trainer is an employee or agent of the operator-in-training's employer.

(ii) The operator's trainer is either a certified operator under this section, or has passed the written portion of a certification test under one of the options in paragraphs (b) through (e) of this section, and is familiar with the proper use of the equipment's controls.

(iii) While monitoring the operator-in-training, the operator's trainer performs no tasks that detract from the trainer's ability to monitor the operator-in-training.

(iv) For equipment other than tower cranes: the operator's trainer and the operator-in-training must be in direct line of sight of each other. In addition, they must communicate verbally or by hand signals. For tower cranes: the operator's trainer and the operator-in-training must be in direct communication with each other.

(4) *Continuous monitoring*. The operator-in-training must be monitored by the operator's trainer at all times, except for short breaks where all of the following are met:

(i) The break lasts no longer than 15 minutes and there is no more than one break per hour.

(ii) Immediately prior to the break the operator's trainer informs the operator-in-training of the specific tasks that the operator-in-training is to perform and limitations to which he/she must adhere during the operator trainer's break.

(iii) The specific tasks that the operator-in-training will perform during the operator trainer's break are within the operator-in-training's abilities.

(5) The operator-in-training must not operate the equipment in any of the following circumstances unless the exception stated in paragraph (f)(5)(v) of this section is applicable:

(i) If any part of the equipment, load line or load (including rigging and lifting accessories), if operated up to the equipment's maximum working radius in the work zone (see § 1926.1408(a)(1)), could get within 20 feet

of a power line that is up to 350 kV, or within 50 feet of a power line that is over 350 kV.

(ii) If the equipment is used to hoist personnel.

(iii) In multiple-equipment lifts.

(iv) If the equipment is used over a shaft, cofferdam, or in a tank farm.

(v) In multiple-lift rigging operations, except where the operator's trainer determines that the operator-in-training skills are sufficient for this high-skill work.

(g) Under this section, a testing entity is permitted to provide training as well as testing services as long as the criteria of the applicable accrediting agency (in the option selected) for an organization providing both services are met.

(h) *Language and Literacy Requirements*.

(1) Tests under this section may be administered verbally, with answers given verbally, where the operator candidate:

(i) Passes a written demonstration of literacy relevant to the work.

(ii) Demonstrates the ability to use the type of written manufacturer procedures applicable to the class/type of equipment for which the candidate is seeking certification.

(2) Tests under this section may be administered in any language the operator candidate understands, and the operator's certificate must note the language in which the test was given. The operator is qualified under paragraph (b)(2) of this section to operate equipment that is furnished with materials required by this

subpart that are written in the language of the certification. The operator may only operate equipment furnished with such materials.

(i) [*Reserved*.]

(j) *Certification criteria*. Qualifications and certifications must be based, at a minimum, on the following:

(1) A determination through a written test that:

(i) The individual knows the information necessary for safe operation of the specific type of equipment the individual will operate, including all of the following:

(A) The controls and operational/performance characteristics.

(B) Use of, and the ability to calculate (manually or with a calculator), load/capacity information on a variety of configurations of the equipment.

(C) Procedures for preventing and responding to power line contact.

(D) Technical knowledge similar to the subject matter criteria listed in Appendix C of this subpart applicable to the specific type of equipment the individual will operate. Use of the Appendix C criteria meets the requirements of this provision.

(E) Technical knowledge applicable to:

(1) The suitability of the supporting ground and surface to handle expected loads.

(2) Site hazards.

(3) Site access.

(F) This subpart, including applicable incorporated materials.

(ii) The individual is able to read and locate relevant information in the equipment manual and other materials containing information referred to in paragraph (j)(1)(i) of this section.

(2) A determination through a practical test that the individual has the skills necessary for safe operation of the equipment, including the following:

(i) Ability to recognize, from visual and auditory observation, the items listed in § 1926.1412(d) (shift inspection).

(ii) Operational and maneuvering skills.

(iii) Application of load chart information.

(iv) Application of safe shut-down and securing procedures.

(k) *Phase-in*.

(1) The provisions of this section are applicable [INSERT DATE 90 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER], except for paragraphs (a)(2) and (f) which are applicable [INSERT DATE 4 YEARS AND 90 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER].

(2) When § 1926.1427(a)(1) is not applicable, all of the requirements in paragraphs (k)(2)(i) and (ii) of this section apply until [INSERT DATE 4 YEARS AND 90 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER]:

(i) The employer must ensure that operators of equipment covered by this standard are competent to operate the equipment safely.

(ii) Where an employee assigned to operate machinery does not have the required knowledge or ability to operate the equipment safely, the employer must train that employee prior to operating the equipment. The employer must ensure that each operator is evaluated to confirm that he/she understands the information provided in the training.

§ 1926.1428 Signal person qualifications.

(a) The employer of the signal person must ensure that each signal person meets the Qualification Requirements (paragraph (c) of this section) prior to giving any signals. This requirement must be met by using either Option (1) or Option (2) of this section.

(1) *Option (1) – Third party qualified evaluator*. The signal person has documentation from a third party qualified evaluator (see Qualified Evaluator (third party), § 1926.1401 for definition) showing that the signal person meets the Qualification Requirements (see paragraph (c) of this section).

(2) *Option (2) – Employer's qualified evaluator*. The employer's qualified (see Qualified Evaluator (not a third party), § 1926.1401 for definition) evaluator assesses the individual and determines that the individual meets the Qualification Requirements (see paragraph (c) of this section) and provides documentation of that determination. An assessment by an employer's qualified evaluator under this option is not

portable – other employers are not permitted to use it to meet the requirements of this section.

(3) The employer must make the documentation for whichever option is used available at the site while the signal person is employed by the employer. The documentation must specify each type of signaling (e.g. hand signals, radio signals, etc.) for which the signal person meets the requirements of paragraph (c) of this section.

(b) If subsequent actions by the signal person indicate that the individual does not meet the Qualification Requirements (see paragraph (c) of this section), the employer must not allow the individual to continue working as a signal person until re-training is provided and a re-assessment is made in accordance with paragraph (a) of this section that confirms that the individual meets the Qualification Requirements.

(c) *Qualification Requirements*. Each signal person must:

(1) Know and understand the type of signals used. If hand signals are used, the signal person must know and understand the Standard Method for hand signals.

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

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

(4) Know and understand the relevant requirements of § 1926.1419 through § 1926.1422 and § 1926.1428.

(5) Demonstrate that he/she meets the requirements in paragraphs (c)(1) through (4) of this section through an oral or written test, and through a practical test.

§ 1926.1429 Qualifications of maintenance & repair employees.

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

(1) The operation is limited to those functions necessary to perform maintenance, inspect the equipment, or verify its performance.

(2) The personnel either:

(i) Operate the equipment under the direct supervision of an operator who meets the requirements of § 1926.1427 (Operator qualification and certification); or

(ii) Are familiar with the operation, limitations, characteristics and hazards associated with the type of equipment.

(b) Maintenance and repair personnel must meet the definition of a qualified person with respect to the equipment and maintenance/repair tasks performed.

§ 1926.1430 Training.

The employer must provide training as follows:

(a) *Overhead powerlines*. The employer must train each employee specified in § 1926.1408(g) and § 1926.1410(m) in the topics listed in § 1926.1408(g).

(b) *Signal persons*. The employer must train each employee who will be assigned to work as a signal persons who does not meet the requirements of § 1926.1428(c) in the areas addressed in that paragraph.

(c) *Operators*.

(1) *Operators-in-Training for equipment where certification or qualification is required by this subpart*. The employer must train each operator-in-training in the areas addressed in § 1926.1427(j). The employer must provide re-training if the operator-in-training does not pass a qualification or certification test.

(2) *Transitional Period*. During the four-year phase-in period for operator certification or qualification, as provided in § 1926.1427(k), employers must train each operator who has not yet been certified or qualified in the areas addressed in § 1926.1427(j).

(3) *Operators excepted from the requirements of § 1926.1427*. The employer must train each operator excepted under § 1926.1427(a) from the requirements of § 1926.1427 on the safe operation of the equipment the operator will be using.

(4) The employer must train each operator of the equipment covered by this subpart in the following practices:

(i) On friction equipment, whenever moving a boom off a support, first raise the boom a short distance (sufficient to take the load of the boom) to determine if the boom hoist brake needs to be adjusted. On other types of equipment with a boom, the same practice is applicable, except that typically there is no means of adjusting the brake; if the brake does not hold, a repair is necessary. See § 1926.1417(f) and (j) for additional requirements.

(ii) Where available, the manufacturer's emergency procedures for halting unintended equipment movement.

(d) *Competent persons and qualified persons*. The employer must train each competent person and each qualified person regarding the requirements of this subpart applicable to their respective roles.

(e) *Crush/pinch points*. The employer must train each employee who works with the equipment to keep clear of holes, and crush/pinch points and the hazards addressed in § 1926.1424 (Work area control).

(f) *Tag-out*. The employer must train each operator and each additional employee authorized to start/energize equipment or operate equipment controls (such as maintenance and repair employees), in the tag-out and start-up procedures in §§ 1926.1417(f) and (g).

(g) *Training administration*.

(1) The employer must evaluate each employee required to be trained under this subpart to confirm that the employee understands the information provided in the training.

(2) The employer must provide refresher training in relevant topics for each employee when, based on the conduct of the employee or an evaluation of the employee's knowledge, there is an indication that retraining is necessary.

(3) Whenever training is required under subpart CC, the employer must provide the training at no cost to the employee.

§ 1926.1431 Hoisting personnel.

The requirements of this section are supplemental to the other requirements in this subpart and apply when one or more employees are hoisted.

(a) The use of equipment to hoist employees is prohibited except where the employer demonstrates that the erection, use, and dismantling of conventional means of reaching the work area, such as a personnel hoist, ladder, stairway, aerial lift, elevating work platform, or scaffold, would be more hazardous, or is not possible because of the project's structural design or worksite conditions. This paragraph does not apply to work covered by subpart R (Steel Erection) of this part.

(b) *Use of personnel platform*.

(1) When using equipment to hoist employees, the employees must be in a personnel platform that meets the requirements of paragraph (e) of this section.

(2) *Exceptions*: A personnel platform is not required for hoisting employees:

(i) Into and out of drill shafts that are up to and including 8 feet in diameter (see paragraph (o) of this section for requirements for hoisting these employees).

(ii) In pile driving operations (see paragraph (p) of this section for requirements for hoisting these employees).

(iii) Solely for transfer to or from a marine worksite in a marine-hoisted personnel transfer device (see paragraph (r) of this section for requirements for hoisting these employees).

(iv) In storage-tank (steel or concrete), shaft and chimney operations (see paragraph (s) of this section for requirements for hoisting these employees).

(c) *Equipment set-up*.

(1) The equipment must be uniformly level, within one percent of level grade, and located on footing that a qualified person has determined to be sufficiently firm and stable.

(2) Equipment with outriggers or stabilizers must have them all extended and locked. The amount of extension must be the same for all outriggers and stabilizers and in accordance with manufacturer procedures and load charts.

(d) *Equipment criteria*.

(1) *Capacity: use of suspended personnel platforms*. The total load (with the platform loaded, including the hook, load line and rigging) must not exceed 50 percent of the rated capacity for the radius and configuration of the equipment, except during proof testing.

(2) *Capacity: use of boom-attached personnel platforms*. The total weight of the loaded personnel platform must not exceed 50 percent of the rated capacity for the radius and configuration of the equipment (except during proof testing).

(3) *Capacity: hoisting personnel without a personnel platform*. When hoisting personnel without a personnel platform pursuant to paragraph (b)(2) of this section, the total load (including the hook, load line, rigging and any other equipment that imposes a load) must not exceed 50 percent of the rated capacity for the radius and configuration of the equipment, except during proof testing.

(4) When the occupied personnel platform is in a stationary working position, the load and boom hoist brakes, swing brakes, and operator actuated secondary braking and locking features (such as pawls or dogs) or automatic secondary brakes must be engaged.

(5) *Devices*.

(i) Equipment (except for derricks and articulating cranes) with a variable angle boom must be equipped with all of the following:

(A) A boom angle indicator, readily visible to the operator, and

(B) A boom hoist limiting device.

(ii) Articulating cranes must be equipped with a properly functioning automatic overload protection device.

(iii) Equipment with a luffing jib must be equipped with:

(A) A jib angle indicator, readily visible to the operator, and.

(B) A jib hoist limiting device.

(iv) Equipment with telescoping booms must be equipped with a device to indicate the boom's extended length clearly to the operator, or must have measuring marks on the boom.

(v) *Anti two-block*. A device which automatically prevents damage and load failure from contact between the load block, overhaul ball, or similar component, and the boom tip (or fixed upper block or similar component) must be used. The device(s) must prevent such damage/failure at all points where two-blocking could occur. *Exception*: this device is not required when hoisting personnel in pile driving operations. Instead, paragraph (p)(2) of this section specifies how to prevent two-blocking during such operations.

(vi) *Controlled load lowering*. The load line hoist drum must have a system, other than the load line hoist brake, which regulates the lowering

rate of speed of the hoist mechanism. This system or device must be used when hoisting personnel.

(NOTE: Free fall of the load line hoist is prohibited (see § 1926.1426(d); the use of equipment in which the boom hoist mechanism can free fall is also prohibited (see § 1926.1426(a)(1).)

(vii) *Proper operation required*. Personnel hoisting operations must not begin unless the devices listed in this section are in proper working order. If a device stops working properly during such operations, the operator must safely stop operations. Personnel hoisting operations must not resume until the device is again working properly. Alternative measures are not permitted. (See § 1926.1417 for tag-out and related requirements.)

(6) Direct attachment of a personnel platform to a luffing jib is prohibited.

(e) *Personnel platform criteria*.

(1) A qualified person familiar with structural design must design the personnel platform and attachment/suspension system used for hoisting personnel.

(2) The system used to connect the personnel platform to the equipment must allow the platform to remain within 10 degrees of level, regardless of boom angle.

(3) The suspension system must be designed to minimize tipping of the platform due to movement of employees occupying the platform.

(4) The personnel platform itself (excluding the guardrail system and personal fall arrest system anchorages), must be capable of supporting, without failure, its own weight and at least five times the maximum intended load.

(5) All welding of the personnel platform and its components must be performed by a certified welder familiar with the weld grades, types and material specified in the platform design.

(6) The personnel platform must be equipped with a guardrail system which meets the requirements of subpart M of this part, and must be enclosed at least from the toeboard to mid-rail with either solid construction material or expanded metal having openings no greater than ½ inch (1.27cm). Points to which personal fall arrest systems are attached must meet the anchorage requirements in subpart M of this part.

(7) A grab rail must be installed inside the entire perimeter of the personnel platform except for access gates/doors.

(8) *Access gates/doors*. If installed, access gates/doors of all types (including swinging, sliding, folding, or other types) must:

(i) Not swing outward. If due to the size of the personnel platform, such as a 1-person platform, it is infeasible for the door to swing inward and allow safe entry for the platform occupant, then the access gate/door may swing outward.

(ii) Be equipped with a device that prevents accidental opening.

(9) Headroom must be sufficient to allow employees to stand upright in the platform.

(10) In addition to the use of hard hats, employees must be protected by overhead protection on the personnel platform when employees are exposed to falling objects. The platform overhead protection must not obscure the view of the

operator or platform occupants (such as wire mesh that has up to ½ inch openings), unless full protection is necessary.

(11) All edges exposed to employee contact must be smooth enough to prevent injury.

(12) The weight of the platform and its rated capacity must be conspicuously posted on the platform with a plate or other permanent marking.

(f) *Personnel platform loading*.

(1) The personnel platform must not be loaded in excess of its rated capacity.

(2) *Use*.

(i) Personnel platforms must be used only for employees, their tools, and the materials necessary to do their work. Platforms must not be used to hoist materials or tools when not hoisting personnel.

(ii) *Exception*: materials and tools to be used during the lift, if secured and distributed in accordance with paragraph (f)(3) of this section may be in the platform for trial lifts.

(3) Materials and tools must be:

(i) Secured to prevent displacement.

(ii) Evenly distributed within the confines of the platform while it is suspended.

(4) The number of employees occupying the personnel platform must not exceed the maximum number the platform was designed to hold or the number required to perform the work, whichever is less.

(g) *Attachment and rigging*.

(1) *Hooks and other detachable devices*.

(i) Hooks used in the connection between the hoist line and the personnel platform (including hooks on overhaul ball assemblies, lower load blocks, bridle legs, or other attachment assemblies or components) must be:

(A) Of a type that can be closed and locked, eliminating the throat opening.

(B) Closed and locked when attached.

(ii) Shackles used in place of hooks must be of the alloy anchor type, with either:

(A) A bolt, nut and retaining pin, in place; or

(B) Of the screw type, with the screw pin secured from accidental removal.

(iii) Where other detachable devices are used, they must be of the type that can be closed and locked to the same extent as the devices addressed in paragraphs (g)(1)(i) and (ii) of this section. Such devices must be closed and locked when attached.

(2) *Rope bridle*. When a rope bridle is used to suspend the personnel platform, each bridle leg must be connected to a master link or shackle (see paragraph (g)(1) of this section) in a manner that ensures that the load is evenly divided among the bridle legs.

(3) Rigging hardware (including wire rope, shackles, rings, master links, and other rigging hardware) and hooks must be capable of supporting, without failure, at least five times the maximum intended load applied or transmitted to that

component. Where rotation resistant rope is used, the slings must be capable of supporting without failure at least ten times the maximum intended load.

(4) Eyes in wire rope slings must be fabricated with thimbles.

(5) Bridles and associated rigging for suspending the personnel platform must be used only for the platform and the necessary employees, their tools and materials necessary to do their work. The bridles and associated rigging must not have been used for any purpose other than hoisting personnel.

(h) *Trial lift and inspection*.

(1) A trial lift with the unoccupied personnel platform loaded at least to the anticipated liftweight must be made from ground level, or any other location where employees will enter the platform, to each location at which the platform is to be hoisted and positioned. Where there is more than one location to be reached from a single set-up position, either individual trial lifts for each location, or a single trial lift, in which the platform is moved sequentially to each location, must be performed; the method selected must be the same as the method that will be used to hoist the personnel.

(2) The trial lift must be performed immediately prior to each shift in which personnel will be hoisted. In addition, the trial lift must be repeated prior to hoisting employees in each of the following circumstances:

(i) The equipment is moved and set up in a new location or returned to a previously used location.

(ii) The lift route is changed, unless the competent person determines that the new route presents no new factors affecting safety.

(3) The competent person must determine that:

(i) Safety devices and operational aids required by this section are activated and functioning properly. Other safety devices and operational aids must meet the requirements of § 1926.1415 and § 1926.1416.

(ii) Nothing interferes with the equipment or the personnel platform in the course of the trial lift.

(iii) The lift will not exceed 50 percent of the equipment's rated capacity at any time during the lift.

(iv) The load radius to be used during the lift has been accurately determined.

(4) Immediately after the trial lift, the competent person must:

(i) Conduct a visual inspection of the equipment, base support or ground, and personnel platform, to determine whether the trial lift has exposed any defect or problem or produced any adverse effect.

(ii) Confirm that, upon the completion of the trial lift process, the test weight has been removed.

(5) Immediately prior to each lift:

(i) The platform must be hoisted a few inches with the personnel and materials/tools on board and inspected by a competent person to ensure that it is secure and properly balanced.

(ii) The following conditions must be determined by a competent person to exist before the lift of personnel proceeds:

(A) Hoist ropes must be free of deficiencies in accordance with § 1926.1413(a).

(B) Multiple part lines must not be twisted around each other.

(C) The primary attachment must be centered over the platform.

(D) If the load rope is slack, the hoisting system must be inspected to ensure that all ropes are properly seated on drums and in sheaves.

(6) Any condition found during the trial lift and subsequent inspection(s) that fails to meet a requirement of this standard or otherwise creates a safety hazard must be corrected before hoisting personnel. (See § 1926.1417 for tag-out and related requirements.)

(i) [*Reserved*.]

(j) *Proof testing*.

(1) At each jobsite, prior to hoisting employees on the personnel platform, and after any repair or modification, the platform and rigging must be proof tested to 125 percent of the platform's rated capacity. The proof test may be done concurrently with the trial lift.

(2) The platform must be lowered by controlled load lowering, braked, and held in a suspended position for a minimum of five minutes with the test load evenly distributed on the platform.

(3) After proof testing, a competent person must inspect the platform and rigging to determine if the test has been passed. If any deficiencies are found that pose a safety hazard, the platform and rigging must not be used to hoist personnel unless

the deficiencies are corrected, the test is repeated, and a competent person determines that the test has been passed. (See § 1926.1417 for tag-out and related requirements.)

(4) Personnel hoisting must not be conducted until the competent person determines that the platform and rigging have successfully passed the proof test.

(k) *Work practices*.

(1) Hoisting of the personnel platform must be performed in a slow, controlled, cautious manner, with no sudden movements of the equipment or the platform.

(2) Platform occupants must:

(i) Keep all parts of the body inside the platform during raising, lowering, and horizontal movement. This provision does not apply to an occupant of the platform when necessary to position the platform or while performing the duties of a signal person.

(ii) Not stand, sit on, or work from the top or intermediate rail or toeboard, or use any other means/device to raise their working height.

(iii) Not pull the platform out of plumb in relation to the hoisting equipment.

(3) Before employees exit or enter a hoisted personnel platform that is not landed, the platform must be secured to the structure where the work is to be performed, unless the employer can demonstrate that securing to the structure would create a greater hazard.

(4) If the platform is tied to the structure, the operator must not move the platform until the operator receives confirmation that it is freely suspended.

(5) Tag lines must be used when necessary to control the platform.

(6) *Platforms without controls*. Where the platform is not equipped with controls, the equipment operator must remain at the equipment controls, on site, and in view of the equipment, at all times while the platform is occupied.

(7) *Platforms with controls*. Where the platform is equipped with controls, all of the following must be met at all times while the platform is occupied:

(i) The occupant using the controls in the platform must be a qualified person with respect to their use, including the safe limitations of the equipment and hazards associated with its operation.

(ii) The equipment operator must be at a set of equipment controls that include boom and swing functions of the equipment, and must be on site and in view of the equipment.

(iii) The platform operating manual must be in the platform or on the equipment.

(8) *Environmental conditions*.

(i) *Wind*. When wind speed (sustained or gusts) exceeds 20 mph at the personnel platform, a qualified person must determine if, in light of the wind conditions, it is not safe to lift personnel. If it is not, the lifting operation must not begin (or, if already in progress, must be terminated).

(ii) *Other weather and environmental conditions*. A qualified person must determine if, in light of indications of dangerous weather conditions, or other impending or existing danger, it is not safe to lift personnel. If it

is not, the lifting operation must not begin (or, if already in progress, must be terminated).

(9) Employees being hoisted must remain in direct communication with the signal person (where used), or the operator.

(10) *Fall protection*.

(i) Except over water, employees occupying the personnel platform must be provided and use a personal fall arrest system. The system must be attached to a structural member within the personnel platform. When working over or near water, the requirements of § 1926.106 apply.

(ii) The fall arrest system, including the attachment point (anchorage) used to comply with paragraph (i) of this section, must meet the requirements in § 1926.502.

(11) *Other load lines*.

(i) No lifts must be made on any other of the equipment's load lines while personnel are being hoisted, except in pile driving operations.

(ii) *Factory-produced boom-mounted personnel platforms that incorporate a winch as original equipment*. Loads are permitted to be hoisted by such a winch while employees occupy the personnel platform only where the load on the winch line does not exceed 500 pounds and does not exceed the rated capacity of the winch and platform.

(12) *Traveling – equipment other than derricks*.

(i) Hoisting of employees while the equipment is traveling is prohibited, except for:

(A) Equipment that travels on fixed rails; or

(B) Where the employer demonstrates that there is no less hazardous way to perform the work.

(C) This exception does not apply to rubber-tired equipment.

(ii) Where employees are hoisted while the equipment is traveling, all of the following criteria must be met:

(A) Equipment travel must be restricted to a fixed track or runway.

(B) Where a runway is used, it must be a firm, level surface designed, prepared and designated as a path of travel for the weight and configuration of the equipment being used to lift and travel with the personnel platform. An existing surface may be used as long as it meets these criteria.

(C) Equipment travel must be limited to boom length.

(D) The boom must be parallel to the direction of travel, except where it is safer to do otherwise.

(E) A complete trial run must be performed to test the route of travel before employees are allowed to occupy the platform. This trial run can be performed at the same time as the trial lift required by paragraph (h) of this section which tests the lift route.

(13) *Traveling – derricks*. Derricks are prohibited from traveling while personnel are hoisted.

(l) [*Reserved*.]

(m) *Pre-lift meeting*. A pre-lift meeting must be:

(1) Held to review the applicable requirements of this section and the procedures that will be followed.

(2) Attended by the equipment operator, signal person (if used for the lift), employees to be hoisted, and the person responsible for the task to be performed.

(3) Held prior to the trial lift at each new work location, and must be repeated for any employees newly assigned to the operation.

(n) *Hoisting personnel near power lines*. Hoisting personnel within 20 feet of a power line that is up to 350 kV, and hoisting personnel within 50 feet of a power line that is over 350 kV, is prohibited, except for work covered by subpart V of this part (Power Transmission and Distribution).

(o) *Hoisting personnel in drill shafts*. When hoisting employees into and out of drill shafts that are up to and including 8 feet in diameter, all of the following requirements must be met:

(1) The employee must be in either a personnel platform or on a boatswain's chair.

(2) If using a personnel platform, paragraphs (a) through (n) of this section apply.

(3) If using a boatswain's chair:

(i) The following paragraphs of this section apply: (a), (c), (d)(1), (d)(3), (d)(4), (e)(1), (e)(2), (e)(3), (f)(1), (f)(2)(i), (f)(3)(i), (g), (h), (k)(1), (k)(6), (k)(8), (k)(9), (k)(11)(i), (m), (n). Where the terms "personnel platform" or "platform" are used in these paragraphs, substitute them with "boatswain's chair."

(ii) A signal person must be stationed at the shaft opening.

(iii) The employee must be hoisted in a slow, controlled descent and ascent.

(iv) The employee must use personal fall protection equipment, including a full body harness, attached independent of the crane/derrick.

(v) The fall protection equipment must meet the applicable requirements in § 1926.502.

(vi) The boatswain's chair itself (excluding the personal fall arrest system anchorages), must be capable of supporting, without failure, its own weight and at least five times the maximum intended load.

(vii) No more than one person must be hoisted at a time.

(p) *Hoisting personnel for pile driving operations*. When hoisting an employee in pile driving operations, the following requirements must be met:

(1) The employee must be in a personnel platform or boatswain's chair.

(2) For lattice boom cranes: Clearly mark the cable (so that it can easily be seen by the operator) at a point that will give the operator sufficient time to stop the hoist to prevent two-blocking, or use a spotter who is in direct communication with the operator to inform the operator when this point is reached. For telescopic boom cranes: Clearly mark the cable (so that it can be easily seen by the operator) at a point that will give the operator sufficient time to stop the hoist to prevent two-blocking, and use a spotter who is in direct communication with the operator to inform the operator when this point is reached.

(3) If using a personnel platform, paragraphs (b) through (n) of this section apply.

(4) If using a boatswain's chair:

(i) The following paragraphs of this section apply: (a), (c), (d)(1), (d)(3), (d)(4), (e)(1), (e)(2), (e)(3), (f)(1), (f)(2)(i), (f)(3)(i), (g), (h), (j), (k)(1), (k)(6), (k)(8), (k)(9), (k)(11)(i), (m), and (n). Where the terms "personnel platform" or "platform" are used in these paragraphs, substitute them with "boatswains chair."

(ii) The employee must be hoisted in a slow, controlled descent and ascent.

(iii) The employee must use personal fall protection equipment, including a full body harness, independently attached to the lower load block or overhaul ball.

(iv) The fall protection equipment must meet the applicable requirements in § 1926.502.

(v) The boatswain's chair itself (excluding the personal fall arrest system anchorages), must be capable of supporting, without failure, its own weight and at least five times the maximum intended load.

(vi) No more than one person must be hoisted at a time.

(q) [*Reserved*.]

(r) *Hoisting personnel for marine transfer*. When hoisting employees solely for transfer to or from a marine worksite, the following requirements must be met:

(1) The employee must be in either a personnel platform or a marine-hoisted personnel transfer device.

(2) If using a personnel platform, paragraphs (a) through (n) of this section apply.

(3) If using a marine-hoisted personnel transfer device:

(i) The following paragraphs of this section apply: (a), (c)(2), (d)(1), (d)(3), (d)(4), (e)(1) through (5), (e)(12), (f)(1), (g), (h), (j), (k)(1), (k)(8), (k)(9), (k)(10)(ii), (k)(11)(i), (k)(12), (m), and (n). Where the terms "personnel platform" or "platform" are used in these paragraphs, substitute them with "marine-hoisted personnel transfer device."

(ii) The transfer device must be used only for transferring workers.

(iii) The number of workers occupying the transfer device must not exceed the maximum number it was designed to hold.

(iv) Each employee must wear a U.S. Coast Guard personal flotation device approved for industrial use.

(s) *Hoisting personnel for storage-tank (steel or concrete), shaft and chimney operations*. When hoisting an employee in storage tank (steel or concrete), shaft and chimney operations, the following requirements must be met:

(1) The employee must be in a personnel platform except when the employer can demonstrate that use of a personnel platform is infeasible; in such a case, a boatswain's chair must be used.

(2) If using a personnel platform, paragraphs (a) through (n) of this section apply.

(3) If using a boatswain's chair:

(i) The following paragraphs of this section apply: (a), (c), (d)(1), (d)(3), (d)(4), (e)(1), (e)(2), (e)(3), (f)(1), (f)(2)(i), (f)(3)(i), (g), (h), (k)(1), (k)(6), (k)(8), (k)(9), (k)(11)(i), (m), (n). Where the terms "personnel platform"

or “platform” are used in these paragraphs, substitute them with “boatswains chair.”

(ii) The employee must be hoisted in a slow, controlled descent and ascent.

(iii) The employee must use personal fall protection equipment, including a full body harness, attached independent of the crane/derrick. When there is no adequate structure for attachment of personal fall arrest equipment as required in § 1926.502(d)(15), the attachment must be to the lower load block or overhaul ball.

(iv) The fall protection equipment must meet the applicable requirements in § 1926.502.

(v) The boatswain’s chair itself (excluding the personal fall arrest system anchorages), must be capable of supporting, without failure, its own weight and at least five times the maximum intended load.

(vi) No more than one person must be hoisted at a time.

§ 1926.1432 Multiple-crane/derrick lifts -- supplemental requirements.

(a) *Plan development*. Before beginning a crane/derrick operation in which more than one crane/derrick will be supporting the load, the operation must be planned. The planning must meet the following requirements:

(1) The plan must be developed by a qualified person.

(2) The plan must be designed to ensure that the requirements of this subpart are met.

(3) Where the qualified person determines that engineering expertise is needed for the planning, the employer must ensure that it is provided.

(b) *Plan implementation*.

(1) The multiple-crane/derrick lift must be directed by a person who meets the criteria for both a competent person and a qualified person, or by a competent person who is assisted by one or more qualified persons (lift director).

(2) The lift director must review the plan in a meeting with all workers who will be involved with the operation.

§ 1926.1433 Design, construction and testing.

The following requirements apply to equipment that has a manufacturer-rated hoisting/lifting capacity of more than 2,000 pounds.

(a) Crawler, truck and locomotive cranes manufactured prior to [INSERT DATE 90 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER] must meet the applicable requirements for design, construction, and testing as prescribed in ANSI B30.5-1968 (incorporated by reference, see § 1926.6), PCSA Std. No. 2 (1968) (incorporated by reference, see § 1926.6), the requirements in paragraph (b) of this section, or the applicable DIN standards that were in effect at the time of manufacture.

(b) Mobile (including crawler and truck) and locomotive cranes manufactured on or after [INSERT DATE 90 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER] must meet the following portions of ASME B30.5-2004 (incorporated by reference, see § 1926.6) as applicable:

(1) In section 5-1.1.1 (“Load Ratings – Where Stability Governs Lifting Performance”), paragraphs (a) – (d) (including subparagraphs).

(2) In section 5-1.1.2 (“Load Ratings – Where Structural Competence Governs Lifting Performance”), paragraph (b).

(3) Section 5-1.2 (“Stability (Backward and Forward)”).

(4) In section 5-1.3.1 (“Boom Hoist Mechanism”), paragraphs (a), (b)(1) and (b)(2), except that when using rotation resistant rope, § 1926.1414(c)(4)(ii)(A) applies.

(5) In section 5-1.3.2 (“Load Hoist Mechanism”), paragraphs (a)(2) through (a)(4) (including subparagraphs), (b) (including subparagraphs), (c) (first sentence only) and (d).

(6) Section 5-1.3.3 (“Telescoping Boom”).

(7) Section 5-1.4 (“Swing Mechanism”).

(8) In section 5-1.5 (“Crane Travel”), all provisions except 5-1.5.3(d).

(9) In section 5-1.6 (“Controls”), all provisions except 5-1.6.1 (c).

(10) Section 5-1.7.4 (“Sheaves”).

(11) Section 5-1.7.5 (“Sheave sizes”).

(12) In section 5-1.9.1 (“Booms”), paragraph (f).

(13) Section 5-1.9.3 (“Outriggers”).

(14) Section 5-1.9.4 (“Locomotive Crane Equipment”).

(15) Section 5-1.9.7 (“Clutch and Brake Protection”).

(16) In section 5-1.9.11 (“Miscellaneous equipment”), paragraphs (a), (c), (e), and (f).

(c) Prototype testing: mobile (including crawler and truck) and locomotive cranes manufactured on or after [INSERT DATE 90 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER] must meet the prototype testing requirements in Test Option A or Test Option B of this section. Tower cranes manufactured on or after [INSERT DATE 90 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER] must meet the prototype testing requirements in BS EN 14439:2006 (incorporated by reference, see § 1926.6).

NOTE: Prototype testing of crawler, locomotive and truck cranes manufactured prior to [INSERT DATE 90 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER] must conform to paragraph (a) of this section.

(1) *Test Option A*.

(i) The following applies to equipment with cantilevered booms (such as hydraulic boom cranes): All the tests listed in SAE J1063 (Nov. 1993) Table 1 (incorporated by reference, see § 1926.6) must be performed to load all critical structural elements to their respective limits. All the strength margins listed in SAE J1063 (Nov. 1993) Table 2 (incorporated by reference, see § 1926.6) must be met.

(ii) The following applies to equipment with pendant supported lattice booms: All the tests listed in SAE J987 (Jun. 2003) Table 1 (incorporated by reference, see § 1926.6) must be performed to load all critical structural elements to their respective limits. All the strength margins listed in SAE J987 (Jun. 2003) Table 2 (incorporated by reference, see § 1926.6) must be met.

(2) *Test Option B*. The testing and verification requirements of BS EN 13000:2004 (incorporated by reference, see § 1926.6) must be met. In applying BS EN 13000:2004, the following additional requirements must be met:

(i) The following applies to equipment with cantilevered booms (such as hydraulic boom cranes): The analysis methodology (computer modeling) must demonstrate that all load cases listed in SAE J1063 (Nov. 1993) (incorporated by reference, see § 1926.6) meet the strength margins listed in SAE J1063 (Nov. 1993) Table 2.

(ii) The following applies to equipment with pendant supported lattice booms: The analysis methodology (computer modeling) must demonstrate that all load cases listed in SAE J987 (Jun. 2003) (incorporated by reference, see § 1926.6) meet the strength margins listed in SAE J987 (Jun. 2003) Table 2.

(iii) *Analysis verification*. The physical testing requirements under SAE J1063 (Nov. 1993) (incorporated by reference, see § 1926.6) and SAE J987 (Jun. 2003) (incorporated by reference, see § 1926.6) must be met unless the reliability of the analysis methodology (computer modeling) has been demonstrated by a documented history of verification through strain gauge measuring or strain gauge measuring in combination with other physical testing.

(d) All equipment covered by this subpart must meet the following requirements:

(1) *Rated capacity and related information*. The information available in the cab (see § 1926.1417(c)) regarding "rated capacity" and related information must include, at a minimum, the following information:

(i) A complete range of the manufacturer's equipment rated capacities, as follows:

(A) At all manufacturer approved operating radii, boom angles, work areas, boom lengths and configurations, jib lengths and angles (or offset).

(B) Alternate ratings for use and nonuse of option equipment which affects rated capacities, such as outriggers, stabilizers, and extra counterweights.

(ii) A work area chart for which capacities are listed in the load chart. (Note: an example of this type of chart is in ASME B30.5-2004, section 5-1.1.3, Figure 11).

(iii) The work area figure and load chart must clearly indicate the areas where no load is to be handled.

(iv) Recommended reeving for the hoist lines must be shown.

(v) Recommended parts of hoist reeving, size, and type of wire rope for various equipment loads.

(vi) Recommended boom hoist reeving diagram, where applicable; size, type and length of wire rope.

(vii) Tire pressure (where applicable).

(viii) Caution or warnings relative to limitations on equipment and operating procedures, including an indication of the least stable direction.

(ix) Position of the gantry and requirements for intermediate boom suspension (where applicable).

(x) Instructions for boom erection and conditions under which the boom, or boom and jib combinations, may be raised or lowered.

(xi) Whether the hoist holding mechanism is automatically or manually controlled, whether free fall is available, or any combination of these.

(xii) The maximum telescopic travel length of each boom telescopic section.

(xiii) Whether sections are telescoped manually or with power.

(xiv) The sequence and procedure for extending and retracting the telescopic boom section.

(xv) Maximum loads permitted during the boom extending operation, and any limiting conditions or cautions.

(xvi) Hydraulic relief valve settings specified by the manufacturer.

(2) Load hooks (including latched and unlatched types), ball assemblies and load blocks must be of sufficient weight to overhaul the line from the highest hook position for boom or boom and jib lengths and the number of parts of the line in use.

(3) Hook and ball assemblies and load blocks must be marked with their rated capacity and weight.

(4) *Latching hooks*.

(i) Hooks must be equipped with latches, except where the requirements of paragraph (d)(4)(ii) of this section are met.

(ii) Hooks without latches, or with latches removed or disabled, must not be used unless:

(A) A qualified person has determined that it is safer to hoist and place the load without latches (or with the latches removed/tied-back).

(B) Routes for the loads are pre-planned to ensure that no employee is required to work in the fall zone except for employees necessary for the hooking or unhooking of the load.

(iii) The latch must close the throat opening and be designed to retain slings or other lifting devices/accessories in the hook when the rigging apparatus is slack.

(5) *Posted warnings*. Posted warnings required by this subpart as well as those originally supplied with the equipment by the manufacturer must be maintained in legible condition.

(6) An accessible fire extinguisher must be on the equipment.

(7) *Cabs*. Equipment with cabs must meet the following requirements:

(i) Cabs must be designed with a form of adjustable ventilation and method for clearing the windshield for maintaining visibility and air circulation. Examples of means for adjustable ventilation include air conditioner or window that can be opened (for ventilation and air

circulation); examples of means for maintaining visibility include heater (for preventing windshield icing), defroster, fan, windshield wiper.

(ii) Cab doors (swinging, sliding) must be designed to prevent inadvertent opening or closing while traveling or operating the machine. Swinging doors adjacent to the operator must open outward. Sliding operator doors must open rearward.

(iii) *Windows*.

(A) The cab must have windows in front and on both sides of the operator. Forward vertical visibility must be sufficient to give the operator a view of the boom point at all times.

(B) Windows may have sections designed to be opened or readily removed. Windows with sections designed to be opened must be designed so that they can be secured to prevent inadvertent closure.

(C) Windows must be of safety glass or material with similar optical and safety properties, that introduce no visible distortion or otherwise obscure visibility that interferes with the safe operation of the equipment.

(iv) A clear passageway must be provided from the operator's station to an exit door on the operator's side.

(v) Areas of the cab roof that serve as a workstation for rigging, maintenance or other equipment-related tasks must be capable of supporting 250 pounds without permanent distortion.

(8) Belts, gears, shafts, pulleys, sprockets, spindles, drums, fly wheels, chains, and other parts or components that reciprocate, rotate or otherwise move must be guarded where contact by employees (except for maintenance and repair employees) is possible in the performance of normal duties.

(9) All exhaust pipes, turbochargers, and charge air coolers must be insulated or guarded where contact by employees (except for maintenance and repair employees) is possible in the performance of normal duties.

(10) Hydraulic and pneumatic lines must be protected from damage to the extent feasible.

(11) The equipment must be designed so that exhaust fumes are not discharged in the cab and are discharged in a direction away from the operator.

(12) *Friction mechanisms*. Where friction mechanisms (such as brakes and clutches) are used to control the boom hoist or load line hoist, they must be:

(i) Of a size and thermal capacity sufficient to control all rated loads with the minimum recommended reeving.

(ii) Adjustable to permit compensation for lining wear to maintain proper operation.

(13) *Hydraulic load hoists*. Hydraulic drums must have an integrally mounted holding device or internal static brake to prevent load hoist movement in the event of hydraulic failure.

(e) The employer's obligations under paragraphs (a) through (c) and (d)(7) through (13) of this section are met where the equipment has not changed (except in accordance with § 1926.1434 (Equipment modifications)) and it can refer to documentation from the

manufacturer showing that the equipment has been designed, constructed and tested in accordance with those paragraphs.

§ 1926.1434 Equipment modifications.

(a) Modifications or additions which affect the capacity or safe operation of the equipment are prohibited except where the requirements of paragraphs (a)(1), (a)(2), (a)(3), (a)(4), or (a)(5) of this section are met.

(1) *Manufacturer review and approval*.

(i) The manufacturer approves the modifications/additions in writing.

(ii) The load charts, procedures, instruction manuals and instruction plates/tags/decals are modified as necessary to accord with the modification/addition.

(iii) The original safety factor of the equipment is not reduced.

(2) *Manufacturer refusal to review request*. The manufacturer is provided a detailed description of the proposed modification/addition, is asked to approve the modification/ addition, but it declines to review the technical merits of the proposal or fails, within 30 days, to acknowledge the request or initiate the review, and all of the following are met:

(i) A registered professional engineer who is a qualified person with respect to the equipment involved:

(A) Approves the modification/addition and specifies the equipment configurations to which that approval applies, and

(B) Modifies load charts, procedures, instruction manuals and instruction plates/tags/decals as necessary to accord with the modification/addition.

(ii) The original safety factor of the equipment is not reduced.

(3) *Unavailable manufacturer*. The manufacturer is unavailable and the requirements of paragraphs (a)(2)(i) and (ii) of this section are met.

(4) *Manufacturer does not complete the review within 120 days of the request*. The manufacturer is provided a detailed description of the proposed modification/addition, is asked to approve the modification/ addition, agrees to review the technical merits of the proposal, but fails to complete the review of the proposal within 120 days of the date it was provided the detailed description of the proposed modification/addition, and the requirements of paragraphs (a)(2)(i) and (ii) of this section are met.

(5) *Multiple manufacturers of equipment designed for use on marine work sites*. The equipment is designed for marine work sites, contains major structural components from more than one manufacturer, and the requirements of paragraphs (a)(2)(i) and (ii) of this section are met.

(b) Modifications or additions which affect the capacity or safe operation of the equipment are prohibited where the manufacturer, after a review of the technical safety merits of the proposed modification/addition, rejects the proposal and explains the reasons for the rejection in a written response. If the manufacturer rejects the proposal but does not explain the reasons for the rejection in writing, the employer may treat this as a manufacturer refusal to review the request under paragraph (a)(2) of this section.

(c) The provisions in paragraphs (a) and (b) of this section do not apply to modifications made or approved by the U.S. military.

§ 1926.1435 Tower cranes.

(a) This section contains supplemental requirements for tower cranes; all sections of this subpart apply to tower cranes unless specified otherwise.

(b) *Erecting, climbing and dismantling*.

(1) Section 1926.1403 (Assembly/Disassembly – selection of manufacturer or employer procedures), § 1926.1404 (Assembly/Disassembly – general requirements (applies to all assembly and disassembly operations)), § 1926.1405 (Disassembly – additional requirements for dismantling of booms and jibs (applies to both the use of manufacturer procedures and employer procedures)), and § 1926.1406 (Assembly/Disassembly – employer procedures - general requirements), apply to tower cranes (except as otherwise specified), except that the term "assembly/ disassembly" is replaced by "erecting, climbing and dismantling," and the term "disassembly" is replaced by "dismantling."

(2) *Dangerous areas (self-erecting tower cranes)*. In addition to the requirements in § 1926.1404(e), for self-erecting tower cranes, the following applies: Employees must not be in or under the tower, jib, or rotating portion of the crane during erecting, climbing and dismantling operations until the crane is secured in a locked position and the competent person in charge indicates it is safe to enter this area, unless the manufacturer's instructions direct otherwise and only the necessary personnel are permitted in this area.

(3) *Foundations and structural supports*. Tower crane foundations and structural supports (including both the portions of the structure used for support and the means of attachment) must be designed by the manufacturer or a registered professional engineer.

(4) *Addressing specific hazards*. The requirements in § 1926.1404(h)(1) through (9) apply. In addition, the A/D director must address the following:

(i) *Foundations and structural supports*. The A/D director must determine that tower crane foundations and structural supports are installed in accordance with their design.

(ii) *Loss of backward stability*. Backward stability before swinging self erecting cranes or cranes on traveling or static undercarriages.

(iii) *Wind speed*. Wind must not exceed the speed recommended by the manufacturer or, where manufacturer does not specify this information, the speed determined by a qualified person.

(5) *Plumb tolerance*. Towers must be erected plumb to the manufacturer's tolerance and verified by a qualified person. Where the manufacturer does not specify plumb tolerance, the crane tower must be plumb to a tolerance of at least 1:500 (approximately 1 inch in 40 feet).

(6) *Multiple tower crane jobsites*. On jobsites where more than one fixed jib (hammerhead) tower crane is installed, the cranes must be located such that no crane can come in contact with the structure of another crane. Cranes are permitted to pass over one another.

(7) *Climbing procedures*. Prior to, and during, all climbing procedures (including inside climbing and top climbing), the employer must:

(i) Comply with all manufacturer prohibitions.

(ii) Have a registered professional engineer verify that the host structure is strong enough to sustain the forces imposed through the braces, brace anchorages and supporting floors.

(8) *Counterweight/ballast*.

(i) Equipment must not be erected, dismantled or operated without the amount and position of counterweight and/or ballast in place as specified by the manufacturer or a registered professional engineer familiar with the equipment.

(ii) The maximum counterweight and/or ballast specified by the manufacturer or registered professional engineer familiar with the equipment must not be exceeded.

(c) *Signs*. The size and location of signs installed on tower cranes must be in accordance with manufacturer specifications. Where these are unavailable, a registered professional engineer familiar with the type of equipment involved must approve in writing the size and location of any signs.

(d) *Safety devices*.

(1) Section 1926.1415 does not apply to tower cranes.

(2) The following safety devices are required on all tower cranes unless otherwise specified:

(i) Boom stops on luffing boom type tower cranes.

(ii) Jib stops on luffing boom type tower cranes if equipped with a jib attachment.

(iii) Travel rail end stops at both ends of travel rail.

(iv) Travel rail clamps on all travel bogies.

(v) Integrally mounted check valves on all load supporting hydraulic cylinders.

(vi) Hydraulic system pressure limiting device.

(vii) The following brakes, which must automatically set in the event of pressure loss or power failure, are required:

(A) A hoist brake on all hoists.

(B) Swing brake.

(C) Trolley brake.

(D) Rail travel brake.

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

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

(x) Trolley end stops must be provided at both ends of travel of the trolley.

(3) *Proper operation required*. Operations must not begin unless the devices listed in this section are in proper working order. If a device stops working properly during operations, the operator must safely stop operations. The equipment must be taken out of service, and operations must not resume until the device is again working properly. See § 1926.1417(f). Alternative measures are not permitted to be used.

(e) *Operational aids*.

(1) Section 1926.1416 does not apply to tower cranes.

(2) The devices listed in this section ("operational aids") are required on all tower cranes covered by this subpart, unless otherwise specified.

(3) Operations must not begin unless the operational aids are in proper working order, except where the employer meets the specified temporary alternative measures. More protective alternative measures specified by the tower crane manufacturer, if any, must be followed. See § 1926.1417(j) for additional requirements.

(4) If an 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 under § 1926.1434.

(5) *Category I operational aids and alternative measures*. Operational aids listed in this paragraph that are not working properly must be repaired no later than 7 calendar days after the deficiency occurs. *Exception*: If the employer documents that it has ordered the necessary parts within 7 calendar days of the occurrence of the deficiency, the repair must be completed within 7 calendar days of receipt of the parts.

(i) *Trolley travel limiting device*. The travel of the trolley must be restricted at both ends of the jib by a trolley travel limiting device to

prevent the trolley from running into the trolley end stops. *Temporary alternative measures*:

(A) *Option A*. The trolley rope must be marked (so it can be seen by the operator) at a point that will give the operator sufficient time to stop the trolley prior to the end stops.

(B) *Option B*. A spotter who is in direct communication with the operator must be used when operations are conducted within 10 feet of the outer or inner trolley end stops.

(ii) *Boom hoist limiting device*. The range of the boom must be limited at the minimum and maximum radius. *Temporary alternative measures*: Clearly mark the cable (so it can be seen by the operator) at a point that will give the operator sufficient time to stop the boom hoist within the minimum and maximum boom radius, or use a spotter who is in direct communication with the operator to inform the operator when this point is reached.

(iii) *Anti two-blocking device*. The tower crane must be equipped with a device which automatically prevents damage from contact between the load block, overhaul ball, or similar component, and the boom tip (or fixed upper block or similar component). The device(s) must prevent such damage at all points where two-blocking could occur. *Temporary alternative measures*: Clearly mark the cable (so it can be seen by the operator) at a point that will give the operator sufficient time to stop the hoist to prevent two-blocking, or use a spotter who is in direct

communication with the operator to inform the operator when this point is reached.

(iv) *Hoist drum lower limiting device*. Tower cranes manufactured after [INSERT DATE 1 YEAR AND 90 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER] must be equipped with a device that prevents the last 2 wraps of hoist cable from being spooled off the drum. *Temporary alternative measures*: Mark the cable (so it can be seen by the operator) at a point that will give the operator sufficient time to stop the hoist prior to last 2 wraps of hoist cable being spooled off the drum, or use a spotter who is in direct communication with the operator to inform the operator when this point is reached

(v) *Load moment limiting device*. The tower crane must have a device that prevents moment overloading. *Temporary alternative measures*: A radius indicating device must be used (if the tower crane is not equipped with a radius indicating device, the radius must be measured to ensure the load is within the rated capacity of the crane). In addition, the weight of the load must be determined from a source recognized by the industry (such as the load's manufacturer), or by a calculation method recognized by the industry (such as calculating a steel beam from measured dimensions and a known per foot weight), or by other equally reliable means. This information must be provided to the operator prior to the lift.

(vi) *Hoist line pull limiting device*. The capacity of the hoist must be limited to prevent overloading, including each individual gear ratio if

equipped with a multiple speed hoist transmission. *Temporary alternative measures*: The operator must ensure that the weight of the load does not exceed the capacity of the hoist (including for each individual gear ratio if equipped with a multiple speed hoist transmission).

(vii) *Rail travel limiting device*. The travel distance in each direction must be limited to prevent the travel bogies from running into the end stops or buffers. *Temporary alternative measures*: A spotter who is in direct communication with the operator must be used when operations are conducted within 10 feet of either end of the travel rail end stops; the spotter must inform the operator of the distance of the travel bogies from the end stops or buffers.

(viii) *Boom hoist drum positive locking device and control*. The boom hoist drum must be equipped with a control that will enable the operator to positively lock the boom hoist drum from the cab. *Temporary alternative measures*: The device must be manually set when required if an electric, hydraulic or automatic control is not functioning.

(6) *Category II operational aids and alternative measures*. Operational aids listed in this paragraph that are not working properly must be repaired no later than 30 calendar days after the deficiency occurs. *Exception*: If the employer documents that it has ordered the necessary parts within 7 calendar days of the occurrence of the deficiency, and the part is not received in time to complete the repair in 30 calendar days, the repair must be completed within 7 calendar days of receipt of the parts.

(i) *Boom angle or hook radius indicator*.

(A) Luffing boom tower cranes must have a boom angle indicator readable from the operator's station.

(B) Hammerhead tower cranes manufactured after [INSERT DATE 1 YEAR AND 90 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER] must have a hook radius indicator readable from the operator's station.

(C) *Temporary alternative measures*: Hook radii or boom angle must be determined by measuring the hook radii or boom angle with a measuring device.

(ii) *Trolley travel deceleration device*. The trolley speed must be automatically reduced prior to the trolley reaching the end limit in both directions. *Temporary alternative measure*: The employer must post a notice in the cab of the crane notifying the operator that the trolley travel deceleration device is malfunctioning and instructing the operator to take special care to reduce the trolley speed when approaching the trolley end limits.

(iii) *Boom hoist deceleration device*. The boom speed must be automatically reduced prior to the boom reaching the minimum or maximum radius limit. *Temporary alternative measure*: The employer must post a notice in the cab of the crane notifying the operator that the boom hoist deceleration device is malfunctioning and instructing the

operator to take special care to reduce the boom speed when approaching the minimum or maximum radius limits.

(iv) *Load hoist deceleration device*. The load speed must be automatically reduced prior to the hoist reaching the upper limit. *Temporary alternative measure*: The employer must post a notice in the cab of the crane notifying the operator that the load hoist deceleration device is malfunctioning and instructing the operator to take special care to reduce the load speed when approaching the upper limits.

(v) *Wind speed indicator*. A device must be provided to display the wind speed and must be mounted above the upper rotating structure on tower cranes. On self erecting cranes, it must be mounted at or above the jib level. *Temporary alternative measures*: Use of wind speed information from a properly functioning indicating device on another tower crane on the same site, or a qualified person estimates the wind speed.

(vi) *Load indicating device*. Cranes manufactured after [INSERT DATE 1 YEAR AND 90 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER] must have a device that displays the magnitude of the load on the hook. Displays that are part of load moment limiting devices that display the load on the hook meet this requirement. *Temporary alternative measures*: The weight of the load must be determined from a source recognized by the industry (such as the load's manufacturer), or by a calculation method recognized by the industry (such as calculating a steel beam from measured dimensions and a known

per foot weight), or by other equally reliable means. This information must be provided to the operator prior to the lift.

(f) *Inspections*.

(1) Section 1926.1412 (Inspections) applies to tower cranes, except that the term "assembly" is replaced by "erection." Section 1926.1413 (Wire rope – inspection) applies to tower cranes.

(2) *Pre-erection inspection*. Before each crane component is erected, it must be inspected by a qualified person for damage or excessive wear.

(i) The qualified person must pay particular attention to components that will be difficult to inspect thoroughly during shift inspections.

(ii) If the qualified person determines that a component is damaged or worn to the extent that it would create a safety hazard if used on the crane, that component must not be erected on the crane unless it is repaired and, upon reinspection by the qualified person, found to no longer create a safety hazard.

(iii) If the qualified person determines that, though not presently a safety hazard, the component needs to be monitored, the employer must ensure that the component is checked in the monthly inspections. Any such determination must be documented, and the documentation must be available to any individual who conducts a monthly inspection.

(3) *Post-erection inspection*. In addition to the requirements in § 1926.1412(c), the following requirements must be met:

(i) A load test using certified weights, or scaled weights using a certified scale with a current certificate of calibration, must be conducted after each erection.

(ii) The load test must be conducted in accordance with the manufacturer's instructions when available. Where these instructions are unavailable, the test must be conducted in accordance with written load test procedures developed by a registered professional engineer familiar with the type of equipment involved.

(4) *Monthly*. The following additional items must be included:

(i) Tower (mast) bolts and other structural bolts (for loose or dislodged condition) from the base of the tower crane up or, if the crane is tied to or braced by the structure, those above the upper-most brace support.

(ii) The upper-most tie-in, braces, floor supports and floor wedges where the tower crane is supported by the structure, for loose or dislodged components.

(5) *Annual*. In addition to the items that must be inspected under § 1926.1412(f), all turntable and tower bolts must be inspected for proper condition and torque.

§ 1926.1436 Derricks.

(a) This section contains supplemental requirements for derricks, whether temporarily or permanently mounted; all sections of this subpart apply to derricks unless specified otherwise. A derrick is powered equipment consisting of a mast or equivalent member that is held at or near the end by guys or braces, with or without a boom, and its hoisting

mechanism. The mast/equivalent member and/or the load is moved by the hoisting mechanism (typically base-mounted) and operating ropes. Derricks include: A-frame, basket, breast, Chicago boom, gin pole (except gin poles used for erection of communication towers), guy, shearleg, stiffleg, and variations of such equipment.

(b) *Operation – procedures*.

(1) Section 1926.1417 (Operation) applies except for § 1926.1417(c) (Accessibility of procedures).

(2) *Load chart contents*. Load charts must contain at least the following information:

(i) Rated capacity at corresponding ranges of boom angle or operating radii.

(ii) Specific lengths of components to which the rated capacities apply.

(iii) Required parts for hoist reeving.

(iv) Size and construction of rope must be included on the load chart or in the operating manual.

(3) *Load chart location*.

(i) *Permanent installations*. For permanently installed derricks with fixed lengths of boom, guy, and mast, a load chart must be posted where it is visible to personnel responsible for the operation of the equipment.

(ii) *Non-permanent installations*. For derricks that are not permanently installed, the load chart must be readily available at the job site to personnel responsible for the operation of the equipment.

(c) Construction.

(1) *General requirements*.

(i) Derricks must be constructed to meet all stresses imposed on members and components when installed and operated in accordance with the manufacturer's/ builder's procedures and within its rated capacity.

(ii) Welding of load sustaining members must conform to recommended practices in ANSI/AWS D14.3-94 (incorporated by reference, see § 1926.6) or AWS D1.1/D1.1M:2002 (incorporated by reference, see § 1926.6).

(2) *Guy derricks*.

(i) The minimum number of guys must be 6, with equal spacing, except where a qualified person or derrick manufacturer approves variations from these requirements and revises the rated capacity to compensate for such variations.

(ii) Guy derricks must not be used unless the employer has the following guy information from the manufacturer or a qualified person, when not available from the manufacturer:

(A) The number of guys.

(B) The spacing around the mast.

(C) The size, grade, and construction of rope to be used for each guy.

(iii) For guy derricks manufactured after December 18, 1970, in addition to the information required in paragraph (c)(2)(ii) of this section, the

employer must have the following guy information from the manufacturer or a qualified person, when not available from the manufacturer:

(A) The amount of initial sag or tension.

(B) The amount of tension in guy line rope at anchor.

(iv) The mast base must permit the mast to rotate freely with allowance for slight tilting of the mast caused by guy slack.

(v) The mast cap must:

(A) Permit the mast to rotate freely.

(B) Withstand tilting and cramping caused by the guy loads.

(C) Be secured to the mast to prevent disengagement during erection.

(D) Be provided with means for attaching guy ropes.

(3) *Stiffleg derricks*.

(i) The mast must be supported in the vertical position by at least two stifflegs; one end of each must be connected to the top of the mast and the other end securely anchored.

(ii) The stifflegs must be capable of withstanding the loads imposed at any point of operation within the load chart range.

(iii) The mast base must:

(A) Permit the mast to rotate freely (when necessary).

(B) Permit deflection of the mast without binding.

(iv) The mast must be prevented from lifting out of its socket when the mast is in tension.

(v) The stiffleg connecting member at the top of the mast must:

(A) Permit the mast to rotate freely (when necessary).

(B) Withstand the loads imposed by the action of the stifflegs.

(C) Be secured so as to oppose separating forces.

(4) *Gin pole derricks*.

(i) Guy lines must be sized and spaced so as to make the gin pole stable in both boomed and vertical positions. *Exception*: Where the size and/or spacing of guy lines do not result in the gin pole being stable in both boomed and vertical positions, the employer must ensure that the derrick is not used in an unstable position.

(ii) The base of the gin pole must permit movement of the pole (when necessary).

(iii) The gin pole must be anchored at the base against horizontal forces (when such forces are present).

(5) *Chicago boom derricks*. The fittings for stepping the boom and for attaching the topping lift must be arranged to:

(i) Permit the derrick to swing at all permitted operating radii and mounting heights between fittings.

(ii) Accommodate attachment to the upright member of the host structure.

(iii) Withstand the forces applied when configured and operated in accordance with the manufacturer's/ builder's procedures and within its rated capacity.

(iv) Prevent the boom or topping lift from lifting out under tensile forces.

(d) *Anchoring and guying*.

(1) Load anchoring data developed by the manufacturer or a qualified person must be used.

(2) *Guy derricks*.

(i) The mast base must be anchored.

(ii) The guys must be secured to the ground or other firm anchorage.

(iii) The anchorage and guying must be designed to withstand maximum horizontal and vertical forces encountered when operating within rated capacity with the particular guy slope and spacing specified for the application.

(3) *Stiffleg derricks*.

(i) The mast base and stifflegs must be anchored.

(ii) The mast base and stifflegs must be designed to withstand maximum horizontal and vertical forces encountered when operating within rated capacity with the particular stiffleg spacing and slope specified for the application.

(e) *Swingers and hoists*.

(1) The boom, swinger mechanisms and hoists must be suitable for the derrick work intended and must be anchored to prevent displacement from the imposed loads.

(2) *Hoists*.

(i) Base mounted drum hoists must meet the requirements in the following sections of ASME B30.7-2001 (incorporated by reference, see § 1926.6):

(A) Sections 7-1.1 ("Load ratings and markings").

(B) Section 7-1.2 ("Construction"), except: 7-1.2.13 ("Operator's cab"); 7-1.2.15 ("Fire extinguishers").

(C) Section 7-1.3 ("Installation").

(D) Applicable terms in section 7-0.2 ("Definitions").

(ii) *Load tests for new hoists*. The employer must ensure that new hoists are load tested to a minimum of 110% of rated capacity, but not more than 125% of rated capacity, unless otherwise recommended by the manufacturer. This requirement is met where the manufacturer has conducted this testing.

(iii) *Repaired or modified hoists*. Hoists that have had repairs, modifications or additions affecting their capacity or safe operation must be evaluated by a qualified person to determine if a load test is necessary. If it is, load testing must be conducted in accordance with paragraphs (e)(2)(ii) and (iv) of this section.

(iv) *Load test procedure*. Load tests required by paragraphs (e)(2)(ii) or (e)(2)(iii) of this section must be conducted as follows:

(A) The test load must be hoisted a vertical distance to assure that the load is supported by the hoist and held by the hoist brake(s).

(B) The test load must be lowered, stopped and held with the brake(s).

(C) The hoist must not be used unless a competent person determines that the test has been passed.

(f) *Operational aids*.

(1) Section 1926.1416 (Operational aids) applies, except for § 1926.1416(d)(1) (Boom hoist limiting device), § 1926.1416(e)(1) (Boom angle or radius indicator), and § 1926.1416(e)(4) (Load weighing and similar devices).

(2) *Boom angle aid*. A boom angle indicator is not required but if the derrick is not equipped with a functioning one, the employer must ensure that either:

(i) The boom hoist cable must be marked with caution and stop marks. The stop marks must correspond to maximum and minimum allowable boom angles. The caution and stop marks must be in view of the operator, or a spotter who is in direct communication with the operator; or

(ii) An electronic or other device that signals the operator in time to prevent the boom from moving past its maximum and minimum angles, or automatically prevents such movement, is used.

(3) *Load weight/capacity devices*.

(i) Derricks manufactured more than one year after [INSERT DATE 90 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER] with a maximum rated capacity over 6,000 pounds must have at least one of the following: load weighing device, load moment indicator, rated capacity indicator, or rated capacity limiter. *Temporary*

alternative measures: The weight of the load must be determined from a source recognized by the industry (such as the load's manufacturer), or by a calculation method recognized by the industry (such as calculating a steel beam from measured dimensions and a known per foot weight), or by other equally reliable means. This information must be provided to the operator prior to the lift. See § 1926.1417(j) for additional requirements.

(ii) A load weight/capacity device that is not working properly must be repaired no later than 30 days after the deficiency occurs. *Exception*: If the employer documents that it has ordered the necessary parts within 7 days of the occurrence of the deficiency, and the part is not received in time to complete the repair in 30 days, the repair must be completed within 7 days of receipt of the parts.

(g) *Post-assembly approval and testing – new or reinstalled derricks*.

(1) *Anchorages*.

(i) Anchorages, including the structure to which the derrick is attached (if applicable), must be approved by a qualified person.

(ii) If using a rock or hairpin anchorage, the qualified person must determine if any special testing of the anchorage is needed. If so, it must be tested accordingly.

(2) *Functional test*. Prior to initial use, new or reinstalled derricks must be tested by a competent person with no hook load to verify proper operation. This test must include:

(i) Lifting and lowering the hook(s) through the full range of hook travel.

(ii) Raising and lowering the boom through the full range of boom travel.

(iii) Swinging in each direction through the full range of swing.

(iv) Actuating the anti two-block and boom hoist limit devices (if provided).

(v) Actuating locking, limiting and indicating devices (if provided).

(3) *Load test*. Prior to initial use, new or reinstalled derricks must be load tested by a competent person. The test load must meet the following requirements:

(i) Test loads must be at least 100% and no more than 110% of the rated capacity, unless otherwise recommended by the manufacturer or qualified person, but in no event must the test load be less than the maximum anticipated load.

(ii) The test must consist of:

(A) Hoisting the test load a few inches and holding to verify that the load is supported by the derrick and held by the hoist brake(s).

(B) Swinging the derrick, if applicable, the full range of its swing, at the maximum allowable working radius for the test load.

(C) Booming the derrick up and down within the allowable working radius for the test load.

(D) Lowering, stopping and holding the load with the brake(s).

(iii) The derrick must not be used unless the competent person determines that the test has been passed.

(4) *Documentation*. Tests conducted under this paragraph must be documented. The document must contain the date, test results and the name of the tester. The

document must be retained until the derrick is re-tested or dismantled, whichever occurs first. All such documents must be available, during the applicable document retention period, to all persons who conduct inspections in accordance with § 1926.1412.

(h) *Load testing repaired or modified derricks*. Derricks that have had repairs, modifications or additions affecting the derrick's capacity or safe operation must be evaluated by a qualified person to determine if a load test is necessary. If it is, load testing must be conducted and documented in accordance with paragraph (g) of this section.

(i) [*Reserved*.]

(j) *Power failure procedures*. If power fails during operations, the derrick operator must safely stop operations. This must include:

(1) Setting all brakes or locking devices.

(2) Moving all clutch and other power controls to the off position.

(k) *Use of winch heads*.

(1) Ropes must not be handled on a winch head without the knowledge of the operator.

(2) While a winch head is being used, the operator must be within reach of the power unit control lever.

(l) [*Reserved*.]

(m) *Securing the boom*.

(1) When the boom is being held in a fixed position, dogs, pawls, or other positive holding mechanisms on the boom hoist must be engaged.

(2) When taken out of service for 30 days or more, the boom must be secured by one of the following methods:

(i) Laid down.

(ii) Secured to a stationary member, as nearly under the head as possible, by attachment of a sling to the load block.

(iii) For guy derricks, lifted to a vertical position and secured to the mast.

(iv) For stiffleg derricks, secured against the stiffleg.

(n) The process of jumping the derrick must be supervised by the A/D director.

(o) Derrick operations must be supervised by a competent person.

(p) *Inspections*. In addition to the requirements in § 1926.1412, the following additional items must be included in the inspections:

(1) *Daily*: Guys for proper tension.

(2) *Annual*.

(i) Gudgeon pin for cracks, wear, and distortion.

(ii) Foundation supports for continued ability to sustain the imposed loads.

(q) *Qualification and Training*. The employer must train each operator of a derrick on the safe operation of equipment the individual will operate. Section 1926.1427 of this subpart (Operator qualification and certification) does not apply.

§ 1926.1437 Floating cranes/derricks and land cranes/derricks on barges.

(a) This section contains supplemental requirements for floating cranes/derricks and land cranes/derricks on barges, pontoons, vessels or other means of flotation (i.e.,

vessel/flotation device). The sections of this subpart apply to floating cranes/derricks and land cranes/derricks on barges, pontoons, vessels or other means of flotation, unless specified otherwise. The requirements of this section do not apply when using jacked barges when the jacks are deployed to the river, lake, or sea bed and the barge is fully supported by the jacks.

(b) *General requirements*. The requirements in paragraphs (c) through (k) of this section apply to both floating cranes/derricks and land cranes/derricks on barges, pontoons, vessels or other means of flotation.

(c) *Work area control*.

(1) The requirements of § 1926.1424 (Work area control) apply, except for § 1926.1424(a)(2)(ii).

(2) The employer must either:

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

(ii) 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. In addition, the employer must train each employee to understand what these markings signify.

(d) *Keeping clear of the load*. Section 1926.1425 does not apply.

(e) *Additional safety devices*. In addition to the safety devices listed in § 1926.1415, the following safety devices are required:

(1) Barge, pontoon, vessel or other means of flotation list and trim device. The safety device must be located in the cab or, when there is no cab, at the operator's station.

(2) Positive equipment house lock.

(3) *Wind speed and direction indicator*. A competent person must determine if wind is a factor that needs to be considered; if wind needs to be considered, a wind speed and direction indicator must be used.

(f) *Operational aids*.

(1) An anti two-block device is required only when hoisting personnel or hoisting over an occupied cofferdam or shaft.

(2) Section 1926.1416(e)(4) (Load weighing and similar devices) does not apply to dragline, clamshell (grapple), magnet, drop ball, container handling, concrete bucket, and pile driving work performed under this section.

(g) *Accessibility of procedures applicable to equipment operation*. If the crane/derrick has a cab, the requirements of § 1926.1417(c) apply. If the crane/derrick does not have a cab, the employer must ensure that:

(1) Rated capacities (load charts) are posted at the operator's station. If the operator's station is moveable (such as with pendant-controlled equipment), the load charts are posted on the equipment.

(2) Procedures applicable to the operation of the equipment (other than load charts), recommended operating speeds, special hazard warnings, instructions and operators manual, must be readily available on board the vessel/flotation device.

(h) *Inspections*. In addition to meeting the requirements of § 1926.1412 for inspecting the crane/derrick, the employer must inspect the barge, pontoons, vessel or other means of flotation used to support a floating crane/derrick or land crane/derrick, and ensure that:

(1) *Shift*. For each shift inspection, the means used to secure/attach the equipment to the vessel/flotation device is in proper condition, including wear, corrosion, loose or missing fasteners, defective welds, and (when applicable) insufficient tension.

(2) *Monthly*. For each monthly inspection:

(i) The means used to secure/attach the equipment to the vessel/flotation device is in proper condition, including inspection for wear, corrosion, and, when applicable, insufficient tension.

(ii) The vessel/flotation device is not taking on water.

(iii) The deckload is properly secured.

(iv) The vessel/flotation device is watertight based on the condition of the chain lockers, storage, fuel compartments, and hatches.

(v) The firefighting and lifesaving equipment is in place and functional.

(3) The shift and monthly inspections are conducted by a competent person, and:

(i) If any deficiency is identified, an immediate determination is made by a qualified person whether the deficiency constitutes a hazard.

(ii) If the deficiency is determined to constitute a hazard, the vessel/flotation device is removed from service until the deficiency has been corrected.

(4) *Annual: external vessel/flotation device inspection*. For each annual inspection:

(i) The external portion of the barge, pontoons, vessel or other means of flotation used is inspected annually by a qualified person who has expertise with respect to vessels/flotation devices and that the inspection includes the following items:

(A) The items identified in paragraphs (h)(1) (*Shift*) and (h)(2) (*Monthly*) of this section.

(B) Cleats, bitts, chocks, fenders, capstans, ladders, and stanchions, for significant corrosion, wear, deterioration, or deformation that could impair the function of these items.

(C) External evidence of leaks and structural damage; evidence of leaks and damage below the waterline may be determined through internal inspection of the vessel/flotation device.

(D) Four-corner draft readings.

(E) Firefighting equipment for serviceability.

(ii) Rescue skiffs, lifelines, work vests, life preservers and ring buoys are inspected for proper condition.

(iii) If any deficiency is identified, an immediate determination is made by the qualified person whether the deficiency constitutes a hazard or, though not yet a hazard, needs to be monitored in the monthly inspections.

(A) If the qualified person determines that the deficiency constitutes a hazard, the vessel/flotation device is removed from

service until it has been corrected. See requirements in § 1926.1417(f).

(B) If the qualified person determines that, though not presently a hazard, the deficiency needs to be monitored, the deficiency is checked in the monthly inspections.

(5) *Four-year: internal vessel/flotation device inspection*. For each four-year inspection:

(i) A marine engineer, marine architect, licensed surveyor, or other qualified person who has expertise with respect to vessels/flotation devices surveys the internal portion of the barge, pontoons, vessel, or other means of flotation.

(ii) If the surveyor identifies a deficiency, an immediate determination is made by the surveyor as to whether the deficiency constitutes a hazard or, though not yet a hazard, needs to be monitored in the monthly or annual inspections, as appropriate.

(A) If the surveyor determines that the deficiency constitutes a hazard, the vessel/flotation device is removed from service until it has been corrected.

(B) If the surveyor determines that, though not presently a hazard, the deficiency needs to be monitored, the deficiency is checked in the monthly or annual inspections, as appropriate.

(6) *Documentation*. The monthly and annual inspections required in paragraphs (h)(2) and (h)(4) of this section are documented in accordance with §§ 1926.1412

(e)(3) and 1926.1412(f)(7), respectively, and that the four-year inspection required in paragraph (h)(5) of this section is documented in accordance with § 1926.1412(f)(7), except that the documentation for that inspection must be retained for a minimum of 4 years. All such documents must be made available, during the applicable document retention period, to all persons who conduct inspections in accordance with § 1926.1412.

(i) [*Reserved*.]

(j) *Working with a diver*. The employer must meet the following additional requirements when working with a diver in the water:

(1) If a crane/derrick is used to get a diver into and out of the water, it must not be used for any other purpose until the diver is back on board. When used for more than one diver, it must not be used for any other purpose until all divers are back on board.

(2) The operator must remain at the controls of the crane/derrick at all times.

(3) In addition to the requirements in §§ 1926.1419 through 1926.1422 (Signals), either:

(i) A clear line of sight must be maintained between the operator and tender; or

(ii) The signals between the operator and tender must be transmitted electronically.

(4) The means used to secure the crane/derrick to the vessel/flotation device (see paragraph (n)(5) of this section) must not allow any amount of shifting in any direction.

(k) Manufacturer's specifications and limitations.

(1) The employer must ensure that the barge, pontoons, vessel, or other means of flotation must be capable of withstanding imposed environmental, operational and in-transit loads when used in accordance with the manufacturer's specifications and limitations.

(2) The employer must ensure that the manufacturer's specifications and limitations with respect to environmental, operational, and in-transit loads for a barge, pontoon, vessel, or other means of flotation are not exceeded or violated.

(3) When the manufacturer's specifications and limitations are unavailable, the employer must ensure that the specifications and limitations established by a qualified person with respect to environmental, operational and in-transit loads for the barge, pontoons, vessel, or other means of flotation are not exceeded or violated.

(l) [*Reserved*.]

(m) *Floating cranes/derricks*. For equipment designed by the manufacturer (or employer) for marine use by permanent attachment to barges, pontoons, vessels or other means of flotation:

(1) *Load charts*.

(i) The employer must not exceed the manufacturer load charts applicable to operations on water. When using these charts, the employer must comply with all parameters and limitations (such as dynamic and environmental parameters) applicable to the use of the charts.

(ii) The employer must ensure that load charts take into consideration a minimum wind speed of 40 miles per hour.

(2) The employer must ensure that the requirements for maximum allowable list and maximum allowable trim as specified in Table M1 of this section are met.

TABLE M1		
Equipment designed for marine use by permanent attachment (other than derricks):		
Rated Capacity	Maximum Allowable List	Maximum Allowable Trim
25 tons or less	5 degrees	5 degrees
Over 25 tons	7 degrees	7 degrees
Derricks designed for marine use by permanent attachment:		
Any rated capacity	10 degrees	10 degrees

(3) The employer must ensure that the equipment is stable under the conditions specified in Tables M2 and M3 of this section. (Note: Freeboard is the vertical distance between the water line and the main deck of the vessel.)

TABLE M2		
Operated at	Wind speed	Minimum freeboard
Rated capacity	60 mph	2 ft
Rated capacity plus 25%	60 mph	1 ft
High boom, no load	60 mph	2 ft

TABLE M3	
For backward stability of the boom:	
Operated at	Wind speed
High boom, no load, full back list (least stable condition)	90 mph

(4) If the equipment is employer-made, it must not be used unless the employer has documents demonstrating that the load charts and applicable parameters for

use meet the requirements of paragraphs (m)(1) through (3) of this section. Such documents must be signed by a registered professional engineer who is a qualified person with respect to the design of this type of equipment (including the means of flotation).

(5) The employer must ensure that the barge, pontoons, vessel or other means of flotation used:

(i) Are structurally sufficient to withstand the static and dynamic loads of the crane/derrick when operating at the crane/derrick's maximum rated capacity with all planned and actual deck loads and ballasted compartments.

(ii) Have a subdivided hull with one or more longitudinal watertight bulkheads for reducing the free-surface effect.

(iii) Have access to void compartments to allow for inspection and pumping.

(n) *Land cranes/derricks*. For land cranes/derricks used on barges, pontoons, vessels or other means of flotation, the employer must ensure that:

(1) The rated capacity of the equipment (including but not limited to modification of load charts) applicable for use on land is reduced to:

(i) Account for increased loading from list, trim, wave action, and wind.

(ii) Be applicable to a specified location(s) on the specific barge, pontoons, vessel or other means of flotation that will be used, under the environmental conditions expected and encountered.

(iii) The conditions required in paragraphs (n)(3) and (n)(4) of this section are met.

(2) The rated capacity modification required in paragraph (n)(1) of this section is performed by the equipment manufacturer, or a qualified person who has expertise with respect to both land crane/derrick capacity and the stability of vessels/flotation devices.

(3) For list and trim.

(i) The maximum allowable list and the maximum allowable trim for the barge, pontoon, vessel or other means of flotation must not exceed the amount necessary to ensure that the conditions in paragraph (n)(4) of this section are met. In addition, the maximum allowable list and the maximum allowable trim does not exceed the least of the following: 5 degrees, the amount specified by the crane/derrick manufacturer, or, when, an amount is not so specified, the amount specified by the qualified person.

(ii) The maximum allowable list and the maximum allowable trim for the land crane/derrick does not exceed the amount specified by the crane/derrick manufacturer, or, when, an amount is not so specified, the amount specified by the qualified person.

(4) For the following conditions:

(i) All deck surfaces of the barge, pontoons, vessel or other means of flotation used are above water.

(ii) The entire bottom area of the barge, pontoons, vessel or other means of flotation used is submerged.

(5) Physical attachment, corralling, rails system and centerline cable system meet the requirements in Option (1), Option (2), Option (3), or Option (4) of this section, and that whichever option is used also meets the requirements of paragraph (n)(5)(v) of this section.

(i) *Option (1) – Physical attachment*. The crane/derrick is physically attached to the barge, pontoons, vessel or other means of flotation. Methods of physical attachment include crossed-cable systems attached to the crane/derrick and vessel/flotation device, bolting or welding the crane/derrick to the vessel/flotation device, strapping the crane/derrick to the vessel/flotation device with chains, or other methods of physical attachment.

(ii) *Option (2) – Corralling*. The crane/derrick is prevented from shifting by installing barricade restraints (i.e., a corralling system). Employers must ensure that corralling systems do not allow the equipment to shift by any amount of shifting in any direction.

(iii) *Option (3) – Rails*. The crane/derrick must be prevented from shifting by being mounted on a rail system. Employers must ensure that rail clamps and rail stops are used unless the system is designed to prevent movement during operation by other means.

(iv) *Option (4) – Centerline cable system*. The crane/derrick is prevented from shifting by being mounted to a wire rope system. The employer must ensure that the wire rope system meets the following requirements:

(A) The wire rope and attachments are of sufficient size and strength to support the side load of crane/derrick.

(B) The wire rope is attached physically to the vessel/flotation device.

(C) The wire rope is attached to the crane/derrick by appropriate attachment methods (such as shackles or sheaves) on the undercarriage, and that the method used will allow the crew to secure the crane/derrick from movement during operation and to move the crane/derrick longitudinally along the vessel/flotation device for repositioning.

(D) Means are installed to prevent the crane/derrick from passing the forward or aft end of the wire rope attachments.

(E) The crane/derrick is secured from movement during operation.

(v) The systems/means used to comply with Option (1), Option (2), Option (3), or Option (4) of this section are designed by a marine engineer, registered professional engineer familiar with floating crane/derrick design, or qualified person familiar with floating crane/derrick design.

(6) *Exception*. For mobile auxiliary cranes used on the deck of a floating crane/derrick, the requirement specified by paragraph (n)(5) of this section to use

Option (1), Option (2), Option (3), or Option (4) does not apply when the employer demonstrates implementation of a plan and procedures that meet the following requirements:

(i) A marine engineer or registered professional engineer familiar with floating crane/derrick design develops and signs a written plan for the use of the mobile auxiliary crane.

(ii) The plan is designed so that the applicable requirements of this section are met despite the position, travel, operation, and lack of physical attachment (or corralling, use of rails or cable system) of the mobile auxiliary crane.

(iii) The plan specifies the areas of the deck where the mobile auxiliary crane is permitted to be positioned, travel, and operate, and the parameters and limitations of such movements and operation.

(iv) The deck is marked to identify the permitted areas for positioning, travel, and operation.

(v) The plan specifies the dynamic and environmental conditions that must be present for use of the plan.

(vi) If the dynamic and environmental conditions in paragraph (n)(6)(v) of this section are exceeded, the mobile auxiliary crane is attached physically or corralled in accordance with Option (1), Option (2) or Option (4) of paragraph (n)(5) of this section.

(7) The barge, pontoons, vessel or other means of flotation used:

(i) Are structurally sufficient to withstand the static and dynamic loads of the crane/derrick when operating at the crane/derrick's maximum rated capacity with all anticipated deck loads and ballasted compartments.

(ii) Have a subdivided hull with one or more longitudinal watertight bulkheads for reducing the free surface effect.

(iii) Have access to void compartments to allow for inspection and pumping.

§ 1926.1438 Overhead & gantry cranes.

(a) *Permanently installed overhead and gantry cranes*. The requirements of § 1910.179, except for § 1910.179(b)(1), and not the requirements of this subpart CC, apply to the following equipment when used in construction and permanently installed in a facility: overhead and gantry cranes, including semigantry, cantilever gantry, wall cranes, storage bridge cranes, and others having the same fundamental characteristics.

(b) *Overhead and gantry cranes that are not permanently installed in a facility*.

(1) This paragraph applies to the following equipment when used in construction and not permanently installed in a facility: overhead and gantry cranes, overhead/bridge cranes, semigantry, cantilever gantry, wall cranes, storage bridge cranes, launching gantry cranes, and similar equipment having the same fundamental characteristics, irrespective of whether it travels on tracks, wheels, or other means.

(2) The following requirements apply to equipment identified in paragraph (b)(1) of this section:

(i) Sections 1926.1400 through 1926.1414; §§ 1926.1417 through 1926.1425; § 1926.1426(d), §§ 1926.1427 through 1926.1434; § 1926.1437, § 1926.1439, and § 1926.1441.

(ii) The following portions of § 1910.179:

(A) Paragraphs (b)(5),(6),(7); (e)(1),(3),(5),(6); (f)(1),(4); (g); (h)(1),(3); (k); and (n) of § 1910.179.

(B) The definitions in § 1910.179(a) except for "hoist" and "load." For those words, the definitions in § 1926.1401 apply.

(C) Section 1910.179(b)(2), but only where the equipment identified in paragraph (b)(1) of this section (§ 1926.1438) was manufactured before September 19, 2001.

(iii) For equipment manufactured on or after September 19, 2001, the following sections of ASME B30.2-2005 (incorporated by reference, see § 1926.6) apply: 2-1.3.1; 2-1.3.2; 2-1.4.1; 2-1.6; 2-1.7.2; 2-1.8.2; 2-1.9.1; 2-1.9.2; 2-1.11; 2-1.12.2; 2-1.13.7; 2-1.14.2; 2-1.14.3; 2-1.14.5; 2-1.15.; 2-2.2.2; 2-3.2.1.1. In addition, 2-3.5 applies, except in 2-3.5.1(b), "29 CFR 1910.147" is substituted for "ANSI Z244.1."

§ 1926.1439 Dedicated pile drivers.

(a) The provisions of subpart CC apply to dedicated pile drivers, except as specified in this section.

(b) Section 1926.1416(d)(3) (Anti two-blocking device) does not apply.

(c) Section 1926.1416(e)(4) (Load weighing and similar devices) applies only to dedicated pile drivers manufactured after [INSERT DATE 1 YEAR AND 90 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER].

(d) In § 1926.1433, only §§ 1926.1433(d) and (e) apply to dedicated pile drivers.

§ 1926.1440 Sideboom cranes.

(a) The provisions of this standard apply, except § 1926.1402 (Ground conditions), § 1926.1415 (Safety devices), § 1926.1416 (Operational aids), and § 1926.1427 (Operator qualification and certification).

(b) Section 1926.1426 (Free fall and controlled load lowering) applies, except § 1926.1426(a)(2)(i). Sideboom cranes in which the boom is designed to free fall (live boom) are permitted only if manufactured prior to [INSERT DATE 90 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER].

(c) Sideboom cranes mounted on wheel or crawler tractors must meet all of the following requirements of ASME B30.14-2004 (incorporated by reference, see § 1926.6):

(1) Section 14-1.1 (“Load Ratings”).

(2) Section 14-1.3 (“Side Boom Tractor Travel”).

(3) Section 14-1.5 (“Ropes and Reeving Accessories”).

(4) Section 14-1.7.1 (“Booms”).

(5) Section 14-1.7.2 (“General Requirements – Exhaust Gases”).

(6) Section 14-1.7.3 (“General Requirements – Stabilizers (Wheel-Type Side Boom Tractors)”).

(7) Section 14-1.7.4 (“General Requirements – Welded Construction”).

(8) Section 14-1.7.6 (“General Requirements – Clutch and Brake Protection”).

(9) Section 14-2.2.2 (“Testing – Rated Load Test”), except that it applies only to equipment that has been altered or modified.

(10) In section 14-3.1.2 (“Operator Qualifications”), paragraph (a), except the phrase “When required by law.”

(11) In section 14-3.1.3 (“Operating Practices”), paragraphs (e), (f)(1) – (f)(4), (f)(6), (f)(7), (h), and (i).

(12) In section 14-3.2.3 (“Moving the Load”), paragraphs (j), (l), and (m).

§ 1926.1441 Equipment with a rated hoisting/lifting capacity of 2,000 pounds or less.

The following paragraphs of this section specify requirements for employers using equipment with a maximum rated hoisting/lifting capacity of 2,000 pounds or less.

(a) The employer using this equipment must comply with the following provisions of this subpart: § 1926.1400 (Scope); § 1926.1401 (Definitions); § 1926.1402 (Ground conditions); § 1926.1403 (Assembly/disassembly—selection of manufacturer or employer procedures); § 1926.1406 (Assembly/disassembly—employer procedures); §§ 1926.1407 through 1926.1411 (Power line safety); § 1926.1412(c) (*Post-assembly*); §§ 1926.1413 through 1926.1414 (Wire rope); § 1926.1418 (Authority to stop operation); §§ 1926.1419 through 1926.1422 (Signals); § 1926.1423 (Fall protection); § 1926.1425 (Keeping clear of the load) (except for § 1926.1425(c)(3) (qualified rigger)); § 1926.1426 (Free fall and controlled load lowering); § 1926.1432 (Multiple crane/derrick lifts—supplemental requirements); § 1926.1434 (Equipment modifications); § 1926.1435

(Tower cranes); § 1926.1436 (Derricks); § 1926.1437 (Floating cranes/derricks and land cranes/derricks on barges); § 1926.1438 (Overhead & gantry cranes).

(b) *Assembly/disassembly*.

(1) In addition to compliance with §§ 1926.1403 (Assembly/disassembly—selection of manufacturer or employer procedures) and 1926.1406 (Assembly/disassembly—employer procedures), the employer must also comply with § 1926.1441(b)(2)-(3).

(2) *Components and configuration*. The employer must ensure that:

(i) The selection of components, and the configuration of the equipment, that affect the capacity or safe operation of the equipment complies with either the:

(A) Manufacturer instructions, recommendations, limitations, and specifications. When these documents and information are unavailable, a registered professional engineer familiar with the type of equipment involved must approve, in writing, the selection and configuration of components; or

(B) Approved modifications that meet the requirements of § 1926.1434 (Equipment modifications).

(ii) *Post-assembly inspection*. Upon completion of assembly, the equipment is inspected to ensure that it is in compliance with paragraph (b)(2)(i) of this section (see § 1926.1412(c) for post-assembly inspection requirements).

(3) *Manufacturer prohibitions*. The employer must comply with applicable manufacturer prohibitions.

(c) *Operation – procedures*.

(1) The employer must comply with all manufacturer procedures applicable to the operational functions of the equipment, including its use with attachments.

(2) *Unavailable operation procedures*. The employer must:

(i) When the manufacturer's procedures are unavailable, develop, and ensure compliance with, all procedures necessary for the safe operation of the equipment and attachments.

(ii) Ensure that procedures for the operational controls are developed by a qualified person.

(iii) Ensure that procedures related to the capacity of the equipment are developed and signed by a registered professional engineer familiar with the equipment.

(3) *Accessibility*. The employer must ensure that:

(i) The load chart is available to the operator at the control station;

(ii) Procedures applicable to the operation of the equipment, recommended operating speeds, special hazard warnings, instructions, and operator's manual are readily available for use by the operator.

(iii) When rated capacities are available at the control station only in electronic form and a failure occurs that makes the rated capacities inaccessible, the operator immediately ceases operations or follows safe

shut-down procedures until the rated capacities (in electronic or other form) are available.

(d) *Safety devices and operational aids*.

(1) The employer must ensure that safety devices and operational aids that are part of the original equipment are maintained in accordance with manufacturer procedures.

(2) *Anti two-blocking*. The employer must ensure that equipment covered by this section manufactured more than one year after [INSERT DATE 90 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER] have either an anti two-block device that meets the requirements of § 1926.1416(d)(3), or is designed so that, in the event of a two-block situation, no damage or load failure will occur (for example, by using a power unit that stalls in response to a two-block situation).

(e) *Operator qualifications*. The employer must train each operator, prior to operating the equipment, on the safe operation of the type of equipment the operator will be using.

(f) *Signal person qualifications*. The employer must train each signal person in the proper use of signals applicable to the use of the equipment.

(g) [*Reserved*.]

(h) *Inspections*. The employer must ensure that equipment is inspected in accordance with manufacturer procedures.

(i) [*Reserved*.]

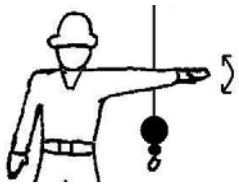
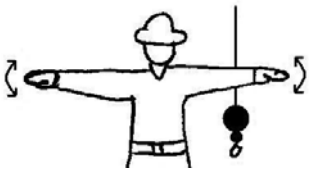
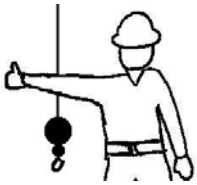
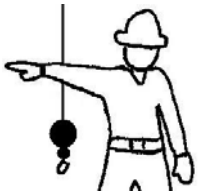
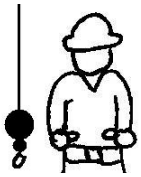
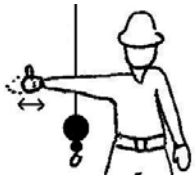
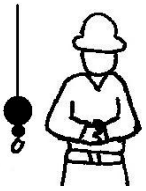
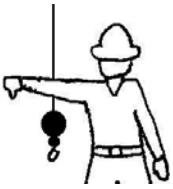
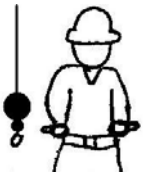
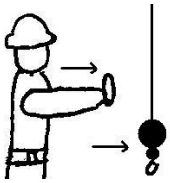
(j) *Hoisting personnel*. The employer must ensure that equipment covered by this section is not used to hoist personnel.

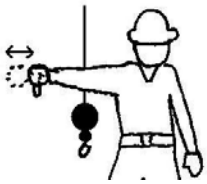
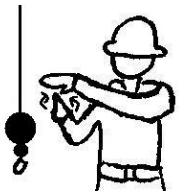
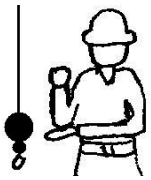
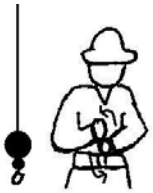
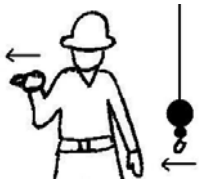
(k) *Design*. The employer must ensure that the equipment is designed by a qualified engineer.

§ 1926.1442 Severability.

Should a court of competent jurisdiction hold any provision(s) of subpart CC to be invalid, such action shall not affect any other provision of the subpart.

Appendix A to Subpart CC of Part 1926–Standard Hand Signals.

 **STOP –** With arm extended horizontally to the side, palm down, arm is swung back and forth.	 **EMERGENCY STOP** – With both arms extended horizontally to the side, palms down, arms are swung back and forth.	**HOIST –** With upper arm extended to the side, forearm and index finger pointing straight up, hand and finger make small circles.
 **RAISE BOOM –** With arm extended horizontally to the side, thumb points up with other fingers closed.	 **SWING –** With arm extended horizontally, index finger points in direction that boom is to swing.	 **RETRACT TELESCOPING BOOM –** With hands to the front at waist level, thumbs point at each other with other fingers closed.
 **RAISE THE BOOM AND LOWER THE LOAD –** With arm extended horizontally to the side and thumb pointing up, fingers open and close while load movement is desired.	 **DOG EVERYTHING –** Hands held together at waist level.	**LOWER –** With arm and index finger pointing down, hand and finger make small circles.
 **LOWER BOOM –** With arm extended horizontally to the side, thumb points down with other fingers closed.	 **EXTEND TELESCOPING BOOM –** With hands to the front at waist level, thumbs point outward with other fingers closed.	 **TRAVEL/TOWER TRAVEL** – With all fingers pointing up, arm is extended horizontally out and back to make a pushing motion in the direction of travel.

 **LOWER THE BOOM AND RAISE THE LOAD –** With arm extended horizontally to the side and thumb pointing down, fingers open and close while load movement is desired.	 **MOVE SLOWLY –** A hand is placed in front of the hand that is giving the action signal.	 **USE AUXILIARY HOIST** (whipline) **–** With arm bent at elbow and forearm vertical, elbow is tapped with other hand. Then regular signal is used to indicate desired action.
 **CRAWLER CRANE TRAVEL, BOTH TRACKS –** Rotate fists around each other in front of body; direction of rotation away from body indicates travel forward; rotation towards body indicates travel backward.	 **USE MAIN HOIST –** A hand taps on top of the head. Then regular signal is given to indicate desired action.	 **CRAWLER CRANE TRAVEL, ONE TRACK –** Indicate track to be locked by raising fist on that side. Rotate other fist in front of body in direction that other track is to travel.
 **TROLLEY TRAVEL** – With palm up, fingers closed and thumb pointing in direction of motion, hand is jerked horizontally in direction trolley is to travel.		

Appendix B to Subpart CC of Part 1926–Assembly/Disassembly: Sample Procedures for Minimizing the Risk of Unintended Dangerous Boom Movement.

1. Section 1926.1404(f)(1) provides that when pins (or similar devices) are being removed, employees must not be under the boom, jib, or other components, except where the requirements of § 1926.1404(f)(2) are met. The exception in § 1926.1404(f)(2) applies when the employer demonstrates that site constraints require one or more employees to be under the boom, jib, or other components when pins (or similar devices) are being removed. In such a situation, the A/D director must implement procedures that minimize the risk of unintended dangerous movement and minimize the duration and extent of exposure under the boom.

The following scenario is an example of how the exception applies: A boom cannot be disassembled on the ground because of aboveground piping (as might be found, for example, in an oil refinery) that precludes lowering the boom to the ground. The boom must therefore be disassembled in the air, and the employees who remove the pins must perform that work from an aerial lift whose base is positioned on one side (the near side) of the boom. To gain access to the pins on the far side, the aerial lift basket must move under the boom, since, due to lack of room, the aerial lift cannot be repositioned on the far side. Due to lack of room, the aerial lift cannot be repositioned on the far side, so the aerial basket must move under the boom to gain access to the pins on the far side.

To minimize the risk of unintended dangerous movement while the pins are removed, the A/D director uses an assist crane that is rigged to support the boom section

that is being detached, using particular care to ensure that the section end that is near the employee(s) removing the pins is well supported. The duration and extent of exposure is minimized by removing the far side pins first, moving the aerial lift basket as soon as possible to the near side so that the employees are no longer under the boom, and then removing the near side pins.

2. Section 1926.1404(h)(6)(i) provides that, during assembly/disassembly, the center of gravity of the load must be identified if that is necessary for the method used for maintaining stability. Section 1926.1404(h)(6)(ii) states that, where there is insufficient information to accurately identify the center of gravity, measures designed to prevent unintended dangerous movement resulting from an inaccurate identification of the center of gravity must be used.

An example of the application of § 1926.1404(h)(6)(ii) is as follows: The boom is assembled by lowering boom sections sequentially into place using an assist crane. The A/D director's plan is to keep the boom sections stable while they are lowered into place by attaching the assist crane hoist line above the center of gravity of each section. However, in assembling the non-symmetrical top section of the boom, the A/D director is not able to determine where to attach the assist crane hoist line so that it is above the center of gravity. In this situation, before raising the section, all personnel are kept clear of the section and the section is first raised a few inches to determine whether it tips when raised (if it did tip, it would indicate it is not rigged over the center of gravity). If this occurs, the hoist line is repositioned and the procedure repeated (with employees kept

clear of the section while it is raised) until the A/D director determines that it is rigged over the center of gravity and can be moved into place without dangerous movement.

Appendix C to Subpart CC of Part 1926–Operator Certification: Written Examination: Technical Knowledge Criteria.

This appendix contains information for employers, accredited testing organizations, auditors and government entities developing criteria for a written examination to test an individual's technical knowledge relating to the operation of cranes.

(a) General technical information.

(1) The functions and limitations of the crane and attachments.

(2) Wire rope:

(i) Background information necessary to understand the inspection and removal from service criteria in § 1926.1413 and § 1926.1414.

(ii) Capacity and when multi-part rope is needed.

(iii) Relationship between line pull and safe working load.

(iv) How to determine the manufacturer's recommended rope for the crane.

(3) Rigging devices and their use, such as:

(i) Slings.

(ii) Spreaders.

(iii) Lifting beams.

(iv) Wire rope fittings, such as clips, shackles and wedge sockets.

(v) Saddles (softeners).

(vi) Clamps (beams).

(4) The technical limitations of protective measures against electrical hazards:

(i) Grounding.

(ii) Proximity warning devices.

(iii) Insulated links.

(iv) Boom cages.

(v) Proximity to electric power lines, radii, and microwave structures.

(5) The effects of load share and load transfer in multi-crane lifts.

(6) Basic crane terms.

(7) The basics of machine power flow systems.

(i) Mechanical.

(ii) Electrical.

(iii) Pneumatic.

(iv) Hydraulic.

(v) Combination.

(8) The significance of the instruments and gauge readings.

(9) The effects of thermal expansion and contraction in hydraulic cylinders.

(10) Background information necessary to understand the requirements of pre-operation and inspection.

(11) How to use the safety devices and operational aids required under § 1926.1415 and § 1926.1416.

(12) The difference between duty-cycle and lifting operations.

(13) How to calculate net capacity for every possible configuration of the equipment using the manufacturer’s load chart.

(14) How to use manufacturer-approved attachments and their effect on the equipment.

(15) How to obtain dimensions, weight, and center of gravity of the load.

(16) The effects of dynamic loading from:

(i) Wind.

(ii) Stopping and starting.

(iii) Impact loading.

(iv) Moving with the load.

(17) The effect of side loading.

(18) The principles of backward stability.

(b) Site information.

(1) How to identify the suitability of the supporting ground/surface to support the expected loads of the operation. Elements include:

(i) Weaknesses below the surface (such as voids, tanks, loose fill).

(ii) Weaknesses on the surface (such as retaining walls, slopes, excavations, depressions).

(2) Proper use of mats, blocking/cribbing, outriggers, stabilizers, or crawlers.

(3) Identification of site hazards such as power lines, piping, and traffic.

(4) How to review operation plans with supervisors and other workers (such as the signal person), including how to determine working height, boom length, load radius, and travel clearance.

(5) How to determine if there is adequate room for extension of crawlers or outriggers/stabilizers and counterweights.

(c) Operations.

(1) How to pick, carry, swing and place the load smoothly and safely on rubber tires and on outriggers/stabilizers or crawlers (where applicable).

(2) How to communicate at the site with supervisors, the crew and the signal person.

(3) Proper procedures and methods of reeving wire ropes and methods of reeving multiple-part lines and selecting the proper load block and/or ball.

(4) How to react to changes in conditions that affect the safe operation of the equipment.

(5) How to shut down and secure the equipment properly when leaving it unattended.

(6) Know how to apply the manufacturer's specifications for operating in various weather conditions, and understand how environmental conditions affect the safe operation of the equipment.

(7) How to properly level the equipment.

(8) How to verify the weight of the load and rigging prior to initiating the lift.

(9) How to determine where the load is to be picked up and placed and how to verify the radii.

(10) Know basic rigging procedures.

(11) How to carry out the shift inspection required in this subpart.

(12) Know that the following operations require specific procedures and skill levels:

(i) Multi-crane lifts.

(ii) Hoisting personnel.

(iii) Clamshell/dragline operations.

(iv) Pile driving and extracting.

(v) Concrete operations, including poured-in-place and tilt-up.

(vi) Demolition operations.

(vii) Operations on water.

(viii) Magnet operations.

(ix) Multi-drum operations.

(13) Know the proper procedures for operating safely under the following conditions:

(i) Traveling with suspended loads.

(ii) Approaching a two-block condition.

(iii) Operating near power lines.

(iv) Hoisting personnel.

(v) Using other than full outrigger/crawler or stabilizer extensions.

(vi) Lifting loads from beneath the surface of the water.

(vii) Using various approved counterweight configurations.

(viii) Handling loads out of the operator's vision ("operating in the blind").

(ix) Using electronic communication systems for signal communication.

(14) Know the proper procedures for load control and the use of hand-held tag lines.

(15) Know the emergency response procedure for:

(i) Fires.

(ii) Power line contact.

(iii) Loss of stability.

(iv) Control malfunction.

(v) Two-blocking.

(vi) Overload.

(vii) Carrier or travel malfunction.

(16) Know how to properly use outriggers and stabilizers in accordance with manufacturer specifications.

(d) Use of load charts.

(1) Know the terminology necessary to use load charts.

(2) Know how to ensure that the load chart is the appropriate chart for the equipment in its particular configuration and application.

(3) Know how to use load charts. This includes knowing:

(i) The operational limitations of load charts and footnotes.

(ii) How to relate the chart to the configuration of the crane, crawlers, or outriggers/stabilizers extended or retracted, jib erected or offset, and various counterweight configurations.

(iii) The difference between structural capacity and capacity limited by stability.

(iv) What is included in capacity ratings.

(v) The range diagram and its relationship to the load chart.

(vi) The work area chart and its relationship to the load chart.

(vii) Where to find and how to use the “parts-of-line” information.

(4) Know how to use the load chart together with the load indicators and/or load moment devices.

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